首届中英三校博士生联合论坛
暨2025年西交利物浦大学博士生论坛

THE FIRST XJTLU-UoL-XJTU POSTGRADUATE RESEARCH JOINT CONFERENCE & 2025 XJTLU POSTGRADUATE RESEARCH SYMPOSIUM

2025年3月19日-21日
MARCH 19-21, 2025

江苏，苏州
Suzhou, Jiangsu

CONTACT
XJTLU GRADUATE SCHOOL

E: GraduateSchool@xjtlu.edu.cn
T: +86(0)512-81889001
L: Room 1117, 11th floor of Central building
Xi'an Jiaotong-Liverpool University

Xi'an Jiaotong-Liverpool University 西交利物浦大学
UNIVERSITY OF LIVERPOOL
西安交通大学 XI'AN JIAOTONG UNIVERSITY

ABOUT THE FIRST XJTLU-UOL-XJTU POSTGRADUATE RESEARCH JOINT CONFERENCE & 2025 XJTLU POSTGRADUATE RESEARCH SYMPOSIUM

The First XJTLU-UoL-XJTU Postgraduate Research Joint Conference & 2025 XJTLU Postgraduate Research Symposium is dedicated to providing an international academic forum for exchanging and discussing research ideas among doctoral researchers from a wide range of disciplinary areas.

Postgraduate research (PhD) students from universities and institutes all over the world are warmly welcomed to showcase their latest research through poster and oral presentation sessions at XJTLU, engage in discussions, and receive feedback from academics, industry experts, and fellow students. In addition, all participants will have the opportunity to directly communicate with industry experts and visit prominent companies within Suzhou Industrial Park (SIP) to gain firsthand insights into technology implementation and explore potential collaborative opportunities.

THEME

The Journey from Research to Impact - Translation and Application of Academic Findings into Practical Solutions

HOSTED BY

Xi'an Jiaotong-Liverpool University (XJTLU)
University of Liverpool (UoL)
Xi'an Jiaotong University (XJTU)

SUPPORTED BY

UK-Jiangsu World Class University Consortium

CONTENTS

RESEARCH AREA

Architecture

PAGE 51

	PROJECT TITLE	INSTITUTION	CANDIDATE
1	Performance and Parametric Design Optimization of Semi-Transparent Building-Integrated Photovoltaic Façade in Different Climatic Regions	XJTLU	Aanuoluwapo Aderonke Oguntade
2	The architectural vernacular and cultural heritage of the Akha: A case study from Alulaozhai, Xishuangbanna (Sipsongpanna), China	UoL	Daneel Starr
3	Holographic Construction in Design for disassembly inspired by Iranian timber structures for post-disaster temporary housing	XJTLU	Farkhondeh Vahdati
4	Conversational AI design partner for early-stage collaborative architectural design process	XJTLU	Lok Hang Cheung
5	Optimisation of Low-rise Lightweight Steel-Framed Residential Building Design in the Hot-Summer-Cold-Winter Region of China by Life Cycle Analysis	XJTLU	Yang Yang
6	Fractal-Based Computational Design and 3D-Concrete Printing of Extra-Light Porous Panels for Building Applications	XJTLU	Yuhan Li

RESEARCH AREA

Biological Sciences

PAGE 54

	PROJECT TITLE	INSTITUTION	CANDIDATE
7	Investigation of the underlying mechanism of E3 ubiquitin ligase TRIM31 (TRIM31) in triggering tumorigenesis and progression of esophageal squamous cell carcinoma	XJTLU	Aidi Gao
8	Disease-responsive IL-10R+ oligodendrocytes promote myelin repair	SNNU	Bing Han
9	Challenges in evaluating generative models for molecular design	XJTLU	Bo Li
10	Research on the mechanism of Triptolide regulating NRP1-mediated Rac1/PI3K/AKT signal pathway in relieving Cytokine Release Syndrome	XJTLU	Chencheng Li
11	Prevention of α-synuclein aggregation by small molecules as a promising therapeutic approach for Parkinson's disease	XJTLU	Gang Yong

RESEARCH AREA

Biological Sciences

PAGE 56

	PROJECT TITLE	INSTITUTION	CANDIDATE
12	The role of Neutrophil extracellular traps (NETs)-DNA in atherosclerosis	XJTLU	Guona Chen
13	Machine Learning-Driven Calibration and Systematic Variance Analysis Advance m6A Epitranscriptomics	XJTLU	Haokai Ye
14	Developing a generalized deep learning approach for large scale virtual screening in the entire chemical space	XJTLU	Haoruo Zha
15	Statistical modeling of single-cell epitranscriptomics enabled trajectory and regulatory inference of RNA methylation	XJTLU	Haozhe Wang
16	Comparative Analysis of Governance and Regulatory Institutions on Intellectual Property and Technology Transfer in 'Orphan Drugs' Biotech Companies' International Expansion: P.R.C. vs. U.S.	XJTLU	Henian Song
17	The development and optimization of transdermal protein delivery system for the treatment of chronic diseases	XJTLU	Huan Xu
18	In vitro and in vivo pharmacological validation of APG-5918 in T-cell lymphoma	XJTLU	Huanshan Guo
19	Investigation of inhibitory cross interactions between renal URAT1 and OAT3 transporters	XJTLU	Jialin Bian
20	Structure-based vaccine design of a pre-fusion glycoprotein B for varicella-zoster virus	XJTLU	Jianguo Yin
21	Profiling circular RNA modifications from nanopore direct RNA sequencing	XJTLU	Jiayi Li
22	Nanodiamonds inhibit migration and angiogenesis in glioblastoma-conditioned endothelial cells	XJTLU	Jiayi Wan
23	Role of CD70 in renal clear cell carcinoma	XJTLU	Jie Ni
24	Water-Mediated Active Conformational Transitions of Lipase on Organic Solvent Interfaces	NTU	Jihang Zhang
25	Design and optimization of JO-IEX process for highly efficient quaternary separation of 5′-ribonucleotides	NTU	Jingwei Kou

RESEARCH AREA

Biological Sciences

PAGE 64

	PROJECT TITLE	INSTITUTION	CANDIDATE
26	Enhance CAR-T cell infiltration into pancreatic solid tumors through the expression of an engineered membrane-anchored Tissue Inhibitor of Metalloproteinases (TIMP)	XJTLU	Jipeng Zheng
27	Multifunctional bioactive materials	XJTU	Junping Ma
28	Investigation of mitochondria-targeted compounds in Alzheimer's disease models	XJTLU	Junyu Yao
29	ROS-related mitochondrial homeostasis and signalling pathways in mtDNA 3243A>G mutation diseases	XJTLU	Keyue Ding
30	PorX/PorY Two-Component System and SigP Act as Regulators of the Type IX Secretion System in Flavobacterium psychrophilum	XJTLU	Lin Su
31	Exploring the Prevalence of Monkey B Virus in Primate Breeding Colonies in China and Its Cellular Entry Mechanisms	XJTLU	Lingyan Yang
32	Microbial community formation during dietary exposure to Fe3O4-urease nanoconjugates in silkworm (Bombyx mori): Principal fungi groups facilitate functional flux	JUST	Marriam Khurshid
33	Developing a HSD17B13 Gene Knockdown Approach Based on siRNA for The Therapy of Non-alcoholic Steatohepatitis (NASH)	XJTLU	Qin Meng
34	Investigating the role of bioactive compounds from red beet (Beta vulgaris L.) in modulating lipid metabolism via the function of gut microbiota	XJTLU	Qingyang Wu
35	Assessment of Recombinant Ligase-type Asparaginyl Endopeptidase Proteolytic Activity Expressed in Nicotiana benthamiana	JSU	Rehman Sarwar
36	T1Pr downregulates IFN-γ-mediated PD-L1 production in MDA-MB-231 cells	XJTLU	Renrong Tao
37	Enhancing m6A modification prediction with summary statistics of nanopore current signal using XGBoost and LSTM models	XJTLU	Rong Zhu
38	Mechanism and application of IDA small peptide signaling pathway affecting organ separation in Brassica napus	JSU	Rui Geng
39	Transposon Element Expression Dynamic During Mouse Gastrulation	XJTLU	Rui Song

RESEARCH AREA

Biological Sciences

PAGE 71

	PROJECT TITLE	INSTITUTION	CANDIDATE
40	Advanced protein separation technologies based on surface functionalized magnetic beads	XJTLU	Rujia Qu
41	Thiazole Derivatives Alleviate Myocardial Injury in The Models of Myocardial Ischemia-Reperfusion Injury by Regulating Mitochondrial Function	XJTLU	Shihao Chen
42	Deciphering the genetic interplay between depression and dysmenorrhea: a Mendelian randomization study	XJTLU	Shuhe Liu
43	Engineering multifunctional intracellular energy metabolism enhanced polycitrate-based hydrogel for MRSA infected wound therapy	XJTU	Sihua Li
44	Photothermal-antibacterial bioactive noncrystalline nanosystem promotes infected wound tissue regeneration through thermo-ions activation	XJTU	Ting Li
45	Intrinsically bioactive multifunctional poly (citrate-curcumin) for rapid lung injury and MRSA infection therapy	XJTU	Tongtong Leng
46	A Computational Pipeline for Designing Therapeutic Antibodies	XJTLU	Wanding Wang
47	mRNA/acRNA-LNP transduced allogenic CD30 · CAR-NK cells therapy	XJTLU	Wei Wang
48	Integrated bioinformatic analysis reveals novel signatures of N4-acetylcytidine (ac4C) modification in pan-cancer	XJTLU	Xiangyu Yin
49	Influences of Seasonal Changes, Plastic Materials and Land Use Patterns on Microbial Community Structure of Biofilms developed on Microplastics in Freshwater System	XJTLU	Xiaotian Zhao
50	Plug-and-play: design of protein nanocage for targeted drug delivery	XJTLU	Xiaoyun Liu
51	m6AConquer: A Data Resource for Unified Quantification and Integration of m6A Detection Techniques	XJTLU	Xichen Zhao
52	Gene regulation using a CRISPR/dCas9 based technology	XJTLU	Xinghan Zhang
53	Targeted Protein Degradation Database: Enabling Data-Driven Drug Discovery for Undruggable Targets	XJTLU	Xinran Qin

RESEARCH AREA

Biological Sciences

PAGE 81

	PROJECT TITLE	INSTITUTION	CANDIDATE
54	m7GHub V2.0: an updated database for decoding the N7-methylguanosine (m7G) epitranscriptome	XJTLU	Xuan Wang
55	Structural Studies and Interaction Mechanism of MroQ and AgrB in Staphylococcus aureus Quorum Sensing Pathway	XJTLU	Xuefei Zhao
56	Deciphering Cellular Dynamics in the Immune Microenvironment Using RNA Velocity in scRNA-seq	XJTLU	Yajunzi Wang
57	Roles of G protein signalling in the regulation of m6A mRNA methylation	XJTLU	Yakai Yang
58	Therapeutic target validation for MELAS stroke-like syndrome	XJTLU	Yanyan Li
59	Creating Inducible DEK Knockout Cell Line and DEK Functional Assessment Combining an Overexpression System	XJTLU	Yewei Liu
60	Comprehensive Analysis of the Lysine Succinylome in Fish Oil Treated Prostate Cancer Cells	XJTLU	Yifan Jiang
61	PROTAC-inspired Design and Development of Mitochondrial Targeting Cancer Therapeutics	XJTLU	Yifan Li
62	To investigate the structure-activity relationships and pharmacology of a series of flavonoids with the potential to treat NAFLD	XJTLU	Yifan Tang
63	Physiological and molecular functional characterisation of Drosophila melanogaster TMEM16O	XJTLU	Ying Lei
64	Molecular Insights into Structural Dynamics and Binding Interactions of Selected Inhibitors Targeting SARS-CoV-2 Main Protease	XJTLU	Yuanyuan Wang
65	In vitro pharmacological activity of a novel EED inhibitor (APG-5918) in prostate cancer	XJTLU	Yun Yang
66	Epigenetic regulation of nuclear-encoded mito-ribosomal gene expression by EP400NL complex	XJTLU	Yuxin Liang
67	Mechanism study of therapeutic effect of Mesenchymal stem cell-derived exosomes in the treatment of idiopathic pulmonary fibrosis	XJTLU	Zerun Hao

RESEARCH AREA

Biological Sciences

PAGE 88

	PROJECT TITLE	INSTITUTION	CANDIDATE
68	Prognostic Value of Habitat based Radiomics for First-line Immunology in Stage IIIB-IV Non-Small Cell Lung Cancer Patients: A Multi-institutional Study	XJTLU	Zhe Zhang
69	The role and mechanism of TSP2 in the progression of NASH liver fibrosis	XJTLU	Zheng Pang
70	Exploring mitochondria-targeting therapeutics for neurodegenerative disease	XJTLU	Zhenxing Gu
71	NEAT1/miR-196a-5p/Trpm3 axis contributes to photophobia	XJTLU	Zhuoan Huang
72	Pharmacological studies of isoliquiritigenin on proliferation and metastasis in choroidal melanoma cell lines	XJTLU	Ziyan Zhao
73	Src Family Kinases in Transcriptional Regulation of Neuroinflammation in Migraine Models	XJTLU	Ziyang Gong

RESEARCH AREA

Business

PAGE 91

	PROJECT TITLE	INSTITUTION	CANDIDATE
74	The Role of Immersion and Digital Personas in Building Customer Loyalty in Metaverse Retailing	XJTLU	Cheng Ma
75	The role of government policies in the diffusion of electric vehicles: a configuration perspective	XJTLU	Chi Yang
76	Strategic Network Formation Game with Unreliable Players	XJTLU	Enjun Liu
77	Striking resemblance in the mirror: Leveraging perceived homophily for hybrid entrepreneurial intentions	XJTLU	Famei Shen
78	Structural Shocks on Renewable Energy Consumption and Investment Regimes	XJTLU	Guimin Yao

RESEARCH AREA

Business

PAGE 93

	PROJECT TITLE	INSTITUTION	CANDIDATE
79	Enhancing Coworker-directed Helping through Customer Gratitude in Hotel Frontlines: Pride as Mediator and Mindfulness as Moderator	XJTLU	Han Hong Feng
80	Allocation of pollution and carbon emissions reduction targets for city cluster: empirical evidence from China's Yangtze River Delta city cluster based on cost optimization	CUMT	Hao Zhang
81	History Matters: Path-Dependent Return Predictability	XJTLU	Haojun Ji
82	Exploring the Impact of Overtime, Regulatory Pressure, and Economic Pressure on Audit Quality in China	XJTLU	Hengxian Lei
83	Inflationary effects of commodity price shocks: empirical evidence from New-Keynesian Philips Curve framework	XJTLU	Huiru Han
84	ESG Incident and managing investor relationship: The role of interactive investor platforms	XJTLU	Jia Liu
85	Hyundai Motor Company's organizational culture and cross-cultural management in the era of digitalization and artificial intelligence	XJTLU	Jiaxiang Zhang
86	A Bayesian Network Approach for Dynamic Behavior Analysis: Real-Time Intention Recognition	XJTU	Jiaxuan Jiang
87	The impact of government subsidies on technology diversification in SMEs: from the perspective of R&D risk and organizational learning	XJTLU	Jiayi Xiao
88	Unmasking barriers to supply chain collaboration in the circular economy context: insights from a systematic literature review using grounded theory approach	XJTLU	Jielin Dai
89	Subordinate expediency under supervisor performance pressure: The roles of perceived exploitation and supervisor benevolence	XJTU	Jingyu Dong
90	The impact of the ISSB's validation of Scope 3 GHG emissions on US manufacturers' stock valuations: The role of supplier complexity	XJTLU	Jingyuan Tian
91	Construction of Radical Innovation Capability in the New Era	XJTLU	Junchao Fang
92	How does enterprise intelligent Manufacturing affect audit fees?	XJTU	Junmin Hu

RESEARCH AREA

Business

PAGE 101

	PROJECT TITLE	INSTITUTION	CANDIDATE
93	Less is more: The role of bricolage, exaptation, and product modularization on frugal innovation	XJTU	Lianyong Xu
94	AI orientation and ambidextrous Innovation: the role of dynamic capabilities and environmental dynamism	XJTLU	Liyan Lu
95	China-U.S. dispute about PCAOB inspection access and its Impact on earnings management of U.S.-Listed Chinese companies	XJTLU	Lu Peng
96	A mystery of iniquity? Exploring experiences of women in UK academia	UoL	Malika Ben Kahla
97	Energy-poverty-inequality SDGs: A large-scale household analysis and forecasting in China	XJTU	Minglai Li
98	How can brands turn praise received from other brands into opportunities for positive brand outcomes?	XJTLU	Mingli Huang
99	Analyzing the Influence of Geographical Indications and Ancestral Surnames on the Competitiveness of SMEs in China	XJTLU	Na Sai
100	How External Uncertainty Influences Women's Entry into Corporate Boards: A Real Options Perspective	UoL	Qi Yu
101	Innovation spillover of customer digital transformation along the supply chain	CUMT	Qian Yue
102	Climate Change and Corporate Green Innovation: Empirical evidence from China	XJTLU	Qianzhi Xu
103	AI in B2B: Navigating the New Era of Digital Transformation – The Role of Market Environment and Technological Evolution in Shaping Entrepreneurial AI Adoption	XJTLU	Qiaoqiao Xiang
104	The Generational Divide: Who Gained and Who Lost from the 2021 – 23 Inflation Surge?	UoL	Satyam Goel
105	How Replies from Social Bots Affect Opinion Polarization on Social Media	XJTLU	Shiyu Shen
106	The Impact of Robot Application on Industrial Chain Risk: Cross-Country Evidence	XJTU	Shuyun Zheng

RESEARCH AREA

Business

PAGE 110

	PROJECT TITLE	INSTITUTION	CANDIDATE
107	Diabetes Burden and Firm Value	XJTLU	Siying Quan
108	The Impact of Market Knowledge on New Product Development Advantage: The Moderating Roles of Market and Technological Turbulence	XJTU	Siyu Shao
109	Enhancing ESG Performance Evaluation: Integrating Diverse Data Sources and Entropy Weighting for a More Accurate and Reliable Assessment	XJTLU	Tianqi Wang
110	Exploring the impact of social presence on consumers' online second-hand consumption behavior by an integrated SEM and fsQCA method	CUMT	Ting Xu
111	Psychological Perception and Interactive Behaviour in Physical AR/MR Retail Environments: Unveiling the Dual Mechanisms Behind Consumer Decision-Making	XJTLU	Weihan Liang
112	Communicating in 29x29 pixels: the influence of app icon typicality on user behaviour	XJTLU	Wenzhe Liang
113	Sustainable product innovation through horizontal coopetition: The role of boundary-spanning search and partner similarity	XJTU	Xia Wu
114	The impact of China's Green Finance Innovation and Reform Pilot Policy on corporate ESG performance: A Multi-dimension analysis	XJTLU	Xiangwan Liu
115	Engaging new realities: The influence of spatial presence, immersion and interactivity on consumer behavior through flow theory	XJTLU	Xiaowei Fan
116	Digitalization and gender pension gap: evaluating the impact of data transparency and pension policy reforms in China	XJTLU	Xinyan Guo
117	The Influence of Flooding Risk and Various Distances on the Operational Efficiency and Innovation of Firms within the Supply Chain	XJTLU	Xuyan Gao
118	Does customer order matter? Explore the dynamics of lost-sales remanufacturing system under AR(1) demand	XJTLU	Yan Lu
119	Holding all the cards from the good old days: How nostalgia enhances artificial intelligence service acceptance	OU	Yanxi Yi

RESEARCH AREA

Business

PAGE 117

	PROJECT TITLE	INSTITUTION	CANDIDATE
120	Examining the Nexus between Socially Responsible Investing and the Transition to Clean Energy in the Digital Age: Insights from Energy Sector Analysis	XJTLU	Yi Ke
121	The impact of foreign lead venture capitalist in the syndicate on IPO underpricing: Evidence from China	XJTLU	Yi Li
122	The impact of top management team power on digital transformation: Evidence from China	XJTLU	Yinjie Han
123	Balancing Act: The Role of Economic Theory in Data-Driven Model	XJTLU	Yintai Ding
124	Heterogeneous Agents and Money Demand in Micro-Founded Model	UoL	Yuchen Su
125	14 Years of Research on Demand Forecasting and Inventory Management by Machine Learning: Current Insights and Future Directions	XJTLU	Yuhao Zhang
126	Does CEO's early life experience affect corporate audit fees? Evidence from Chinese Great Famine	XJTU	Zenglian Liu
127	When Logic Takes a Backseat: Romantic Motives Drives Extreme Ratings	XJTLU	Zhiwei Luo
128	How institutional investor influence audit fee through shareholding network	XJTU	Zi'ang Chen
129	Green Credit Policy and Accounting Information Quality: Evidence from China	XJTLU	Ziyi Zhai

RESEARCH AREA

Chemistry

PAGE 123

	PROJECT TITLE	INSTITUTION	CANDIDATE
130	Exploring the Characteristics of coke formation on biochar-based catalysts during the biomass pyrolysis	XJTU	Biao Wang
131	Recyclable Selenoviologen-Based D-A Porous Ionic Polymer: From Dual-Channels Photocatalytic Degradation to Plant Growth	XJTU	Chenjing Liu
132	Electrode Material for High-Performance Capacitive Deionization Using MXene/Polyaniline/NaTi2(PO4)3	XJTLU	Chuhan Huang
133	Innovations in Flow-Through Capacitive Deionization (FTCDI): Harnessing MXene-Enhanced Structures for Advanced Water Treatment	XJTLU	Di Kang
134	Investigating nano-structure of carbon-based materials for lithium-ion capacitors	XJTLU	Dongqi You
135	Preparation and electrocatalytic performance of low iridium based catalyst for proton exchange membrane electrolyzer	HIT	Fengge Wang
136	Application of liquid eutectic Gallium-Indium electrodes to study structure-thermopower relationships in molecular thermoelectrics	XJTLU	Hailian Huang
137	Boundary conditions regulation and kinetic mechanism of chiral locomotion transitions of an active gel	CUMT	Haodi Yu
138	Semiconductor sers technology for biological diagnosis	XJTLU	Haoyan Wang
139	Molecular engineering design and performance study of naphthalene diimide materials in neutral aqueous organic redox flow battery	XJTU	Heng Zhang
140	Synthesis of iron-based catalysts based on nickel foam for seawater oxygen evolution reaction (OER) catalysis	XJTLU	Huajie Wu
141	Directional Motion of Asymmetric Self-Propelling MXene Films	CUMT	Hui Wang
142	DNA hypomethylation in early pan-cancer detection	XJTLU	Jiaxuan Wang
143	Investigating the novel structure and configuration of the anode in the advanced lithium ion batteries	XJTLU	Jiayi Zhang

RESEARCH AREA

Chemistry

PAGE 130

	PROJECT TITLE	INSTITUTION	CANDIDATE
144	Exploration and Application of High-Performance Novel Lithium Batteries	XJTLU	Jingchao Zhang
145	Research on Producing PMA-doped Surface in High Efficiency Nonfullerene Organic Photovoltaics	XJTLU	Jinlong Wu
146	Rapid synthesis of formamides from amines via catalyzed transamidation in DMF	XJTLU	Jinting Li
147	Semi-quantification of Escherichia Coli by using Glassy Carbon Electrode	XJTLU	Kaiwen Zhou
148	DFT mechanistic study of Ti-Catalyzed Ketone Synthesis from Carboxylic Derivatives and gem-Dihaloalkanes	XJTLU	Kehang Cheng
149	Study of anisotropic and highly absorptive materials for suspended particle devices	XJTLU	Lidan Fan
150	Mechanistic insight into CoH-catalyzed enantioselective hydrogenation of quinolines: a DFT study	XJTLU	Lin Liu
151	Defects passivation of flexible perovskite solar cells-Modification of Tin Dioxide Electron Transport Layer	XJTLU	Linghao Jin
152	Machine learning-enhanced prediction of formation energies and voltage profiles in phosphate vanadium cathodes for Sodium-ion batteries	XJTU	Lingzhi Wang
153	Non-invasive wearable flexible sensor for real-time continuous monitoring of glucose	XJTLU	Maoning Ding
154	Non-monotonic relationship between oscillatory frequency and light intensity of BZ-Ru(II) homogeneous and self-oscillating gel systems	CUMT	Meng Zhang
155	Isomer-Pure ICBA for Organic Electronics	XJTLU	Mengmeng Zhang
156	Interfacial cavity-enhanced CO2 capture in metal-organic cage-based porous liquids	XJTLU	Mingrui Zuo
157	The Development Of Novel Protective Polymeric Materials Against Fomite Transmission Of Respiratory Viruses And The Mechanism Study	XJTLU	Minhao Shi

RESEARCH AREA

Chemistry

PAGE 137

	PROJECT TITLE	INSTITUTION	CANDIDATE
158	Development of phosphorous-based prodrugs towards Matrix metalloproteinases (MMPs) inhibition in tumor progression and metastasis	XJTLU	Palmer Sivoko Imbenzi
159	Polymer-based nanocapsule development for intracellular delivery	XJTLU	Pingqing Fan
160	Hollow Co3O4 nano material-based sandwich structure and Cobalt nanowires for both glucose and solid-state pH sensor	XJTLU	Qi Qin
161	Single entity electrocatalysis: Oxidized MXene as Electrocatalysts for Oxygen Reduction Reactions	XJTLU	Qiaoyi Peng
162	Synythesis and characterization of Hexaarylbenzene (HAB) derivatives	XJTLU	Qiqi Dong
163	Rapid synthesis of symmetrical diesters, asymmetrical diesters, monoesters, and prodrugs from ethylene glycol by using a rotary evaporator	XJTLU	Shangshu Sheng
164	A new synthetic approach for the efficient synthesis of aza-annulated organic semiconductor materials	XJTLU	Tian Gao
165	Design, Synthesis, and Evaluation of Nitroimidazole-Oxazolidinone Hybrids against Anerobic Bacteria	XJTLU	Weiding Wang
166	Design, Synthesis and Characterization of Multi-dimensional Non-fullerene Acceptors for Organic Photovoltaic Cells	XJTLU	Weihao Da
167	Molecular Simulation Investigation for Sequence Effect on Mechanical Properties of Sustainable Polymeric Materials	XJTLU	Weijian Zhang
168	Metal oxide enabled gas sensor for early diagnosis of Colorectal Cancer (CRC) at low temperature and its GC-MS confirmation	XJTLU	Weiyu Xiao
169	Synthesis of Substituted Tetralins via Nitrogen Deletion/Diels – Alder Cascade Reaction	XJTLU	Wen Ye
170	Metal single-atom nanomaterials as seawater electrocatalysts	XJTLU	Wenhan Fang
171	The distance-dependent inter-nitrogen synergistic effect in metal-free nitrogen-doped carbon catalysts for carbon dioxide electroreduction	CUMT	Xiao Kong

RESEARCH AREA

Chemistry

PAGE 145

	PROJECT TITLE	INSTITUTION	CANDIDATE
172	Polymer Microparticle Reinforced Ultra High Performance Concrete	XJTLU	Xunhe Liu
173	Effects of halogenation of small molecule acceptors for efficient organic solar cells in high boiling point solvent	XJTLU	Yan Xia
174	Synthesis and development of Dual-functional polymer materials against microbial transmission	XJTLU	Yao Yu
175	The Magneto-Structural Correlations of Sandwich type Dysprosiacarboranes Single-Molecule Magnets (SMMs)	XJTU	Yeye Liu
176	Study on Extraction of Marine Active Substances by Supercritical Method	XJTLU	Yi Wang
177	Design, Synthesis of Neomycin-Oxazolidinone dual-target Hybrid Antibiotics and Antibacterial Evaluation against ESKAPE Pathogens	XJTLU	Yinzhe Chen
178	The Synthesis of Chalcogenoviologen-Based Assemblies and Application of Visible-Light Photocatalysis	XJTU	Yujing Gao
179	Superhelical Locomotion of a BZ self-oscillating Gel Driven by Scroll Waves	CUMT	Yunjie Wang
180	Synthesis of Substituted Benzimidazoles via Amino Acid/Copper-Catalyzed Intramolecular Arylation	XJTLU	Yuqi Huang
181	Tafel plot as a tool to study the kinetics on metal-based electrocatalysts	XJTLU	Yuqi Ma
182	Three-dimensional printable viologen-based Ionogel for visible sensing and display	XJTU	Zhikang Han
183	Titanate composite materials for applications in Na batteries	XJTLU	Zhiyi Zhou
184	A Chemistry Foundation Model to Predict Molecular Properties	XJTLU	Ziqi Wang
185	Synthesis of Antimicrobial Polymers and Development of Surface Coatings	XJTLU	Zixing Lu

RESEARCH AREA

China Studies

PAGE 152

	PROJECT TITLE	INSTITUTION	CANDIDATE
186	Du Li, 独立, Relocating the notion of independence in popular music to mainland China: process of cultural and conceptual translation in popular music	UoL	Changbo Duan
187	Community participation and social networks of older people in urban China	XJTLU	Jiayao Zhou
188	The role of Confucius Institutes (CIs) in promoting economic exchange between China and Central and Eastern Europe (CEE)	XJTLU	Min Zhang
189	Localisation of Christianity in China: Pitfalls to and possibilities for harmonious cultural integration	NJU	Xiaowei Zhou
190	The imapct of political polaristion and "China threat" on the EU's China policy shift	XJTLU	Xingzuo Fan
191	Reconstruction, development, and facing challenges: the evolution of Protestant missionary activities in Shandong (1901–1928)	UKM	Xinhao Zhang
192	Domestic Abuse in China: Exploring Victim Helping-Seeking Experiences and Institutional Responses in China's Socio-Legal Context	XJTLU	Yanxi Dai

RESEARCH AREA

Civil Engineering

PAGE 155

	PROJECT TITLE	INSTITUTION	CANDIDATE
193	Experimental Investigations on Vibration Performance of Timber-Reinforced Truss Concrete Composite Beams with Notch-Screw Connections	NTU	Bo Wen
194	Cyclic shear test and finite element analysis of TRC-reinforced damaged confined masonry walls	CUMT	Boxue Wang
195	Incentive-Driven Knowledge Sharing on Recycled Aggregates in Sustainable Construction: A PLS-SEM and fsQCA Approach	XJTLU	Caimiao Zheng
196	Repair and strengthening of corroded reinforced concrete columns using organic corrosion inhibitors and textile-reinforced mortar (TRM)	XJTLU	Dhanushka Kobbekaduwa Kobbekaduwa Walawwe

RESEARCH AREA

Civil Engineering

PAGE 157

	PROJECT TITLE	INSTITUTION	CANDIDATE
197	A study of durability performances of alkali activated high volume fly ash concrete	XJTLU	Duo Xie
198	Identifying the critical success factors for the implementation of zero carbon industrial parks: from a PF- AHP perspective	XJTLU	He Yun
199	Investigation on gradation optimization design of basalt fiber asphalt mixture based on discrete element simulation	YZU	Hu Chen
200	Optimization of self-anchored systems for CFRP cables and the complex force analysis of the CFRP rod	XJTLU	Jialu Tang
201	Analysis of microstructure and compressive properties of full coral concrete under fiber reinforcement	CUMT	Junyan Dai
202	Investigation on the Performance of Waste Rubber and Steel Fiber-Reinforced Geopolymer Composites	XJTLU	Kuangye Zhang
203	The impact of solute diffusivity on the twin migration behavior in Mg alloys	XJTLU	Lang Liu
204	Data-driven Building Energy Management System for Smart Retrofitting	XJTLU	Lin Zheng
205	Revisiting what factors promote BIM adoption more effectively through the TOE framework: A meta-analysis	CUMT	Min Tao
206	Enhancing Reservoir Landslide Displacement Prediction Models with Crack Width Data Integration: A Case Study of the Daping Landslide	XJTLU	Ningxin Weng
207	Enhancing Environmental Monitoring through Multispectral Imaging: The WasteMS Dataset for Semantic Segmentation of Lakeside Waste	XJTLU	Qinfeng Zhu
208	Assessing the building spatial design from fire evacuation perspective by integrating BIM and VR technologies	XJTLU	Rong Fu
209	Experimental investigation and development of shear models for RC Deep beams focusing on size effects	XJTLU	Tao Xu
210	Evaluation of Low-Temperature Cracking Resistance in Multi-Scale Hot In-Place Recycled Asphalt Mixtures	YZU	Tianyi Sang

RESEARCH AREA

Civil Engineering

PAGE 165

	PROJECT TITLE	INSTITUTION	CANDIDATE
211	The feasibility of traditional materials and passive strategies for developing sustainable, low-carbon homes in Zambia	XJTLU	Tusankine Salasini
212	Gender Mainstreaming in the Context of the Sustainable Development Goals: Analyzing the Impact of Gender Disparities on Global Development Outcomes	XJTLU	Wansong Liu
213	In-fire material properties of high-strength aluminium alloys	XJTLU	Wen Cheng
214	Refractory superalloys with ultra-high hardness	XJTLU	Wen Su
215	Experimental and numerical research on structural behaviour of ultra-high performance concrete under fire conditions	XJTLU	Xiaodong Cheng
216	A lattice-Boltzmann study on the effect of porous media morphology on immiscible displacements	XJTLU	Xiaoxuan Peng
217	CECA: An Intelligent Large-Language-Model-Enabled Method for Accounting Embodied Carbon in Buildings	XJTLU	Xierong Gu
218	Study on human thermal comfort and heat stress in deep underground environment	CUMT	Xingming Wang
219	Developing Defect Embedded Masonry H-BIM Using Deep Learning-Based Detection and Segmentation	XJTLU	Xinyu Tong
220	Magnetically separable quaternary g-C3N4/Fe3O4/AgBr/rGO nanocomposite for enhanced photocatalytic degradation of ofloxacin in water under visible light irradiation	XJTLU	Xiyang Liu
221	Investigation on the Crack Resistance of Fiber-Reinforced Asphalt Mixtures Utilizing Digital Image Correlation Technique	YZU	Xueyang Jiu
222	Assessing the Impact of Carbon Tax on the Sustainability of the Construction Industry in China	XJTLU	Xutong Han
223	Investigation of the Basalt Fiber Type and Content on Performances of Cement Mortar and Concrete	YZU	Ye Wang
224	A Dialectical Systems Framework for Developing Business Models in Construction and Demolition Waste Management	XJTLU	Yi Yang

RESEARCH AREA

Civil Engineering

PAGE 174

	PROJECT TITLE	INSTITUTION	CANDIDATE
225	Enhancing Building Inspection Automation with Dynamic Environmental Perception and 3D Reconstruction	XJTLU	Ying Lo
226	Temporal Equilibrium for Electrified Ride-Sourcing Markets Considering Charging Capacity and Driving Fatigue	NYU Shanghai	Yuhao Liu
227	Microstructure and Mechanical Property Prediction in Additive Manufacturing Using Machine Learning	XJTLU	Yuxiang Ji
228	Exploring the microscopic mechanism of elongation fluctuations in high-pressure die-cast AlSi7MnMg alloy	XJTLU	Zhen Zheng
229	On the value of orderly electric vehicle charging in carbon emission reduction	NYU Shanghai	Zhi Li
230	Prediction of wave-current induced pore water and seabed liquefaction around twin-piles using WCSSI model	XJTLU	Ziheng Huang

RESEARCH AREA

Computer Science and Software Engineering

PAGE 177

	PROJECT TITLE	INSTITUTION	CANDIDATE
231	Influencing Factors of Human-Artificial Intelligence Interaction Satisfaction: An Experimental Study of Cuban Red Culture Knowledge Chatbot	JSU	Amalia Isabel Rivero Chavez
232	Enhancing usability with virtual imagery: insights into feedback mechanism from a BCI-VR integrated system	XJTLU	Annan Lu
233	Exploring Test-Time Style Transfer for Improving Cross-Organ Domain Generalization in Pathology Imaging	XJTLU	Biwen Meng
234	Towards Robust Medical Image Segmentation: A Text Prompt-Driven Weakly Supervised Approach with Segment Anything Models	XJTLU	Bolin Ren
235	ADDNet: Mitigating Concept Drift in Stream Environment by Knowledge Distillation	XJTLU	Borong Lin
236	A Knowledge-Informed Deep Learning Paradigm for Generalizable and Stable Car-Following Models	XJTLU	Chengming Wang
237	A Mathematical Modeling-Inspired Architecture for Addressing Cross-Device Challenges in Motor Imagery	XJTLU	Chengxuan Qin
238	AI-assisted Ultrasound Diagnosis of Atypical Breast Cancer	XJTLU	Chenhao Wang
239	Counterfactual Contrastive Learning for Fine Grained Image Classification	XJTLU	Chenke Yin
240	Multi-sensor Fusion Perception for Intelligent Transportation Systems	XJTLU	Fengyufan Yang
241	A Design Space of Visual, Auditory, and Haptic Cues for Attention Guidance in AR	XJTLU	Fuqi Xie
242	MA-KANet: Enhancing Retinal Vessel Segmentation through Multi-scale Attention and Feature Fusion	XJTLU	Guojie Li
243	Communication Strategy on Macro-and-Micro Traffic State in Cooperative Deep Reinforcement Learning for Regional Traffic Signal Control	XJTLU	Hankang Gu
244	Distributed and Graph-based Learning for Artificial Intelligent Internet of Things (AIoT) in Smart Cities	XJTLU	Hanyue Xu

RESEARCH AREA

Computer Science and Software Engineering

PAGE 186

	PROJECT TITLE	INSTITUTION	CANDIDATE
245	Updatable Signature and Application	XJTLU	Haotian Yin
246	A Dataset and Model for Realistic License Plate Deblurring	XJTLU	Haoyan Gong
247	Multi-Instance Learning for Parkinson's Tremor Level Detection with Learnable Discriminative Pool	XJTLU	Haoyu Wu
248	Strongly recurrent configurations of the Abelian sandpile model and prime graphical parking functions	XJTLU	Haoyue Zhu
249	Towards a Unified Image Stitching Framework	XJTLU	Huajun Yuan
250	A Lightweight and Responsive On-line IDS towards Intelligent Connected Vehicles System	XJTLU	Jia Liu
251	Mu-nopoly: Design and Evaluation of a Board Game for Museum Edutainment	XJTLU	Jiachen Liang
252	Salience-Enhanced Network for Metal Artifact Reduction in CT Imaging	XJTLU	Jiahao Wang
253	SyncMalloc: A Synchronized Host-Device Co-Management System for GPU Dynamic Memory Allocation across All Scales	XJTLU	Jiajian Zhang
254	PPKI: A Photovoltaic Physical Knowledge-Informed Model for Short-Term Power Prediction	XJTLU	Jialong Pei
255	Multimodal learning in medical diagnostic applications	XJTLU	Jianfeng Wang
256	Frequency Domain-DQN for Flexible Photovoltaic Power Point Tracking under Noisy Operating Condition	XJTLU	Jiang Rong Yuan
257	Selecting Key Points for Pose-Agnostic Anomaly Detection	XJTLU	Jiejie Liu
258	AI-Empowered Graph-based Multimodal Situation Awareness System	XJTLU	Jieli Chen

RESEARCH AREA

Computer Science and Software Engineering

PAGE 195

	PROJECT TITLE	INSTITUTION	CANDIDATE
259	Machine Consciousness: A Comprehensive Review of Definitions, Theoretical Models, and Applications	XJTLU	Jingjing Mu
260	ST-GCN: A Spatiotemporal Graph Convolution Neural Network for EEG Motor Imagery Signal Decoding	XJTLU	Jingzhou Xu
261	Quantum Dot-Enhanced Dual-modality Heterojunction Optoelectronic Synapse for Neuromorphic Computing	XJTLU	Junyan Li
262	Four Dimensional Adjustable Electroencephalography Cap for Solid gel Electrode	XJTLU	Junyi Zhang
263	Focus-Driven Augmented Feedback: Enhancing Focus and Maintaining Engagement in Upper Limb Virtual Reality Rehabilitation	XJTLU	Kai-Lun Liao
264	Identification for First Arrivals of Acoustic Logging Signals Based on Transformer Network	XJTU	Li Zhu
265	Human-Vehicle Risk Level Prediction for Human-Machine Co-driving Control	XJTLU	Lin Zhou
266	Tangible Progress: Employing Visual Metaphors and Physical Interfaces in AI-based English Language Learning	XJTLU	Mei Wang
267	Sensorless beta-particle-filter strategy for optimizing solar trackers under partial shading conditions	XJTLU	Ming Huang
268	Dynamic integration and early warning model for analyzing patients with severe ICU sepsis based on biochemical indicators and medical history	XJTLU	Mingyu Zhang
269	State of Charge Estimation for Lithium-Ion Batteries Based on Informer-LSTM Hybrid Network	XJTLU	Ningfei Song
270	Industrial Network Data Injection Detection Method Using Predictive Modeling Based on Markov State Transition Matrix	SEU	Qi Yu
271	Clustering-driven state embedding for reinforcement learning under visual distractions	CUMT	Rongrong Wang
272	A Novel Hybrid Macroscopic Fundamental Diagram-informed Deep Learning Method for Lane-level Traffic Prediction	XJTLU	Ruiyuan Jiang

RESEARCH AREA

Computer Science and Software Engineering

PAGE 203

	PROJECT TITLE	INSTITUTION	CANDIDATE
273	Remanufacturing flexible job shop scheduling via graph neural network and reinforcement learning	XJTLU	Runjing Wang
274	Energy-Efficient Proof-of-Work Mechanism for Blockchain	XJTU	Shasha Yu
275	Physics informed deep learning approach for inverse kinematics of a high degrees of freedom mobile manipulator	XJTLU	Shihui Fang
276	Rethink Cross-Domain Data Management with Large Language Models	XJTLU	Shiyao Zhang
277	Robust Offline Actor-Critic with On-policy Regularized Policy Evaluation	CUMT	Shuo Cao
278	What-Ifs: Enhancing Exploratory Visualization for Spatial Data Analysis	XJTLU	Shuzi Zou
279	Web3.0 Literary Landscape: Deep Learning and Blockchain for Nobel Prize Predictions	XJTLU	Sida Huang
280	Data-driven approach to predict the fatigue properties of ferrous metal materials using the cGAN and machine-learning algorithms	XJTLU	Sigeng Li
281	DiffClick: Click-Differentiated Enhancement Network for Interactive Segmentation	XJTLU	Siqi Song
282	Mind the Gap: Promoting Missing Modality Brain Tumor Segmentation with Alignment	XJTLU	Tianyi Liu
283	Knowledge Base-enhanced Multilingual Relation Extraction with Large Language Models	XJTLU	Tong Chen
284	Spatial-temporal fusion adaptive gated graph convolution networks for short-term residential load forecasting	CUMT	Tong Zhang
285	Improved Video-Based Probabilistic Multi-Object Tracking Algorithms for Maritime Multi-Object Tracking	XJTLU	Xiaoyu Huang
286	GA-YOLO: Enhancing the Small Object Detection on Traffic Monitoring	XJTLU	Xinyue Zhang

RESEARCH AREA

Computer Science and Software Engineering

PAGE 211

	PROJECT TITLE	INSTITUTION	CANDIDATE
287	ResponsiveView: Enhancing 3D Artifact Viewing Experience in VR Museums	XJTLU	Xueqi Wang
288	High-Order Reward Prioritization: Self-adaptive High-quality Augmented Prioritized Experience Replay for Goal-Oriented Navigation	XJTLU	Xueyan Yao
289	RDSA: A Robust Deep Graph Clustering Framework via Dual Soft Assignment	XJTLU	Yang Xiang
290	Review of Multi-modal Emotion Recognition in Conversation	XJTLU	Yangu Zhou
291	Create3DHistory: Creating and Customizing Historical Timelines with AI-Generated Content	XJTLU	Yejuan Xie
292	Collaborative AI Learning with Improved Adversarial Neural Networks for Multi-modalities Data	XJTLU	Yibo He
293	Multimodal sentiment analysis structure based on transformer	XJTLU	Yifan Gao
294	Multi-modality learning approach in Alzheimer's disease: Review	XJTLU	Yifan Guan
295	A Survey on Applications Involving Multi-Device Interaction with Smartwatches	XJTLU	Yihan Liu
296	Business Compliance Detection of Smart Contracts in Electricity and Carbon Trading Scenarios	XJTU	Yin Wu
297	City2Scene: Improving acoustic scene classification with city features	XJTLU	Yiqiang Cai
298	Multimodal Data Approach for Predicting Sentinel Lymph Node Metastasis in Breast Cancer	XJTLU	Yiyi Miao
299	Perceptive Salience in Audio Event Recognition: Exploring the Gap between Human and Model Perception	XJTLU	Yizhou Tan

RESEARCH AREA

Computer Science and Software Engineering

PAGE 220

	PROJECT TITLE	INSTITUTION	CANDIDATE
300	Multimedia Modelling and Analytics with Embedded AI Internet of Things	XJTLU	Yuanxin Su
301	Affordance-based human-AmI interaction framework	XJTLU	Yue Li
302	A Survey on RL-Based Approaches for Traffic Signal and Joint Vehicle-Signal Control	XJTLU	Yuli Zhang
303	Model Security in Music Information Retrieval	XJTLU	Yuxuan Liu
304	Integrating Diffusion Models for Enhanced Depth Estimation and Generalization	XJTLU	Yuzheng Feng
305	Machine Learning-Based Extraction of Mechanical Properties from Multi-Fidelity Small Punch Test Data	XJTLU	Zhengni Yang
306	Enhancing Object Detection in Adverse Weather Conditions through Entropy and Guided Multimodal Fusion	XJTLU	Zhenrong Zhang
307	Multi-Agent Reinforcement Learning for Dynamic Benchmark-Driven Portfolio Management	XJTLU	Zhepeng Li
308	FinBPM: A Framework for Portfolio Management-based Financial Investor Behavior Perception Model	XJTLU	Zhilu Zhang
309	Modeling on the UHSS Resistance Spot Welding Process Based on Data Mining and Machine Learning Algorithms	XJTLU	Zhongjie Yue
310	An experimental and numerical study of the role of node fillet on the fatigue strength of lattice materials	XJTLU	Zhouyi Xiang
311	ZeroDiff: Solidified Visual-semantic Correlation in Zero-Shot Learning	XJTLU	Zihan Ye
312	Is your model really a good math reasoner? Evaluating mathematical reasoning with checklist	XJTLU	Zihao Zhou
313	Detecting Conversational Mental Manipulation with Intent-Aware Prompting	XJTLU	Zimu Wang

RESEARCH AREA

Computer Science and Software Engineering

PAGE 228

	PROJECT TITLE	INSTITUTION	CANDIDATE
314	FFR: Frequency Feature Rectification for Weakly Supervised Semantic Segmentation	XJTLU	Ziqian Yang
315	A Multiple Case Study to Evaluate Usability of Current Unmanned Surface Vehicle system	XJTLU	Zitian Peng
316	Multi-sensor fusion on autonomous driving perception: A comprehensive survey	XJTLU	Zixuan Chu
317	A Decentralized Fair Data Trading Ecosystem Based on Verifiable Proxy Re-Encryption	XJTLU	Ziyang Ji
318	Cyberbullying Detection in Session-Scenario	XJTLU	Ziyu Ye
319	Integrating Technological Innovations in Collaborative Music Making Among Professional Musicians	XJTLU	Ziyue Zhang

RESEARCH AREA

Education

PAGE 231

	PROJECT TITLE	INSTITUTION	CANDIDATE
320	Revitalizing psychological counseling through AI intervention	XJTLU	Bowen Li
321	Increasing Learning Motivation among Vocational College Students: A Case Study of Constructivist Teaching Practices Based on Self-Determination Theory	XJTLU	Chang Liao
322	Supervision Across Cultures: Exploring Doctoral Relationships in a Transnational University Context	XJTLU	Cheng Cui
323	Professional Quality Expectations of Freshmen: A Systematic Literature Review of Chinese College Art Teachers' Perspectives	XJTLU	Chenye Zhang
324	Unveiling the Role of Distributed Leadership in Shaping Teacher Digital Literacy and Well-being: Insights from a Sino-Foreign Collaborative Educational Setting	XJTLU	Chunxi Liu

RESEARCH AREA

Education

PAGE 234

	PROJECT TITLE	INSTITUTION	CANDIDATE
325	When the Body, Heart, and Mind are All Involved in Learning – That is True Engagement! Exploring Faculty Perspectives on Student Engagement within Classrooms	XJTLU	Di Liu
326	A Longitudinal Study on Students' Perception Change of Employability: A Social-psychology Perspective	XJTLU	Hanlihui Ma
327	Why commitment becomes difficult: a qualitative study on the ruminative career exploration experience	XJTLU	Huaiyuan Zhang
328	Empowering Later Life: An Analysis of Senior Universities in Suzhou	XJTLU	Hui Li
329	Exploring the metacognition of self-directed informal learning on social media platforms: Taking time and social interactions into consideration	XJTLU	Huijin Lu
330	Students' engagement in virtual internationalization: Enacting the students as partners in virtual mobility	XJTLU	Jiajun Li
331	Components constitute the language assessment literacy of Chinese EFL teacher educators in international K-12 schools	XJTLU	Jingjing Fu
332	Beyond Compliance: The Next Era of ESG among Chinese Cosmetics Companies	XJTLU	Jingwen Xia
333	另开生面，以心解锁 The influence of achievement goal orientation and perception of a university's learning culture ecosystem on student intent to volunteer for entrepreneurial service-learning	XJTLU	Joseph Eugene Iesue
334	Artificial Intelligence Literacy Education: A Scoping Literature Review from 2020-2024	XJTLU	Ling Xia
335	The Privileged Path: Live-In-Home Tutors in Chinese Affluent Families	XJTLU	Lu Liu
336	The role of language in algebraic learning: a bilingual training experiment	XJTLU	Qi Zhou
337	Beliefs and Opinions of Chinese Kindergarten Educators on Outdoor Environments	XJTLU	Tian Hong

RESEARCH AREA
Education

PAGE 240

	PROJECT TITLE	INSTITUTION	CANDIDATE
338	Value Cohesion in the 21st Century: Reassembling British Higher Education Transnational Education Provision in China	XJTLU	Ting Zhang
339	From Logic Assimilation to Logic Contraction: A case study of Deinstitutionlization in Transnational Higher Education in China	XJTLU	Weiran Zheng
340	The role of organizational support, emotion regulation ability, technostress for faculty's digital professional competence	XJTLU	Xiaochen Lin
341	The Impact of Social Media Use (Red) on College Students' Self-Efficacy and Perception of Academic Stress	XJTLU	Xilin Jin
342	Trajectories of Children's Reading Ability and the Longitudinal Associations with Teacher and Parental Engagement across Elementary School Years	XJTLU	Xin Han
343	Strategy as Space: How Powerful Authorities Introduce New Competing Institutional Logics into Existing Mature Institutional Environments	XJTLU	Xin Xu
344	Intergenerational transfer of tacit knowledge and its role in shaping role identity of successors in Chinese family firms	XJTLU	Xingyu Zhou
345	Proposing new directions on the research of language teacher emotion labor: A systematic review from 2015 to 2024	XJTLU	Xinyu Hui
346	Exploring the Home Math Environment: A Comparative Study of Time Diaries and Questionnaires in Predicting Young Children's Math Performance	XJTLU	Xinyun Lyu
347	Digitization and compulsory education in China: A Social imaginary-Governmentality analysis	XJTLU	Xuhui Jiao
348	Longitudinal Analysis of Marital Conflict: Between- and Within-Couple Dynamics and the Moderating Effect of First-Time Parenthood	XJTLU	Xuyan Meng
349	The Forgotten Isolated Island: A Study on the Mechanisms of the Digital Divide among Older Parents Who Have Lost Their Only Child and Countermeasures	XJTLU	Yajing Liu
350	Studies on Language Teachers' Beliefs and Emotions: Current Status and Future Directions	XJTU	Yanchen Liu
351	Investigating the Impact of AI on Learning Readiness, Academic Emotions, and Academic Burnout among University Students in China	XJTLU	Yanyi Chen

RESEARCH AREA
Education

PAGE 248

	PROJECT TITLE	INSTITUTION	CANDIDATE
352	Overcoming the challenges: the transition model of undergraduate students in a transnational context	XJTLU	Yimei Mi
353	Shadow education as a social emotional space: evidence from middle school English tutoring centers in Runzhou District, Zhenjiang	XJTLU	Yingying Bai
354	Professional Development of Expatriate Higher Education Faculty Through Informal and Incidental Learning on Social Media	XJTLU	Yinyin Zhou
355	A measurement model for the elegant-formality of written Chinese words based on deep learning	CNU	Yipu Wang
356	Digital Literacy Development of Chinese Undergraduate Students at Transnational Universities in China	XJTLU	Yiqun Sun
357	An Empirical Study on Self-efficacy and academic competence of English postgraduates	XJTU	Yu Cui
358	Navigating Transitions: A New Model for Student Success in Transnational Higher Education	XJTLU	Yu Wang
359	Exploration of family communication patterns and main conflicts in the context of intergenerational succession in Chinese family businesses	XJTLU	Yuan Yue
360	Does far transfer exist beyond curriculum learning? A processing study about undergraduates' EAP learning outcomes, learning strategies and transferable skills development	XJTLU	Yuchen Lu
361	The Professional Development of Teachers in Chinese-Foreign Joint Universities	XJTLU	Yuchen Wang
362	Exploring the Application of Artificial Intelligence in Mental Health Education for Chinese Children: A Qualitative Study from the Perspective of Schools	XJTLU	Yue Xi
363	Teachers' perspectives on the quality of AI-Enabled student assessments at Xi'an Jiaotong-Liverpool University in China	XJTLU	Yutan Li
364	Unveiling heterogeneity in cognitive development trajectories from late childhood to young adulthood: Evidence from 12 Years of nationally representative data in China	XJTLU	Yuxin Chen

RESEARCH AREA

Electronic and Electrical Engineering

PAGE 257

	PROJECT TITLE	INSTITUTION	CANDIDATE
365	Unlock Pose Diversity: Accurate and Efficient Keypoint-based Spatiotemporal Diffusion for Audio-driven Talking Portrait	XJTLU	Chaolong Yang
366	An integrated transfer learning approach with multi-source dataset based on physics guided neural networks for fatigue life prediction of adhesive bonded joints	XJTLU	Chendi Wei
367	3D object generation	XJTLU	Chengrui Zhang
368	Laser Vibrometer using CD/DVD OPUs for MEMS Vibration Measurement	XJTLU	Fengji Yang
369	Extraction of interstitial fluid using hollow microneedle for real-time detection of glucose and pH	XJTLU	Gang Chen
370	Cooperative Non-inertial Frame Based Swarm Robot Control	XJTLU	Ge Wan
371	Mapless Navigation for Amphibious Turtle Robots Using Deep Reinforcement Learning and Machine Vision	XJTLU	Ge Wang
372	On the use of sky images for intra-hour solar forecasting benchmarking: Comparison of indirect and direct approaches	XJTLU	Guoping Ruan
373	Core-shell ZIF-8/Au nanoparticles as labels for lateral flow assays via thiol-functionalization and seed-mediated growth	XJTLU	Haibo Ma
374	Optimized Stress Transfer Interfaces Enable High Sensitive Wearable Tribo-Electronics for Precise Physiological Monitoring	XJTLU	Hao Lei
375	NPC Three-Level Inverter Open-Circuit Fault Diagnosis Based on Adaptive Electrical Period Partition and Random Forest	CUMT	Hong Wan
376	The research on the impact of socio-economic development to power network expansion for developing countries	XJTLU	Hong Xie
377	Urban Autonomous Electric Vehicles Fleet Operation Strategy—From the Perspective of Operators	XJTLU	Huayu Zhang
378	Research on integrated design of multi-spectrum compatible stealth metasurface	AFEU	Huiting Sun

RESEARCH AREA

Electronic and Electrical Engineering

PAGE 265

	PROJECT TITLE	INSTITUTION	CANDIDATE
379	Machine Learning Enhanced Paper-based Microfluidic Devices	XJTLU	Jia Zhu
380	Disentangling Tabular Data Towards Better One-Class Anomaly Detection	XJTLU	Jianan Ye
381	A Fully Automated Paper-Based smartphone-assisted Microfluidic Chemiluminescence Immunoassay Platform	XJTLU	Jihong Sun
382	Quantum dots modified high response metal oxide synapses for optoelectronic vision recognition	XJTLU	Jinwei Zhang
383	Topology Optimization of Additive Manufactured Microchannel Heat Exchangers considering Manufacturability Constraints	XJTLU	Junjia Zou
384	Wireless power and communication for implantable applications	XJTLU	Kai Xie
385	Distribution wthin microchannel heat exchanger	XJTLU	Keliang Zhang
386	High-Performance Boundary Control for NPC-DAB Converters: Multi-Trajectory Natural Switching Surface Derivation and Implementation	XJTLU	Lanbo Dai
387	A 2-DoF Switchable Variable Stiffness Actuator for Legged Walking Robots	XJTLU	Lei Yu
388	Research on dry-out characteristics and two-phase flow heat transfer in irregular micro-channel	XJTLU	Luyao Guo
389	GaN-based Power device	XJTLU	Maoqing Ling
390	Federated Learning-Driven Edge Resource Allocation for IoT Applications	XJTLU	Medhav Kumar Goonjur
391	Hydrogel Microneedle Technology for Delivering Exosomes in Skin Anti-Aging	XJTLU	Min Yu
392	Flexible Mesh Electrodes with In-Situ Gelled Hydrogel Interface for Long-Term EMG Monitoring	XJTLU	Mingxuan Zhang

RESEARCH AREA

Electronic and Electrical Engineering

PAGE 274

	PROJECT TITLE	INSTITUTION	CANDIDATE
393	Data Driven Wind Energy Forecasting model using novel automated DBSCAN with XGBoost	XJTU	Muhammad Armoghan Khan
394	Vehecle behaviour recognition based on radar-camera information fusion	XJTLU	Ningwei Ouyang
395	High-Accuracy Thermal Resistance Measurement Method for GaN HEMTs based on Harmonic Pulse Width Sub-Threshold	XJTLU	Ningyu Luo
396	An Innovative Approach for Vehicle Speed Recognition through Noise Emission Analysis by Using Machine Learning	XJTLU	Pengfei Fan
397	Solar Forecasting Based on Sky Imagery	XJTLU	Qi Su
398	Improving the rated voltage of electric vehicle traction inverter circuit through circuit design	XJTLU	Qiwen Zheng
399	Vibrational analysis of mesh structure in Vibrating Mesh Atomizer	UNNC	Roopitha Kaimal
400	Sliding mode based fault diagnosis and tolerant control in PMSM drives for electric vehicles	XJTLU	Runze Guo
401	Deep Reinforcement Learning-Driven Simultaneous Navigation and Task Allocation for Social Swarm Robots in Airport	XJTLU	Ruxin Xiao
402	Warpage model of reflow soldering and molding process for high-power IGBT modules	XJTLU	Sanli Liu
403	Energy-efficient motion control of a turtle-like biomimetic amphibious robot	XJTLU	Shufan Wang
404	A low-profile air material based semi-cylinder metamaterial millimeter-wave luneburg lens antenna using transformation-optics	XJTLU	Silin He
405	An Efficient MPC-based Motion Planning and Control Framework for Autonomous Vehicles	XJTLU	Siying Qin
406	MvP-Diff: Multivariate yet Precise Diffusion for Anomaly Images Synthesis and Segmentation	XJTLU	Siyue Yao

RESEARCH AREA

Electronic and Electrical Engineering

PAGE 281

	PROJECT TITLE	INSTITUTION	CANDIDATE
407	Enhancing Automated Guided Vehicle Navigation with Multi-Sensor Fusion and Algorithmic Optimization	XJTLU	Taoyu Wu
408	Spatial-Temporal Perception with Causal Inference for Naturalistic Driving Action Recognition	XJTLU	Wei Dai
409	Photographed document analysis	XJTLU	Weiguang Zhang
410	Compact Distance-Adaptive Wireless Power Transfer Using a Reconfigurable Auxiliary Coil	XJTLU	Weijun Hong
411	An Integrated Electrochemical Sensor for Sensitive Detection of Carcinoembryonic Antigen (CEA) in Gastrointestinal Fluids	XJTLU	Wenjun He
412	Density and Impurity based Supervoxel Selection for Active Point Cloud Semantic Segmentation	XJTLU	Xianglin Qiu
413	CNC: Cross-modal Normality Constraint for Unsupervised Multi-class Anomaly Detection	XJTLU	Xiaolei Wang
414	Template-Driven LLM-Paraphrased Framework for Tabular Math Word Problem Generation	XJTLU	Xiaoqiang Kang
415	A Dual-Network, Antibacterial, Healable and Hot-Humid Tolerant Strain Sensor based on MXene Conductive Hydrogel for Wearable Electronics	XJTLU	Xiaoyan Wang
416	Investigations on key techniques of wireless power transmission using metamaterials	XJTLU	Xiaozhe Ji
417	Research on the dynamic lifespan of cable under cyclic load variation	XJTLU	Yanxi Lyu
418	Impedance Decoupled Secondary Control Based on a Consensus Prototype for All-Electric Ships	XJTLU	Yi Zhu
419	Impact Assessment of Distributed Secondary Control Schemes for Autonomous AC Microgrids under Multipoint FDI Attacks on Q-V Droop	XJTLU	Yifeng Huang
420	Subspace regularization for few-shot class incremental learning	XJTLU	Yijie Hu

RESEARCH AREA

Electronic and Electrical Engineering

PAGE 288

	PROJECT TITLE	INSTITUTION	CANDIDATE
421	A topological and interfacial microstructure-based bilayer Bi/Al resistive switching memristor	XJTLU	Yiming Liu
422	Continual Segmentation with Disentangled Objectness Learning and Class Recognition	XJTLU	Yizheng Gong
423	Research on LPBF-Ti-6Al-4V parts defect detection method based on Printing Window	XJTLU	Yuanzhe He
424	GRASP-SLAM: Gmapping-augmented DRL for Active SLAM using Policy Gradient	XJTLU	Yue Zhang
425	Multi-objective optimization of control parameters in motor servo system by AMOGOA for industrial application	XJTLU	Yunfei Xie
426	Dynamic Performance Analysis of Ultra-fast Inverter based on Tri-gate AlGaN/GaN MIS-HEMTs	XJTLU	Yunsong Xu
427	An Integrated Mobile Robotic System for Pavement Crack Sealing Using 3D Printing	XJTLU	Yushi Fan
428	A Design of Wireless Power Transfer System Using Pattern Reconfigurable Antenna for 5G Applications	XJTLU	Zeyu Liu
429	Characterization and control of residual stresses in Laser Powder Bed Fusion processed metals at the microscale.	XJTLU	Zhaofeng Zhang
430	Multimodal Optoelectronic Synaptic Transistors Based on DTT-TCNQ Cocrystals for Robotic Vision	XJTLU	Zhaohui Cai
431	Dynamic Wi-Fi fingerprint database establishment and data augmented	XJTLU	Zhe Tang
432	Acceleration research of the computational fluid dynamics (CFD) solver based on the flux reconstruction method	XJTLU	Zhehao Sheng
433	Advanced dual-input artificial optical synapse for Neuromorphic computing	XJTLU	Zhengjun Liu
434	A polymer-like ultrahigh-strength metal alloy	XJTU	Zhizhi Xu
435	Neuro-inspired Devices for In-memory Sensing and Computing System	XJTLU	Zishen Zhao

RESEARCH AREA

English Culture and Communication

PAGE 296

	PROJECT TITLE	INSTITUTION	CANDIDATE
436	Wojtyła's the Acting Person: Inconsistencies in English Translation and the Concept of Experience	UoL	Bartlomiej Zbigniew Kowalczyk
437	The impact of different conversational generative AI chatbots on EFL learners: An analysis of willingness to communicate, foreign language speaking anxiety, and self-perceived communicative competence	XJTLU	Chenghao Wang
438	An Analysis of Self-Presentation Strategies by Chinese Female Social Media Influencers On Douyin	XJTLU	Danni Tang
439	"Isn't This Just a Game?" - Unpacking Audience Engagement in Chinese Interactive Web Series: Ludification vs. Gamification	XJTLU	Hanxue Zhang
440	Can Large Language Models Provide Useful Feedback in Translation Education?	XJTLU	Hui Jiao
441	Measuring intercultural experience and its effects on intercultural competence: A structural equation modeling approach	XJTU	Jiaqi Jiang
442	Imagining Shanghai as the lost hometown: Wong Kar-wai's spatial construction in "In the Mood for Love"	XJTLU	Jie Sun
443	Analysis of China-Related Discourse in Mainstream French Media: A Corpus-Based Discourse-Historical Approach	XJTU	Jing Li
444	Children's Imagery in War: An Analysis Focused on Children's Imagery in the 2013 Syrian Al Ghouta Attack	UoL	Kindah Ali
445	The role of positive and negative contact in shaping intergroup attitudes: Evidence of secondary transfer effects among Chinese university students	XJTU	Lingjie Tang
446	Decoding Paradoxical Identities: The Discourse Construction of Left-Behind Children in News Reports	XJTU	Linlin Liang
447	"Never seen Chinese people and Korean people try to learn each other's language so hard"	XJTLU	Mengdi Liu
448	The impact of mobile phone vernacular photography on aesthetics appreciation among practitioners in daily life	XJTLU	Qi Wang
449	An Investigation into Chinese IELTS Learners' Motivation and its Effect on Learning Outcomes	XJTLU	Qingyue Zhang

RESEARCH AREA

English Culture and Communication

PAGE 304

	PROJECT TITLE	INSTITUTION	CANDIDATE
450	Vietnamese media and the Russia-Ukraine war	XJTLU	Thi Kim Quy Hoang
451	Exploring how cultural immersion in museums shapes visitor experience	XJTLU	Tianyi Chen
452	The Role of English in the Linguistic Landscape of Luang Prabang	XJTU	Xiaochen Wang
453	The impact of mobile-assisted language learning (MALL) on EFL learners' listening skills and strategy use	XJTLU	Xiaojie Ni
454	An Upcoming War or an Escalating Tension? The Run-up to the Russia-Ukraine War in the Times of India and Hindustan Times	XJTLU	Yifang Yuan
455	Navigating Filial Caregiver' role and Digital Engagement: The Influence of Living Arrangements on Short Video Addiction among Retired Elderly	XJTLU	Yimin Lin
456	Discursive investigation of Chinese student returnees' cultural identity reconstruction in the workplace	XJTLU	Ying Jiang
457	Digital narratives: WeChat Public Accounts and the bicultural identities of second-generation Chinese immigrants in Spain	XJTLU	Yuan Yao
458	Is Suzhou a Classical Woman or a Masculine Man? A Case Study of mage Highlighting in Suzhou's Bilingual Promotional Video	XJTLU	Yuanxin Yang
459	Tracing foreign language emotion dynamics of Chinese senior secondary school students	XJTLU	Yuqing Wang
460	A Pilot Study on Translation Process Research: How Prior Knowledge Plays a Role Among Student Translators?	XJTLU	Yuxin Deng
461	Fragmented Narratives and Observational Approaches: Exploring the Moving Image Practices of Yang Di and Yang Dingliu	XJTLU	Zitong Zhu

RESEARCH AREA

Environmental Science

PAGE 311

	PROJECT TITLE	INSTITUTION	CANDIDATE
462	Effect of island area on quality and quantity of information about predators	XJTLU	Agnishikhe Munipapa Reddy Ashok Kumar
463	Antibiotic dispensing for Tuberculosis Patients: Cross sectional study in Pakistan using Standardized Patient at Community Pharmacies	XJTU	Ali Hassan Gillani
464	Real-time Characterization of Bioaerosols Under Different Air Quality Conditions	XJTLU	Baifeng Zhu
465	Unforeseen Minimum Wage Consequences	UoL	Davidmac Olisa Ekeocha
466	Pharmacists' Concerns regarding Physicians' Opioid Prescribing, Provision of Opioid Stewardship Interventions and Barriers in Providing these Interventions: A Cross-Sectional Study from Pakistan	XJTU	Hafsa Arshad
467	Comparative Assessment of Eight Global Fire Emission Inventories: Long-Term Trends and Case Studies	XJTLU	Hanyue Zheng
468	Revealing Millimeter-Scale Disturbances: Automated High-Resolution Insights into Wetland Carbon Emissions	XJTLU	Hao Liu
469	Ni encapsulated within Mo-doped CNT arrays derived from water hyacinth: A sustainable carbon source for efficient water electrolysis	JSU	Hennayaka Mudiyanselage Charitha Madusanka Jayawardana
470	Ecological baselines drive local people's perception of ecosystem restoration in socio – ecological systems	XJTLU	Huxuan Dai
471	Research on Species Diversity in Global Mixed-species Bird Flocks and their Information Flows	XJTLU	Jiahao Wu
472	Mechanisms of social innovations in an urban living lab: a case study on the development of Nature-based Solutions in Outdoor Research and Teaching Space	XJTLU	Jiawei Tong
473	Porous ionic liquid for oxidative desulfurization	JSU	Jie Yin
474	Evaluation and influence of coal mining on groundwater resources in arid mining areas	CUMT	Jingzhong Zhu

RESEARCH AREA

Environmental Science

PAGE 319

	PROJECT TITLE	INSTITUTION	CANDIDATE
475	Spatial pattern and controlling factors of riverine methane (CH4) emissions: A case study in Suzhou	XJTLU	Junyue Zhou
476	The relationship of legal and illegal wildlife trade	XJTLU	Lan Luo
477	High performance of N-doped cobalt oxide (N-CoOx) for peroxymonosulfate activation and the application potential of catalytic membrane system	XJTU	Meiling Liu
478	Umbrella, Keystone, or Flagship? An Integrated Framework for Identifying Effective Surrogate Species	XJTLU	Minyi Kau
479	Unveiling the dynamic impact and mechanisms of economic growth and renewable energy adoption on carbon emission in Developing countries	XJTU	Naila Rafique
480	A Review of Controlled Nuclear Fusion and the Energy Trilemma: Insights from ITER and Non-ITER Member Countries	CUMT	Qilin Jian
481	A systematic review of urban bird conservation within urban planning and design	XJTLU	Ruochen He
482	Impacts of urbanization on wild bees' food acquisition and reproduction rate	XJTLU	Shasha Zou
483	Current Status and Future Prospects of Research on Wind Dispersal of Seeds in Orchidaceae	XJTLU	Siqi Liu
484	Exploring the Sources, Abundance, Distribution, and Variability of Atmospheric Microplastics in Ningbo, China	UNNC	Taiseer Hussain Nafea
485	Dynamic processes of Fe-bound organic carbon formation at soil-water interface	XJTLU	Xiao Shu
486	Assessment of Carbon Resilience Dynamics in Urban Ecosystems Based on Early Warning Signals	CUMT	Xueqing Wang
487	Novel indicator of soil degradation states: two small molecular organic phosphorus species	XJTLU	Yaqin Wang
488	Performance assessment of solar photovoltaic-based constructed wetland for sustainable rural wastewater treatment	XJTU	Ye Yang

RESEARCH AREA

Environmental Science

PAGE 326

	PROJECT TITLE	INSTITUTION	CANDIDATE
489	Screening, characterization, and evaluation of selenium-and zinc-enriched probiotics	XJTLU	Yidan Wang
490	Degradation of tetracycline in aqueous solution by electron beam: performance and degradation pathway	XJTU	Yingying Dong
491	Are there dose-dependent or dose-molar ratio-dependent interaction effects between antimony and selenium in selenium hyperaccumulator Cardamine hupingshanensis?	XJTLU	Yuhua Duan
492	Effects of atmospheric stability upon impact threshold velocity of sand	XJTLU	Zeheng He
493	Challenges of Grassland Restoration on the Qinghai-Tibetan Plateau: Declining Soil Health and Microbial Fragility Highlight the Urgency of Native Grassland Protection	XJTLU	Ziao Liu
494	Methane Generation Driven by Soil Reactive Oxygen Species during Wet-Dry Alternation	XJTLU	Ziyan Liu

RESEARCH AREA

Industrial Design

PAGE 329

	PROJECT TITLE	INSTITUTION	CANDIDATE
495	Augmented Reality in Chinese museums: a case study on visitor experience	XJTLU	Guangyi Wu
496	Design for improved acceptance of wearable medical devices for elderly diabetic patients	XJTLU	Haojun Zhi
497	Enhancing the Experience of Senior Citizens in Medical Service Scenarios through Hybrid Digital-Physical Interaction.	XJTLU	Lei Mao
498	AI for sustainability: promoting sustainable behavior through image recognition	XJTLU	Xiaoyan Liu
499	Gamification in Design Education: An Educational Technology Perspective	XJTLU	Yubin Guo

RESEARCH AREA

International Relations

PAGE 332

	PROJECT TITLE	INSTITUTION	CANDIDATE
500	Evolving Dynamics in Urban Neighborhood Governance: Insights from the Yangtze River Delta region in the Post-Pandemic Era	XJTLU	Alessia Orazzo
501	Rule Competition: How American Hegemon Shapes International Rules	UNM	Leci Zhang
502	Nickel export bans and global market implications: The case of Indonesia	XJTLU	Venessa
503	Navigating Hegemonic Orders: China's Engagement with Central and Eastern Europe, 2012-2024	XJTLU	Vladimir Milić
504	EU Digital Public Diplomacy in China during the COVID-19 Pandemic	XJTLU	Xiangdong Chen

RESEARCH AREA

Mathematical Sciences

PAGE 334

	PROJECT TITLE	INSTITUTION	CANDIDATE
505	Evolution of star clusters with initial bulk rotation	XJTLU	Abylay Bissekenov
506	Predicting Rheological Properties of HAMA/GelMA Hybrid Hydrogels via Machine Learning	XJTLU	Bincan Deng
507	Classification prediction of China's population aging situation based on generative data and ensemble learning algorithms	XJTLU	Chongwen Tian
508	On Encounter Rate for Stars in Clusters	XJTLU	Chuang Du
509	Iwasawa theory of fine Selmer group	XJTLU	Hang Chen
510	The effects of multiple-parton interactions on the underlying events, minimum bias and pentaquark productions	XJTLU	Hao Yang

RESEARCH AREA

Mathematical Sciences

PAGE 337

	PROJECT TITLE	INSTITUTION	CANDIDATE
511	Equity-linked annuity valuation with the LRD feature in financial and mortality dynamics	XJTLU	Haoran Jiang
512	SSCL-GBM: A Novel Semi-Supervised Approach for Stock Prediction	XJTLU	Huijia Wang
513	Centre of mass location, flight modes, stability and dynamic modelling of gliders	NYU Shanghai	Huilin Li
514	The Interaction Impact of WHR and Low-level PM2.5 to Brain Structure	XJTLU	Jiahao Zhao
515	Pricing Chinese Convertible Bonds with Learning-Based Monte Carlo Simulation Model	XJTLU	Jiangshan Zhu
516	Numerical stability and convergence for nonlinear space-fractional delayed diffusion equations with mixed boundary conditions in two dimensions	XJTLU	Jing Chen
517	Zoonotic Emerging Infectious Diseases and Wildlife Trade	XJTLU	Kai Wang
518	The Influence of Hyperparameters on Physics-Informed Neural Networks (PINNs): Application to the Problem of Plane Stress	XJTU	Ningjie Wang
519	Dividend and capital injection control with transaction costs and optimal exiting strategies	XJTLU	Ningning Feng
520	Asymptotic Capital Allocation for Light-Tailed or Moderately Heavy-Tailed Risks based on the Higher Moment Risk Measure	XJTLU	Qingxin Yi
521	FAD: Feature Augmented Distillation for Anomaly Detection and Localization	XJTLU	Qiyin Zhong
522	Synthesis and Post-functionalization of Polysaccharide-based Microspheres with ordered Internal Pore Structures for Next-generation Chromatographic Technology	XJTLU	Rui Wang
523	Modelling of in-plane shear behaviour of woven prepregs considering viscoelasticity	XJTLU	Ruihan Dong

RESEARCH AREA

Mathematical Sciences

PAGE 344

	PROJECT TITLE	INSTITUTION	CANDIDATE
524	The Impact and Mechanisms of Macroprudential Policies on Equity Markets: Evidence from China	XJTLU	Ruijun Zong
525	The stability of China's insurance industry under regulatory measures	XJTLU	Ruina Xing
526	A Guided Approach to Ensuring Safety in Diffusion-Based Generative Models	XJTLU	Sidong Jiang
527	Point2pix-Zero: Point-Driven Refined Diffusion for Multi-object Image Editing	XJTLU	Siyuan Wang
528	Image Augmentation with Controlled Diffusion for Weakly Supervised Semantic Segmentation	XJTLU	Wangyu Wu
529	BFANet: Revisiting 3D Semantic Segmentation with Boundary Feature Analysis	XJTLU	Weiguang Zhao
530	Extremes of extended tail Gini functionals with application in systemic risk variability control	XJTLU	Weiran Li
531	Regression approaches for CALT parameter estimate	XJTLU	Wenhan Zhang
532	Convertible bond issuance and liquidity of small cap listed companies	XJTLU	Xiao Lin
533	Economic Scenario Generation (ESG) for Equity Markets	XJTLU	Xiaofan Xu
534	Test of Reliability in Coherent system on a Specific Time	XJTLU	Xuan Xu
535	Time-lagged Marginal Expected Shortfall	XJTLU	Xuannan Liu
536	Multiscale modelling of cellulose nano-fiber composites	XJTLU	Yang Zhou
537	Associations between Short-Term Exposure to Ambient Meteorological Factors and Hand Foot and Mouth Disease: An Individual-Level Case-Crossover Study in Jiangsu, China	XJTLU	Yifan Tang

RESEARCH AREA

Mathematical Sciences

PAGE 351

	PROJECT TITLE	INSTITUTION	CANDIDATE
538	High-Resolution Spectral Analysis of Kinematic and Chemical Properties in LP 2442 gp1-5	XJTLU	Yifan Wang
539	On the clinical trial design under cure rate assumption	XJTLU	Yiliang Zhou
540	The Effect of Issuing Green Bonds on Corporate Financial Performance in China	XJTLU	Ying Xu
541	Sector Sentiment, Mispricing and Future Stock Returns	XJTLU	Yinze Ji
542	Focuses on applying ANNs to predict sales volumes in live streaming based on various input variables	XJTLU	Yuhuan Chen
544	Intelligent Method for Word Tokenization in Text Analysis	XJTLU	Yuqing Liu
545	Physics-Informed Neural Networks for Modeling the Dynamics of Fiberboids	XJTLU	Zaibo Liu
546	Paths, Pasts, or More – a High-Frequency Perspective in Cryptocurrency Volatility	XJTLU	Zheng Tao
547	Semi-Template Framework for Retrosynthesis Prediction Using Graph Neural Network	XJTLU	Zongao Ye

RESEARCH AREA

Public Health

PAGE 356

	PROJECT TITLE	INSTITUTION	CANDIDATE
548	Exploring the role of multidimensional poverty in antibiotic resistance among urinary tract infection patients	XJTU	Iltaf Hussain
549	Cost-effectiveness of aortic valve replacement in low- and intermediate-risk Chinese patients with severe aortic stenosis	XJTU	Jin Peng

RESEARCH AREA

Public Health

PAGE 357

	PROJECT TITLE	INSTITUTION	CANDIDATE
550	Optimizing antibiotic prescribing practices for acute respiratory tract infections during the influenza season: utilization of diagnostic tests at primary healthcare facilities in China	XJTU	Muhetaer Kadeerhazi
551	Factors Influencing Tuberculosis Treatment Success and Failure in Pakistan: A Retrospective Analysis	XJTU	Naveel Atif
552	Geographical association of biodiversity with cancer and cardiovascular mortality rates: analysis of 39 distinct conditions	XJTLU	Qiaochu Xu
553	Trajectories of Changes in Family Endowments and Fertility Decisions	XJTU	Qihang Chen
554	Production of narrative macrostructures in Mandarin-Speaking children with Autism Spectrum Disorder: Age, linguistic and cognitive factors	XJTU	Ruijie Zhao
555	Predicting Primary Care Providers' Reading Behavior of Depression Clinical Practice Guidelines in Tibet: An Application of the Theory of Planned Behavior	XJTU	Ruixue Zhao
556	The association between drug shortages and prices across 74 countries: uncovering global access inequities	XJTU	Shuchen Hu
557	Evaluating National Essential Medicines Lists, Drug Registration, and Local Production of Anti-Cancer Medicines in South Asian Region: A Data-driven Assessment	XJTU	Sundus Shukar
558	Determinants of Disability Prevalence among Older Adults in Pakistan: Insights from Pakistan Social and Living Measurement Survey (2019-20)	XJTU	Tanzeela Jamil
559	The Long-Term Impact of Catastrophic Health Expenditure on Household Livelihoods in China: A Quasi-Experimental Analysis	XJTU	Yan Zhuang
560	Fermi Level Dependent Reaction Pathway and Activity of Photocatalytic CO2 Reduction by g-C3N4: Importance of π-conjugated Orbital Electron Density and Lewis Structure Variation	XJTLU	Yang You
561	Mediating Role of Internet Use in Cognitive-Depressive Pathways: A Longitudinal Study in Low- and Middle-Income Country	XJTU	Zhichao Wang
562	Who Seeks Help and Why? Exploring Mental Health Profiles and Behavioral Preferences for Support Among University Students	XJTU	Ziwei Qiang
563	Poly-victimization and suicidal ideation among Chinese university and high school students: the roles of hopelessness and interpersonal relationships	XJTU	Zixuan Cao

RESEARCH AREA

Urban Planning and Design

PAGE 366

	PROJECT TITLE	INSTITUTION	CANDIDATE
564	Fun, Fact, or Fiction? Guiding Authenticity in the Creation of XR Experiences at Heritage Sites	XJTLU	Anna Vichnevetskaia
565	To whom do we entrust the memories of our colonial past? – The dissonance of prison heritage in Qingdao and Dalian in postcolonial China	XJTLU	Beixi Sun
566	Cooperation Industrial Park: a way to enable regional path development	XJTLU	Chang Luo
567	How to identify urban residential spatial differentiation? Evaluation and mapping based on multidimensional residential quality at the neighborhood scale	XJTU	Kui Liu
568	Placemaking of Digital Nomads	XJTLU	Liyang Chen
569	Nexus between Urban Blue-Green Space and Residents Mental Health in Dhaka, Bangladesh: A Multilevel Modeling Approach	XJTU	Maruf Ahmad
570	Regeneration of Traditional Blocks in China: Can the Replication of Exemplary Regeneration Experiences Succeed?	XJTLU	Qinyu Zhang
571	Coordination mechanisms of integrated development of transit and land use in TOD (transit-oriented development)-based old city regeneration in China	XJTLU	Xiang Chen
572	Heritage-making, Art Festivals, and Sustainability in Rural China: A Comparative Study of Wuzhen Theatre Festival and Countryside Theatre Festival	XJTLU	Xiaotong Guo
573	Urban investment bonds and local government financing in China	XJTLU	Yuxuan Ou
574	A Study of Land Property Rights and Rural Revitalisation in China	XJTLU	Zhaoqin Shi
575	An analysis of blue-green space across Suzhou and its association with subjective well-being and physical activity	XJTLU	Zijun Guo

INSTITUTION	ABBREVITATION
Air Force Engineering University	AFEU
Capital Normal University	CNU
China University of Mining and Technology	CUMT
Harbin Institute of Technology	HIT
Jiangsu University	JSU
Jiangsu University of Science and Technology	JUST
Nanjing University	NJU
Nanjing Tech University	NTU
New York University Shanghai	NYU Shanghai
Osaka University	OU
Southeast University	SEU
Shaanxi Normal University	SNNU
The National University of Malaysia	UKM
University of Nottingham Malaysia	UNM
University of Nottingham Ningbo China	UNNC
University of Liverpool	UoL
Xi'an Jiaotong-Liverpool University	XJTLU
Xi'an Jiaotong University	XJTU
Yangzhou University	YZU

ABSTRACTS

001

Performance and Parametric Design Optimization of Semi-Transparent Building-Integrated Photovoltaic Façade in Different Climatic Regions

Aanuoluwapo Aderonke Oguntade (PhD)

SUPERVISORS Marco Cimillo (XJTLU)
Asterios Agkathidis (UoL)

ACADEMY/SCHOOL Design School

The use of semi-transparent BIPV is on the rise. Much research has been conducted to determine how semi-transparent BIPV affect building thermal, visual, and electrical performance. From previous studies, no research has been optimized for maximizing energy generation and visual and thermal comfort while reducing building energy consumption, cost, and environmental impact; also, many focused on one single mode of BIPV application. Therefore, this research will examine the thermal, visual, electrical, cost and environmental performance of semi-transparent façade in the five climatic regions in China. While building performance simulation can be utilized to examine the thermal, visual, electrical, cost and environmental performance of a semi-transparent façade, carrying out such analysis for several design alternatives to determine the most optimized design can be time-consuming. Therefore, this research also seeks to develop a multi-objective parametric optimization tool that simplifies this process, reduces the simulation time and makes the results easier to interpret for easy decision-making for all the stakeholders.

002

The architectural vernacular and cultural heritage of the Akha: A case study from Alulaozhai, Xishuangbanna (Sipsongpanna), China

Daneel Starr (PhD)

SUPERVISORS Iain Jackson

UNIVERSITY/INSTITUTE University of Liverpool / School of Architecture

The focus on this research is to document the vernacular architecture and cultural heritage of the Akha of Alulaozhai, Yunnan, China. Historically, the Akha relied on oral traditions to preserve their rich cultural heritage, a practice increasingly endangered by rapid development. This study examines the impact of these changes on Akha architectural traditions and cultural identity. Key findings reveal significant shifts in architectural practices, such as a transition from locally sourced materials such and timber and bamboo, to modern construction techniques that utilize concrete and steel. This is in part driven by governmental policies and shifting societal needs. Despite these changes, elements like hearth-centred practices and symbolic roof adornments persist, acting as “golden threads” of cultural continuity. The research underscores the urgency of preserving vernacular architecture to sustain cultural identity and offers a replicable framework for safeguarding heritage in similar communities globally.

003

Holographic Construction in Design for disassembly inspired by Iranian timber structures for post-disaster temporary housing

Farkhondeh Vahdati (PhD)

SUPERVISORS Mia Tedjosaputro, Charles Kwet Shin Loo Chin Moy (XJTLU)
Asterios Agkathidis (UoL)

ACADEMY/SCHOOL Design School

This research focuses on post-disaster temporary housing design and emergency shelters. Temporary shelter solutions exist in vernacular Iranian architecture, constructed out of load-bearing timber frames with interlocking joints. The flexibility and modularity of timber connections and panels in Shekili houses combined with contemporary technology could allow innovative Design for Disassembly (DfD, henceforth) solutions. This research answers the following questions: How can traditional Iranian vernacular timber structures be optimised for temporary shelter solutions which can be easily disassembled and reassembled? What is the workflow for designing and disassembling using parametric design tools and AR-assisted disassembly techniques? To answer these questions, the literature review for the "Design for Disassembly" and "disaster relief shelters" keywords is studied through ScienceDirect and CumInCAD, and the authors developed a workflow based on an analysis of the Shekili houses, which then was validated and evaluated to conclude its suitability for the design and assembly of temporary shelters. The utilised tools include Rhinoceros 3D, Fologram, Microsoft HoloLens2, and laser cutters. Our findings highlight leveraging technology to integrate elements from the Shekili structure into current practice and design. Future studies will focus more on the disassembly of augmented timber frames using augmented reality (AR).

004

Conversational AI design partner for early-stage collaborative architectural design process

Lok Hang Cheung (PhD)

SUPERVISORS Juan Carlos Dall'Asta, Giancarlo Di Marco (XJTLU)
Asterios Agkathidis (UoL)

ACADEMY/SCHOOL Design School

Human-computer interaction (HCI) has been explored in the architecture discipline since the 1960s. It stated that humans and architecture (as machines) are both designers. However, most AI-assisted architectural design processes are limited to one-to-one interaction, one-directional design processes and require a long learning curve for applying sophisticatedly developed AI applications. Despite agentic AI systems showing promising potential in enhancing human-AI collaboration in creative scenarios, they are underexplored in architectural design. This research proposes a conversational design framework for early-stage architectural design exploration, with a developed architectural-focus agentic multimodal AI system. Through a series of design workshop cases and iterative development of the AI chatbot, the proposed framework and agentic AI tool encourage designers to dedicate themselves to the design process with minimum learning curves. Collaborative environment integration allows more sophisticated designers, to enhance design conversation by asking follow-up questions, catalysed mutual-learning among the design team members.

005

Optimisation of Low-rise Lightweight Steel-Framed Residential Building Design in the Hot-Summer-Cold-Winter Region of China by Life Cycle Analysis

Yang Yang (PhD)

SUPERVISORS Marco Cimillo, Jianli Hao (XJTLU)
David Chow (UoL)

ACADEMY/SCHOOL Design School

According to China's policies and plans, the number of low-rise steel-framed residential buildings in the country will keep increasing, particularly in the hot-summer-cold-winter (HSCW) region. On the other hand, the reduction of carbon emissions from the steel industry and the building sector is critical to fulfilling China's pledge to peak carbon emissions by 2030. Life Cycle Assessment (LCA) is an effective tool for controlling energy-related emissions in buildings, avoiding burden shifting among different stages of the building's life cycle. However, there is limited research focusing on how the design of LSF houses can be optimised from its early stages and contribute to energy saving and the reduction of buildings' impact over their entire life cycle. Thus, this research aims to identify and optimise the most significant design variables of low-rise LSF residential buildings in the HSCW region of China by using LCA, incorporating embodied carbon calculations and operational energy simulations.

006

Fractal-Based Computational Design and 3D-Concrete Printing of Extra-Light Porous Panels for Building Applications

Yuhan Li (PhD)

SUPERVISORS Iasef Md Rian, Shu Tang (XJTLU)
Han-Mei Chen (UoL)

ACADEMY/SCHOOL Design School

This research explores the application of fractal curves in 3D Concrete Printing (3DCP) to improve printing efficiency through continuous toolpath design, targeting structural integrity and insulation efficiency of 3D-printed panels by introducing porosity. Current limitations include discontinuous extrusion for complex designs, local buckling of extruded material, and material inefficiency, which hinder high-performance component production. By introducing continuous toolpaths derived from fractal principles, this study aims to create multiple cavities with parametric porous morphology while addressing structural challenges. Key objectives include mitigating local buckling, enhancing insulation through increased cavity formation, and achieving lightweight yet strong designs. Methodology integrates computational modeling, performance simulation, and empirical testing to validate the performance of the printed panels. Expected outcomes include stronger, resilient panels with improved material efficiency and insulation properties, showcasing the transformative potential of fractal geometry in modern construction. This research aims to advance 3DCP technology and contribute to development of sustainable concrete materials.

007

Investigation of the underlying mechanism of E3 ubiquitin ligase TRIM31 (TRIM31) in triggering tumorigenesis and progression of esophageal squamous cell carcinoma

Aidi Gao (PhD)

SUPERVISORS Mu Wang (XJTLU)
Sonia Rocha (UoL)
Jundong Zhou (External)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Esophageal squamous cell carcinoma (ESCC) accounts for over 90% of esophageal carcinoma cases in china, and develops from inflammation (INF), hyperplasia (HYP), dysplasia (DYS) to carcinoma in situ (CIS). However, how ESCC initiates from INF to CIS remains unclear. Our preliminary data demonstrated that TRIM31 drives ESCC progression. TRIM31 is also an important regulator of inflammation. Interestingly, we found TRIM31 expression is activated by the well-known INF-CIS transformation associated pathway IL-6/STAT3 in ESCC. In this project, we aim to illustrate the function and mechanism of TRIM31 in the INF-CIS process, which will promote development of early prediction marker for ESCC.

008

Disease-responsive IL-10R+ oligodendrocytes promote myelin repair

Bing Han (PhD)

SUPERVISORS Yuan Zhang

UNIVERSITY/INSTITUTE Shaanxi Normal University / School of Life Sciences

The microenvironment characterized by various cytokines from infiltrating immune cells and/or resident glial cells, play a critical role in myelin repair. Here, we identified a disease-responsive subset of oligodendrocytes (OLs) expressing the interleukin-10 receptor (IL-10R) at demyelinating lesion sites (IL-10R+ OLs) by spatial transcriptomics and immunofluorescence staining. IL-10R+ OLs can be activated by IL-10, promoting oligodendrocyte differentiation and myelin regeneration, which are developmental stage and disease progression dependent. Conditional knockout of IL-10R in OLs at different developmental stages resulted in a significant reduction in the number of mature OLs and aggravation of demyelination. IL-10R neutralizing antibodies and STAT3 inhibitors blocked the promoting activity of IL-10 on OPC differentiation. Our findings indicate that IL-10 has a "non-classic" pro-regenerative role in oligodendrocyte development, and targeting disease-responsive IL-10R+ OLs cells may represent an attractive therapeutic strategy for the repair of myelin injury.

009

Challenges in evaluating generative models for molecular design

Bo Li (PhD)

SUPERVISORS Xin Liu (XJTLU)
Manolis Papamichos Chronakis (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Fragment-based drug design (FBDD) is a robust approach in drug discovery, identifying small chemical fragments that bind weakly yet selectively to target proteins. These fragments are merged or linked to create lead compounds, enabling exploration of vast chemical space with reliable interactions. However, traditional FBDD involves "fragmented" stages such as fragment docking, hotspot identification, and linker design, which rely heavily on expert intuition and intensive labor. We introduce GenFBDD, a web server for FBDD with an integrated multi-stage framework—Dock-Link-ReDock—enhanced by state-of-the-art generative models and practical strategies to overcome these challenges. Fragments are first docked to the target of interest using DiffDock, and hotspots are identified via topological prediction of Fpocket or pose clustering. DiffLinker then connects fragments into novel compounds, which are finally re-docked using DiffDock to refine binding poses. GenFBDD establishes a new paradigm in FBDD, streamlining the process and reducing barriers to entry in drug discovery.

010

Research on the mechanism of Triptolide regulating NRP1-mediated Rac1/PI3K/AKT signal pathway in relieving Cytokine Release Syndrome

Chencheng Li (PhD)

SUPERVISORS Yiqiang Wang (XJTLU)
Xiaoli Meng (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Cytokine Release Syndrome (CRS) is a syndrome that arises from the excessive activation of immune cells, leading to the release of a large amount of cytokines and subsequently triggering severe systemic inflammatory responses. Triptolide, one of the main active ingredients in Tripterygium glycosides, exhibits significant anti-inflammatory and immunomodulatory effects. We have found that Triptolide alleviates CRS by targeting and binding to NRP1 to inhibit its activity, thereby disrupting NRP1-mediated Rac1/PI3K/AKT signaling, inhibiting macrophage activation, and reducing the secretion of inflammatory cytokines. This provides a scientific basis for the use of Tripterygium preparations in the treatment of CRS.

011

Prevention of α-synuclein aggregation by small molecules as a promising therapeutic approach for Parkinson's disease

Gang Yong (PhD)

SUPERVISORS Lei Fu (XJTLU)
Christopher Goldring (UoL)
Min Xu (PegBio Co., Ltd.)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Aggregation of α-synuclein, a component called amyloids of Lewy bodies in Parkinson's disease (PD), is strongly linked with PD development, making it an attractive therapeutic target. However, the key challenge in the treatment of such diseases is the effective inhibition using extrinsic However, the key challenge in the treatment of such diseases is the effective inhibition using extrinsic However, the key challenge in the treatment of such diseases is the effective inhibition using extrinsic agents of protein fibrillation. Thus, molecules that can inhibit protein fibril formation have great therapeutic utility. In the current study, we employed a Th-T (Thioflavin) assay using recombinant α-synuclein to screen candidate compounds which were subsequently confirmed by Transmission electron microscopy for preventing the aggregation of compounds which were subsequently confirmed by Transmission electron microscopy for preventing the aggregation of α-synuclein among small molecules in our in-house compound library. We found that a small molecule LF4, which modulated aggregated α-synuclein to prevent further elongation of α-synuclein fibrils. The fluorescence of Th-T decreased upon binding of LF4 to fibrils of α-synuclein. The potential compound could be promising therapeutic to Parkinson's disease.

012

The role of Neutrophil extracellular traps (NETs)-DNA in atherosclerosis

Guona Chen (PhD)

SUPERVISORS Yiqiang Wang (XJTLU)
Xiaoli Meng (UoL)
Hui Ren (Beaver Biomedical Engineering Co., Ltd.)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Neutrophil extracellular traps (NETs) are network structures released by activated neutrophils, primarily composed of double-stranded DNA, histones, and neutrophil granule proteins. The sustained release of NETs in response to external stimuli can lead to the activation of surrounding platelets and monocytes/macrophages, as well as damage to endothelial cells (EC) and vascular smooth muscle cells (VSMC). Some clinical trials have also demonstrated an association between NETs and the severity and prognosis of atherosclerosis. Recent studies suggest that NET-derived DNA (NET-DNA) is related to cancer metastasis in mouse cancer models. However, the role of NET-DNA in the development of atherosclerosis remains unclear. Therefore, we plan to investigate the mechanisms by which NETs contribute to atherosclerosis, exploring the mediating role of NET-DNA components in inflammatory diseases. This research aims to provide new insights and methods for the early diagnosis and treatment of cardiovascular-related diseases.

013

Machine Learning-Driven Calibration and Systematic Variance Analysis Advance m6A Epitranscriptomics

Haokai Ye (PhD)

SUPERVISORS Zhen Wei, Jia Meng, Tonglong Li (XJTLU)
Dan Rigden (UoL)

ACADEMY/SCHOOL School of Science

N6-methyladenosine (m6A) is a prevalent RNA modification that plays a critical role in RNA stability, translation, and gene expression regulation. Despite advances in detection technologies, technical variability and artifacts continue to limit the accuracy and reproducibility of m6A profiling. In this study, we compiled 797,091 m6A sites from 13 high-resolution techniques and identified over 16 million m6A enrichment peaks from 2,712 MeRIP-seq experiments. To address antibody-related artifacts in MeRIP-seq, we developed m6ACali, a machine-learning framework that enhances m6A profiling accuracy by identifying off-target peaks and calibrating detection without requiring in-vitro transcribed (IVT) controls. Furthermore, using a binomial generalized linear mixed-effects model (GLMM), we quantified m6A variance across nine profiling techniques and diverse biological contexts, identifying low-variance reference sites to enable robust cross-platform normalization. These contributions improve the reproducibility of m6A detection and support standardized data integration across experimental platforms and conditions, advancing the field of epitranscriptomics.

014

Developing a generalized deep learning approach for large scale virtual screening in the entire chemical space

Haoruo Zha (PhD)

SUPERVISORS Xin Liu (XJTLU)
Manolis Papamichos Chronakis (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

In recent years, deep learning has achieved excellent predictive performance in virtual screening tasks. However, there are sample selection bias in the distribution of data used to train deep learning models, which can reduce the generalization of model predictions in chemical space. This selection bias is caused by chemists pre-selected molecules that are more likely to be drugs for experimentation. To overcome this problem, this study proposes a deep learning method for virtual screening of the entire chemical space (ESVS). This method simulated sample selection bias using multitask learning and integrated it with molecular activity prediction to improve the generalization of the final prediction results. The effectiveness of the proposed method has been demonstrated through experiments on various datasets, and compared to the baseline method, it has higher screening ability on datasets simulating chemical spatial distribution. Additionally, this method is not tied to any specific deep learning architecture.

015

Statistical modeling of single-cell epitranscriptomics enabled trajectory and regulatory inference of RNA methylation

Haozhe Wang (PhD)

SUPERVISORS Jia Meng, Jionglong Su (XJTLU)
Anh Nguyen (UoL)

ACADEMY/SCHOOL School of Science

As a fundamental mechanism for gene expression regulation, post-transcriptional RNA methylation plays versatile roles in various biological processes and disease mechanisms. Recent advances in single-cell technology have enabled simultaneous profiling of transcriptome-wide RNA methylation in thousands of cells, holding the promise to provide deeper insights into the dynamics, functions, and regulation of RNA methylation. However, it remains a major challenge to determine how to best analyze single-cell epitranscriptomics data. In this study, we developed SigRM, a computational framework for effectively mining single-cell epitranscriptomics datasets with a large cell number, such as, those produced by scDART-seq technique from SMART-seq2 platform. SigRM not only outperforms state-of-the-art models in RNA methylation site detection on both simulated and real dataset, but also provides rigorous quantification metrics of RNA methylation levels. This facilitates various downstream analyses, including trajectory inference and regulatory network reconstruction concerning the dynamics of RNA methylation. Keywords: single-cell, epitranscriptome, m6A, RNA methylation, scDART-seq, statistical modeling, trajectory inference, cell cycle, gene regulatory network.

016

Comparative Analysis of Governance and Regulatory Institutions on Intellectual Property and Technology Transfer in 'Orphan Drugs' Biotech Companies' International Expansion: P.R.C. vs. U.S.

Henian Song (PhD)

SUPERVISORS Jun Yang, Lei Fu (XJTLU)
Gabriella Pizzuto (UoL)
Keyun Ren (CATUG Biotechnology)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

This research aims to conduct a comprehensive and comparative analysis of the governance and regulatory issues surrounding intellectual property (IP) and technology transfer in the international expansion of orphan drug biotech companies, focusing on the People's Republic of China (P.R.C.) and the United States (U.S.). By comparing the governance and regulatory institutions in the two jurisdictions, the study primarily: i) seeks to identify challenges faced by biotech companies during international expansion and propose strategies to enhance IP protection and facilitate technology transfer; and ii) provides valuable insights into the complexities faced by orphan drug biotech companies as they expand overseas, contributing to the propositions of effective and optimized measures within the scope of governance and regulation in a jurisdiction to support their business operations.

017

The development and optimization of transdermal protein delivery system for the treatment of chronic diseases

Huan Xu (PhD)

SUPERVISORS Lei Fu (XJTLU)
Neil Liptrott, Dan Carr (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Transdermal administration offers distinctive advantages over traditional oral and intravenous routes, including no first-pass effect, non-invasiveness, and better patient compliance. Nevertheless, the landscape of existing transdermal drug delivery systems predominantly caters to small molecular drugs. The achievement of needleless transdermal delivery of macromolecules, like therapeutic proteins, remains a great challenge. In this study, we have optimized the protein-binding delivery system, which serves as an efficient and biocompatible transdermal carrier capable of assembling with various proteins, including insulin. The binding nanocomplex demonstrated remarkable transdermal penetration capabilities both in ex vivo and in vivo experiments. Furthermore, the transdermal administration of the FCS-insulin nanocomplex showed potent blood glucose regulation and therapeutic efficacy in diabetic mouse and pig models. Hence, the FCS-based transdermal delivery system presents a promising opportunity to penetrate the skin barrier and facilitate the efficient transdermal delivery of biomacromolecules.

018

In vitro and in vivo pharmacological validation of APG-5918 in T-cell lymphoma

Huanshan Guo (PhD)

SUPERVISORS Lei Fu (XJTLU)
Christopher Goldring (UoL)
Dajun Yang (Ascentage Pharma)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

TCLs encompass a heterogeneous group of hematologic neoplasms derived from clonal proliferation of T lymphocytes and are often characterized by aggressive clinical behavior and poor prognosis. Enhancer of zeste homolog 2 (EZH2), as a crucial histone methyltransferase and the catalytic subunit of the polycomb repressive complex 2 (PRC2), mediates trimethylation of histone H3 at lysine 27 (H3K27me3) to silence gene expression. EZH2 is aberrantly overexpressed with very poor prognosis in TCLs. EED, another core subunit of the PRC2, is vital for maintaining histone methyltransferase activity. Targeting of EED has emerged as a promising strategy to inhibit PRC2 function. APG-5918 is an investigational potent, selective, small-molecule EED inhibitor. The aim of this study was to evaluate antitumor activity and molecular mechanisms of APG-5918 monotherapy in preclinical models of TCLs.

019

Investigation of inhibitory cross interactions between renal URAT1 and OAT3 transporters

Jialin Bian (PhD)

SUPERVISORS Lei Fu (XJTLU)
David Dickens, Bettina Wilm (UoL)
Hongjian Zhang (Viva Star Biosciences (Suzhou) Co., Ltd.)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Kidney is an important organ responsible for the clearance of substances from the body. To facilitate this function, many transporters are expressed in the kidney. Among them, OAT3 and URAT1 have high protein sequence homology, which are encoded by the SLC22A gene subfamily. This high protein sequence homology and potential functional overlap in transporting certain substances beg the question on the interaction potential of URAT1 inhibitors. Dotinurad is a selective urate reabsorption inhibitor and the inhibitory effect of Dotinurad on OAT3 is relative strong. Due to the significant role of OAT3 in the renal elimination of many drugs, the cross inhibition of OAT3 by URAT1 inhibitors may change the safety and pharmacokinetics profiles of drugs that are cleared via OAT3. The objectives of the present study are to examine whether major metabolites of Dotinurad would alter OAT3 activity and whether Dotinurad metabolism would be linked to potential OAT3-mediated drug-drug interactions.

020

Structure-based vaccine design of a pre-fusion glycoprotein B for varicella-zoster virus

Jianguo Yin (PhD)

SUPERVISORS Lei Fu (XJTLU)
Neil Liptrott, Christopher Goldring (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Varicella-zoster virus (VZV), a double-stranded DNA virus, causes varicella (chickenpox) and herpes zoster (shingles), contributing to significant global morbidity. Although vaccines like ZOSTAVAX and GSK Shingrix exist, they present limitations such as side effects and unmet clinical needs. Our project focuses on developing a novel mRNA vaccine targeting the VZV gB protein. By stabilizing the gB pre-fusion conformation through disulfide bond mutations, we enhance immunogenicity. The prefusion gB trimer design was validated using electrophoresis and electron microscopy. Over three years, we will analyze the pre-fusion gB structure, optimize mRNA sequences and promoters, encapsulate mRNA in lipid nanoparticles (LNPs), and evaluate immune responses in mice. Antibody screening will follow to ensure efficacy. This research aims to bridge gaps in current VZV prevention and treatment, offering a more effective and safer solution to control VZV infections globally.

021

Profiling circular RNA modifications from nanopore direct RNA sequencing

Jiayi Li (PhD)

SUPERVISORS Jia Meng (XJTLU)

ACADEMY/SCHOOL School of Science

This project is aimed to develop the first computational solution for detecting multiple RNA modifications in circular RNAs at single-base and single-molecule resolution from Oxford nanopore direct RNA sequencing data. We are also interested in studying further the molecular and biological functions of circular RNA modifications, especially how they are related to translation, stability and molecular mechanisms of diseases and other phenotypes.

022

Nanodiamonds inhibit migration and angiogenesis in glioblastoma-conditioned endothelial cells

Jiayi Wan (PhD)

SUPERVISORS Xia Huang, Zhiliang Lu (XJTLU)
Carrie Duckworth (UoL)

ACADEMY/SCHOOL School of Science

Glioblastoma is the most aggressive primary malignant brain tumor in adults. The main treatments for glioblastoma include surgery, radiation, and chemotherapy, whilst the side effects and high cost hinder the treatment. Recently, the usage of different kinds of nanoparticles (NPs) have showed the potential to inhibit tumor angiogenesis. Nanodiamonds (NDs) are a type of NPs with high biocompatibility and low toxicity, whilst the effects of NDs in tumor angiogenesis remain unknown. In this project, we will explore whether NDs could inhibit tumor migration and angiogenesis. The supernatant of glioblastoma cells with or without NDs will be added onto endothelial cells to achieve indirect cell co-culture. It is found that NDs could inhibit the migration and angiogenesis of co-cultured endothelial cells. The potential mechanism underlying this process may be related to the binding between VEGF165 secreted from glioblastoma cells and NDs.

023

Role of CD70 in renal clear cell carcinoma

Jie Ni (PhD)

SUPERVISORS Mu Wang (XJTLU)
Natalia Savelyeva (UoL)
Xin Dong (Suzhou Neologics Bioscience Co., Ltd.)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Over the past two decades, significant progresses have been made to improve the outcomes of clear cell renal cell carcinoma (ccRCC). Unfortunately, patients with advanced or metastatic disease remain a therapeutic challenge. Recent evidences have indicated that overexpression of CD70 is tightly associated with ccRCC and targeting CD70 may provide a potentially novel therapeutic strategy for advanced RCC patients. However, to date the underlying mechanism of CD70 in the process of metastasis remains to be investigated. In this study, we utilized the omics technologies, such as RNAseq and mass spectrometry-based proteomics, to discover differentially expressed genes and proteins after CD70 depletion with a goal to further explore the potential role of CD70 in regulating tumor development of ccRCC.

024

Water-Mediated Active Conformational Transitions of Lipase on Organic Solvent Interfaces

Jihang Zhang (PhD)

SUPERVISORS Hanjie Ying

UNIVERSITY/INSTITUTE Nanjing Tech University /
College of Biotechnology and Pharmaceutical Engineering

Enzyme biocatalysis has emerged as a sustainable alternative to conventional chemical processes, but the need for enzymes with enhanced stability in organic solvents remains a critical challenge. Organic solvents significantly affect enzyme properties, limiting their practical application. This study focuses on Lipase Thermomyces lanuginose, through molecular dynamics simulations and experiments, we quantified the effect of different solvent-lipase interfaces on the interfacial activation of lipase. Solvent-protein interactions were used to interpret the factors influencing changes in lipase conformation and enzyme activity. We found that water content is crucial for enzyme stability. In the presence of benzene-water interface, the interfacial activation angle of lipase increased from 78° to 102°. Methanol induces interfacial activation in addition to significant competitive inhibition and denaturation at low water content. Our findings shed light on the importance of understanding solvent effects on enzyme function and provide practical insights for enzyme engineering and optimization in various solvent-lipase interfaces.

025

Design and optimization of JO-IEX process for highly efficient quaternary separation of 5′-ribonucleotides

Jingwei Kou (PhD)

SUPERVISORS Hanjie Ying

UNIVERSITY/INSTITUTE Nanjing Tech University /
College of Biotechnology and Pharmaceutical Engineering

The developed JO-IEX technology was applied to continuously separate four 5′-ribonucleotides here. The unit contained seven columns with three separation steps, among which three columns were for the quaternary separation and the others for the regeneration of resins. The operating conditions, that is, the critical flow rates in three separation steps were preliminarily designed according to the equilibrium theory and optimized by a three-dimensional theoretical separation region approach. The feasibility of the JO-IEX process and the separation performances were validated by four runs using the actual 5′-ribonucleotides' enzymatic hydrolysate as feed solutions. The purities and yields of 5′-ribonucleotides could reach above 97%. The productivity was enhanced to 0.91 g/(kg · h), and the desorbent consumption was reduced to 1.01 L/g, compared to those of 0.70 g/(kg · h) and 1.75 L/g in the fixed-bed process. The technology proposed could be a potential technique in the continuous multicomponent ion-exchange separation process.

026

Enhance CAR-T cell infiltration into pancreatic solid tumors through the expression of an engineered membrane-anchored Tissue Inhibitor of Metalloproteinases (TIMP)

Jipeng Zheng (PhD)

SUPERVISORS Meng Lee (XJTLU)
Dan Carr (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Chimeric Antigen Receptor (CAR) T-cell therapy has emerged as a revolutionary immunotherapeutic approach in cancer treatment. However, its clinical application remains largely limited to hematological malignancies due to poor infiltration into solid tumors. A critical barrier is the impaired transmigration of CAR-T cells across the endothelial barrier, primarily attributed to the shedding of crucial adhesion molecules by TNF-α Converting Enzyme (TACE). To address this limitation, we engineered a membrane-anchored Tissue Inhibitor of Metalloproteinases (TIMP) variant, designated T1 Prα TACE, which exhibits potent TACE inhibitory activity. Expression of this novel TIMP construct on CAR-T cells effectively prevents TACE-mediated shedding of adhesion molecules, thereby preserving the cells' transendothelial migration capacity. This innovation potentially enhances CAR-T cell infiltration into solid tumors, representing a promising strategy to expand the therapeutic scope of CAR-T cell therapy beyond hematological malignanciesdue to poor infiltration into solid tumors.

027

Multifunctional bioactive materials

Junping Ma (PhD)

SUPERVISORS Bo Lei

UNIVERSITY/INSTITUTE Xi'an Jiaotong University /
Frontier Institute of Science and Technology

The development of efficient biomaterials strategy with precise bioactive functions is urgent in overcoming clinical challenge. In this study, we introduce a bioactive, multifunctional MXene (transition metal carbides and/or nitrides)-based hydrogel. This hydrogel, formed through the self-assembly of Ti3C2TX MXene and poly(salicylic acid)-Pluronic F127-poly(salicylic acid) (FPSa@M), exhibited the precise capabilities for regulating thermo-antioxidation and anti-inflammatory environments. FPSa@M exhibited the injectability, rapid gelation, electrical conductivity, and beneficial antioxidant and photothermal effects. The photothermal temperature-adjustable FPSa@M hydrogel effectively achieved complete photothermal eradication of high concentrations of multidrug-resistant bacteria. Additionally, FPSa@M hydrogel significantly impacted the multiple cellular behaviors, stimulating proliferation, scavenging reactive oxygen species (ROS), reducing inflammatory factor expression, promoting human umbilical vein endothelial cells (HUVECs) migration and tubule-forming activity of HUVECs. In the methicillin-resistant Staphylococcus aureus (MRSA)-infected or burn wound model, FPSa@M could efficiently eradicate bacterial infection, remodel the microenvironment of oxidative stress and inflammation in wound healing through activating the heat shock protein 90 and angiogenesis, thus significantly promote the wound repair.

028

Investigation of mitochondria-targeted compounds in Alzheimer's disease models

Junyu Yao (PhD)

SUPERVISORS Lei Fu (XJTLU)
Massimiliano Stagi (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Alzheimer's disease (AD) is a common neurodegenerative disorder in the elderly without a cure and has been proposed as a metabolic disease. Moreover, a series of mitochondrial abnormalities have been identified in AD, including structure alteration, mitochondrial DNA (mtDNA) changes, altered mitochondrial membrane potential, excessive mitochondrial ROS production, and reduced mitochondrial ATP, leading to defective mitophagy in microglia cells. LPS-induced BV2 microglial cell activation results in inflammatory responses strongly correlated with AD, leading to synaptic degeneration, neuronal cell death, and cognitive dysfunction. This project investigates the effects of mitochondria-targeted compounds on Alzheimer's disease models in BV2-LPS neuroinflammation to study their molecular mechanisms and signaling pathways to explore potential AD-targeting drugs.

029

ROS-related mitochondrial homeostasis and signalling pathways in mtDNA 3243A>G mutation diseases

Keyue Ding (PhD)

SUPERVISORS Lei Fu, Yixue Qiao (XJTLU)
Amy Chadwick (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

The mtDNA 3243A>G mutation, located in the mitochondrial DNA MT-TL1 gene encoding tRNA (Leu (UUR)), is among the most prevalent and pathogenic mtDNA mutations. When its heteroplasmy level exceeds a critical threshold, it triggers complex disease phenotypes by impairing respiration, energy metabolism, and promoting excessive Reactive Oxygen Species (ROS) production. While ROS are essential for cellular functions, their overproduction damages mitochondria and cells. Current treatments remain symptomatic, underscoring the need for targeted therapies. This study emphasizes the role of ROS dynamics in mitochondrial diseases through a literature review, establishment of mtDNA 3243A>G mutation cell lines, pharmacological interventions, and cellular energy metabolism assays. It identifies ROS-related signaling pathways as potential therapeutic targets, offering a foundation for developing interventions for disorders caused by the mtDNA 3243A>G mutation. This research aims to advance understanding and therapeutic strategies for mitochondrial disorders.

030

PorX/PorY Two-Component System and SigP Act as Regulators of the Type IX Secretion System in Flavobacterium psychrophilum

Lin Su (PhD)

SUPERVISORS Yongtao Zhu, Sekar Raju (XJTLU)
Rachel Floyd (UoL)
Shaowu Li (HRFRI: Heilongjiang River Fisheries Research Institute)

ACADEMY/SCHOOL School of Science

Bacterial cold-water disease (BCWD), caused by Flavobacterium psychrophilum, is a major threat to salmonid aquaculture worldwide. The type IX secretion system (T9SS) is essential for the virulence of F. psychrophilum, but its regulatory mechanisms remain unclear. This study explored the roles of the PorX/PorY two-component system and a sigma factor SigP in regulation of F. psychrophilum T9SS. We demonstrated that deleting porY eliminated gliding motility and decreased proteolytic activity, similar to the mutant lacking gldN, a core component of the T9SS. Deletion of porX and sigP partially reduced motility and proteolytic activity. Proteomic analysis of the mutants revealed alterations in extracellular protein profiles, indicating PorX/PorY and SigP influence the T9SS-secreted proteins including potential virulence factors. qPCR confirmed downregulation of T9SS-related genes in these mutants. In vivo assays demonstrated reduced pathogenicity and increased rainbow trout survival vaccinated with these mutants. These findings highlight the regulatory mechanisms of T9SS in F. psychrophilum and their potential in developing live attenuated vaccines against BCWD.

031

Exploring the Prevalence of Monkey B Virus in Primate Breeding Colonies in China and Its Cellular Entry Mechanisms

Lingyan Yang (PhD)

SUPERVISORS Rong Rong, Zhiliang Lu (XJTLU)
David Fernig (UoL)

ACADEMY/SCHOOL School of Science

To investigate the prevalence of Monkey B Virus (BV) in Chinese primate breeding colonies, the recombinant BV antigens were produced, along with the rapid Enzymatic Recombinase Amplification (ERA) assay for onsite diagnosis and the Kompetitive Allele Specific PCR (KASP) method for genotyping were developed. To examine the interactions with cellular receptors, pseudoviruses expressing BV glycoproteins (gB, gD, gH, and gL) were engineered and examined on CHO cells stably expressing Nectin-1, HVEM, and PILRα. The expression of receptors and glycoproteins was validated through RT-qPCR, immunofluorescence, and Western blot analyses. Furthermore, luciferase assays demonstrated that successful cellular entry required the Nectin-1 receptor and all the four BV glycoproteins, whereas lacking any of the glycoproteins led to ineffective entry into cells. These findings highlight the pivotal role of Nectin-1 and the coordinated function of BV glycoproteins in BV entry, providing valuable insights for enhancing detection methodologies and developing effective control strategies.

032

Microbial community formation during dietary exposure to Fe3O4-urease nanoconjugates in silkworm (Bombyx mori): Principal fungi groups facilitate functional flux

Marriam Khurshid (PhD)

SUPERVISORS Jun Wang

UNIVERSITY/INSTITUTE Jiangsu University of Science and Technology / School of Biotechnology

Silkworm's gut microbiota plays a pivotal role in various metabolic processes, but fungal diversity and its role is understudied. This study investigates impact of gut fungi on nutrient absorption and flexibility in 5th star silkworms by exposing them to Fe3O4-urease nanoconjugates for 168 hours. The shifts in the principal fungal groups by dietary responses were analyzed using high-throughput microbiome sequencing. The fungi groups Mucoromycota and Basidiomycota significantly increased, while Ascomycota decreased without impacting growth and sustainability of the host insect. FunGuild analysis revealed an increase in trophic nodes while functions of DEGs demonstrated an increased metabolic capacity associated with iron binding, heme binding and lipase activity, suggesting a pivotal role in facilitating functional flux in gut ecosystem. Results indicates successful gut reconstruction with specific fungal taxa having enhanced abundance and diversity because of Fe3O4-urease nanoconjugates, serving as a potential for engineered nanomaterials to promote the sustainability and development of sericulture.

033

Developing a HSD17B13 Gene Knockdown Approach Based on siRNA for The Therapy of Non-alcoholic Steatohepatitis (NASH)

Qin Meng (PhD)

SUPERVISORS Mu Wang (XJTLU)
Sudeep Pushpakom (UoL)
Hui Feng (Shanghai Junshi Biosciences Co., Ltd.)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Non-alcoholic steatohepatitis (NASH) is the most severe form of non-alcoholic fatty liver disease (NAFLD) and is closely related to the triple epidemic of obesity, pre-diabetes, and diabetes. But its symptoms are often silent or non-specific to NASH, making it difficult to diagnose. As a result, NASH patients can remain unaware of their condition until late stages of the disease. No medicines have been approved to treat NASH. Considering NASH is a chronic disease, we plan to develop a siRNA drug for NASH treatment. The siRNA drugs are administered at long intervals with long duration of efficacy, and at the same time, they are easy to administer.

034

Investigating the role of bioactive compounds from red beet (Beta vulgaris L.) in modulating lipid metabolism via the function of gut microbiota

Qingyang Wu (PhD)

SUPERVISORS Ken Cheng, Kim Lau (XJTLU)
Xiaoli Meng (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Red beetroot is recognized as a functional food, rich in bioactive compounds such as betalains, phenolics, and nitrates, which are known for their antioxidant, anti-inflammatory, and cardiovascular benefits. Previous studies have shown promising effects on lipid metabolism, including lipid-lowering and fat browning, with potential reductions in blood pressure, cholesterol levels, and liver fat accumulation. It is known that gut microbiome plays a key role in metabolic health by influencing lipid absorption and bile acid metabolism. While red beetroot has been shown to alter gut microbiota composition of healthy human, the direct link between its bioactive compounds, lipid metabolism, and gut microbiota remains unclear. Thus, by using a multi-omics approach including metabolomics and gut microbiota, combining in vivo interventions and in vitro fermentation, this project aims to investigate the pharmacokinetics, metabolism, and microbiota interactions of bioactive compounds from red beetroot, thereby to identify novel mechanisms linking these pathways. The findings from this project will provide evidence for the roles of functional nutrients in mitigating the progression of metabolic syndrome.

035

Assessment of Recombinant Ligase-type Asparaginyl Endopeptidase Proteolytic Activity Expressed in Nicotiana benthamiana

Rehman Sarwar (PhD)

SUPERVISORS Xiaoli Tan

UNIVERSITY/INSTITUTE Jiangsu University / School of Food and Biological Engineering

Asparaginyl endopeptidases (AEPs), also known as legumains, are proteolytic enzymes with remarkable substrate specificity, cleaving peptide bonds at asparagine residues. Recently, interest in ligase-type AEPs has grown due to their unique ability to catalyze peptide ligation, making them valuable tools in protein engineering. In this study, we explore the proteolytic activity of a recombinant ligase-type AEP expressed in Nicotiana benthamiana, a versatile plant model widely used for transient protein expression. This work provides insights into enzyme functionality, production efficiency, and potential applications, bridging the gap between fundamental enzymology and practical biotechnological uses.

036

T1Pr downregulates IFN-γ-mediated PD-L1 production in MDA-MB-231 cells

Renrong Tao (PhD)

SUPERVISORS Meng Lee (XJTLU)
George Bou-Gharios (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Triple-negative breast cancers (TNBC) express programmed death-ligand 1 (PD-L1) on their surface to interact with PD-1 on T cells, enabling immune escape and tumor progression. Membrane type 1-matrix metalloproteinase (MT1-MMP) and tumor necrosis factor-α converting enzyme (TACE) are membrane-anchored metalloproteinases that promote cancer proliferation through extracellular matrix regulation. This study investigates the effect of engineered tissue inhibitors of metalloproteinase-1s (TIMP-1s), modified to include a glycosyl-phosphatidyl inositol (GPI) anchor for membrane localization, on PD-L1 expression in MDA-MB-231 breast adenocarcinoma cells. We hypothesize that these GPI-linked TIMPs can inhibit MMP and TACE activity, leading to PD-L1 downregulation and potential therapeutic effects in TNBC. Our findings demonstrate that a GPI-TIMP variant, "T1Pr", effectively suppresses PD-L1 expression by attenuating JAK2/STAT1 phosphorylation, a critical pathway for PD-L1 transcription, highlighting its potential as a novel therapeutic strategy for TNBC.

037

Enhancing m6A modification prediction with summary statistics of nanopore current signal using XGBoost and LSTM models

Rong Zhu (PhD)

SUPERVISORS Zhen Wei (XJTLU)

ACADEMY/SCHOOL School of Science

N6-methyladenosine (m6A) is a crucial RNA modification involved in various biological processes. Nanopore sequencing enables direct, real-time m6A detection, offering an alternative to next-generation sequencing. This study aims to evaluate the impact of various summary statistics of nanopore current signals as features on the performance of the m6A modification prediction model. Using the developed R package DirectRMtools, summary statistics were calculated for 18 DRACH sequence contexts. XGBoost models and LSTM networks were built, and feature importance was evaluated. Results show that incorporating the five-number summary (minimum, first quartile, median, third quartile, maximum) with classic features (length, mean, and standard deviation of the nanopore current signal) significantly enhances m6A prediction performance, increasing the Matthews correlation coefficient (MCC) by 2.44% for XGBoost, and by 1.61% for LSTM, compared to using only the classic features (length, mean, median, and standard deviation). These findings demonstrate the critical role of the five-number summary in m6A modification prediction.

038

Mechanism and application of IDA small peptide signaling pathway affecting organ separation in Brassica napus

Rui Geng (PhD)

SUPERVISORS Xiaoli Tan

UNIVERSITY/INSTITUTE Jiangsu University / School of Food and Biological Engineering

The shedding of rapeseed petals not only defines the plant's decorative flowering duration but also facilitates the onset of rapeseed sclerotinia. Post-pollination, rapeseed flowers develop into pods, and their eventual cracking at maturity represents organ separation, crucial for mechanized harvesting efficiency. Investigating genes associated with this separation in rapeseed is vital for understanding the aging and separation mechanisms, significantly impacting rapeseed production. This project aims to identify and validate the uncharted upstream and downstream genes of the IDA-HAE/HSL2 signaling pathway in Brassica napus. Transcriptome and phosphoproteomics analyses will reveal downstream genes and key targets for flower organ abscission, while small molecule inhibitors for HAE/HSL receptor kinases will be developed to probe the molecular mechanisms of this process. This research will uncover the gene regulatory network behind floral organ shedding in Brassica napus, offering new germplasm and strategies to the rapeseed industry for disease resistance, extended flowering periods, and improved mechanization.

039

Transposon Element Expression Dynamic During Mouse Gastrulation

Rui Song (PhD)

SUPERVISORS Yiqiang Wang (XJTLU)
Xiaoli Meng (UoL)
Naihe Jing (Gangzhou Lab)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Transposon element (TE) is widely distributed in mouse genome and play a critical role in various developmental process. However, the function of TE during embryo gastrulation remains unclear due to its expression count limits. Our project used E6.5-E7.5 single cell multi-omics data to reveal TE expression and chromatin accessibility dynamic during mouse embryo gastrulation. The umap plot used snRNA sequencing data to quantify TE expression which shows clear difference between extraembryonic (EXE) and embryonic cells. Three cell types, EXE endoderm, EXE ectoderm and visceral endoderm, are selected to compare with embryo cells. Transposable elements with long terminal direct repeats (LTR) were considered as the main category of marker TE. For the snATAC-seq signal in different cell type, here is an example shows the EXE ectoderm specific expressed RLTR13B3 also have the high chromatin accessibility in these cells. We also found TE sequence enriched BMP signaling related transcription factors motif.

040

Advanced protein separation technologies based on surface functionalized magnetic beads

Rujia Qu (PhD)

SUPERVISORS Kim Lau (XJTLU)
Gita Sedghi (UoL)
Mingxian Huan (Beaver Biomedical Engineering Co., Ltd.)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Diseases related antibody purification is growing more important for biotechnology research and biomedicine. Protein A affinity matrix with high antibody binding capacity would significantly increase the purification efficiency and would also decrease the costs of the purification of biopharmaceuticals. Due to good bio-compatibility, non-toxicity, and bio-biodegradability, chitosan has been used in various biomedical, environmental and industrial applications. However, there are not many studies on the antibody purification with chitosan-based matrix. Therefore, the objective of this research is to develop chitosan-magnetic beads composite with improved physical and chemical characteristics to improve the efficiency of purification and hopefully, expand the scope of application. Magnetic-chitosan composite material was prepared by a newly developed spraying method. After modification with maleimide groups, the surface maleimide content was measured to be 80.35 μmol/g. Then, after coupling with Protein A, the human serum IgG binding capacity of the product was 2500 mg/g. The performance observed was significantly better than similar materials reported in the literature.

041

Thiazole Derivatives Alleviate Myocardial Injury in The Models of Myocardial Ischemia-Reperfusion Injury by Regulating Mitochondrial Function

Shihao Chen (PhD)

SUPERVISORS Lei Fu (XJTLU)
Amy Chadwick (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Myocardial ischemia-reperfusion (I/R) injury exacerbates ischemic myocardial damage upon restoring blood flow to affected cardiac vessels. This process is intricately linked to mitochondrial dysfunction, characterized by increased reactive oxygen species (ROS), calcium overload, and inflammatory responses. Our previous studies revealed that thiazole compounds can enhance mitochondrial quality, dynamics, and oxidative metabolism by mildly inhibiting mitochondrial function. Building on these findings, this project investigates the effects of thiazole derivatives on myocardial I/R injury using cell and murine models. The primary goal is to alleviate myocardial damage and improve mitochondrial function, while also uncovering the mechanisms underlying the therapeutic effects of these compounds. Preliminary results are promising, demonstrating that thiazole compounds can reduce ROS levels and enhance mitochondrial respiration in damaged cells. These findings suggest a potential therapeutic role for thiazole derivatives in addressing myocardial I/R injury and associated mitochondrial dysfunction.

042

Deciphering the genetic interplay between depression and dysmenorrhea: a Mendelian randomization study

Shuhe Liu (PhD)

SUPERVISORS John Moraros, Zhen Wei (XJTLU)
Dan Carr (UoL)

ACADEMY/SCHOOL School of Science

This study explores the link between depression and dysmenorrhea using a genomic, transcriptomic, and protein interaction data/information from various resources. A bidirectional, multivariate Mendelian randomization (MR) analysis with genome-wide association study (GWAS) data were used to identify a significant causal effect of depression on dysmenorrhea [odds ratio (95% CI) = 1.51 (1.19, 1.91), $P=7.26\times10^{-4}$], but no reverse causality (P = 0.74). Colocalization analysis and eQTL data pinpointed shared genetic influences, including rs34341246 (RBMS3) as a causal variant. Genes such as GRK4, TRAIP, and RNF123 were identified, suggesting depression influences reproductive function via these pathways. A protein – protein interaction network further detailed the biological mechanisms. These findings emphasize the need for integrated strategies to screen for depression in women with dysmenorrhea and propose targeted preventive measures.

043

Engineering multifunctional intracellular energy metabolism enhanced polycitrate-based hydrogel for MRSA infected wound therapy

Sihua Li (PhD)

SUPERVISORS Sihua Li, Bo Lei

UNIVERSITY/INSTITUTE Xi'an Jiaotong University /
Frontier Institute of Science and Technology

Multidrug resistant-bacteria (MDRB) impaired wound repair and regeneration is still a challenge, due to the refractory infection, excessive inflammation and deficient vascularization. Herein, an anti-inflammatory, antibacterial, vascularized and bioenergetic-active hydrogel (PCDO-Co) for treating MDRB infection and accelerating wound healing is reported. The PCDO-Co hydrogel was formed by cross-linking of enamine and hydrogen bonding between oxidized hyaluronic acid (OHA) and citric acid-based polymers (PCDA) with chelating Co2+. The PCDO-Co possesses self-healing, hemostatic, anti-bacterial, anti-inflammatory, and reactive oxygen species (ROS) scavenging activities. PCDO-Co effectively induces the upregulation of HIF-1α and significantly promotes expression of VEGF, cell migration, tube formation, angiogenesis. PCDO-Co can accelerate injured skin tissue repair and regeneration by participating in the cellular tricarboxylic acid cycle (TCA) cycle, enhancing mitochondrial membrane potential, and boosting energy metabolism. The in vivo studies demonstrated that PCDO-Co could effectively promote methicillin-resistant staphylococcus aureus (MRSA) infected wound healing and skin regeneration. This work implies that the cellular energy reinforcing and antibacterial functions design on bioactive materials is a promising alternative for the treatment of MDRB infected tissue repair.

044

Photothermal-antibacterial bioactive noncrystalline nanosystem promotes infected wound tissue regeneration through thermo-ions activation

Ting Li (PhD)

SUPERVISORS Bo Lei

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / Frontier Institute of Science and Technology

The efficient repair of infected wounds is still a major challenge, among which the bacterial infection, inflammation and oxidative stress induced poor angiogenesis are the key obstacles. The nanosystem with single repair pathway could not meet the requirement of regenerating complicated wound tissue. Herein, we construct a photothermal multifunctional bioactive nanoglass (BGN@PDA-Cu) with the metal polyphenol coordination. It possesses the strong MRSA inhibition, ROS scavenging, mild photothermal stimulation and hemostatic ability. Thermal stimulation and sustainable bioactive ions release significantly reverse the inflammatory phenotype of macrophage and enhance angiogenesis through the activation of HIF-1α and HSP90 pathways. The MRSA infected wound model demonstrated that BGN@PDA-Cu could inhibit MRSA infection and accelerate wound repair which has 2 times improvement on healing rate compared with commercial bioglass dressing. This work demonstrates that bioactive ions release combined with mild thermal stimulation is a promising strategy to design multifunctional bioactive biomaterials for angiogenetic tissue regeneration.

045

Intrinsically bioactive multifunctional poly (citrate-curcumin) for rapid lung injury and MRSA infection therapy

Tongtong Leng (PhD)

SUPERVISORS Bo Lei

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / Frontier Institute of Science and Technology

Dysregulated inflammation after trauma or infection could result in the further disease and delayed tissue reconstruction. The conventional anti-inflammatory drug treatment suffers to the poor bioavailability and side effects. Herein, we developed an amphiphilic multifunctional poly (citrate-polyglycol-curcumin) (PCGC) nano oligomer with the robust anti-inflammatory activity for treating acute lung injury (ALI) and Methicillin-resistant staphylococcus aureus (MRSA) infected wound. PCGC demonstrated the sustained curcumin release, inherent photoluminescence, good cellular compatibility, hemocompatibility, robust antioxidant activity and enhanced cellular uptake. PCGC could efficiently scavenge nitrogen-based free radicals, oxygen-based free radicals, and intracellular oxygen species, enhance the endothelial cell migration and reduce the expression of pro-inflammatory factors through the NF-κB signal pathway. Combined the anti-inflammation and antioxidant properties, PCGC can shortened the inflammatory process. In animal models of ALI, PCGC was able to reduce the pulmonary edema, bronchial cell infiltration, and lung inflammation, while exhibiting rapid metabolic behavior in vivo. The MRSA-infection wound model showed that PCGC significantly reduced the expression of pro-inflammatory factors, promoted the angiogenesis and accelerated the wound healing. The transcriptome sequencing and molecular mechanism studies further demonstrated that PCGC could inhibit multiple inflammatory related pathways including TNFAIP3, IL-15RA, NF-κB. This work demonstrates that PCGC is efficient in resolving inflammation and promotes the prospect of application in inflammatory diseases as the drug-loaded therapeutic system.

046

A Computational Pipeline for Designing Therapeutic Antibodies

Wanding Wang (PhD)

SUPERVISORS Francesco Zonta (XJTLU)

ACADEMY/SCHOOL School of Science

Antibody therapies have achieved remarkable success, but the development of new antibody drugs is costly and time-consuming. Molecular simulations can partially substitute experiments and reduce the development costs. The first critical characteristic for new drug candidates is their ability to bind selectively to the desired target. However, existing algorithms for calculating binding free energy face challenges of high computational resource demands and low efficiency, while the vast diversity of antibody sequences complicates effective sequence sampling. This research aims to develop new methods to enhance the efficiency of binding free energy calculations and optimize antibody sequence sampling techniques to improve binding affinity. Additionally, a high-precision computational platform will be designed to streamline the design and development of therapeutic antibodies. This approach will help address the limitations of current methods, reducing development time and costs.

047

mRNA/acRNA-LNP transduced allogenic CD30·CAR-NK cells therapy

Wei Wang (PhD)

SUPERVISORS Meng Lee (XJTLU)
Dean Naisbitt (UoL)
Xiulian Sun (uBrigene)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Chimeric antigen receptor (CAR) immune cell therapy has demonstrated remarkable clinical efficacy against hematologic tumors in recent years. Among these therapies, T cell and NK cell-based approaches have shown superior efficacy and reduced toxicity. Our study is dedicating to develop a novel RNA-lipid nanoparticle (RNA-LNP) based CAR delivery technology and compare the potent of therapeutic RNAs, such as messenger RNA (mRNA), circular RNA (circRNA), and self-amplifying RNA (saRNA). RNA-LNPs are generated through improved in vitro transcription (IVT) followed by LNP packaging process. The RNA-LNPs with uniform particle size and RNA encapsulation efficiency facilitats RNA delivery into T and NK cells with high efficiency. In this study, the CAR expression and cell killing efficiency were detected by flow cytometry, and the functional CAR-T or CAR-NK cells using different types of RNA-LNP were compared.

048

Integrated bioinformatic analysis reveals novel signatures of N4-acetylcytidine (ac4C) modification in pan-cancer

Xiangyu Yin (PhD)

SUPERVISORS Jia Meng (XJTLU)
Neil Blake (UoL)

ACADEMY/SCHOOL School of Science

N4-acetylcytidine (ac4C) represents a pivotal epitranscriptomic modification with significant implications in oncogenesis. Deregulation of ac4C levels has been associated with enhanced metastatic potential and tumor progression in various cancer types. However, the common signatures of ac4C in pan-cancer remain inadequately characterized. In this study, we comprehensively analyzed the transcriptomic and genomic signatures of ac4C modification linked to cancer, utilizing transcriptomic data from The Cancer Genome Atlas (TCGA) alongside a comprehensive collection of experimentally validated ac4C sites, encompassing 18 distinct human cancer types. The cancer-associated ac4C-mediated genes were characterized for differential expression, survival outcomes, and immune cell infiltration across the 18 TCGA cancer types. We then developed an ensemble model integrating random forest and transformer encoder methodologies to identify hyper-acetylated ac4C sites in pan-cancer, leveraging combined sequence and genomic features, achieving an AUROC of 0.82. Shapley additive explanations (SHAP) were performed to identify the top genomic features influencing model predictions, from which the common signatures of ac4C modification sites were revealed. Our results indicate the existence of shared ac4C signatures at both transcriptomic and genomic levels across diverse cancer types. This highlights the importance of a comprehensive understanding of the pan-cancer epitranscriptome and holds potential implications for the development of RNA methylation-based therapeutics for various cancers.

049

Influences of Seasonal Changes, Plastic Materials and Land Use Patterns on Microbial Community Structure of Biofilms developed on Microplastics in Freshwater System

Xiaotian Zhao (PhD)

SUPERVISORS Sekar Raju (XJTLU)
Alan McCarthy, Mal Horsburgh (UoL)

ACADEMY/SCHOOL School of Science

The accumulation of plastic waste in aquatic systems has emerged as one of the major environmental issues. Specifically, microplastics, plastic particles less than 5mm in diameter, exhibited concerning threats. In addition to the harmful impacts on aquatic life, microplastics could provide new microbial niches to microorganisms and even pathogens through biofilm formation on the plastic surface. Although the influences of microplastics on marine environments have been widely studied, their impact on freshwater systems was only recognized recently. The present study investigated the microbial community structure of biofilms associated with microplastics of different plastic materials in urban freshwater system with varying land use patterns. Preliminary results showed significant seasonal variations in the microbial community composition of the biofilm formed on the microplastics. Moreover, distinct microbial community were found in biofilms developed in canals in commercial land use and biodegradable plastic material compared to other land use patterns and polymer types, respectively.

050

Plug-and-play: design of protein nanocage for targeted drug delivery

Xiaoyun Liu (Master)

SUPERVISORS Antony Kam, Shining Loo (XJTLU)

ACADEMY/SCHOOL School of Science

Protein nanocages are a type of organic nanoparticle based on proteins and they possess highly ordered structures at the nanoscale, typically formed by the self-assembly of multiple protein subunits into hollow, cage-like structures of varying shapes and sizes. Protein nanocages, due to their biocompatibility, biodegradability, and high stability, have been widely applied in the development of vaccines and biomedical imaging. Plug-and-play protein nanocage is a protein nanocage that can be inserted into different functional modules to achieve various functions. This research designs a dual plug-and-play platform (SC-mi3-Ha) for post-supramolecular assembly incorporation of drugs and targeting molecules. HaloTag (Ha) and SpyCatcher003 (SC) are respectively fused to the interior and exterior surfaces of the superstable mi3 protein nanocages (mi3) obtained through computational design. The conjugation of various drugs and ligands to the interior and exterior surfaces of protein nanocages through the HaloTag/chloroalkane and SpyCatcher003/SpyTag003 system enables the targeted delivery of distinct pharmaceuticals.

051

m6AConquer: A Data Resource for Unified Quantification and Integration of m6A Detection Techniques

Xichen Zhao (PhD)

SUPERVISORS Zhen Wei, Xinzhao Tong, Jia Meng (XJTLU)
Dan Rigden (UoL)

ACADEMY/SCHOOL School of Science

N6-methyladenosine (m6A) is the most prevalent RNA modification in mammalian cells and the most extensively studied epitranscriptomic mark. More than 10 m6A detection techniques have been proposed to measure m6A stoichiometry at either the site or peak level. However, these detection techniques are processed through heterogeneous pipelines, using different computational filters and reference features, leading to difficulties in fully harnessing data integration and analysis across orthogonal m6A detection techniques. Our m6AConquer (Consistent Quantification of External m6A RNA Modification Data) tackles this challenge by establishing a consistent multi-omics data-sharing standard, summarizing quantitative m6A data from 10 detection techniques using a unified reference feature set. Furthermore, we standardize site calling and m6A count matrix normalization procedures across platforms through a computational framework that accounts for over-dispersion in m6A levels. Available m6A detection techniques can be categorized into four types: antibody-assisted, chemical-assisted, enzyme-assisted, and direct-RNA sequencing. We leverage this categorization to develop a reproducibility-based integration framework that enables the reliable detection of high-confidence m6A sites confirmed across orthogonal techniques. Empirical evaluations report that both the site-calling and the integration framework outperform common alternatives, enhancing biological relevance. We apply interpretable machine learning models on our integrated high-confidence sites, and the result consistently identify proximity to intron-exon junctions as the driving predictor of m6A site coordinates across different techniques, demonstrating the high quality of the data curated in m6AConquer.

052

Gene regulation using a CRISPR/dCas9 based technology

Xinghan Zhang (PhD)

SUPERVISORS Jeong Hyeon Park (XJTLU)

ACADEMY/SCHOOL School of Science

CRISPR/Cas9 has been widely used for sequence-specific genome editing in biomedical research and applications. CRISPR/dCas9 system containing a nuclease-deficient version of Cas9 (dCas9) serves as a powerful tool to alter transcription regulations at the promoter regions by tethering the functional domains of transcription factors or epigenetic enzymes. In our study, the CRISPR/dCas9 was tethered with a new epigenetic modifier EP400 N-terminal like protein (EP400NL) for targeted gene activation or upregulation ideally through H2A.Z deposition activities. The early stage of this project is to test the H2A.Z deposition in vitro through a biochemical assay based artificially constructed chromatins. Later in vivo studies will be carried out for genome-wide screening of responsive sites for more specific studies.

053

Targeted Protein Degradation Database: Enabling Data-Driven Drug Discovery for Undruggable Targets

Xinran Qin (PhD)

SUPERVISORS Xin Liu (XJTLU)
Manolis Papamichos Chronakis (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

A lot of proteins are considered undruggable due to the lack of suitable binding pockets. Targeted Protein Degradation (TPD) technology leverages cellular degradation pathways to degrade these undruggable targets, significantly expanding the druggable proteome. TPD primarily encompasses proteasomal degradation strategies, such as molecular glues and PROteolysis TArgeting Chimeras (PROTACs), as well as lysosomal degradation approaches like Lysosome-Targeting Chimeras (LYTACs) and Antibody-based PROTACs (AbTACs). By employing distinct pathways, TPD facilitates the degradation of intracellular and extracellular proteins, effectively intervening in disease processes. However, aside from PROTACs, no systematic database exists for TPD-related compounds, hindering data-driven methods like deep learning from accelerating TPD drug discovery. To bridge this gap, this project aims to establish a comprehensive TPD database to advance drug development against undruggable targets.

054

m7GHub V2.0: an updated database for decoding the N7-methylguanosine (m7G) epitranscriptome

Xuan Wang (PhD)

SUPERVISORS Jia Meng (XJTLU)

ACADEMY/SCHOOL School of Science

This project is an integrated resource that enables the sharing, annotation and customized analysis of m7G data will greatly facilitate m7G studies under various physiological contexts. Here, we present m7GHub v.2.0, an updated resource for a comprehensive collection of m7G modifications in various types of RNA across multiple species: an m7GDB database containing 430 898 putative m7G sites identified in 23 species, collected from both widely applied next-generation sequencing (NGS) and the emerging Oxford Nanopore direct RNA sequencing (ONT) techniques; an m7GDiseaseDB hosting 156 206 m7G-associated variants (involving addition or removal of an m7G site), including 3238 disease-relevant m7G-SNPs that may function through epitranscriptome disturbance; and two enhanced analysis modules to perform interactive analyses on the collections of m7G sites (m7GFinder) and functional variants (m7GSNPer). We expect that m7Ghub v.2.0 should serve as a valuable centralized resource for studying m7G modification.

055

Structural Studies and Interaction Mechanism of MroQ and AgrB in Staphylococcus aureus Quorum Sensing Pathway

Xuefei Zhao (PhD)

SUPERVISORS Lanlan Han (XJTLU)

ACADEMY/SCHOOL School of Science

This research project aims to investigate the structure of the integral membrane protease MroQ and the interaction mechanism with AgrB and MroQ in the S. aureus accessory gene regulator (agr) quorum sensing pathway. The proposed research will combine structural biology techniques, proteinprotein interaction assays, and genetic studies to achieve these objectives.

056

Deciphering Cellular Dynamics in the Immune Microenvironment Using RNA Velocity in scRNA-seq

Yajunzi Wang (PhD)

SUPERVISORS Xin Liu (XJTLU)
Manolis Papamichos Chronakis (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Cellular dynamics within the immune microenvironment are critical for understanding disease progression and immune regulation, particularly in the context of cancer and immune-related diseases. Single-cell RNA sequencing (scRNA-seq), combined with RNA velocity analysis, offers a powerful framework for investigating transcriptional kinetics and cellular transitions. By modeling spliced and unspliced mRNA profiles, RNA velocity predicts future cell states, enabling the study of cell differentiation, lineage trajectories, and dynamic immune responses. This project aims to explore the regulatory mechanisms underlying immune cell interactions in diseases and cancer, focusing on the temporal progression of immune states and their influence on the microenvironment. By integrating RNA velocity with advanced computational methods, we seek to uncover biomarkers and therapeutic targets, providing novel insights into the role of immune dynamics in health and disease.

057

Roles of G protein signalling in the regulation of m6A mRNA methylation

Yakai Yang (PhD)

SUPERVISORS Zhiliang Lu (XJTLU)

ACADEMY/SCHOOL School of Science

G proteins act as molecular switches and cellular signal transducers, mediating many neurotransmitters and hormones' pathophysiologic activities. Dysfunction of G protein signalling is closely related to many diseases, e.g. neurological and metabolic disorders, and cancers. Meanwhile, in the past decades, evidence has suggested that N6-methyladenosine (m6A) methylation, the most common modification in mRNA, and its associated factors are markedly dysregulated in tumours, contributing to carcinogenesis, cancer progression, cancer stem cell renewal, and cancer therapy resistance. However, how m6A mRNA modification is regulated during cellular processes and tumorigenesis remains unknown. This project aims to investigate how activation of heterotrimeric G proteins and monomeric G protein, Ras, can modulate m6A mRNA methylation, which affects protein translation and further cellular functions. Our study will provide a novel insight into the development of potential biomarkers and molecular therapeutic targets in cancers.

058

Therapeutic target validation for MELAS stroke-like syndrome

Yanyan Li (PhD)

SUPERVISORS Yixue Qiao, Lei Fu (XJTLU)
David Wilkinson (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

MELAS (Mitochondrial Encephalopathy, Lactic Acidosis, and Stroke-like episodes) disease is a complex mitochondrial genetic disorder caused by mutations in mitochondrial DNA, particularly the m.3243A>G mutation in the MT-TL1 gene. MELAS patients experience a range of symptoms affecting neurological, muscular, and nervous systems, posing significant challenges for effective treatment. Studies have shown that specific biological pathways, including MNRR1 (Mitochondrial Nuclear Retrograde Regulator 1) and the PI3K-Akt-mTORC1 have been implicated in disease development, their exact mechanisms and therapeutic potential remain poorly understood. The objectives of the research are to establish in vitro models to evaluate pathway dysregulation, validate the relevance of key proteins within these pathways to disease pathology, and identify and validate potential therapeutic targets using chemical probes. Now, ND-5 mutant 293t cell culture work is in progress and treatment with MitoFu-O will be given for 20 days and then sequenced to see if the mutant load has changed.

059

Creating Inducible DEK Knockout Cell Line and DEK Functional Assessment Combining an Overexpression System

Yewei Liu (PhD)

SUPERVISORS Jeong Hyeon Park (XJTLU)
Aditi Kanhere (UoL)
Ferdinand Kappes (DKU: Duke Kunshan University)

ACADEMY/SCHOOL School of Science

The human DEK oncogene is implicated in essential aspects of cellular activities and participates in tumor development. However, the underlying mechanisms driving these (oncogenic) activities remain ill-defined and true DEK knockout (KO) cell lines for detailed functional assessment of DEK remain unavailable. Thus, this project aims to establish a cellular testing platform, combining inducible DEK knockout (iKO) with inducible overexpression (iOE) strategies. First, an inducible CRISPR/Cas9-mediated system (ddCas9) was devised, using five functional gRNAs validated via a classical CRISPR/Cas9 approach. These gRNAs were added to the ddCAS9 system as combinatorial polycistronic tRNA-gRNA (PTG) constructs, which were delivered to cells by transfection or lentiviral delivery. Unfortunately, the ddCAS9 system was not effective in reducing DEK protein levels in cells. As this strategy appears non-functional, an inducible degron system (AID2), allowing for instant protein knockout, is currently established as an alternative way forward.

060

Comprehensive Analysis of the Lysine Succinylome in Fish Oil Treated Prostate Cancer Cells

Yifan Jiang (PhD)

SUPERVISORS Mu Wang (XJTLU)
Sonia Rocha (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Prostate cancer (PCa) is a leading health threat for males. Fish oil (FO) can prevent PCa progression by triggering multiple mitochondria-related pathways. Succinylation is a newly discovered post-translational modification that is closely associated with mitochondria. In this study, PCa cell samples were injected into a mass spectrometry-based succinylomics platform to profile all detectable succinylated peptides. Bioinformatics analysis of these peptides identified GOT2 protein as a key player in PCa cell proliferation. Immunoprecipitation and RNA interference technologies were employed to validate the functional data. Further analyses revealed the significance of GOT2 protein in regulating nucleotide synthesis by providing aspartate, which is critical for the survival and proliferation of PCa cells. Our findings suggest that FO-dependent GOT2 succinylation status has the potential to inhibit building block generation. It highlights the potential of FO as a nutrition supplement for cancer therapy to slow down PCa progression.

061

PROTAC-inspired Design and Development of Mitochondrial Targeting Cancer Therapeutics

Yifan Li (PhD)

SUPERVISORS Lei Fu (XJTLU)
Amy Chadwick (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Mitochondria are believed to participate in many important processes of cellular life. The existing experimental results have successfully confirmed that Mito-Fu, a mitochondrial targeting compound family, has inhibitory activity against a variety of solid tumor cells. Existing studies have not only confirmed the cancer inhibitory ability of Mito-Fu, but also found that it has targeting toxicity to normal mitochondria. This project aims to enhance the targeting ability of Mito-Fu towards cancer cell mitochondria by referencing existing PROTAC targeted drug technologies, thereby reducing its potential biological toxicity in future clinical use.

062

To investigate the structure-activity relationships and pharmacology of a series of flavonoids with the potential to treat NAFLD

Yifan Tang (PhD)

SUPERVISORS Guoxia Han, Ruiyao Wang (XJTLU)
Sudeep Pushpakom (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Flavonoids, especially quercetins and chalcones, have been found to have high daily intake with strong antioxiding, anti-inflammatory and unique cytotoxic properties, which warrants the necessity of studying their structure-activity relationships (SARs) and pharmacology, as well as their potential therapeutic effects on nonalcoholic fatty liver disease (NAFLD). The global incidence of NAFLD increases steadily, currently without any useful treatment, posing a great threat to human health. Based on previous studies of quercetins and chalcones, we will explore the specific effects of 1). B-ring catechol groups, 2). conjugate positions on the B and C rings, 3). the form of C3 substituents, and 4). the glycosylation modification on the bioactivity and metabolism of flavonoids in vivo, to deepen the understanding of SARs of those flavonoids and to facilitate the NAFLD drug discovery.

063

Physiological and molecular functional characterisation of Drosophila melanogaster TMEM16O

Ying Lei (PhD)

SUPERVISORS Tatsuhiko Kadowaki (XJTLU)
Greg D. D. Hurst (UoL)

ACADEMY/SCHOOL School of Science

The transmembrane protein 16 (TMEM16) protein family members function as calcium-activated chloride channels, or both calcium-dependent lipid scramblases and nonselective cation channels. It is well-conserved in eukaryotes and involved in diverse physiological functions. Only mammalian subfamilies A/B and F have been well-studied so far, and little is known about the physiological functions of TMEM16 proteins in insects, even in fruit flies. An arthropod-specific-TMEM16 family member, TMEM16O of D. melanogaster (DmTMEM16O), will be investigated in this study. This research project aims to explore the physiological functions and molecular characterisation of DmTMEM16O. Such knowledge may contribute to the current development for controlling vector-borne diseases.

064

Molecular Insights into Structural Dynamics and Binding Interactions of Selected Inhibitors Targeting SARS-CoV-2 Main Protease

Yuanyuan Wang (PhD)

SUPERVISORS Faez Iqbal Khan (XJTLU)
Dan Rigden (UoL)

ACADEMY/SCHOOL School of Science

The SARS-CoV-2 main protease (3CLpro) is a key target for antiviral therapy due to its critical role in viral replication and maturation. This study investigated the inhibitory effects of Bofutrelvir, Nirmatrelvir, and Selinexor on 3CLpro through molecular docking, MD simulations, and free energy calculations. Nirmatrelvir exhibited the strongest binding affinity across docking tools (AutoDock Vina: −8.3 kcal/mol; DiffDock: −7.75 kcal/mol; DynamicBound: 7.59 to 7.89 kcal/mol), outperforming Selinexor and Bofutrelvir. Triplicate 300 ns MD simulations revealed that the Nirmatrelvir–3CLpro complex displayed high conformational stability, reduced RMSD, and a modest decrease in SASA, indicating enhanced structural rigidity. Gibbs free energy analysis highlighted greater flexibility in unbound 3CLpro, stabilized by Nirmatrelvir binding, supported by stable hydrogen bonds. MM/PBSA analysis calculated a binding free energy of −100.664 ± 0.691 kJ/mol for the Nirmatrelvir–3CLpro complex, further supporting its stability and binding potency. These results underscore Nirmatrelvir's potential as a promising therapeutic agent for SARS-CoV-2.

065

In vitro pharmacological activity of a novel EED inhibitor (APG-5918) in prostate cancer

Yun Yang (PhD)

SUPERVISORS Lei Fu, Yixue Qiao (XJTLU)
Sudeep Pushpakom (UoL)
Dajun Yang (Ascentage Pharma)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Castration-resistant prostate cancer (PCa) presents a critical unmet need in oncology. Dysregulation of the polycomb repressive complex 2 (PRC2), responsible for H3K27me3-mediated gene silencing, is common in PCa and correlates with poor prognosis. Embryonic ectoderm development (EED), a key PRC2 component, is essential for histone methyltransferase activity. This study evaluates the antitumor effects and mechanisms of APG-5918, an EED inhibitor, in preclinical PCa models. APG-5918 demonstrated strong antiproliferative activity in 22RV1 (IC50: 56 nM) and LNCaP (IC50: 113 nM) cell lines. In a 22RV1 xenograft model, APG-5918 (50 mg/kg and 100 mg/kg) reduced tumor growth by 58.4% and 66.2%, respectively. Mechanistic studies revealed downregulation of UHRF1, DNMT1, pRb, CDK6, MCL-1, and PRC2 targets (H3K27me3, EED, EZH2), alongside upregulation of p53, p21, and PARP-1 cleavage. These findings highlight APG-5918's potential as a novel therapeutic for advanced PCa by targeting DNA methylation, cell cycle, and apoptotic pathways.

066

Epigenetic regulation of nuclear-encoded mito-ribosomal gene expression by EP400NL complex

Yuxin Liang (PhD)

SUPERVISORS Jeong Hyeon Park (XJTLU)

ACADEMY/SCHOOL School of Science

Mitochondria produce energy essential for the rapid proliferation and division of cancer cells. Various types of cancer exhibit high levels of expression of mitochondrial ribosomal proteins (MRPs) encoded by the nucleus and display abnormal mitochondrial activities. Research has shown that the histone variant H2A.Z upregulates the expression of cancer related MRPs. The EP400 ATPase, which has H2A.Z deposition activity, alters both the genomic and epigenetic landscapes. The involvement of the EP400 N-terminal-like (EP400NL) protein in mitochondrial biogenesis and its functions will be investigated using RNA interference. Multi-omics approaches will be utilized to elucidate the mechanism by which EP400NL regulates mitochondrial ribosomal genes. The potential of EP400NL as a therapeutic target for modulating cellular proliferation and survival will be assessed.

067

Mechanism study of therapeutic effect of Mesenchymal stem cell-derived exosomes in the treatment of idiopathic pulmonary fibrosis

Zerun Hao (PhD)

SUPERVISORS Gang Ruan (XJTLU)
Neil Liptrott (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Introduction: Idiopathic pulmonary fibrosis (IPF) patients typically have a life expectancy of only 3-5 years after diagnosis, with disease progression causing symptoms. Current medications have significant individual variation in efficacy. Mesenchymal stem cells (MSCs), multipotent cells found in bone and fat tissue, offer potential for immunoregulation, fibrosis inhibition, and lung tissue regeneration in IPF. However, stem cell injections may risk pulmonary embolism. MSC-derived exosomes (MSC-exosomes), nanosized vesicles (30-150 nm) carrying bioactive molecules like proteins, lipids, and miRNA, are promising alternatives with similar therapeutic potential while avoiding uncontrolled stem cell differentiation. Objective: Using a mouse pulmonary fibrosis model, this study investigates the therapeutic effects and mechanisms of MSC-exosomes via proteomics. Methods: Therapeutic MSC-exosomes were administered via nebulization. Lung tissue morphology and fibrosis markers were analysed, and LC-MS/MS combined with clustering tools explored protein-level mechanisms. Conclusion: MSC-exosomes regulate protein expression and activate related pathways in pulmonary fibrosis models.

068

Prognostic Value of Habitat based Radiomics for First-line Immunology in Stage IIIB-IV Non-Small Cell Lung Cancer Patients: A Multi-institutional Study

Zhe Zhang (PhD)

SUPERVISORS Shuihua Wang, John Moraros (XJTLU)
Guangliang Cheng (UoL)

ACADEMY/SCHOOL School of Science

This study aimed to develop a prediction model for immunotherapy efficacy in non-small cell lung cancer (NSCLC) using arterial-phase enhanced CT imaging radiomics of the tumor habitat. The discovery cohort included 128 stage IIIB-IV NSCLC patients from the ORIENT-11 study, with an external validation cohort of 92 real-world patients. Habitat analysis clustered tumor subregions, extracting radiomic features to construct machine learning models. The model demonstrated superior predictive performance with an AUC of 0.758 using radiomics alone, and 0.869 when combined with PD-L1 TPS and clinical metrics. Kaplan-Meier analysis showed significant prognostic stratification for progression-free survival. These findings support personalized medicine and improved prognosis for NSCLC patients.

069

The role and mechanism of TSP2 in the progression of NASH liver fibrosis

Zheng Pang (PhD)

SUPERVISORS Ken Cheng (XJTLU)
Sudeep Pushpakom (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Non-alcoholic steatohepatitis(NASH) is characterized by steatosis, hepatocyte ballooning, lobular inflammation, and fibrosis. Among these features, the extent of fibrosis is the strongest predictor of patient mortality, and is therefore the focus of drug development efforts. Recent studies have used Multi-omics to characterize TSP2 as a brand-new biomarker that is up-regulated in the plasma and liver of NASH patients, but its mechanisms remain to be elucidated.

070

Exploring mitochondria-targeting therapeutics for neurodegenerative disease

Zhenxing Gu (PhD)

SUPERVISORS Lei Fu (XJTLU)
Amy Chadwick (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Our research focuses on developing mitochondria-regulating compounds as potential therapeutics for neurodegenerative diseases and utilizing synthesized derivatives as tool compounds to elucidate the mechanisms of mitochondrial respiration inhibitors and promoters in neuroprotection. These include thiazole-triphenylphosphonium cation (TPP+) derivatives, which act as mitochondrial respiration inhibitors, and benzofuran derivatives, which function as promoters. A primary objective is to explore the correlation between the extent of mitophagy induction and therapeutic efficacy. Over the past year, we synthesized multiple thiazole-TPP+ and benzofuran derivatives. Benzofuran derivatives demonstrated expected neuroprotective effects in various cell-based and C. elegans models, highlighting their potential as therapeutic agents. Similarly, thiazole-TPP+ derivatives exhibited significant effects in the C. elegans model, supporting their role in modulating mitochondrial function. These findings underscore the therapeutic promise of these compounds and lay the foundation for further studies into their mechanisms of action.

071

NEAT1/miR-196a-5p/Trpm3 axis contributes to photophobia

Zhuoan Huang (PhD)

SUPERVISORS Minyan Wang (XJTLU)
Aditi Kanhere (UoL)
Sulev Koks (MURDOCH: Murdoch University)

ACADEMY/SCHOOL School of Science

Photophobia, a symptom of migraine reported by over 80% of migraineurs, involves complex neurovascular mechanisms, including the sensitization of the trigeminal ganglion, while the molecular mechanism is elusive. Non-coding RNAs have been found critical for the development of neurological disorders. This study investigates the role of non-coding RNAs in the trigeminal ganglion of a migraine-associated photophobia mouse model. Focusing on the transcriptome alterations, we identified a first-found, crucial lncRNA-miRNA-mRNA axis, NEAT1/miR-196a-5p/Trpm3, within the competitive endogenous RNA (ceRNA) networks in photophobia mechanism, underscoring the fundamental importance of miRNAs in regulating gene activity related to migraine. This axis represents a novel mediator of migraine-associated photophobia, offering insights into migraine pathogenesis and potential therapeutic targets related to non-coding RNAs.

072

Pharmacological studies of isoliquiritigenin on proliferation and metastasis in choroidal melanoma cell lines

Ziyan Zhao (PhD)

SUPERVISORS Yiqiang Wang (XJTLU)
Dan Carr (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Isoliquiritigenin has been shown to have anti-inflammatory, anti-oxidative, and proliferation inhibition potentials of tumor cells. Uveal melanoma(UVM) is the most common type in these areas. About 85% of uveal melanoma cases are choroidal melanomas, the most common intraocular malignancies in adults. Isoliquiritigenin has 16 targets in common with UVM and has great potential as a therapeutic drug for UVM. KEGG and GO enrichment of relevant targets of Isoliquiritigenin shows it can play a role in multiple pathways of the disease. According our results, Isoliquiritigenin inhibits the proliferation and cell migration of uveal melanoma cells. However the further molecular mechanism need to be explored.

073

Src Family Kinases in Transcriptional Regulation of Neuroinflammation in Migraine Models

Ziyang Gong (PhD)

SUPERVISORS Minyan Wang (XJTLU)
Aditi Kanhere (UoL)

ACADEMY/SCHOOL School of Science

Migraine is the second most disabling disease worldwide with complex pathological processes, of which neuroinflammation plays a critical role in facilitating the aberrant hyperexcitability of the central and trigeminovascular system; In particular, cortical spreading depression (CSD) and trigeminovascular sensitization. Src family kinases (SFKs), non-receptor tyrosine kinases, are essential for CSD propagation and sustained trigeminal ganglion (TG) sensitization via promoting the induction of gene expression of neuroinflammatory factors, yet the underlying mechanism is unclear. In this talk, I will introduce our recent findings on the mechanistic role of SFKs in the transcriptional regulation of neuroinflammation in migraine models. Our data revealed for the first time that nuclear SFKs contribute to the transcriptional regulation of key neuroinflammation factors via specific histone modification in complementary ex vivo and in vivo migraine models. These data provide novel insight into the molecular mechanisms underlying the sustained central and trigeminal gangion sensitization in migraine.

074

The Role of Immersion and Digital Personas in Building Customer Loyalty in Metaverse Retailing

Cheng Ma (PhD)

SUPERVISORS Jiyao Xun, Yi Hong (XJTLU)
Zi Ye (UoL)

ACADEMY/SCHOOL Entrepreneurship and Enterprise Hub

The rapid advancement of Metaverse technology has fostered the emergence of new industries. Metaverse retail is gaining prominence as a transformative force in consumer markets, driven by the increasing demand for digital shopping experiences. Renowned for its convenience and efficiency, the Metaverse provides unprecedented opportunities to cultivate customer loyalty, a fundamental determinant of sustained business success. Despite its potential, existing retail literature offers limited understanding of how loyalty can be effectively developed and maintained within Metaverse environments. Addressing this research gap, this study examines two pivotal dimensions of Metaverse retail—immersion and digital personas—and their influence on customer loyalty. Adopting a 2×2 experimental design, the study manipulates levels of immersion (high vs. low) and the digital personas (present vs. absent) to evaluate their respective impacts on consumer loyalty. A theoretical model was developed and rigorously validated, revealing significant variances in how these variables shape loyalty.

075

The role of government policies in the diffusion of electric vehicles: a configuration perspective

Chi Yang (PhD)

SUPERVISORS Lixian Qian, Miaomiao Liu (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

Many countries have implemented government policies for promoting the diffusion of electric vehicles (EVs), but their effects vary across socioeconomic situations. Based on a configuration perspective, we investigate how government policies and socioeconomic factors influence EV diffusions across 25 countries between 2013 and 2020, using fuzzy-sets qualitative comparative analysis. We find that government policies are crucial when the levels of socioeconomic factors are non-high during the COVID-19 pandemic. Interestingly, government policies are unnecessary with high GDP per capita, non-high population density, and sufficient charging facilities before the pandemic. The study also reveals that incentive policies are more effective in the short-term, while regulatory policies work better in the mid-term. Additionally, providing sufficient charging facilities is always necessary for EV diffusion. Our research resolves inconsistencies in previous studies and offers insights for policymakers and EV manufacturers, helping to adjust strategies based on varying socioeconomic conditions to promote EV adoption globally.

076

Strategic Network Formation Game with Unreliable Players

Enjun Liu (PhD)

SUPERVISORS Marc Gronwald, Mofei Jia (XJTLU)
Michele Lombardi (UoL)

ACADEMY/SCHOOL International Business School Suzhou

Real-world network formations often face the issue of player reliability due to various factors. However, prior literature on network formation games frequently overlooks this aspect of unreliability. This paper delves into strategic network formation under conditions of uncertainty, with a particular focus on the interplay between stability and efficiency when confronted with unreliable players. We introduce the unreliability by considering the game in which one player will be removed from the network with a positive possibility during the network formation process, and we analyze how the degree of unreliability impacts the network formation process, as well as the resulting stable and efficient network structures.

077

Striking resemblance in the mirror: Leveraging perceived homophily for hybrid entrepreneurial intentions

Famei Shen (PhD)

SUPERVISORS Jie Li (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

Hybrid entrepreneurs are individuals who are employed in wage-paid jobs and entrepreneurs at the same time. The nature of hybrid entry is worthy of exploring to mitigate unemployment risk as employees are easily replaced by emerging technologies (e.g., artificial intelligence). In this research, we draw upon similar attraction theory and social comparison literature to develop a theoretical model predicting that perceived homophily promotes entrepreneurial efficacy and positively affects hybrid entrepreneurial intentions. Employees with higher job insecurity or lower anticipated organizational change will experience stronger entrepreneurial self-efficacy, which further leads to their higher intentions to start a new business. We examine our hypotheses with a scenario experiment and a multi-wave survey study. Our findings provide insights into hybrid entrepreneurial entry and career choice. Theoretical and practical implications are further discussed.

078

Structural Shocks on Renewable Energy Consumption and Investment Regimes

Guimin Yao (PhD)

SUPERVISORS Syed Abbas, Hao Lan (XJTLU)
Charlie Cai (UoL)

ACADEMY/SCHOOL International Business School Suzhou

This paper provides useful insights into how macroeconomic and oil price shocks affect renewable energy consumption and investment in China. It includes inflation, business cycle, monetary policy, and oil price shocks. A novel methodology is employed based on a two-step approach, where a structural vector autoregressive (SVAR) model is used to extract structural shocks in the first step and then the Markov-Switching model is used to examine the heterogeneous effects of structural shocks on renewable energy consumption and stock returns in different regimes. Our results show that inflation, monetary policy, and oil price shocks play an important role in renewable energy consumption and investment in the low-growth regime and the low-volatility regime. These results are robust to different specifications, which yield useful implications for the policymakers.

079

Enhancing Coworker-directed Helping through Customer Gratitude in Hotel Frontlines: Pride as Mediator and Mindfulness as Moderator

Han Hong Feng (PhD)

SUPERVISORS Daniel Hampson, Li Pan (XJTLU)
Natasha Clennell (UoL)

ACADEMY/SCHOOL International Business School Suzhou

Although customer gratitude is frequently observed in the hotel frontline, the literature on its impact on the frontline workplace remains sparse, especially concerning its positive influences on mutual helping among employees. Drawing on the broaden-and-build theory, this study examines how frontline employees' receipt of customer gratitude positively influences their interactions with coworkers and explores approaches to enhance these effects. Data from a three-wave survey (n=271) of hospitality frontline employees reveals that receipt of customer gratitude promotes coworker-directed helping through increasing pride. Moreover, mindfulness strengthens the effects of received gratitude on pride and the overall mediating effect. This research expands current knowledge on how receiving customer gratitude influences employee emotions and coworker-directed helping, emphasizing how mindfulness enhances the effects of receipting customer gratitude. These findings provide hotel managers with insights into how customer gratitude can shape frontline employees within organization interaction.

080

Allocation of pollution and carbon emissions reduction targets for city cluster: empirical evidence from China's Yangtze River Delta city cluster based on cost optimization

Hao Zhang (PhD)

SUPERVISORS Feng Wang

UNIVERSITY/INSTITUTE China University of Mining and Technology / School of Economics and Management

Based on the principles of equity, capability, and efficiency, this paper utilizes the STIRPAT model and programming model to design a target allocation scheme that minimizes emission reduction costs based on determining the overall carbon and pollution reduction target of the Yangtze River Delta (YRD) city cluster. The results show that: (1) The integrated air pollutant emissions of the YRD show an oscillating upward trend, with population size having the greatest impact. (2) Regional development in the YRD is uneven, with coastal cities generally showing a higher level of maturity than inland cities. (3) While the introduction of the maturity indicator gives cities in the high maturity group more emission reduction tasks, most cities in the low maturity group still need to reduce a larger proportion of their emissions. The results of the study have important policy implications for the realization of regional total emission control targets.

081

History Matters: Path-Dependent Return Predictability

Haojun Ji (PhD)

SUPERVISORS Xuezhong He, Jiatao Liu (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

We introduce a novel path-dependent approach to extract useful information embedded in path-dependent returns parsimoniously and systematically. We document that path-dependent cross-sectional returns can generate significant alpha and exhibit strong explanatory power for market excess return, momentum, and known return predictors, but not in other way around. This demonstrate that the path-dependent factors are fundamentally driven for return predictability. By decomposing the expected returns, we show that the return paths, instead of returns, play dominating role in the predictability.

082

Exploring the Impact of Overtime, Regulatory Pressure, and Economic Pressure on Audit Quality in China

Hengxian Lei (Master)

SUPERVISORS Kim Kwong Samuel Kwok (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

Audit quality is crucial for ensuring transparency and integrity in financial reporting, particularly in rapidly developing markets like China, where regulatory demands are increasingly stringent. However, recent audit failures have raised concerns about auditors' ability to uphold market stability, protect investor confidence, and support the financial system's health. This study explores the relationship between audit quality and the workload of auditors, emphasizing the impact of excessive overtime during peak seasons, which often leads to fatigue and impaired decision-making. The findings highlight the importance of effective workload management and strategies to mitigate audit fatigue, demonstrating that improved working conditions significantly enhance financial reporting reliability and restore investor trust.

083

Inflationary effects of commodity price shocks: empirical evidence from New-Keynesian Philips Curve framework

Huiru Han (Master)

SUPERVISORS Syed Abbas (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

This paper investigates the connections between commodity price shocks and inflation within the context of the New-Keynesian Phillips Curve (NKPC). This study aims at understanding how fluctuations in the prices of top 3 exported commodity for each country influence inflation dynamics in Australia, Canada and UK. Utilizing monthly data of the commodity prices spanning several decades, this paper firstly estimates the commodity price shocks. This follows incorporating these shocks in the NKPC. The findings reveal significant positive relationships between commodity price shocks and inflation, suggesting that commodity prices shocks contribute to higher inflation rate, especially energy commodities. Additionally, the positive and negative price shocks of selected commodities are examined play different roles in boosting inflation rate. These results highlight the importance of taking commodity price movements into account in the formulation of monetary policy and inflation forecasting.

084

ESG Incident and managing investor relationship: The role of interactive investor platforms

Jia Liu (PhD)

SUPERVISORS Rui Ding, Xudong Ji (XJTLU)
Charlie Cai (UoL)

ACADEMY/SCHOOL International Business School Suzhou

This study investigates interactions between retail investors and management on Investor Interactive Platforms (IIPs) in response to ESG incidents among Chinese A-share listed companies. Using natural language processing (NLP), it analyzes investor inquiries and management responses following the disclosure of ESG incidents. The findings reveal that investor engagement on IIPs does not significantly increase on average after ESG incidents, likely due to the limited economic impact of some incidents or alternative information sources. Companies receiving more ESG-related questions before incidents see no significant rise in investor inquiries afterward, unlike those with fewer prior questions. Management adopts a more proactive communication approach, with faster responses and more positive sentiment, yet this only mitigates negative market reactions in high-impact incidents. The study highlights the role of IIPs in managing trust during ESG crises and emphasizes the importance of transparent communication, especially for non-state-owned enterprises and economically significant incidents.

085

Hyundai Motor Company's organizational culture and cross-cultural management in the era of digitalization and artificial intelligence

Jiaxiang Zhang (Master)

SUPERVISORS Changhee Kim (XJTLU)

ACADEMY/SCHOOL Entrepreneurship and Enterprise Hub

With the deepening of economic globalization and the rapid development of science and technology such as digitalization and artificial intelligence, organizational culture and cross-cultural management play an increasingly important role in modern enterprises, especially in the manufacturing field, which has a decisive impact on the competitiveness and innovation ability of enterprises in the global market. As one of the world's leading automobile manufacturers, Hyundai Motor Company's practice in organizational culture and cross-cultural management has provided rich research materials for industry and academia. This paper aims to critically analyze the strategic role of organizational culture and cross-cultural management of Hyundai Motor Company in the era of digitalization and artificial intelligence, and explore its practice and experience in the context of global integration, taking Beijing-Hyundai Auto (Beijing Hyundai) as an example.

086

A Bayesian Network Approach for Dynamic Behavior Analysis: Real-Time Intention Recognition

Jiaxuan Jiang (PhD)

SUPERVISORS Xiuwu Liao

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Management

Dynamic intention recognition is widely applied across diverse domains, including autonomous driving, e-commerce, and human-computer interaction, to understand and identify individuals' evolving behavioral intentions. While observable behaviors often serve as proxies for underlying intentions, accurately establishing the relationships between dynamic behaviors and evolving intentions becomes a challenging task. Moreover, external factors introduce dynamism and noise into behavioral data, complicating the process of inferring intentions. To address these challenges, we propose a novel Bayesian network approach that comprehensively models the real-time inference of behavioral intentions from dynamic behaviors. Our model incorporates a filtering mechanism designed to process evolving, noisy, and time-stamped behavioral data, enhancing data quality and ensuring reliable intention recognition. By mapping latent states to intentions through conditional dependencies and visualizing the generative process using directed acyclic graphs, we provide a transparent representation of the model's structure and reasoning. Experimental evaluations conducted on both real and synthetic datasets demonstrate the superior performance of our model compared to existing benchmarks, particularly in handling imbalanced data and minority classes. Furthermore, we extend our analysis to multi-target intention recognition scenarios, validating the model's adaptability in inferring the intentions of multiple individuals concurrently. Our approach offers a practical tool for decision analysis, empowering managers and practitioners to understand, predict, and proactively respond to individual behavioral intentions, thereby facilitating the development of targeted strategies and personalized services.

087

The impact of government subsidies on technology diversification in SMEs: from the perspective of R&D risk and organizational learning

Jiayi Xiao (PhD)

SUPERVISORS Yumiao Tian, Yao Fu (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

By diversifying technology, firms can enter a broader range of technologies or entirely new technological fields, thereby promoting the advancement of their core competencies. Due to the limitations of resources such as capital and knowledge for small and medium-sized enterprises (SMEs), the government has formulated a series of policies to foster the technological development of SMEs. This study uses a sample of 254 SMEs to analyze the relationship between government subsidies and firm's technological diversification from the perspectives of corporate R&D risk and organizational learning. Results indicate that government subsidies significantly promote SMEs' technological diversification. Compared to R&D subsidies, non-R&D subsidies are more conducive to SMEs' technological diversification. Moreover, firm's risk tolerance capability, regional intellectual property protection, firm's technology crowding and the size of the inventors could play moderating effect on the relationship between government subsidies and technological diversification.

088

Unmasking barriers to supply chain collaboration in the circular economy context: insights from a systematic literature review using grounded theory approach

Jielin Dai (PhD)

SUPERVISORS Yuan Virtanen (XJTLU)
Peter North (UoL)

ACADEMY/SCHOOL School of Intelligent Finance and Business

In the circular economy (CE), supply chain collaboration (SCC) is crucial for improving operational performance and keeping pace with contemporary progress, but the underlying barriers remain inadequately comprehended. Despite numerous efforts by scholars to summarize the barriers, the extant research outcomes remain dispersed and lack insights into mitigating them. To shed light on these gaps, this study selected 58 articles and conducted a systematic literature review (SLR). Additionally, the Latent Dirichlet Allocation (LDA) topic modeling was employed to investigate the categories and evolutionary trends of themes in this field. Based on the results, the Grounded Theory approach was used to identify four main categories of barriers and a causal relationship model for the governance research of SCC barriers in the CE context. The study highlighted that effectively overcoming the barriers faced by SCC has become the most pressing issue within the CE context, especially for regulatory and cultural barriers.

089

Subordinate expediency under supervisor performance pressure: The roles of perceived exploitation and supervisor benevolence

Jingyu Dong (PhD)

SUPERVISORS Fuli Li

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Management

Employee expediency has raised concerns in organizational practices. Although prior research highlights the role of employee performance pressure in activating expediency, less is known about whether performance pressure from key figures within the organization, particularly supervisors, influences employee expediency. Drawing on the exploitation perspective in labor relations, we developed and tested a model that explained how supervisor performance pressure leads to subordinate expediency through subordinate perceptions of exploitation, contingent on benevolent leadership. Using two multi-source and time-lagged field studies conducted in two firms (a real estate agency and a commercial bank) located in southwest China, we demonstrated that supervisor performance pressure heightened subordinates' perception of exploitation, which in turn led to their expediency. Furthermore, benevolent leadership mitigated the positive effect of leader performance pressure on subordinates' perceived exploitation, thereby reducing their expediency at work. The theoretical and practical implications of our findings are also discussed.

090

The impact of the ISSB's validation of Scope 3 GHG emissions on US manufacturers' stock valuations: The role of supplier complexity

Jingyuan Tian (PhD)

SUPERVISORS Lujie Chen (XJTLU)
Daniel Xing (UoL)

ACADEMY/SCHOOL International Business School Suzhou

The International Sustainability Standards Board's (ISSB's) validation of Scope 3 greenhouse gas emissions disclosure requirements represents a pivotal advancement in sustainability reporting. This study examines the implications of this validation for US-listed manufacturing firms' stock valuations, taking into account the moderating effect of supplier complexity. Employing the event study methodology and cross-sectional regression analysis, our study reveals a positive market response to the ISSB's validation. Moreover, we observe that supplier concentration complexity and supplier spatial complexity mitigate this positive impact, while supplier horizontal complexity does not exert a significant effect on this positive impact. This highlights the critical role of supply chain optimization in fostering sustainable business practices. Our study contributes to the literature by empirically assessing the impact of Scope 3 emissions disclosure on firm performance and exploring the moderating role of supplier complexity, thereby enhancing our understanding of sustainability disclosures within supply chain operations. Our findings offer crucial insights for manufacturers, investors, and policymakers as they navigate the complex dynamics between sustainability disclosures, supply chain management, and stock valuations.

091

Construction of Radical Innovation Capability in the New Era

Junchao Fang (PhD)

SUPERVISORS Xiao Wang, Bingqing Zhao (XJTLU)
Anup Nair (UoL)

ACADEMY/SCHOOL International Business School Suzhou

Radical innovation (RI) is a critical driver of organizational success, yet environmental uncertainties and inadequate organizational capabilities hinder its realization. A systematic review of prior literature highlights that adopting emerging technologies (e.g., AI, IoT, Big Data) can optimize innovation pathways and outcomes. However, the organizational capabilities required to leverage these technologies for RI remain underexplored. Building on the theories of technological opportunism and dynamic capabilities, this study proposes technological sensing and response capability as a foundational dynamic capability for identifying and deploying technology. Additionally, we introduce digital scouting and digitalization capability as novel competencies that enhance technology exploration and deployment in the digital era. Our conceptual model bridges theoretical gaps, providing a basis for future empirical studies on technology adoption and organizational capabilities. It also responds to calls for updating dynamic capabilities to reflect the demands of the digital age.

092

How does enterprise intelligent Manufacturing affect audit fees?

Junmin Hu (PhD)

SUPERVISORS Fangjun Wang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Management

This paper adopts the staggered difference-in-difference method to explore the impact and mechanism of intelligent manufacturing on audit fees. The results show that intelligent manufacturing reduces audit fees, and this effect is more obvious in process manufacturing enterprises, enterprises with low business complexity, and enterprises with high analyst attention. The results of the mechanism analysis show that intelligent manufacturing reduces the work time lag of auditors, reduces the possibility of internal control deficiencies, and improves the quality of financial reporting. This shows that the application of intelligent manufacturing effectively reduces audit risks and audit input, thus reducing audit fees. Further analysis shows that the reduction of audit fees brought by intelligent manufacturing does not damage audit quality and increase audit failure. The conclusion of this paper supports the view that intelligent manufacturing increases enterprise value, and provides a new perspective for stakeholders to study the economic consequences of intelligent manufacturing.

093

Less is more: The role of bricolage, exaptation, and product modularization on frugal innovation

Lianyong Xu (PhD)

SUPERVISORS Zelong Wei

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Management

How to deliver more value at lower costs challenges firms targeting underserved low-income customers. This study draws on the resource orchestration perspective to investigate the effects of resource orchestration strategies(i.e., bricolage and exaptation) on frugal innovation and growth performance. Furthermore, we examined the moderating role of product modularization. We tested our hypotheses using data from 334 manufacturing firms (two managers in each firm) in China, one of the largest emerging markets. Results show that both bricolage and exaptation foster frugal innovation and further growth performance. Product modularization strengthens the positive effect of exaptation on frugal innovation while weakening the positive effect of bricolage on frugal innovation. The study contributes to the frugal innovation literature by exploring the driving mechanism of frugal innovation from resource orchestration strategies and related product architecture.

094

AI orientation and ambidextrous Innovation: the role of dynamic capabilities and environmental dynamism

Liyan Lu (PhD)

SUPERVISORS Xueji Liang, Cheng Xu (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

Why do certain firms benefit more from leveraging artificial intelligence (AI) for innovation? This paper explores the underlying factors by examining how AI orientation differentially shapes radical and incremental innovation. Using data from Chinese-listed firms from 2008 to 2022, our findings indicate that AI orientation promotes radical innovation more strongly than incremental innovation. Drawing on the dynamic capability view, this study demonstrates that firms with strong sensing, seizing, and transforming capabilities can amplify the benefits of AI orientation for radical innovation, while its effectiveness diminishes for incremental innovation. Furthermore, the role of AI orientation is contingent on industry dynamics. In situations of increased market and technological uncertainty, AI orientation has a more pronounced effect on incremental innovation but shows no significant impact on radical innovation. As competition intensifies, AI orientation significantly supports ambidextrous innovation. These findings offer theoretical and practical insights for firms seeking to develop context-appropriate AI strategies to achieve ambidextrous innovation.

095

China-U.S. dispute about PCAOB inspection access and its Impact on earnings management of U.S.-Listed Chinese companies

Lu Peng (PhD)

SUPERVISORS Xudong Ji, Xingnong Zhu (XJTLU)
Helen Ren (UoL)

ACADEMY/SCHOOL International Business School Suzhou

This study examines the impact of the disputes between China and the U.S. regulators over Public Company Accounting Oversight Board (PCAOB) inspection access. Using a difference-in-differences design, it focuses on two key events in 2015 and 2019. The findings show that the Holding Foreign Companies Accountable Act (HFCAA), which threatens to delist Chinese companies from the U.S. market, unintendedly leads these companies to manage earnings, contrary to the PCAOB's original intent. This result holds across various robustness checks. Additionally, U.S.-listed Chinese companies with negative net income, small size, or high leverage ratio are more likely to manage earnings than those with positive net income, big size, or low leverage ratio.

096

A mystery of iniquity? Exploring experiences of women in UK academia

Malika Ben Kahla (PhD)

SUPERVISORS Caroline Gatrell

UNIVERSITY/INSTITUTE University of Liverpool / University of Liverpool Management School

Women's journey to equitable representation and remuneration in organisations has been widely problematised in the literature, and the gendered nature of academia is no exception. The academy plays a significant role in societal development in both how we construct and develop knowledge, yet progress to achieving equity is slow. This qualitative research extends beyond statistics, exploring the experiences of women in academia, considering theories of the maternal body and neoliberalism to understand work experiences in UK academia. Building on extant literature and key knowledge gaps, this qualitative research will focus on the work experiences of women in UK academia. The findings will generate important implications for managing and promoting Diversity and Inclusion in UK academia, which may be relevant more broadly.

097

Energy-poverty-inequality SDGs: A large-scale household analysis and forecasting in China

Minglai Li (PhD)

SUPERVISORS Cong Li

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Economics and Finance

Affordable and clean energy, eliminating poverty, and reducing inequality are important goals of the United Nations Sustainable Development Goals (SDGs). Using data from Chinese households, we show that a 10% increase in the penetration of clean cooking fuels would result in an increase in total annual household income of US$37 billion nationwide. Income growth from access to clean cooking fuels is greater for lower-income groups due to a shift to higher household incomes and reduced downward household income mobility, which contributes to a reduction in income inequality. The effect of access to clean cooking fuels on household income growth is primarily driven by improved health and increased labor supply. With further promotion of clean cooking fuels, household income and inequality in China are expected to improve further by 2030 and contribute more widely to enhanced human well-being and achievement of the SDGs.

098

How can brands turn praise received from other brands into opportunities for positive brand outcomes?

Mingli Huang (PhD)

SUPERVISORS Daniel Hampson, Eunkyung Lee (XJTLU)
John Byrom (UoL)

ACADEMY/SCHOOL International Business School Suzhou

Brands are increasingly praising the other brands on social media. This trend raises a dilemma for marketers on how to respond to such praise. Drawing on the Communication Accommodation Theory, this paper explores how brands should respond to praise to achieve better brand outcomes. Through two experimental studies (n = 896), we suggest that brands should respond to praise primarily through downgrading (minimizing the praise received). Compared to other response strategies like a simple thanks or a praise upgrade, a downgrade response increases consumers' perception of warmth and social closeness, leading to better brand outcomes regardless of praiser brand status. Our research makes theoretical contributions and offers management guidance for marketers on managing effective online communication when receiving praise from other brands.

099

Analyzing the Influence of Geographical Indications and Ancestral Surnames on the Competitiveness of SMEs in China

Na Sai (PhD)

SUPERVISORS Nimesh Salike, Yang Chen, King Yoong Lim (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

This study investigates the relationship between geographical indications (GIs) and significant surnames on the performance of small and medium enterprises (SMEs) in China. Through an extensive dataset spanning various industries from 1995 to 2019, the research utilizes advanced statistical models to explore how cultural heritage and GIs influence entrepreneurial success and innovation. The analysis aims to uncover patterns that connect local identity and familial legacy with business success, highlighting the unique role of GIs in enhancing competitiveness and market presence. This research contributes to the broader understanding of regional economic development by demonstrating the potential synergies between geographical branding and cultural heritage in the Chinese market.

100

How External Uncertainty Influences Women's Entry into Corporate Boards: A Real Options Perspective

Qi Yu (PhD)

SUPERVISORS Jordi Surroca, Shubin Wu

UNIVERSITY/INSTITUTE University of Liverpool /
University of Liverpool Management School

This study examines the impact of external uncertainty on corporate strategic behavior through the lens of Real Options Theory (ROT). Using board gender diversity as the research context, it explores how firms strategically respond to uncertainties driven by gender equality trends. Unlike institutional and resource-based theories, ROT emphasizes proactive and flexible strategies, framing societal trends as external uncertainty. External uncertainty is quantified using gender equality indices, such as the Global Gender Inequality Index (GII), and metrics like volatility and deviations from predicted values. Changes in female board representation are analyzed using BoardEx data from 33,713 companies across 1990 – 2023. Expected findings highlight that firms proactively adjusting board diversity before regulatory policies demonstrate better adaptability and resilience, showcasing the strategic value of early action under uncertainty. This study offers a novel methodology and extends ROT's application to social contexts, providing new insights into dynamic corporate decision-making.

101

Innovation spillover of customer digital transformation along the supply chain

Qian Yue (PhD)

SUPERVISORS Ming Zhang

UNIVERSITY/INSTITUTE China University of Mining and Technology /
School of Economics and Management

Digital transformation is a new momentum and engine of enterprise innovation, and current research neglects the vertical contagion effect of enterprise behavior in the supply chain. From a supply chain perspective, this study explores the impact and mechanism of customer digital transformation on supplier innovation (especially exploratory innovation) based on China's A-share listed companies, and aims to reveal the innovation spillover effect of customer digital transformation in the supply chain. It is found that: (1) Customer digital transformation significantly facilitates supplier innovation, especially exploratory innovation. (2) The test of the mechanism indicates that customer digital transformation affects suppliers' exploratory innovation mainly through improving the information environment of market supply and demand, and increasing technological spillovers between enterprises. These findings provide important insights on how enterprises can utilize digital transformation and supply chain resources to improve innovation performance.

102

Climate Change and Corporate Green Innovation: Empirical evidence from China

Qianzhi Xu (PhD)

SUPERVISORS Marc Gronwald, Anton Bondarev (XJTLU)
Ruijun Bu (UoL)

ACADEMY/SCHOOL International Business School Suzhou

Climate change is increasingly influencing corporate performance, risk and long-term planning, particularly in areas related to sustainability and adaptation. However, the nuanced effects of acute and chronic climate change on corporate green innovation have received insufficient attention. This study aims to provide the comprehensive analysis of how acute climate events, such as extreme heat and floods, as well as chronic trends like rising temperatures and changing in precipitation patterns, affect corporate green innovation in the short and long term. Based on the panel data of Shanghai and Shenzhen A-share listed companies from 2000 to 2023, combined with ERA5 reanalysis data, this paper evaluates the heterogeneous impact of climate change on corporate green innovation, and explore the nonlinear relationship between the two. Finally, delve into possible influencing mechanisms, such as supply chain concentration, brain drain and other moderating effects.

103

AI in B2B: Navigating the New Era of Digital Transformation – The Role of Market Environment and Technological Evolution in Shaping Entrepreneurial AI Adoption

Qiaoqiao Xiang (PhD)

SUPERVISORS Fawad Ahmed (XJTLU)
Maria Limniou (UoL)

ACADEMY/SCHOOL Entrepreneurship and Enterprise Hub

With the rapid advancement and widespread adoption of artificial intelligence (AI) technologies, B2B companies and SMEs are entering a new era of digital transformation.However, investing in emerging technologies and adapting to new marketing strategies will require substantial financial and human resources. By examining the moderating roles of the digital market environment and entrepreneurs' security and risk perceptions, the research explores how businesses navigate the challenges and opportunities presented by AI adoption. This topic raise key questions: How does AI adoption influence competition and innovation in B2B industries? What psychological effects (security vs. crisis) does AI integration have on business leaders and employees, and how can companies manage these perceptions? Furthermore, it investigates the strategies companies can adopt to maintain a competitive advantage in a landscape where AI is a common resource. The findings aim to provide actionable insights for companies to leverage AI effectively while mitigating risks, ensuring sustainable innovation, and enhancing overall business performance. By combining insights into the technological evolution of AI with strategic business responses,this research contributes to understanding how AI will reshape the marketing and operational models in cross-border B2B industries, guiding businesses in achieving long-term growth and competitive resilience.

104

The Generational Divide: Who Gained and Who Lost from the 2021–23 Inflation Surge?

Satyam Goel (PhD)

SUPERVISORS Oliver De Groot

UNIVERSITY/INSTITUTE University of Liverpool /
University of Liverpool Management School

Following the COVID-19 pandemic and Russia's invasion of Ukraine, the Euro Area faced significant inflation, leading the European Central Bank (ECB) to tighten monetary policy. I use an Overlapping Generations Heterogeneous Agent New Keynesian (O-HANK) model calibrated to the Euro Area to examine the redistributive effects of high inflation and monetary tightening on households across the age distribution and over the life cycle. I use the model to generate a scenario that captures the 2021 – 2023 inflation episode. I find that high inflation impacts households unevenly due to age-related differences in asset holdings and labor income. On impact, all generations incur wealth losses from high inflation, with those nearing retirement hit hardest and the youngest affected least; these losses are larger when the central bank responds more aggressively to inflation deviations in its policy rule. However, over the life cycle, inflation is regressive, benefiting middle-aged cohorts at the expense of the younger and older generations, and a more aggressive monetary policy stance to control inflation enhances welfare for individuals aged 50 and above.

105

How Replies from Social Bots Affect Opinion Polarization on Social Media

Shiyu Shen (PhD)

SUPERVISORS Xiaobo Xu, Chenwei Li (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

This study explores how social bots influence opinion polarization in the reply sections of social media platforms. Social bots, automated entities that mimic human behaviour, have been increasingly implicated in creating echo chambers and spreading disinformation. While previous research has mainly focused on the role of social bots in publishing and reposting content, this study shifts attention to replies, where direct user interaction occurs. Utilizing the heuristic systematic model, the study examines the effects of social bots' replies on public opinion from heuristic and systematic processing. The research aims to bridge gaps in understanding how social bots' replies contribute to the amplification of opinion polarization and proposes a model to assess these dynamics on a daily, topic-specific basis.

106

The Impact of Robot Application on Industrial Chain Risk: Cross-Country Evidence

Shuyun Zheng (PhD)

SUPERVISORS Wanli Li

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Management

Intelligence is accelerating global industrial transformation and industrial chain reshaping. This study examines the impact and underlying mechanisms of robot application on industrial chain risk (ICR) using manufacturing industrial chain samples in 40 countries. We find that the application of robots can significantly reduce ICR and this result remains robust after a series of endogeneity and robustness tests. We also demonstrate that the application of robots mitigates ICR by improving the level of human capital, promoting technological innovation, and raising labor productivity. Additionally, we observe that the negative effect is more pronounced in high-tech, large-scale, and highly competitive industrial chains in developing countries and in countries with low governance levels, high resource levels, a high degree of R&D investment, and prevalent digital infrastructure. We empirically reveal that the application of robots boosts national and economic prosperity, while ICR inhibits both.

107

Diabetes Burden and Firm Value

Siying Quan (PhD)

SUPERVISORS Peng Cheng, Jia Zhai (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

Building on human relations and stakeholder theories, we demonstrate a negative relationship between state-level diabetes burden, measured by diabetes-related death rates, and firm value. This relationship is mediated through three key labor channels. First, organizational capital, which reflects a firm's ability to attract and retain skilled labor, helps companies better withstand value declines as diabetes deaths rise. Second, labor-intensive industries, such as manufacturing and construction, experience more significant negative effects on firm value due to health challenges within the workforce. Lastly, firms with higher labor productivity, measured by sales per employee, are more adversely affected by increasing diabetes mortality. This study contributes to the ESG literature by illustrating how community health influences corporate performance and providing empirical evidence linking the diabetes burden to firm value. By integrating health factors into business strategies, we expand the literature on firm valuation and emphasize the role of public health in creating value by aligning stakeholder interests with workforce well-being. The findings also offer practical implications for policymakers and managers, highlighting the importance of recognizing chronic disease burdens as key determinants of firm performance in the pursuit of sustainable development.

108

The Impact of Market Knowledge on New Product Development Advantage: The Moderating Roles of Market and Technological Turbulence

Siyu Shao (PhD)

SUPERVISORS Jianjun Yang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of management

How companies leverage market knowledge to gain NPD advantages in turbulent market and technological environments is worth exploring. Based on data from 242 enterprises, this study examines the relationship between market knowledge and two dimensions of NPD advantages, as well as the moderating roles of market and technological turbulence. The findings indicate that market knowledge positively impacts both the NPD speed and NPC, with a stronger effect on NPD speed. Furthermore, under high market turbulence, the positive impact of market knowledge on NPD speed is enhanced, while its effect on NPC is weakened. Under high technological turbulence, the positive effects of market knowledge on both NPD speed and NPC are diminished, with a more significant reduction in NPC. The conclusions of this study reveal the complex relationship between market knowledge and NPD advantages, providing insights for enterprises on how to utilize market knowledge to enhance product competitiveness in uncertain environments.

109

Enhancing ESG Performance Evaluation: Integrating Diverse Data Sources and Entropy Weighting for a More Accurate and Reliable Assessment

Tianqi Wang (PhD)

SUPERVISORS Yicheng Wang (XJTLU)
Andrew Woodhouse (UoL)

ACADEMY/SCHOOL School of Intelligent Finance and Business

Accurately measuring ESG performance is critical for evaluating a company's sustainability practices and their impact on financial outcomes. Traditional ESG ratings primarily rely on self-disclosed information, which can be incomplete or biased, leading to a gap between reported performance and actual practices. This study addresses these challenges by incorporating diverse data sources, such as Twitter and Glassdoor, alongside self-disclosed information, to provide a more comprehensive view of ESG performance. Through the application of entropy weighting, the study redistributes indicator weights to better capture the materiality of various ESG factors. The proposed ESG scoring framework demonstrates stronger alignment with financial indicators, offering a more accurate and reliable evaluation of ESG performance while addressing inherent limitations in conventional methodologies.

110

Exploring the impact of social presence on consumers' online second-hand consumption behavior by an integrated SEM and fsQCA method

Ting Xu (PhD)

SUPERVISORS Lingyun Mi

UNIVERSITY/INSTITUTE China University of Mining and Technology / School of Economics and Management

As environmental sustainability becomes increasingly urgent, online second-hand consumption has become a crucial practice for waste reduction and resource conservation. This study examines the influence of social presence on online second-hand consumption behavior, with a focus on the mediating effects of trust in both the platform and the seller. Survey data from 612 respondents were analyzed using structural equation modeling (SEM) and fuzzy-set qualitative comparative analysis (fsQCA). The SEM results demonstrate that social presence directly promote consumer engagement in online second-hand consumption, with trust in the platform and the seller serving as critical mediators in these relationships. The fsQCA findings support the SEM results, identifying four configurations that lead to high levels and two configurations that lead to low levels of online second-hand consumption behavior. The findings offer valuable reference for fostering environmentally responsible behaviors among digital second-hand platforms users.

111

Psychological Perception and Interactive Behaviour in Physical AR/MR Retail Environments: Unveiling the Dual Mechanisms Behind Consumer Decision-Making

Weihan Liang (PhD)

SUPERVISORS Jiyao Xun, Yi Hong (XJTLU)
Les Dolega (UoL)

ACADEMY/SCHOOL Entrepreneurship and Enterprise Hub

This study examines the impact of Augmented Reality (AR) and Mixed Reality (MR) technologies on consumer flow experience and purchase intention in physical retail environments. Utilizing the Presence Theory and the Technology Acceptance Model (TAM), we explore how core factors—immersion, engagement, sensory fidelity, and interface quality—along with technology perceptions (perceived ease of use and perceived usefulness) influence the consumer flow experience. Through a comparative experiment, we collected 263 valid survey responses and 100 consumer behavior data points. The findings show that in AR environments, immersion significantly impacts the flow experience, while in MR environments, immersion, engagement, sensory fidelity, perceived usefulness, and perceived ease of use all positively enhance the flow experience, creating a more immersive and engaging environment. Random forest analysis reveals that in AR, click behavior, particularly on product information pages, significantly influences purchase decisions, while in MR, consumer interactions are more evenly distributed, suggesting a more personalized and consistent shopping experience. This study provides valuable insights for retailers looking to leverage AR and MR technologies to boost engagement and drive sales.

112

Communicating in 29x29 pixels: the influence of app icon typicality on user behaviour

Wenzhe Liang (PhD)

SUPERVISORS Ou Liu, Rhonwyn Vaudrey (XJTLU)
Severina Cartwright (UoL)

ACADEMY/SCHOOL International Business School Suzhou

When users browse or search for apps in the app store, the results include various information. In previous research on accessible information, the focus is on those already launched in the app store for a period, overlooking the newly developed apps. As the first touch point that attracts users and one of the most salient pieces of information presented, an icon is indispensable when launching a new app. Some apps will adopt category-based design elements in icons to deliver functional information and establish their category membership, and some choose distinct icons that are not common or expected. This study examines the effect of typicality on users' choices towards new mobile apps. We hypothesize that typical icons will enhance consumer confidence, leading to higher click intention to know more information about this app. We also argue that the main effect is moderated by app type (hedonic vs. utilitarian) and app characteristics.

113

Sustainable product innovation through horizontal coopetition: The role of boundary-spanning search and partner similarity

Xia Wu (PhD)

SUPERVISORS Jianjun Yang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Management

This study is the first to examine the mediating role of boundary-spanning search and the moderating role of partner similarity in horizontal coopetition for sustainable product innovation. Analyzing empirical data from 236 Chinese firms, we found that horizontal coopetition positively impacts both proactive search (aimed at surpassing competitors) and responsive search (aimed at following competitors), with a stronger influence on proactive search. Both search types mediate the relationship between horizontal coopetition and sustainable product innovation. Furthermore, greater competing similarity (e.g., market coverage) between firms and their partners increases firms' inclination toward proactive search under the influence of horizontal coopetition but weakens their tendency for responsive search. Conversely, greater cooperating similarity (e.g., corporate culture) increases firms' inclination toward responsive search under the influence of horizontal coopetition but weakens their tendency for proactive search.

114

The impact of China's Green Finance Innovation and Reform Pilot Policy on corporate ESG performance: A Multi-dimension analysis

Xiangwan Liu (Master)

SUPERVISORS Gengyang Tu (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

This study utilizes a Difference-in-Differences (DID) approach to investigate the impact of China's 2017 Green Finance Innovation Reform Pilot (GFIRP) on the ESG performance of Shanghai and Shenzhen A-share listed companies from 2010 to 2023. Results indicate that GFIRP significantly improves ESG performance by reducing financing costs and alleviating financial constraints. The effects are stronger for firms in the eastern region and those with higher analyst coverage, as eastern firms benefit more from lower financing costs, while central and western firms or those with limited analyst coverage gain more from eased financial constraints. Internal factors also shape policy outcomes, firms with finance-experienced executives or higher overhead rate face reduced benefits. Nevertheless, finance-experienced executives can mitigate these challenges through optimized resource allocation, enhancing ESG performance. These findings underscore the interaction between GFIRP, external conditions, and internal factors in driving corporate ESG improvements.

115

Engaging new realities: The influence of spatial presence, immersion and interactivity on consumer behavior through flow theory

Xiaowei Fan (PhD)

SUPERVISORS Jiyao Xun, Lin Xiong (XJTLU)
Les Dolega (UoL)

ACADEMY/SCHOOL School of Intelligent Finance and Business

This study investigates how the unique characteristics of the metaverse—such as spatial presence, immersion, and interactivity—affect consumers' continuous usage, purchase, and word-of-mouth intentions in metaverse retail environments, using flow theory as a framework. A two-factor experiment involving 109 participants compared 3D and metaverse shopping experiences. It has developed two virtual convenience stores using Unity, with approximately 50 products. The laptop and extended reality devices were used to construct these two shopping conditions. Results reveal that while spatial presence and interactivity significantly bolster flow experiences and consumer engagement, the effects of spatial immersion are less evident in the metaverse environment. Moreover, hedonic values are found to be crucial in promoting continued use and advocacy. However, utilitarian values show minimal impact on engagement. This study provides strategic insights into enhancing entertainment in metaverse retailing, suggesting that balancing entertainment with utility and managing consumer expectations are pivotal.

116

Digitalization and gender pension gap: evaluating the impact of data transparency and pension policy reforms in China

Xinyan Guo (PhD)

SUPERVISORS Lin Xiong, Bin Hao (XJTLU)

ACADEMY/SCHOOL School of Intelligent Finance and Business

With the development of digitalization, the impact of pension data transparency on pension disparities has become a growing research focus. This study explores the impact of digitalization on pension management, focusing on whether data transparency reduces or exacerbates the gender pension gap. By combining pension policy reforms, it analyzes the redistribution effects of gender differences and evaluates the reform's impact on gender pension disparities. The study employs a combination of the Oaxaca – Blinder decomposition method and the Difference-in-Differences (DiD) model to identify the sources of gender differences before and after the reform, revealing the mechanisms through which the reform affects the gender pension gap and how gender differences change. Data for this research comes from the China Health and Retirement Longitudinal Study (CHARLS). The aim is to integrate digitalization's effects on pension management with gender disparities, providing policy recommendations to reduce pension gaps, improve system fairness, and promote sustainable social development.

117

The Influence of Flooding Risk and Various Distances on the Operational Efficiency and Innovation of Firms within the Supply Chain

Xuyan Gao (PhD)

SUPERVISORS Yang Chen, King Yoong Lim (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

This study explores how flood risks and inter-company relationships within supply chains affect operational efficiency (OE), using rainfall and river proximity as flood risk indicators. We consider the roles of upstream and downstream suppliers, examining how geographical distance and knowledge distance between them impact performance, including the spillover effects from supplier performance. Additionally, we investigate the correlation between post-disaster flood-related patent development and company performance within the supply chain. Our findings reveal that geographical and knowledge distances have differential impacts on performance, and supplier performance may have ripple effects on patent creation. Notably, the OE of downstream suppliers, when considering flood risks, has a spillover impact on the focal firm's OE, while upstream suppliers do not exert the same influence. Moreover, an increase in knowledge distance has a significantly negative effect on the focal firm's risk-mitigating innovation capabilities, as opposed to geographical distance.

118

Does customer order matter? Explore the dynamics of lost-sales remanufacturing system under AR(1) demand

Yan Lu (PhD)

SUPERVISORS Jianghang Chen (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

This paper investigates the system dynamics of a hybrid manufacturing and remanufacturing system operating under AR(1) demand and governed by lost-sales rules. Lost sales occur when customers, after encountering a stock-out, are unwilling to delay their purchases. This is particularly relevant in industries like groceries, clothing, and cell phones, where customers are more sensitive to stock-outs. Given the presence of autocorrelated demand in these industries, the study focuses on how lost sales affect the system dynamics of a hybrid manufacturing-remanufacturing. The study finds that, under lost-sales conditions, the hybrid system performs better than an unconstrained system in terms of reducing the bullwhip effect and inventory variance, when the autoregressive return parameter is lower. Additionally, lost sales modify the influence of system structures on inventory variance under AR(1) demand. These insights provide key managerial implications for controlling bullwhip and inventory variance costs in products characterized by autoregressive demand patterns.

119

Holding all the cards from the good old days: How nostalgia enhances artificial intelligence service acceptance

Yanxi Yi (PhD)

SUPERVISORS Sotaro Katsumata

UNIVERSITY/INSTITUTE Osaka University / Graduate School of Economics

Although artificial intelligence (AI) has become deeply integrated into service, many customers show poor acceptance of AI services. Discovering effective and efficient ways to enhance their acceptance of AI services is of theoretical importance and practical use. We draw on compensatory control theory to propose that customers are more willing to accept AI services when they are provided with nostalgic cues. The proposed mechanism is the sense of control: nostalgic cues in AI services compensate for customers' perception of a loss of control and increase their willingness to accept AI services. The effect of nostalgic cues in AI on customer acceptance is attenuated in customers who feel more powerful; such customers do not require compensation through nostalgic cues. Our proposal was tested using field and online experiments. Our findings provide theoretical insights into AI services and nostalgia and offer practical solutions for the service industry.

120

Examining the Nexus between Socially Responsible Investing and the Transition to Clean Energy in the Digital Age: Insights from Energy Sector Analysis

Yi Ke (PhD)

SUPERVISORS Shu-Hsiang Chen (XJTLU)
Roberto Ferrero (UoL)

ACADEMY/SCHOOL Entrepreneurship and Enterprise Hub

This research aims to investigate the relationship between the socially responsible investing (SRI) of energy firms and their clean energy share in a digital age. Based on the stakeholder theory and recent research on firms' innovation and sustainability, following the empirical test, we conclude that SRI influences clean energy use through a firm's innovation, and this mechanism also depends on the time effects derived from the firm's strategic corporate social responsibility (SCSR) theory. Additionally, the degree of digitalization in an energy firm also carries weight on its innovation. To test the hypotheses, this research leverages the data from Chinese listed energy firms spanning 5 years, together with fixed-effects modelling. This research not only bridges the gap of stakeholder theory and SCSR theory in innovation and sustainability research combined with new digitalization trend, but also provides some applicatory suggestions for Chinese energy firms' practice.

121

The impact of foreign lead venture capitalist in the syndicate on IPO underpricing: Evidence from China

Yi Li (PhD)

SUPERVISORS Qiong Ji, Junsong Chen (XJTLU)
Vaios Dermitzakis (UoL)

ACADEMY/SCHOOL School of Intelligent Finance and Business

This study examines the impact of foreign lead venture capitalist (VC) in the syndicate on initial public offering (IPO) underpricing, focusing on companies listed in the Chinese A-share IPO market. We find that IPO companies backed by foreign lead VC are more likely to be underpriced than those without foreign lead VC. This result is robust to a battery of sensitivity tests. We also find that the relationship between foreign lead VC and IPO underpricing is enhanced when the lead VC has more IPO experience in the Chinese market, while this relationship is weakened when the lead VC has more industry-specific expertise in the industry of target IPO firm.

122

The impact of top management team power on digital transformation: Evidence from China

Yinjie Han (PhD)

SUPERVISORS Peng Cheng, Xiangyun Lu, Li Xie (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

This study explores the impact of top management team (TMT) power on corporate digital transformation, with evidence drawn from Chinese firms. Using Principal Component Analysis (PCA), we construct four dimensions of TMT power—structural power, expert power, prestige power, and political power. Our results show that all four dimensions have a positive influence on digital transformation. Among these, structural power is the most effective in driving digital transformation when corporate governance and intangible assets are robust. Expert power and political power are particularly influential in competitive industries and firms with fewer financial constraints. Expert power guides the implementation of technology, while political power secures necessary resources. In firms rich in intangible assets, flexible decision-making facilitates transformation, with structural power playing a key enabling role. Additionally, overconfidence in executives moderates the relationship between expert power and digital transformation positively. This paper contributes by introducing a novel approach to developing metrics for different dimensions of TMT power and providing empirical evidence on the effectiveness of executive influence in digital transformation, enriching the existing literature.

123

Balancing Act: The Role of Economic Theory in Data-Driven Model

Yintai Ding (PhD)

SUPERVISORS Jia Zhai, Shiment Shi, Yi Cao (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

Recent financial literature demonstrates growing interest in methodologies that incorporate economic theory into data-driven models to enhance their predictive accuracy and interpretability. This study examines whether such theoretical integration consistently improves model performance across varying market conditions, with particular focus on the evaluation of early exercise premiums in American options. Employing transfer learning techniques established in existing literature, this paper reveals a relationship between theoretical understanding and model performance. When market conditions significantly deviate from theoretical predictions, the incorporation of economic theory adversely affects the data-driven model's accuracy. Our empirical findings suggest that model performance can be enhanced by introducing specific training modules on moneyness and maturity whilst maintaining fixed fine-tuning cycles. This approach facilitates more efficient integration of economic insights into model framework. These results contribute to our understanding of the conditional benefits of incorporating economic theory into data-driven financial models, particularly in the context of option pricing dynamics.

124

Heterogeneous Agents and Money Demand in Micro-Founded Model

Yuchen Su (PhD)

SUPERVISORS Alessandro Marchesiani

UNIVERSITY/INSTITUTE University of Liverpool / University of Liverpool Management School

We incorporate heterogeneous impatience in a micro-founded model of money a` la Lagos and Wright (2005) in order to explain the recent trend in the observed money demand. We develop a theory to examine how heterogeneous impatience affects real allocations and calibrate the model to fit the money demand curve. Our findings suggest that while heterogeneity in impatience does not play a significant role, agents should be considered impatient before 2008 and more patient afterward. Additionally, our model indicates that the relative risk aversion ξ\alphaξ decreased after 2008, which contrasts with previous studies Guiso et al. (2013) that found an increase in risk aversion following the 2008 financial crisis.

125

14 Years of Research on Demand Forecasting and Inventory Management by Machine Learning: Current Insights and Future Directions

Yuhao Zhang (PhD)

SUPERVISORS Svetoslav Georgiev, Yicheng Wang, Lin Xiong (XJTLU)
Guangliang Cheng (UoL)

ACADEMY/SCHOOL School of Intelligent Finance and Business

This systematic literature review (SLR) examines the integration of Machine Learning (ML) and Deep Learning (DL) in demand forecasting (DF) and inventory management (IM) within two key frameworks: Integrated Estimation and Optimization (IEO) and End-to-End (E2E). Using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, we review 38 high-impact studies (2010–2023) from top-tier journals, highlighting each framework's strengths and limitations. Our findings show that IEO provides modularity and interpretability through stepwise stages but risks error propagation, while E2E streamlines decision-making and excels in handling complex dependencies but requires high-quality data and computational resources. ML performs well for structured, interpretable problems, while DL dominates E2E for complex, data-driven tasks. We argue that hybrid approaches leveraging both frameworks show promise for improved efficiency and scalability. By bridging ML/DL, DF, and IM, we identify research gaps and offer directions for advancing supply chain management operations in the Industry 4.0 context.

126

Does CEO's early life experience affect corporate audit fees? Evidence from Chinese Great Famine

Zenglian Liu (PhD)

SUPERVISORS Fangjun Wang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Management

This study examines how CEOs' childhood famine experiences affect external audit fees. We find that CEO's childhood famine experience has a significant positive effect on external audit fees. This positive association is particularly pronounced in firms that are non-state-owned and facing financial distress, and cases where auditors lack industry expertise or have shorter tenures. Potential channels test indicating that firms with famine-experienced CEOs are more likely to engage in financial fraud and earnings management and risk taking, which may explain the higher audit fees. Additional analyses indicate that that the severity of the CEO's famine experience, the longer duration of famine exposure, and childhood exposure during ages 3 – 8 are all associated with a greater increase in audit fees. Moreover, such famine experiences also raise the likelihood of companies receiving modified audit opinions. This study offers novel insights into the impact of executive personality traits on audit outcomes.

127

When Logic Takes a Backseat: Romantic Motives Drives Extreme Ratings

Zhiwei Luo (PhD)

SUPERVISORS Daniel Hampson, Wangshuai Wang (XJTLU)
Flora Song (UoL)

ACADEMY/SCHOOL International Business School Suzhou

True love is invaluable, but the journey to find love often involves a material commitment. Romantic relationships hold fundamental significance in the lives of nearly every consumer. However, research on romantic relationships has not yet been extensively extended to the service sector, let alone linked to the booming area of general ratings in the service industry. To fill this gap, this research explores the impact of romantic motives on consumers' extreme rating behavior. We propose the following: (1) romantic motives increase consumers' extreme rating behavior; (2) decision-making styles mediate the effect of romantic motives on extreme ratings. Specifically, romantic motives influence consumers' decision-making styles (Reasons vs. Feelings), which in turn motivates extreme rating behavior; (3) situational involvement moderates the effect of romantic motives on extreme ratings. A set of six studies, one of which was pre-registered, provides convergent evidence for these hypotheses through secondary data, laboratory experiments, and eye-tracking experiments, with diverse manipulations and measurements tested across different samples (China, the US, and the UK). Furthermore, to elucidate the psychological processes examined in this paper, various alternative explanations proposed by predecessors have been excluded. This paper contributes to the literature on romantic motives, extreme ratings, and decision-making styles (Reasons vs. Feelings).

128

How institutional investor influence audit fee through shareholding network

Zi'ang Chen (PhD)

SUPERVISORS Junrui Zhang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Management

Under Chinese A-share listed regulation environment, institutional investor's common ownership plays a more important role. We explore the relationship between institutional investor network and audit fee. We find the firm invested by central institutional investors paid lower audit fee and experienced less audit delay. This result is robustness after we change measures and use PSM matching method. And further analysis show there is no difference between SOEs and non-SOEs but show significant effect on audit delay when the firm is non-SOEs, and media reports can't replace the effect. Last but not least, we do find central institutional investors enhance institution's site visit but there is no evidence that central institutional investor exerts signaling effect. On the contrary, we find the investee firm's audit quality is lower, but the restatement probability has no connection with the centrality. These findings helpful for understanding internal institutional investor's different function and auditor's engagement risk.

129

Green Credit Policy and Accounting Information Quality: Evidence from China

Ziyi Zhai (PhD)

SUPERVISORS Mohamed Omran (XJTLU)
Charlie Cai (UoL)

ACADEMY/SCHOOL International Business School Suzhou

Purpose: This study examines the effect of the green credit policy (GCP2012) on earnings management practices in Chinese listed firms. Design/Methodology: We collect financial data from the Chinese listed firms from 2009 to 2019, including balance sheets and income statements. We also use a difference-in-differences (DID) design, defining 2012 as the event year. Findings: We find that the affected firms, highly polluted enterprises (HPE) will likely carry out more earnings management activities after implementing GCP2012. However, HPEs with higher financial constraints will decrease earnings management practice, especially for real activities, and thus improve the accounting information quality. Implications & Limitations: This study provides a theoretical understanding of the impact of green credit policy on earnings management practices. It also offers practical insights for improving the mechanism of government environmental management and guiding the direction of green finance.

130

Exploring the Characteristics of coke formation on biochar-based catalysts during the biomass pyrolysis

Biao Wang (PhD)

SUPERVISORS Gao Zhan

UNIVERSITY/INSTITUTE Xi'an Jiaotong University /
School of Chemical Engineering and Technology

Coke formation is one of the major obstacles in the development of catalytic pyrolysis of biomass. The experiments were carried out on poplar wood chips using the biochar-based catalysts (poplar biochar: ZSM-5 =1:2) to study the coke formation characteristics of biochar-based catalysts and to develop the kinetic models of coke formation. It is shown that the high temperature and long reaction time promoted the conversion of carbon from amorphous coke to graphitized coke. The higher the degree of graphitization of the coke, the higher the combustion temperature and the richer the cyclized structure. Activated coke and neutral coke were gradually converted to inert coke per unit mass of catalyst. Based on the experimental data, combined AIC evaluation system, it is found that the MMCGM (monolayer-multilayer coke growth model) can only describe the coke formation at low temperature well. Therefore, the kinetic model of carbon particle stacking model was established. This model can well describe the coke formation process on biochar-based catalysts. This study is expected to provide a guide for understanding the characteristics of catalyst coke formation and optimizing pyrolysis conditions and reactors.

131

Recyclable Selenoviologen-Based D-A Porous Ionic Polymer: From Dual-Channels Photocatalytic Degradation to Plant Growth

Chenjing Liu (PhD)

SUPERVISORS Gang He

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / Frontier Institute of Science and Technology

Antibiotic contamination in water systems poses environmental concerns, finding efficient photocatalysts that utilize visible light is still challenge in the field of antibiotic degradation. The selenoviologen-based D-A porous ionic polymer (SeV-PIP) was synthesized by selenoviologen (SeV2+) acceptor units with triazine donor units using Sonogashira reaction. The SeV-PIP exhibits remarkable visible light absorption, effective charge separation and excellent radical cation stability, that both photogenerated electrons and holes participate in dual-channel degradation and shows great recyclability. The efficient degradation of tetracycline antibiotics under visible-light conditions reaches up to 96% degradation rate and 97% recovery rate with wastewater contaminants, realizes the eventual mineralization of the contaminant molecule. A flowing sun-light-degradation tandem plant-growth device was designed and assembled, which verified that the degraded wastewater has plant-growth promoting abilities through bean seedling growth experiments and realized further application. This research contributes to sustainable wastewater treatment strategies, emphasizing the importance of advanced photocatalysis for environmental remediation.

132

Electrode Material for High-Performance Capacitive Deionization Using MXene/Polyaniline/NaTi2(PO4)3

Chuhan Huang (PhD)

SUPERVISORS Meng Ding (XJTLU)
Andrea Vezzoli (UoL)

ACADEMY/SCHOOL School of Science

Capacitive deionization (CDI) is rapidly advancing as an energy-efficient water desalination method and has garnered increasing attention in recent years. However, the low salt adsorption capacity (SAC) presents certain obstacles to the advancement of CDI technology. The development of advanced electrode materials is a crucial approach to addressing this issue. Therefore, the investigation of MXene composited with polyaniline-coated NaTi2(PO4)3 as a promising electrode material for high-performance CDI has been conducted. The introduction of polyaniline improved the poor conductivity of NaTi2(PO4)3, and compared with individual materials, the composite material of MXene and NaTi2(PO4)3 further enhanced the SAC of CDI. Experimental results demonstrate that when the mass ratio of MXene to PANI/NTP is optimal ratio, the SAC of the CDI electrode can reach 205.98 mg g-1. The research findings provide valuable insights into the development of electrode materials for next-generation CDI technology.

133

Innovations in Flow-Through Capacitive Deionization (FTCDI): Harnessing MXene-Enhanced Structures for Advanced Water Treatment

Di Kang (Master)

SUPERVISORS Meng Ding (XJTLU)

ACADEMY/SCHOOL School of Science

The pressing global challenge of water scarcity necessitates the development of efficient and sustainable desalination technologies. Flow-through capacitive deionization (FTCDI) emerges as a promising solution, leveraging electrostatic adsorption for ion removal. Despite its advantages in energy efficiency and simplicity, FTCDI is hindered by the limited adsorption capacity of conventional electrode materials. This work explores the integration of MXene, a class of two-dimensional materials known for its exceptional adsorption capabilities, with FTCDI systems. By engineering the structure and materials of the free-standing electrodes, we aim to overcome the adsorption capacity limitations of FTCDI. Our innovative approach utilizes a 3D-printed resin porous framework as a structural support, coated with MXene layers and safeguarded by a conductive polymer, polyaniline, as the protective layer, to devise a novel electrode architecture for enhanced desalination performance.

134

Investigating nano-structure of carbon-based materials for lithium-ion capacitors

Dongqi You (PhD)

SUPERVISORS Li Yang (XJTLU)
Richard Nichols (UoL)
Mingwen Gao (External)

ACADEMY/SCHOOL School of Science

Lithium-ion capacitor (LIC) generally combines a battery-type anode and a capacitive cathode. It can achieve higher energy density than supercapacitors, as well as higher power density and longer cycling lifetime than lithium-ion batteries. However, the unmatched kinetics mechanism between the battery-type electrode and the capacitive electrode will inevitably lead to unsatisfied electrochemical performance. The complicated pre-lithiated process leads to a high manufacturing cost of LIC, which largely hinders its commercial applications. In this study, by adding a small quantity of battery-type materials to the cathode, as well as a few capacitive materials to the anode, LIC showed a high capacity but still maintain its property of fast-charging and long cycling life. The simple in-situ pre-lithiated process reduces the manufacturing of LIC significantly. In addition, the influence of capacity matching of the anode and the cathode on the performance of LIC was investigated.

135

Preparation and electrocatalytic performance of low iridium based catalyst for proton exchange membrane electrolyzer

Fengge Wang (PhD)

SUPERVISORS Junlei Qi

UNIVERSITY/INSTITUTE Harbin Institute of Technology /
School of Materials Science and Engineering

The sluggish kinetics, poor stability, and high iridium loading in acidic oxygen evolution reaction (OER) challenge proton exchange membrane water electrolyzers (PEMWE). To address this, we develop a low-iridium, durable electrocatalyst (IrO2/MnO2) by anchoring IrO2 nanoparticles onto MnO2 nanowires via molten salt-assisted synthesis. This catalyst leverages the Mn3+/Mn4+ redox properties and strong metal-support interactions to reduce iridium content while enhancing activity and stability. IrO2/MnO2 demonstrates a 7-fold increase in intrinsic activity and superior durability compared to commercial IrO2, facilitated by dynamic electron transfer between Ir and Mn. A PEMWE with IrO2/MnO2 as the anode achieves 2000 mA cm-2 @ 1.89 V without supporting electrolyte and negligible degradation at 1000 mA cm-2 under harsh conditions, with an Ir loading of 0.5 mg cm-2. 51.Its low energy consumption (45.58 kWh kg^{-1} H2) and green hydrogen production cost (ξ0.9 kg^{-1} H2) surpass the 2026 US-DOE target, enabling practical application.

136

Application of liquid eutectic Gallium-Indium electrodes to study structure-thermopower relationships in molecular thermoelectrics

Hailian Huang (PhD)

SUPERVISORS Li Yang (XJTLU)
Richard Nichols (UoL)

ACADEMY/SCHOOL School of Science

Organic-based thermoelectric materials have gained attention due to unique properties and potential advantages in various applications. This project aims to study the direct relationship between thermoelectric efficiency and molecular structure of organic molecular thermoelectric materials to modify it and measure large-area thermoelectric junctions through liquid eutectic gallium–indium. Finally, organic thermoelectric materials with high thermoelectric efficiency and performance temperature should be obtained. This poster introduced the development status, classification, and basic theory of organic thermoelectric materials. In addition, it discussed the development potential of fullerenes and their derivatives in the thermoelectric direction. The experimental part mainly includes the screening of the SAMs substrate, the preparation of the temperature control experimental platform, and the electrical performance testing and characterization of several fullerene molecules with different temperatures and substrates. It was found that the current density of different molecules on AuTS and PtTS substrates will also change with the change of heating temperature.

137

Boundary conditions regulation and kinetic mechanism of chiral locomotion transitions of an active gel

Haodi Yu (PhD)

SUPERVISORS Qingyu Gao

UNIVERSITY/INSTITUTE China University of Mining and Technology /
School of Chemical Engineering & Technology

Transitions between chiral rotational locomotion modes widely exist in nature and artificial systems. However, in the artificial self-propelling system, the universal principle of chiral transition and the method of directionally controlling locomotion chirality based on the principle has yet to be explored. In this study, we performed experiments and simulations to investigate rotational motion of PAAm-based BZ self-oscillating gels in two-dimensional space. It has been found that transition of the chirality of rotational locomotion of the gel can be realized by changing the side length of the square gel. The analysis shows that the orthogonal components of gel displacement evolve periodically in Cartesian coordinates, and the sign of phase difference (△φy-x) determines the rotational chirality. The change in gel size affects the sign of △φy-x and chiral locomotion transition occurs when ☒φy-x changes sign.

138

Semiconductor sers technology for biological diagnosis

Haoyan Wang (Master)

SUPERVISORS Qiuchen Dong (XJTLU)
Shan Cong (JITRI Nanotechnology and Applications Institute)

ACADEMY/SCHOOL School of Science

Surface-enhanced Raman scattering (SERS) spectroscopy is a highly promising characterization technique. By analyzing the characteristic fingerprint peaks formed by molecular vibration and torsion information, SERS can perform highly specific and sensitive detection. Semiconductor substrates represent an important research direction beyond traditional noble metal substrates, while metal-organic-frameworks (MOFs) are rarely used in SERS detection. With the development of defect engineering, semiconductor materials with defects have advantages in electron transport performance and other aspects. Here, we coat metal oxides (MOs) with MOFs to optimize their band structures to match the energy bands of target analytes. Furthermore, we induce defects in MOFs-coated MOs to enhance their performance. We constructed a PCN-225-coated titanium dioxide nanorod array (TNR), which has a detection limit as low as 10-8 for methylene blue (MB).

139

Molecular engineering design and performance study of naphthalene diimide materials in neutral aqueous organic redox flow battery

Heng Zhang (PhD)

SUPERVISORS Gang He

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / Frontier Institute of Science and Technology

Neutral aqueous organic redox flow batteries (AORFBs) have garnered significant attention among various large-scale energy storage technologies due to their advantages. Naphthalene diimide materials have gradually emerged with promising application prospects in the field of neutral aqueous organic redox flow batteries owing to their ultra-stable dual-electron transfer characteristics and ease of modification. By incorporating hydrophilic groups and electron-withdrawing groups respectively at the terminal and bay positions of naphthalene diimide, we have achieved enhanced water solubility and redox potential. Through a combined approach of experimental validation and theoretical calculations, we have delved into the synergistic mechanism between π-π stacking effects and hydrogen bond networks, revealing the intrinsic connection between molecular structural stability and performance optimization. Additionally, by optimizing the hydrothermal synthesis process, we have significantly reduced production costs. During the dual-electron transfer process, these modified molecules have demonstrated the highest battery capacity, power density, and capacity retention recorded so far.

140

Synthesis of iron-based catalysts based on nickel foam for seawater oxygen evolution reaction (OER) catalysis

Huajie Wu (Master)

SUPERVISORS Danlei Li (XJTLU)
Tiejun Zhao
(JITRI Advanced Catalytic Technology Research Institute)

ACADEMY/SCHOOL School of Science

Seawater electrolysis faces challenges such as high overpotential and electrode degradation, hindering its practical application in sustainable hydrogen production. In this study, we employed a hydrothermal etching method to co-dope Ni and Cr into FeOOH, aiming to improve its performance as an anodic catalyst for the oxygen evolution reaction (OER). The co-doping strategy enhances the intrinsic catalytic activity and structural stability of FeOOH, making it more resistant to corrosion in seawater environments. Advanced characterization techniques, including TEM, XPS, and Raman spectroscopy, confirmed the successful incorporation of Ni and Cr and revealed structural and electronic modifications. Electrochemical tests demonstrated that the Ni,Cr co-doped FeOOH catalyst significantly reduces overpotential while maintaining superior long-term stability compared to undoped FeOOH. These findings provide an effective pathway for designing robust and efficient catalysts, addressing critical challenges in seawater splitting and advancing the development of renewable energy technologies.

141

Directional Motion of Asymmetric Self-Propelling MXene Films

Hui Wang (PhD)

SUPERVISORS Qingyu Gao

UNIVERSITY/INSTITUTE China University of Mining and Technology /
School of Chemical Engineering & Technology

Chemically driven actuators that facilitate directional motion have garnered significant interest due to their autonomy, sustainability, and versatility. However, some existing enzyme actuators often face challenges such as high costs and inadequate orientation. We present a straightforward approach to load centimeter-scale MXene (Ti3C2Tx) films with catalase to achieve directional motion. Utilizing a readily controllable and inexpensive vacuum-filtration assisted by masks, the asymmetric films exhibit both linear and rotational motion at the air/water interface. Experiments and numerical simulations reveal that directional locomotion is facilitated by net fluid drag due to buoyancy generated by the decomposition of H2O2. Notably, the composite film behaves like a 54. 'robot vacuum' on polluted water surfaces, effectively adsorbing dye molecules during locomotion. These adaptive and biocompatible actuators show promise for diverse applications in environmental remediation, cargo transportation, and biomedicine, paving the way for future advancements in intelligent robots.

142

DNA hypomethylation in early pan-cancer detection

Jiaxuan Wang (PhD)

SUPERVISORS Xiaodong Jin, Lei Fu (XJTLU)
Konstantin Luzyanin (UoL)
Xinghong Luo
(JITRI Translation Medical and Medicine Innovation Institute)

ACADEMY/SCHOOL School of Science

Aberrant epigenetic alteration of DNA methylation, manifested as DNA hypermethylation in specific CpG islands and DNA hypomethylation in widespread regions, can significantly affect different cancers, and numerous studies have emerged focusing on cancer detection, diagnosis, and prognosis. Nowadays, the majority of research is concentrated on DNA hypermethylation, while the investigation of DNA hypomethylation is challenging and complex. This project works on the role of aberrant DNA hypomethylation in cancer progression and develops hypomethylation products that can be used for cancer early detection. The methodology of the product involves integrating preclinical study results with clinical data, aiming to identify effective biomarkers that can make a substantial impact in the early stage of cancer. Therefore, it will complement the shortcomings of early cancer detection products with DNA hypomethylation.

143

Investigating the novel structure and configuration of the anode in the advanced lithium ion batteries

Jiayi Zhang (PhD)

SUPERVISORS Li Yang, Chenguang Liu (XJTLU)
Richard Nichols (UoL)

ACADEMY/SCHOOL School of Science

Controlling lithium deposition/stripping behaviour is the most critical technical barrier limiting the next generation of safe, high-energy-density lithium-ion batteries. In this study, a Lipophilic substrate composed of a large number of Ti3C2Tx MXene nanosheets was constructed on the surface of a copper collector by using MPTS as a coupling agent, and the effect of the Lipophilic surface on the nucleation and growth behaviour of lithium metal was investigated. The artificially controlled SEI layer significantly affects the nucleation barrier during lithium metal deposition, and the metal particles are uniformly dispersed and tightly arranged to form a dense metal layer. This lithium metal deposition behaviour results in highly reversible cycling properties. The modified collector is cyclically stable in the current density range of 0.5-5.0 mA/cm2, an areal density of 0.5-5.0 mAh/cm2, with a high coulombic efficiency of 98-99% and a long cycle life.

144

Exploration and Application of High-Performance Novel Lithium Batteries

Jingchao Zhang (PhD)

SUPERVISORS Li Yang (XJTLU)
Richard Nichols (UoL)
Liangsheng Liao (Jiangsu JITRI Organic Optoelectronics Institute)

ACADEMY/SCHOOL School of Science

The shuttle effect is a great challenge for lithium metal batteries. Herein, introducing zeolite with different pore sizes and acidity to establish new nanochannels, change the solvation structure, and exhibit high ionic conductivity. Zeolite@Separator@Zeolite were prepared based on MCM-41 and ZSM-5 zeolites, which sieving solvent macromolecules and adsorbed anions to suppress severe side reactions on the anode surface. A Li¦¦Zeolite@Separator@Zeolite¦¦LFP Exhibits significant superior performance compared to commercial PP separator. Specifically, it exhibits good stability, with a capacity retention rate of 99% after 1200 cycles at 0.75A g-1. Due to the low cost of zeolites, this work provides a new approach for composite separators.

145

Research on Producing PMA-doped Surface in High Efficiency Nonfullerene Organic Photovoltaics

Jinlong Wu (Master)

SUPERVISORS Yi Lin (XJTLU)
Changqi Ma (JITRI Nanotechnology and Applications Institute)

ACADEMY/SCHOOL School of Science

Organic photovoltaics (OPV) significantly contributes to the sustainable development. However, the progress of OPV is constrained by the energy-intensive vacuum thermal evaporation, a critical step in the hole transport layer (HTL) fabrication process. In this project, the solution-processed HTL of phosphomolybdic acid (PMA) has been applied to the high efficiency system PM6:L8-BO as photo active layer (PAL) for the first time, and the highest efficiency 13.53% under this method was obtained. By investigating the PMA diffusion in the vertical and horizontal directions in PAL, it was concluded that the fewer the PMA is diffused in the PAL, the less the electrons captured by PMA will be, and the performance will be improved. This discovery could help to promote the industrial production of OPV.

146

Rapid synthesis of formamides from amines via catalyzed transamidation in DMF

Jinting Li (Master)

SUPERVISORS Qian Zhang (XJTLU)

ACADEMY/SCHOOL School of Science

N-formylation is a widely employed technique in organic chemistry. This study examined the transamidation process under various catalytic conditions, utilizing hexylamine as the starting amine and DMF as both the solvent and formylation agent. The optimal reaction conditions were ultimately established, involving the use of 1 mmol of amine, 1 mL of DMF, and 0.1 equivalents of $ZrCl_4$ as a catalyst at 150 °C for 1 hour. This condition led to a high-yield formylation of primary amines.

147

Semi-quantification of Escherichia Coli by using Glassy Carbon Electrode

Kaiwen Zhou (Master)

SUPERVISORS Qiuchen Dong (XJTLU)

ACADEMY/SCHOOL School of Science

This study focuses on the detection of Escherichia coli (E. coli), integrating a review of existing optical and electrochemical methods to propose a novel chemiresistive sensing platform aimed at achieving higher sensitivity, faster response, and easier operability. By modifying glassy carbon electrodes with bovine serum albumin (BSA) optimized at a 5% concentration, a well-ordered porous structure was developed for efficient bacterial capture. Frequency Response Analysis (FRA) was employed to measure the correlation between charge transfer resistance changes and with different quantity of bacterial, achieving a detection limit down to a single bacterium. Compared to conventional methods, this approach demonstrates superior sensitivity, reproducibility, and detection efficiency, offering significant potential for water contamination monitoring. This work not only provides an effective solution for current water quality assessment but also lays the foundation for future advancements in rapid, on-site bacterial detection technologies.

148

DFT mechanistic study of Ti-Catalyzed Ketone Synthesis from Carboxylic Derivatives and gem-Dihaloalkanes

Kehang Cheng (Master)

SUPERVISORS Xiaotai Wang (XJTLU)

ACADEMY/SCHOOL School of Science

In this study, we investigated the mechanism of titanium-catalyzed synthesis of carboxylic acid derivatives and dihaloalkanones based on density-functional theory (DFT) theory. The reaction proceeds through several key steps, starting with the reduction of Cp2Ti(IV)Cl2 to Cp2Ti(II), followed by the formation of alkylidene titanocene. This intermediate undergoes a [2+2] cycloaddition with carboxylic acid derivatives, leading to the formation of oxetane intermediates that subsequently undergo cycloreversion to yield ketone products. Additionally, the study explores the catalyst regeneration process, with TMSCl facilitating the dissociation of the Ti-O bond in the first step, and magnesium promoting the final reduction of the catalyst. We have likewise expanded the range of substrates and further explored the reaction mechanisms of different substrates. Overall, this work provides detailed insights into the mechanistic pathways involved in titanium-catalyzed ketone synthesis and offers a foundation for future developments in transition metal-catalyzed organic synthesis.

149

Study of anisotropic and highly absorptive materials for suspended particle devices

Lidan Fan (PhD)

SUPERVISORS Kim Lau (XJTLU)
Gita Sedghi (UoL)
Wei Zhu (JITRI Smart Liquid Crystal Technologies Institute)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Smart dimming glass can change the light transmission for buildings and vehicles windows to reduce energy consumption and protect privacy. Suspended particle device (SPD) is an intelligent glass that disperses rod-shaped nanoparticles with optical anisotropic absorption in polymer matrix. The arrangement of nanoparticles can be changed by external electric field, thereby altering the transparency of the device. In this project, rod-shaped nanoparticles with optical anisotropic absorption are investigated. Reddish brown Herapathite nanorods with length of approximately 1μm and aspect ratio of 10 have been synthesized by using a controlled precipitation method. The effects of particle size, concentration, viscosity etc. on transmission performance have been studied. The as-prepared prototype device has optical modulation from 10% (dark state) to 70% (bright state).

150

Mechanistic insight into CoH-catalyzed enantioselective hydrogenation of quinolines: a DFT study

Lin Liu (PhD)

SUPERVISORS Xiaotai Wang (XJTLU)
Jianliang Xiao (UoL)

ACADEMY/SCHOOL School of Science

There is ongoing interest in cobalt (Co) catalysis. We report computational findings on CoH-catalyzed enantioselective hydrogenation of 2-substituted quinolines. Using density functional theory (DFT), we identified the most favorable reaction pathway: C=N insertion into CoIIIH, H-N reductive elimination, concerted C=C insertion into Co-H, H2 oxidation addition to Co(I), and H-C reductive elimination to form the product. Enantioinduction occurs during Co-H hydride transfer to C=N. The rate-determining step is H-C reductive elimination with a 21.9 kcal/mol activation energy, consistent with experimental temperatures (25°C). These insights can advance CoH-catalyzed asymmetric hydrogenation of heteroaromatic cycles.

151

Defects passivation of flexible perovskite solar cells-Modification of Tin Dioxide Electron Transport Layer

Linghao Jin (Master)

SUPERVISORS Heechae Choi (XJTLU)
Qun Luo (JITRI Nanotechnology and Applications Institute)

ACADEMY/SCHOOL School of Science

The study aims to improve the electron transport layer (ETL) in all solution flexible perovskite solar cells by modifying tin dioxide (SnO2) layers with surface active agents or other chemical substances such as TMDD, PAA, and polymer PCz. The purpose is to improve the efficiency, wettability, and uniformity of the film, while optimizing the interface performance between the bottom electrode and ETL. Through doping optimization, the efficiency of film formation and interface charge transfer is improved, among which PAA doping can significantly enhance performance. The study also explored the impact of these modifications on large-area flexible devices.

152

Machine learning-enhanced prediction of formation energies and voltage profiles in phosphate vanadium cathodes for Sodium-ion batteries

Lingzhi Wang (PhD)

SUPERVISORS Xiaofei Sun

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Mechanical Engineering

This research focuses on phosphate-vanadium-based cathode materials for sodium-ion batteries (SIBs), integrating machine learning (ML) and first-principles calculations to accelerate materials design. Specifically, an XGBoost model was trained on formation energy data from density functional theory (DFT) calculations, achieving outstanding accuracy (99.6%) and a low error (< 0.04 eV/atom). Additionally, the Shapley value method provided insights into the most influential features affecting formation energy. Using the optimized model, formation energies during discharge were predicted, and these values were used to fit a voltage curve. The resulting voltage profile closely matched experimental data, demonstrating the model's predictive power. Compared to pure DFT calculations, this approach offers significantly improved efficiency, enabling rapid screening of candidate materials. Overall, this work highlights the promise of combining ML models with DFT calculations for reliable, cost-effective, and fast prediction of SIB cathode properties, ultimately expediting the development of sustainable energy storage solutions. It aids rational material design.

153

Non-invasive wearable flexible sensor for real-time continuous monitoring of glucose

Maoning Ding (Master)

SUPERVISORS Qiuchen Dong, Qifeng Lu (XJTLU)

ACADEMY/SCHOOL School of Science

Diabetes, a prevalent chronic disease, significantly impacts human health and pose one of the leading causes for world-wide issue. Current diagnostic and management tools requires calibration and invasive method, leaving room for improvement in monitoring and treatment. To address this, we propose a wearable, minimum invasive device capable of real-time glucose monitoring through interstitial fluid via a microfluidic pathway for a period of time through iontophoresis. This innovative approach aims to enhance diabetes diagnosis and control while offering new perspectives on glucose monitoring, contributing valuable insights to diabetes management.

154

Non-monotonic relationship between oscillatory frequency and light intensity of BZ-Ru(II) homogeneous and self-oscillating gel systems

Meng Zhang (PhD)

SUPERVISORS Qingyu Gao

UNIVERSITY/INSTITUTE China University of Mining and Technology /
School of Chemical Engineering & Technology

With BZ-Ru(II) photosensitive oscillations, the light response in homogeneous system, capillary gel system and bare gel system was investigated by using ambient light intensity as variable. The homogeneous system can be regarded as no diffusion effect, and its oscillation frequency rapidly increases before gradually decreasing with increasing photointensity. The capillary gel and bare gel can be regarded as one-dimensional diffusion system and quasi-two-dimensional diffusion system respectively. The oscillation frequency in the capillary gel is much lower than that in the homogeneous system, and the light response in the bare gel is obviously weak. A series of photosensitive gel locomotion1-3 were designed by using the Non-monotonic relationship between oscillation frequency and light intensity in the BZ gel system catalyzed by (bpy)3Ru(II), which play an important role in the ecological balance and circulation of substances, and can be used to design soft robot materials that are better adapted to the environment.

155

Isomer-Pure ICBA for Organic Electronics

Mengmeng Zhang (PhD)

SUPERVISORS Terence John Dennis, Li Yang (XJTLU)
Steve Rannard (UoL)

ACADEMY/SCHOOL School of Science

Indene-C60 double adduct (IC60BA), as an electron acceptor material in polymer solar cells (PSCs), has a significantly higher open-circuit voltage (Voc) than monoadducts, and has become the research focus in recent years. However, IC60BA have been used as a mixture of several regioisomers applied to PSCs, and the properties of this mixture have never been fully investigated and understood. In this study, regioisomers of IC60BA were isolated by HPLC and characterized by NMR, CV, and UV-vis spectroscopies, which conducted a comprehensive study of their corresponding photovoltaic properties.

156

Interfacial cavity-enhanced CO2 capture in metal-organic cage-based porous liquids

Mingrui Zuo (PhD)

SUPERVISORS Lifeng Ding (XJTLU)
Haifei Zhang (UoL)
Linjiang Chen (USTC: University of Science and Technology of China)

ACADEMY/SCHOOL School of Science

Metal-organic Cage-based porous liquids (MOC-PLs) with permanent porosity, hold consid-erable potential as effective separation agents. In this study, we introduce a streamlined computational strategy to explore a subclass of Metal-organic Cages (MOCs) featuring open copper sites, thereby shortlisting promising candidates for CO2 capture. Through in-silico discovery, a top-performing MOC, tBu-MOC was identified and subsequently synthesized experimentally as the support host for a robust ionic liquid, IL-NTf2. The resulting MOC-PL demonstrated high efficiency, achieving a record-breaking CO2 uptake enhancement (0.195 mmol/g, 2.41 times of neat IL) at 298K, 1 bar. Molecular dynamics simulations revealed that the enhanced CO2 trapping capability stems from synergistic interplay between pore con-finement and the "interfacial cavity" (IfC, proposed for the first time). This work provides novel insights, paving the way for the design of MOC-PLs as state-of-art platforms for CO2 capture.

157

The Development Of Novel Protective Polymeric Materials Against Fomite Transmission Of Respiratory Viruses And The Mechanism Study

Minhao Shi (PhD)

SUPERVISORS Xuan Xue, Lifeng Ding (XJTLU)
Bill Paxton, Georgios Pollakis (UoL)

ACADEMY/SCHOOL School of Science

An important aspect of managing fomite transmission is the knowledge and development of novel virucidal polymers to eliminate the problematic cross-infections. However, there is currently limited information regarding the development of effective antiviral coating materials. Recently, poly (2-diethylamino) ethyl acrylate (pDEAEA), which we demonstrated bind virions strongly and speed their inactivation upon contact, was discovered via experimental high-throughput screening in our group. In this research, a series of pDEAEA-based copolymers were synthesized and fully characterized, and successfully coated on various plastic substrates (e.g. polystyrene) with covalent-bonded epoxy-resin used as the primer layer. Such surfaces are now being evaluated by pseudotyped SARS-CoV-2 adsorption assay to confirm the strong binding affinity. The potential of these polymer coatings to prevent biofilm formation is also being investigated. At the same time, live virus inactivation experiments have been designed and will be carried out to assess the antiviral efficacy of the coating surfaces soon.

158

Development of phosphorous-based prodrugs towards Matrix metalloproteinases (MMPs) inhibition in tumor progression and metastasis

Palmer Sivoko Imbenzi (PhD)

SUPERVISORS Magdalini Matziari (XJTLU)
David Hong (UoL)

ACADEMY/SCHOOL School of Science

Phosphinic peptides have been widely used to study proteases since they act as reversible, non-toxic, potent, and selective inhibitors. They are metabolically stable peptide analogues in which the scissile peptide bond is replaced by the resistant to hydrolysis phosphinate group, and the other peptide fragments fit in specific protease binding sites to achieve enzyme selectivity. This study considers the matrix metalloproteinase since it is a significant target in cancer therapy. While developing C2-symmetrical MMP inhibitors and taking advantage of the ease of access to such compounds, we are synthesizing a library of phosphinic pseudopeptides, which incorporate the combination of the benzyl group via easily accessible acrylates and different amino acid analog substituents. To improve absorption, a highly efficient method for generating phosphinic esters with boswellic acids using amide coupling reagents has been developed.

159

Polymer-based nanocapsule development for intracellular delivery

Pingqing Fan (PhD)

SUPERVISORS Gang Ruan (XJTLU)
Neil Liptrott (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Intracellular delivery of exogenous entities is vital in biotechnology. Nonviral gene delivery, including physical and chemical methods, stands out for gene therapy due to its high biocompatibility and low toxicity. Chemical methods use different kinds of carriers to introduce genes into cells, which are safer and simpler to operate. However, it faces challenges in the application due to the unstable carrier system and the multiple transport barriers, which contribute to inefficient gene transportation. The “SDot system” developed by our group combines a hydrophobic nanoscale surface, a cosolvent, and a natural biomolecular function, representing an unprecedented ability to overcome cellular transport barriers. Quantum dots (QDs) used in the system have excellent fluorescence intensity for detection, but their solid structure limits the ability to hold entities inside. This project will use synthesized polymer nanocapsules (PNCs) as the carrier to replace QD in the SDot design for developing a nanoprobe technology platform. Based on these, particle surface modification will further be studied in this project to see their effects on membrane penetration and gene transfection.

160

Hollow Co3O4 nano material-based sandwich structure and Cobalt nanowires for both glucose and solid-state pH sensor

Qi Qin (Master)

SUPERVISORS Qiuchen Dong (XJTLU)

ACADEMY/SCHOOL School of Science

The goal of this research is to create a non-enzymatic glucose and solid-state pH sensor using hollow Co3O4 nanofibers doped Au sandwich structure (GCE/Au/Co3O4 NFs/Au) and electrodeposited cobalt nanowires (Co NWs) paired with electrodeposited gold in tuning pH sensitivity and glucose sensing performance. This is demonstrated through how different exposed crystalline structures can catalyze glucose oxidation and provide dual purpose pH sensing capabilities. These two distinct materials in various synthetic forms of cobalt were characterized using scanning electron microscopy, X-ray powder diffraction, transmission electron microscopy, X-ray photoelectron spectroscopy, and cyclic voltammetry techniques. The comparison of these two sensors reveals their individual benefits and possible uses, indicating that hollow Co3O4 NFs and electrodeposited cobalt nanowire-based dual sensors hold great promise for creating a novel dual sensor for solid-state pH sensing and superior non-enzymatic glucose sensing.
Keywords: Dual sensor; core-shell Co3O4 NFs; Electrodeposited Cobalt Nanowires; pH sensor; Glucose sensor

161

Single entity electrocatalysis: Oxidized MXene as Electrocatalysts for Oxygen Reduction Reactions

Qiaoyi Peng (Master)

SUPERVISORS Danlei Li (XJTLU)

ACADEMY/SCHOOL School of Science

MXenes are two-dimensional materials with excellent conductivity, strength, and tunable surface chemistry. While fresh MXenes have limited catalytic activity for oxygen reduction reactions (ORR), oxidized MXenes show significantly improved performance. This study focuses on the use of oxidized MXene as an ORR electrocatalyst under alkaline conditions. Structural and chemical changes during oxidation were characterized using X-ray diffraction (XRD), ultraviolet-visible (UV-vis) spectroscopy, Fourier-transform infrared (FTIR) spectroscopy, and X-ray photoelectron spectroscopy (XPS). The ORR activity and mechanisms were investigated through cyclic voltammetry (CV), and nano-impact chronoamperometry (CA) provided detailed insights into the effects of oxidation on catalytic performance at the single-entity level.

162

Synthesis and characterization of Hexaarylbenzene (HAB) derivatives

Qiqi Dong (Master)

SUPERVISORS Yi Lin (XJTLU)

ACADEMY/SCHOOL School of Science

Compared to LEDs, OLEDs have better performance. Due to its luminescence mechanism, the EQR of TADF material can theoretically reach 100%, which is an excellent material for EML layer. The gap between HOMO and LUMO of HAB molecule is small, making it a good choice as a TADF material. In this project, two TAB molecules were synthesized by domino reaction, and two HAB compounds were obtained through other reaction designs, and the two compounds were characterized and tested for their properties. It is promising that these two materials can be made into devices for use in OLEDs.

163

Rapid synthesis of symmetrical diesters, asymmetrical diesters, monoesters, and prodrugs from ethylene glycol by using a rotary evaporator

Shangshu Sheng (Master)

SUPERVISORS Qian Zhang (XJTLU)

ACADEMY/SCHOOL School of Science

The objectives of the present study are to introduce an innovative method for rapidly synthesizing symmetric diesters and monoesters under reduced pressure conditions utilizing a rotary evaporator. This method facilitates the esterification reaction between carboxylic acids and ethylene glycol through the rotary evaporator, significantly enhancing the reaction rate and ensuring high yields, while also being operationally simple.

164

A new synthetic approach for the efficient synthesis of aza-annulated organic semiconductor materials

Tian Gao (PhD)

SUPERVISORS Yi Lin (XJTLU)
Alessandro Troisi (UoL)

ACADEMY/SCHOOL School of Science

This study explores new applications of the Pictet-Spengler reaction in the synthesis of nitrogen-containing heterocyclic organic semiconductors. Structural modifications were achieved through the Pictet-Spengler reaction, introducing six-membered pyridine rings along with various aromatic rings and alkyl chains. Reaction conditions were optimized using high-energy methods, including microwave-assisted synthesis, resulting in moderate yields for several compounds. Challenges such as limited solubility, steric hindrance, and spontaneous side reactions were identified, particularly with alkyl aldehydes and ketones. Despite ongoing difficulties in modifying o-phenylenediamine, experimental outcomes are gradually approaching the desired structures. This work contributes to the design of efficient organic semiconductors, enhancing the feasibility of cost-effective and scalable production for optoelectronic applications.

165

Design, Synthesis, and Evaluation of Nitroimidazole-Oxazolidinone Hybrids against Anerobic Bacteria

Weiding Wang (PhD)

SUPERVISORS Qian Zhang, Lifeng Ding (XJTLU)

ACADEMY/SCHOOL School of Science

A series of hybrid compounds, consisting of oxazolidinone-nitroimidazole, have been synthesized through the amide bond coupling of metronidazole and linezolid derivatives. These compounds have been characterized using NMR and MS spectra. Most synthesized compounds demonstrated good antimicrobial activity, with compounds 24 and 25 demonstrating the most potential activity against anaerobic bacteria. These compounds inhibit bacterial growth by binding to bacterial DNA and causing DNA damage. Furthermore, molecular docking results revealed that compounds 24 and 25 bind more tightly to the ribosomal subunit compared to linezolid. Importantly, both compounds showed no in vitro cytotoxicity against RAW264.7, HepG2, and B16 cells, indicating their pharmaceutical safety.

166

Design, Synthesis and Characterization of Multi-dimensional Non-fullerene Acceptors for Organic Photovoltaic Cells

Weihao Da (PhD)

SUPERVISORS Yi Lin, Kim Lau (XJTLU)
Alessandro Troisi (UoL)

ACADEMY/SCHOOL School of Science

Organic photovoltaic (OPV) cells offer a cost-effective, lightweight, and flexible alternative to silicon-based solar cells, with strong absorption in visible and near-infrared regions. Non-fullerene acceptors (NFAs) have gained attention for their superior electron-accepting and tunable optical properties compared to fullerene-based acceptors. Theoretically, multi-dimensional NFAs (2D and 3D) are expected to enhance absorption and reduce recombination energy, thereby improving light-harvesting and charge recombination dynamics. In this study, novel 2D and 3D compounds were synthesized and fully characterized, demonstrating competitive potential as NFAs. These compounds will be tested within the arena of OPV for photovoltaic performance, and the prospects are promising.

167

Molecular Simulation Investigation for Sequence Effect on Mechanical Properties of Sustainable Polymeric Materials

Weijian Zhang (Master)

SUPERVISORS Zhenghao Wu (XJTLU)

ACADEMY/SCHOOL School of Science

Polymeric materials such as polylactic acid (PLA) and polycaprolactone (PCL) hold significant potential for biodegradable applications. However, their relatively low mechanical strength limits their suitability for broader applications. This project aims to investigate novel design parameters, including monomer sequence and composition, to enhance the mechanical performance of PLA-PCL copolymers using molecular simulations. Systematic coarse-grained (CG) models for PLA and PCL are developed to facilitate large-scale simulations of PLA-PCL copolymers. These models will be employed to study the effects of different copolymer architectures—block, random, and gradient sequences—on mechanical properties such as tensile strength and elasticity. The findings from this work will provide insights into the design of PLA-PCL copolymers with optimized mechanical properties, contributing to their advancement in sustainable material applications.

168

Metal oxide enabled gas sensor for early diagnosis of Colorectal Cancer (CRC) at low temperature and its GC-MS confirmation

Weiyu Xiao (PhD)

SUPERVISORS Qiuchen Dong, Lifeng Ding (XJTLU)

ACADEMY/SCHOOL School of Science

Colonscopy is a gold standard, but invasive method, for identification of colorectal cancer. It may lead to uncomfortableness to senior personnels. Gas released from patients' stool sample is one of unchecked route for pre-screening of early onset of colorectal cancer. This study conducted a quantitative analysis by GC-MS and has revealed isopropanol and p-cresol as two key biomarkers for CRC diagnosis. Electrodeposited zinc oxide on patterned gold electrode has enabled low temperature sensitive quantification to both biomarkers in the current research results. The preliminary results have shown (0,0,-2) and (-1,0,-1) crystal planes are primarily responsible for sensitive isopropanol response.

169

Synthesis of Substituted Tetralins via Nitrogen Deletion/Diels–Alder Cascade Reaction

Wen Ye (PhD)

SUPERVISORS Yi Lin, Xiaodong Jin, Danlei Li (XJTLU)

ACADEMY/SCHOOL School of Science

Skeletal editing is a significant method for altering and broadening the range of biologically active molecules. The use of nitrogen deletion techniques in skeletal editing has recently emerged as a fresh approach for modifying compounds. In this study, we present an unforeseen nitrogen deletion in isoindolines. Instead of the expected formation of cyclobutane through intramolecular radical couplings, the nitrogen deletion of isoindoline triggers a Diels – Alder cycloaddition facilitated by the in situ formation of ortho-xylylene, resulting in the production of tetraline. Inspired by this reaction, we have devised a new approach for creating substituted tetralins, utilizing isoindoline, nitrogen deletion reagent (anomeric amide), and dienophiles. This methodology showcases a novel pathway for tetralin synthesis and the modification and diversification of isoindolines.

170

Metal single-atom nanomaterials as seawater electrocatalysts

Wenhan Fang (Master)

SUPERVISORS Danlei Li (XJTLU)

ACADEMY/SCHOOL School of Science

As the most abundant natural resource on Earth, seawater has always been a research focus for obtaining cheap green energy. This project aims to design a new, efficient, and stable seawater oxygen reduction catalyst. This article successfully synthesized a novel nitrogen chlorine co-doped iron-supported carbon-based catalyst and conducted material characterization and electrochemical test. The results indicate that the catalyst has high current density and low half-wave potential for oxygen reduction reaction, and exhibits good performance stability in resistance to chloride ions, maintaining a constant current density and half wave potential after 150 cycles in an alkaline electrolyte containing 0.5 M chloride ions.

171

The distance-dependent inter-nitrogen synergistic effect in metal-free nitrogen-doped carbon catalysts for carbon dioxide electroreduction

Xiao Kong (PhD)

SUPERVISORS Lang Xu

UNIVERSITY/INSTITUTE China University of Mining and Technology / School of Chemical Engineering & Technology

Carbon materials doped with multiple types of nitrogen atoms show excellent apparent activity in electrochemical CO2 reduction. However, limited by research methods and simplified structural models, the catalytic behavior governed by the proximity of different types of nitrogen atoms has not yet to be understood. Herein, taking pyridine nitrogen, pyrrole nitrogen and graphite nitrogen-doped carbon as an example, the structural models considering the inter-nitrogen proximity are proposed, and the nitrogen-doped carbon catalysts with different inter-nitrogen distances are prepared by in-situ space-confined thermal polymerization. Density functional theory calculations, electrochemical measurements and in situ molecular spectroscopy show that as the average distance (dN) among the three types of nitrogen atoms at the angstrom scale shrinks, the significantly enhanced *CO adsorption strength leads to the reduction of the thermodynamic energy barrier of potential-determining step *COOH→*CO, thus improving the ECR performance. Further mechanistic studies reveal that the average dN around 3 Å is revealed to effectively trigger non-bonding inter-nitrogen inductive effect interactions, which leads to the asymmetric distortion of the electron cloud density near the pyridine nitrogen catalytic site and activates the carbon atom in the ortho-position of pyridine nitrogen as an additional *CO adsorption site to regulate the *CO adsorption strength. This study points to the existence and importance of the distance-dependent inter-nitrogen interaction which, as a fundamental mechanism, needs to be considered as one of the factors in the origin of nitrogen-doped carbon catalytic activity. Meanwhile, this study also helps to bridge the gap of the active sites of nitrogen-doped carbon catalysts between theoretical simulation and experimental synthesis.

172

Polymer Microparticle Reinforced Ultra High Performance Concrete

Xunhe Liu (Master)

SUPERVISORS Zhenghao Wu, Jun Xia (XJTLU)

ACADEMY/SCHOOL School of Science

Ultra-high-strength concrete (uhpc) is an advanced type of concrete with a strength of more than 120 MPa that is susceptible to spalling at elevated temperatures due to its dense structure. This study found that the addition of 0.15% volume fraction of polypropylene particles improved the spalling resistance of uhpc and reduced the loss of strength after high temperature exposure, but higher doses of polypropylene particles weakened its original strength. This study provides insight into the use of polymer-modified uhpc at elevated temperatures.

173

Effects of halogenation of small molecule acceptors for efficient organic solar cells in high boiling point solvent

Yan Xia (Master)

SUPERVISORS Yi Lin (XJTLU)
Qun Luo (JITRI Nanotechnology and Applications Institute)

ACADEMY/SCHOOL School of Science

The unsatisfactory Power conversion efficiency (PCE) of organic solar cells (OSCs) processed with high-boiling solvents is attributed to the poor morphology of the active layer1-3. Therefore, we synthesised four new small molecule acceptors, Y6-4Cl, Y6-4Br, L8-BO-4Cl and L8-BO-4Br, by substituting Cl and Br for F on the end groups, thus exploring the effect of halogenated elements on the end groups of the small molecule acceptors on the morphology of the films as well as on the device efficiencies in high-boiling-point solvents. An investigation into the influence of film formation duration on the aggregation behavior and photovoltaic performance of Y6, Y6-2CL, Y6-4Br, L8-BO, L8-BO-4Cl, L8-BO-4Br has been conducted, utilizing two prevalent solvents: chloroform (CF) (rapid film forming process) and chlorobenzene (CB) (slow film forming process). It was found that due to the large phase separation, the PCE of Y6- and L8-BO-based OSCs decreased sharply from CF- to CB-processed devices, while the PCE of devices based on Y6-4Cl as well as L8-BO-4Cl increased significantly. Furthermore, the results show that the L8-BO-2Cl-based device exhibits the highest efficiency of 17.89%. The results show that chlorination at the end-groups is an effective strategy that can be used to modulate the film morphology and improve the PCE of OSCs processed with high-boiling solvents.

174

Synthesis and development of Dual-functional polymer materials against microbial transmission

Yao Yu (Master)

SUPERVISORS Xuan Xue (XJTLU)

ACADEMY/SCHOOL School of Science

Acrylate polymers which include the ester group are promising coating materials to reduce microbial infection. As previous research shows, cyclododecyl methacrylate(CyDMA) can effectively prevent the biofilm formation. Additionally, the N, N-Diethylethylenediamine (DEAEA) has a strong attachment to the virus (SARS-Cov-2). We aim to synthesize dual-functional polymer material. The Bisphenol A diglycidyl ether (A Resin) and diethylenetriamine can be used as the primer layer coated on the polystyrene. We synthesized three components of copolymers pDEAEA-pCyDMA-pGlyMA. The glycidyl methacrylate (GlyMA) here helps the copolymer layer crosslink with the primer layer to consolidate the coating. As for now, we have successfully polymerized the pDEAEA-pCyDMA-pGlyMA with different compositions, the characterization has been carried out, for example, 1H NMR and GPC. The copolymers have been coated with surface characterization, such as SEM, FT-IR, and water contact angle (WCA). What's more, a preliminary experiment has been conducted to evaluate anti-biofilm formation and virus adsorption.

175

The Magneto-Structural Correlations of Sandwich type Dysprosiacarboranes Single-Molecule Magnets (SMMs)

Yeye Liu (PhD)

SUPERVISORS Yanzheng Zhen

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / Frontier Institute of Science and Technology

The dicarbollide dianion (nido-C2B9H112-) which introduces more B atoms while maintaining pentadentate coordination ring has higher 2p-orbital energy and larger 2s-2p orbital radii compared to pure C atom based rings. When coordinating to the Dy(III), it can effectively increase the axial crystal field strength and has greater rare-earth affinity. Its theoretically optimized linear structure shows even higher magnetic anisotropy compared to Cp based analogues, indicating great potential of dicarbollide ligand for constructing high performance SMMs. Therefore, it is hoped that the introduction of dianionic carborane can further improve the properties of SMMs.

176

Study on Extraction of Marine Active Substances by Supercritical Method

Yi Wang (PhD)

SUPERVISORS Lei Fu, Ken Cheng (XJTLU)
Christopher Goldring (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Plasmalogens, phospholipids with vinyl ether bonds, are abundant in tissues like nerves, heart, and muscle. Ascidians are particularly rich in these compounds. This study investigates extracting phospholipid active substances from ascidians using supercritical extraction. The process involves removing neutral lipids, followed by extracting phospholipid actives. Total lipids were extracted with chloroform/methanol, and ether phospholipids were prepared using PLA1 enzymatic hydrolysis. Ethanolamine and choline ether phospholipids were separated using a diol column. Biological studies showed that the supercritical ascidian extract, along with its ether phospholipid fractions, enhanced SH-SY5Y cell proliferation and reduced inflammatory markers (IL-1β, NOS2) in lipopolysaccharide-induced BV2 cells. These findings suggest that plasmalogen components may promote nerve cell regeneration and alleviate neuroinflammation. This study highlights the potential of ascidian-derived plasmalogens as therapeutic agents for neurological health and anti-inflammatory applications.

177

Design, Synthesis of Neomycin-Oxazolidinone dual-target Hybrid Antibiotics and Antibacterial Evaluation against ESKAPE Pathogens

Yinzhe Chen (PhD)

SUPERVISORS Qian Zhang (XJTLU)
Ishwar Singh (UoL)

ACADEMY/SCHOOL School of Science

The frequency of the advent of antibiotic-resistant bacteria has increased dramatically over the past several decades. Aminoglycosides have worldwide use for over seventy years as traditional Gram-negative antibacterial medications. Oxazolidinones is a relatively new antibiotic used for the treatment of infections caused by Gram-positive bacteria. However, acquired resistance to these two antibiotics restricts their use in clinical treatment. The combination of two antibiotics, which have different antimicrobial mechanisms in one molecule, proved a promising strategy to overcome bacterial resistance. The developed hybrid antibiotics in this project are hopeful to have a broad antibacterial spectrum, low toxicity, and low resistance frequency.

178

The Synthesis of Chalcogenoviologen-Based Assemblies and Application of Visible-Light Photocatalysis

Yujing Gao (PhD)

SUPERVISORS Gang He

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / Frontier Institute of Science and Technology

In the initial study, chalcogenoviologen was integrated into the orthotetrahedral structure, enabling the first heterogeneous photocatalysis of selenoviologen through spatial modifications of the viologen configuration. This catalyst exhibited remarkable photocatalytic efficacy and stability. Following this research, 2,2’-thienoviologens were developed to overcome the limitations of 4,4’-viologen in electron transfer under neutral conditions. By self-assembling 2,2’-thienoviologens with g-C3N4, efficient composites were created for photolytic hydrogen production, representing a significant advancement in hydrogen production efficiency among similar materials.

179

Superhelical Locomotion of a BZ self-oscillating Gel Driven by Scroll Waves

Yunjie Wang (PhD)

SUPERVISORS Qingyu Gao

UNIVERSITY/INSTITUTE China University of Mining and Technology / School of Chemical Engineering & Technology

Understanding the mechanisms behind self-organized helical motion in active materials can offer insights into natural systems and promote the development of intelligent self-propelled materials. We report the superhelical self-propulsion of a model Belousov – Zhabotinsky (BZ) self-oscillating gel in three-dimensional space driven by scroll waves. Using the gel lattice spring model (gLSM), transition from superimposed planar epicyclic locomotion to superhelical and irregular locomotion in three-dimensional space is obtained with non-illuminated and illuminated media, respectively. By applying a gradient light intensity, the perpendicular symmetry of the scroll waves is broken, inducing the three-dimensional spatial locomotion. Furthermore, the simulated locomotion can be perfectly fit with a two-frequency superhelix.

180

Synthesis of Substituted Benzimidazoles via Amino Acid/Copper-Catalyzed Intramolecular Arylation

Yuqi Huang (Master)

SUPERVISORS Xiaodong Jin (XJTLU)

ACADEMY/SCHOOL School of Science

Benzimidazoles are an important class of heterocycles widely recognized for their biological activity and utility as pharmaceutical intermediates. Traditional synthetic routes often suffer from low efficiency and requires harsh conditions or more reactive substrates. Herein, we report an efficient and practical copper-catalyzed synthesis of substituted benzimidazoles at room temperature using dimethylglycine as ligand. This strategy utilizes less toxic ligands and cost-effective substrates, offering significant potential for further applications in synthetic and medicinal chemistry.

181

Tafel plot as a tool to study the kinetics on metal-based electrocatalysts

Yuqi Ma (PhD)

SUPERVISORS Danlei Li, Li Yang (XJTLU)
Richard Nichols (UoL)

ACADEMY/SCHOOL School of Science

Electrocatalysts have been widely used in modern technologies such as batteries, fuel cells, and sensors to lower energy barriers in reactions. This study focuses on Tafel analysis to explore the kinetics and thermodynamics of metal-based electrocatalysts, specifically for oxygen reduction reaction (ORR), oxygen evolution reaction (OER), and hydrogen evolution reaction (HER). Tafel analysis provides insights into reaction mechanisms and optimal conditions for maximizing reaction rates. By examining various electrochemical methods and computational simulations, this work seeks to establish a standardized approach for evaluating catalyst performance, addressing discrepancies in current assessment methods. The research highlights the critical role of accurate characterization of electrode surfaces and diffusion models to improve the reliability of Tafel plots. Ultimately, this study aims to enhance the understanding and optimization of high-performance electrocatalysts for sustainable energy applications.

182

Three-dimensional printable viologen-based Ionogel for visible sensing and display

Zhikang Han (PhD)

SUPERVISORS Gang He

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / Frontier Institute of Science and Technology

Flexible electronics play a key role in the development of human society and our daily activities. However, it remains challenging to fabricate smart sensors with high robustness, reliability, and visible readout. This is because conventional viologen (RV2+) often generates free radicals under photo-irradiation, significantly impeding the polymerization of monomers when incorporated into ionogels. We addressed this challenge by employing two distinct methodologies. Firstly, high-performance electrochromic (EC), ionogels with ultrastable reversibility are prepared by combination of thienoviologen-containing ionic liquids with poly(ethyl acrylate) elastomer. In addition, we synthesized a phenyl viologen ((SPr)2PhMeV) to effectively circumvent the formation of photogenerated radicals under photo-irradiation, which was seamlessly integrated into ionogels through 3D printing technology. Notably, the ionogel demonstrates excellent visual responses to changes in temperature or strain, making it highly suitable for visual sensing applications. This viable strategy provides an opportunity for developing sensors that communicate information through color and fluorescence emission.

183

Titanate composite materials for applications in Na batteries

Zhiyi Zhou (Master)

SUPERVISORS Graham Dawson, Eric Amigues, Chenguang Liu (XJTLU)

ACADEMY/SCHOOL School of Science

This study investigates the synthesis and performance of a composite material, TiNT/CN/MXene, as a potential anode for sodium-ion batteries (SIBs). By integrating titanate nanotubes (TiNT), graphitic carbon nitride (CN), and MXene, the composite leverages the synergistic properties of these materials to address challenges in SIBs, including low energy density and cycle stability. The composite material demonstrates a unique structure with balanced porosity and high specific surface area, as characterized by XRD, FTIR, and BET analyses. Electrochemical evaluations reveal enhanced capacity retention and stability, achieving moderate energy densities over extended cycles. Future work will focus on optimizing the composite structure and incorporating novel organic electrolytes to further enhance battery performance.

184

A Chemistry Foundation Model to Predict Molecular Properties

Ziqi Wang (PhD)

SUPERVISORS Xuan Xue (XJTLU)
Konstantin Luzyanin (UoL)
Yuwen Cui (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Science

In contrast to the reliance on expert-defined sets of molecular features for small molecule tasks, small deep learning employs learned features that can be tailored to a specific task. Correlation property prediction models demon- strate superior performance compared to more traditional QSAR methods. When applied to the field of molecule generation, deep learning enables the generation of molecules by learning rules from an existing molecule training set, rather than relying on random expansion or rule-based fragmentation. By integrating these generative and predictive approaches, researchers can design molecules that fulfil specific biological activities.

185

Synthesis of Antimicrobial Polymers and Development of Surface Coatings

Zixing Lu (Master)

SUPERVISORS Xuan Xue (XJTLU)

ACADEMY/SCHOOL School of Science

This study focuses on the development and application of polymer coatings on solid surfaces to effectively mitigate the transmission of bacteria and viruses. By utilizing advanced materials science and surface engineering techniques, the proposed polymer coatings are designed to exhibit enhanced antimicrobial properties. The research investigates the composition, structure, and surface properties of these coatings, aiming to create a durable and non-toxic barrier that can significantly reduce the adherence, growth, and spread of pathogenic microorganisms. Experimental results demonstrate the effectiveness of the coatings in inhibiting bacterial and viral contamination on various solid substrates, such as medical devices, food packaging, and public surfaces. Furthermore, the study explores the underlying mechanisms of action, including physical barrier effects, surface modification-induced inactivation, and potential release of antimicrobial agents. The findings contribute to the advancement of hygiene technologies and provide a promising solution for reducing the risk of infectious diseases transmitted through contact with contaminated surfaces.

186

Du Li, 独　立 , Relocating the notion of independence in popular music to mainland China: process of cultural and conceptual translation in popular music

Changbo Duan (PhD)

SUPERVISORS Micheal Jones

UNIVERSITY/INSTITUTE University of Liverpool /
School of the Arts, Department of Music

This research examines the cultural and conceptual translation process in popular music. It will focus on how the notions of 'independent' and 'indie' have been translated and transformed into 'Du Li', a Chinese expression. Du Li has become a highly subjective and distinctive concept that differentiates itself from the West that it connotates different emphasis on music-making experiences. From the big players in the Chinese music industry to the small players that support the infrastructure of music making, they all contribute to the process of this readaptation. Six types of Du Li have been identified through musicians' reinterpretation based on their practices. They could be understood as the consequences of the negotiation between art and commerce. This research will be conducted through a qualitative strategy, including participant observation and semi-structured interviews. We could understand Du Li's significance and its power both guides and restricts musicians' practices, values and beliefs.

187

Community participation and social networks of older people in urban China

Jiayao Zhou (PhD)

SUPERVISORS Beibei Tang, Liu Cao (XJTLU)
Anna Shadrina (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

This research aims to explore the mechanisms of community participation in shaping the social networks of older people within their communities, revealing the economic and social changes in urban China through the community participation of older people, highlighting the outcomes of community participation in enriching older people's community life. Using in-depth interviews conducted in Shanghai, the study examines how various community activities and organizations influence the social networks of older adults. The findings reveal that: Residents' Committees strengthen familiar networks among older adults and neighbors through social service activities and recreational activities. Voluntary Community Social Organizations create weak networks with older peers and voluntary staff through fitness exercise and recreational activities. Service Centers for the Elderly promote stable networks with older peers and staff through fitness exercise and recreational activities. And Community Schools cultivate like-minded networks of older classmates through fitness exercise and recreational activities.

188

The role of Confucius Institutes (CIs) in promoting economic exchange between China and Central and Eastern Europe (CEE)

Min Zhang (PhD)

SUPERVISORS Dragan Pavlicevic (XJTLU)

ACADEMY/SCHOOL School of Humanities and Social Sciences

Confucius Institutes (CIs) are educational organizations promoting Chinese language and culture worldwide. By the end of 2023, 498 CIs and 773 Confucius Classrooms operated in 160 countries. While much research examines their role in advancing China's soft power, their economic impact is less explored. This study, grounded in Cultural Identity Theory and Transaction Cost Theory, explores how CIs facilitate economic exchange between China and Central and Eastern Europe (CEE), focusing on Bosnia-Herzegovina and neighbouring countries. It addresses three questions: (1) How do CIs support Chinese enterprises? (2) To what extent do CIs enhance local understanding of China and its economic activities? (3) What are CIs' key achievements and challenges? Based on interviews with CI staff, students, and local Chinese business managers, the study finds CIs reduce communication barriers, foster cultural appreciation, and promote local integration of Chinese enterprises, offering valuable insights for academia, policymakers, and investors.

189

Localisation of Christianity in China: Pitfalls to and possibilities for harmonious cultural integration

Xiaowei Zhou (PhD)

SUPERVISORS Weilin Fang

UNIVERSITY/INSTITUTE Nanjing University / School of Philosophy

The Sinicization of religions has been a hot topic in China's religious communities for several years; from the perspective of Christianity, Sinicization, especially the fusion of Christianity and Chinese culture, has also been a key point of discussion between Chinese churchmen recently. Cultural integration under local conditions is a relatively easy starting point for considering the issues, while political identity and social adaptation are usually based on cultural integration which remains an urgent issue that needs to be solved in the Christian community in China today. This paper discusses cultural integration during the localisation of religion, the integration of Christianity with Chinese traditional culture and the contemporary socialist context, to provide some advice and ideas about the promotion of the localisation of Christianity in China.

190

The imapct of political polaristion and "China threat" on the EU's China policy shift

Xingzuo Fan (PhD)

SUPERVISORS Dragan Pavlicevic (XJTLU)
Ozge Zihnioglu (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

Political polarisation has emerged as a significant political phenomenon in the European Union (EU) over recent decades; however, its impact on the formulation of EU foreign policy remains inadequately explored. To fill this gap, this study begins by reviewing the existing conceptual and empirical literature on polarisation politics and proposes the research question: how does political polarisation affect the EU's China policy? To address the question, this study presents an analytical framework for a deeper understanding of polarised politics within the EU policymaking system towards China; the analysis is based on case studies from muiti-deimesnions, inluding ecnnomic, normative and geopolitics. It contends that relational analytical frameworks that centred on the construction of interactions more effectively illuminate the impact mechanism of polarisation within EU policymaking, particularly by highlighting the various actors' construction of contradictions and conflicts by the formative rifts in different social, economic, and political landscapes in EU member states.

191

Reconstruction, development, and facing challenges: the evolution of Protestant missionary activities in Shandong (1901–1928)

Xinhao Zhang (PhD)

SUPERVISORS Suffian Mansor

UNIVERSITY/INSTITUTE The National University of Malaysia /
Faculty of Social Sciences and Humanities

This study examines the Protestant movement in Shandong Province from 1901 to 1928, focusing on three transformative phases: reconstruction after the Boxer Uprising (1901 – 1912), expansion during the early Republic (1912 – 1919), and adaptation amidst rising anti-Christian sentiment (1919 – 1928). By analysing missionary activities, local societal interactions, and resistance movements, the research highlights how Protestant missions contributed to modernisation while facing cultural and political challenges. Drawing on primary sources such as mission archives and local records, this study provides a nuanced understanding of the evolving dynamics between foreign missions and Chinese society during a period of profound change. The importance of studying Protestant Movement in Shandong from 1901 to 1928 lies in the crucial role they played in promoting educational modernisation, promoting cultural exchange between China and the West, and enhancing the overall quality of society.

192

Domestic Abuse in China: Exploring Victim Helping-Seeking Experiences and Institutional Responses in China's Socio-Legal Context

Yanxi Dai (PhD)

SUPERVISORS Leif Johnson, Beibei Tang (XJTLU)
Barry Godfrey (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

This study examines how domestic abuse victims in China experience and respond to the dual forces of social entrapment and structural violence. Drawing on qualitative interviews with victims, police, and lawyers, as well as survey data, the research highlights how cultural norms—such as family honor, filial piety, and stigma intersect with systemic barriers, including police indifference and weak legal enforcement, to entrench victims in abusive relationships. The findings reveal how victims navigate constrained environments through resistance and help-seeking strategies, often relying on informal networks where formal systems fail. By integrating social entrapment and structural violence frameworks, this study offers a nuanced understanding of how interpersonal control and systemic failures interact in China's socio-legal context.

193

Experimental Investigations on Vibration Performance of Timber-Reinforced Truss Concrete Composite Beams with Notch-Screw Connections

Bo Wen (PhD)

SUPERVISORS Huifeng Yang (NTU: Nanjing Tech University)
Haoyu Huang (NCL: Newcastle University)

UNIVERSITY/INSTITUTE Nanjing Tech University / School of Civil Engineering

Substituting the traditional timber floor with semi-fabricated reinforced truss concrete (RTC) slabs is an effective concept to improve the vibration performance of the floor system in timber structures. In view of this, an experimental programme was conducted to investigate the vibration performance of the timber-RTC composite beams. Five test specimens were adopted in the composite beams to discuss the influence of the reinforcements and connections on the vibration behaviour. The test results demonstrated that the timber-RTC (T-RTC) composite beams have good vibration performances with a vibration frequency higher than 18Hz. Additionally, the composite beams with steel plate strengthened connectors show higher vibration frequency than that ones with steel bar strengthened connectors.

194

Cyclic shear test and finite element analysis of TRC-reinforced damaged confined masonry walls

Boxue Wang (PhD)

SUPERVISORS Shiping Yin

UNIVERSITY/INSTITUTE China University of Mining and Technology / School of Mechanics and Civil Engineering

Due to the low level of seismic fortification during construction, masonry walls are highly vulnerable to earthquakes, but some walls remain in service after repair. To investigate the strengthening effect of textile-reinforced concrete (TRC) on the seismic performance of seismically damaged confined masonry (CM) walls, tests were conducted on four masonry walls, and a finite element model was established for parametric analysis. A TRC facing improves the overall performance of the wall and increases the ductility of the wall. TRC reinforcement technology increases the peak load of CM walls by 19.9%-21.7%, the ductility factor by 42.1%-52.8%, and the cumulative energy dissipation by 95%-118%. The more severe the damage to the wall is, the less effective the strengthening effect of the TRC reinforcement. As the number of layers of textile increases, the load-bearing capacity, deformation capacity and energy dissipation capacity of the walls increase.

195

Incentive-Driven Knowledge Sharing on Recycled Aggregates in Sustainable Construction: A PLS-SEM and fsQCA Approach

Caimiao Zheng (PhD)

SUPERVISORS Jianli Hao, Guobin Gong (XJTLU)
Luigi Di Sarno, Adam Mannis (UoL)

ACADEMY/SCHOOL Design School

As global concerns about climate change intensify, the use of recycled aggregates in construction is increasingly recognized as a sustainable strategy for the industry's ecological and low-carbon transformation. Although the benefits of recycled aggregates are widely acknowledged, their practical application is significantly hindered by barriers to knowledge sharing among construction workers. This study employs Partial Least Squares Structural Equation Modeling (PLS-SEM) and Fuzzy-Set Qualitative Comparative Analysis (fsQCA) to delve into the multi-dimensional incentive mechanisms that enhance knowledge-sharing behaviors regarding recycled aggregates among construction workers. These findings reveal that the incentive mechanisms profoundly influence knowledge-sharing behaviors. Furthermore, knowledge dependency significantly fosters knowledge sharing, while incentive mechanisms related to financial rewards, positional empowerment, and personal identity motivate workers by addressing their intrinsic needs for respect and recognition. This research elucidates the intricate dynamics of knowledge sharing within the construction sector and provides practical insights into knowledge management and incentive strategies that facilitate the industry's shift towards sustainable practices.

196

Repair and strengthening of corroded reinforced concrete columns using organic corrosion inhibitors and textile-reinforced mortar (TRM)

Dhanushka Kobbekaduwa Kobbekaduwa Walawwe (PhD)

SUPERVISORS Ominda Nanayakkara, Theofanis Krevaikas (XJTLU)
Luigi Di Sarno (UoL)

ACADEMY/SCHOOL Design School

Reinforcement corrosion significantly compromises the durability of concrete structures, demanding effective repair solutions. This study evaluated the performance of textile-reinforced mortar (TRM) for repairing corroded small-scale reinforced concrete columns. The TRM systems included carbon and E-glass fibres combined with two distinct mortar matrices, each enhanced using specific organic corrosion inhibitors to improve resistance against corrosion. Key parameters investigated were the type of mortar matrix, reinforcement corrosion levels, and exposure to chloride-induced dry-wet cycles. Half-cell potential measurements were conducted to monitor post-repair corrosion behaviour. The results demonstrated that TRM confinement notably increased compressive strength, with gains of up to 15% at a 10% corrosion ratio. However, strength improvement reduced slightly to 13% at a 30% corrosion ratio. Half-cell measurements indicated that the mortar matrices modified with corrosion inhibitors effectively reduced further corrosion during chloride cycles, highlighting the suitability of TRM as a durable repair solution for corroded structures in aggressive environments.

197

A study of durability performances of alkali activated high volume fly ash concrete

Duo Xie (PhD)

SUPERVISORS Ominda Nanayakkara, Jun Xia (XJTLU)
Xue Zhang (UoL)

ACADEMY/SCHOOL Design School

The carbon dioxide produced by manufacturing and using of Portland Cement (PC) was one of main resources in globally high carbon emission. As the solid waste from combustion of coals in power station, fly ash (FA) was recognized as effective substitution of PC in normal concrete to reduce carbon index. However, due to lower reactivity of FA, comparing to normal concrete, the performance of high volume fly ash concrete (HVFAc) dropped where the replacement ratio of OPC by FA reached 70% or 80%. In order to improve the engineered properties of HVFAc, the hybrid alkali activator was used to activate FA in HVFA system. In this study, the mechanical properties and durability performances on HVFA and alkali activated HVFA concrete were investigated. Based on experimental data, it could be summarized that the compressive strength of HVFA concrete was increased by addition of hybrid activator and durability performances were also improved.

198

Identifying the critical success factors for the implementation of zero carbon industrial parks: from a PF- AHP perspective

He Yun (Master)

SUPERVISORS Jianli Hao, Yu Song (XJTLU)

ACADEMY/SCHOOL Design School

Under the guidance of the SDGs, achieving net-zero emissions has become an urgent task. Especially for 3H industrial parks, its transition to zero carbon is particularly important. Although many studies have been focused on the pathways and green practices of Zero Carbon Industrial Parks (ZCIPs), the Critical Success Factors (CSFs) for the realization of ZCIPs have not yet been clarified. Hence, this study aims to fill in this research gap. Through the systematic literature review based on the Technology-Organization-Environment (TOE) theory, finally, 33 potential CSFs were identified and categorized into 10 aspects. The importance of these factors was then assessed by an empirical survey combined with the Pythagorean Fuzzy Hierarchy Analysis Process (PF-AHP). The results of this study provide guidance and strategies for practitioners and governments to rationalize the allocation of resources and facilitate the effective deployment and long-term development of ZCIP.

199

Investigation on gradation optimization design of basalt fiber asphalt mixture based on discrete element simulation

Hu Chen (PhD)

SUPERVISORS Aihong Kang

UNIVERSITY/INSTITUTE Yangzhou University / College of Architectural Science and Engineering

Basalt fiber (BF) has been widely used to improve pavement performance of asphalt mixtures. This study aims to provide an effective method to investigate the enhancement mechanism of BF on asphalt mixture considering the effect of fiber length distribution. The discrete element (DE) simulation technology is used to construct the aggregate skeleton model of three different gradations. Then, pavement performance tests under different combinations of BF length are designed to verify the relationship between pavement performance and skeleton gap characteristic parameters.It is determined that the BF length distribution based on the longest axis of the aggregate skeleton is the optimal distribution, which can significantly improve the pavement performance. Under the same fiber content, for asphalt mixtures (AC-13, AC-20, AC-25), the high temperature stability enhancement of asphalt mixture with different BF length distribution varies from 6.7% to 30.2%, 8.0% to 29.0%, 9.7% to 29.1%, respectively, the crack resistance enhancement varies from 4.6% to 29.1%, 6.1% to 35.9%, 5.0% to 47.3%, respectively. The optimal BF length distributions are : 2 : 5 : 2, 2 : 2 : 1 and 2 : 3 : 1. DE simulation technology is proven to be an effective method for determining the optimal fiber length distribution.

200

Optimization of self-anchored systems for CFRP cables and the complex force analysis of the CFRP rod

Jialu Tang (PhD)

SUPERVISORS Charles Kwet Shin Loo (XJTLU)
Guijun Xian (External)

ACADEMY/SCHOOL Design School

Carbon Fiber Reinforced Polymer (CFRP) cable is popular due to its good mechanical properties and excellent corrosion resistance performance, and the self-anchored system of CFRP cables is widely used due to its lightweight and simple installation. However, the stress concentration around the metal rings always causes premature failure, which influences the bearing capacity of the whole cable system. Therefore, this project will conduct research on making local reinforcement for the prepregs around the metal rings and improving the metal ring to improve the cable system's bearing capacity. Meanwhile, this project will also research the complex force analysis of the CFRP rod.

201

Analysis of microstructure and compressive properties of full coral concrete under fiber reinforcement

Junyan Dai (PhD)

SUPERVISORS Shiping Yin

UNIVERSITY/INSTITUTE China University of Mining and Technology / School of Mechanics and Civil Engineering

Based on the compressive tests of 120 cubes in 10 groups, the effects of different chopped fibers (polypropylene fiber PPF, glass fiber GF, basalt fiber BF) and their content on the compressive properties of coral aggregate seawater concrete (CASC) were studied. The microstructure of CASC was analyzed by scanning electron microscopy (SEM), and the relationship between microstructure and macroscopic properties was established. The results show that the growth rate of compressive strength of fiber CASC is fast in the early stage and slow in the late stage. When 1kg/m3, 2kg/m3 and 3kg/m3 of PPF were added to the CASC, the compressive strength increased by 6.2%, 17.4% and 9.9%, respectively. SEM images show that PPF forms a dense, chaotic three-dimensional mesh structure in the matrix, which can effectively inhibit crack extension within a certain doping range.

202

Investigation on the Performance of Waste Rubber and Steel Fiber-Reinforced Geopolymer Composites

Kuangye Zhang (PhD)

SUPERVISORS Bowen Xu (XJTLU)
Luigi Di Sarno (UoL)

ACADEMY/SCHOOL Design School

Given the significant environmental impact of Portland cement production, including its substantial CO_2 emissions, geopolymer materials have emerged as a promising and sustainable alternative. This study investigates the combined effects of rubber particles and steel fibers on geopolymer composites as a sustainable alternative to traditional Portland cement. The research focuses on examining the fresh properties, mechanical performance, and microstructure of rubber and steel fiber-reinforced geopolymer composites (RSFRGC). Ten different mix designs were developed using fly ash, ground granulated blast furnace slag, and silica fume as base materials, with varying proportions of rubber particles (10%, 20%, and 30% by volume replacing fine aggregates) and steel fibers (0.5%, 1%, and 1.5% by volume). This approach effectively reduces environmental hazards, reducing CO_2 emissions from cement production and managing waste tires. The study aims to evaluate the feasibility of RSFRGC for applications through testing of flowability, compressive strength, direct tensile strength, and flexural strength.

203

The impact of solute diffusivity on the twin migration behavior in Mg alloys

Lang Liu (PhD)

SUPERVISORS Konstantinos Papadikis (XJTLU)
Qing Liu (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL Design School

The tailoring of twinning properties is essential for the performance enhancement of Mg alloys. It has been extensively investigated that the solute segregation can pin the twin boundaries against migrating effectively. However, the impact of solute diffusivity on twin migration remains unknown. This study focused on how solute diffusivity of Al influences the migration behaviors of the {10-12} coherent twin boundaries in Mg. The atomistic simulation method was adopted. The simulations showed that the lower the Al diffusivity was, the higher the applied force needed to drive the twin migration was. The following energy calculations showed that the Peierls barrier of the twin dislocation did grow up as the Al diffusivity decreased, consistent with the observed twin migration behaviors in simulations. These results suggested that a lower diffusivity of solute segregation may contribute to a stronger solute hardening effect in Mg alloys.

204

Data-driven Building Energy Management System for Smart Retrofitting

Lin Zheng (PhD)

SUPERVISORS Kang Chen, Xu Xu (XJTLU)
Chao Long (UoL)

ACADEMY/SCHOOL Design School

Have you imagined the current building can be smart and understand the occupants' feelings? By 2050, nearly 80% of existing buildings will still be in use, creating significant challenges for global energy consumption and emissions reduction. Smart buildings, equipped with advanced technologies, can reduce energy bills and enhance occupant comfort. While many researchers have focused on optimizing building energy management systems, real-world complexities, such as adaptive information and changing environments, present substantial challenges. Additionally, human thermal comfort is subjective and difficult to quantify. This research proposes a data-driven building energy management system for commercial buildings to maximize comfort and minimize energy consumption. By utilizing deep reinforcement learning, the building synchronously collect and analyze the environmental data and adjust the indoor temperature based on a comfort model trained with ASHRAE Global Thermal Comfort Dataset. This approach has the potential to significantly reduce energy bills and improve occupant satisfaction in commercial buildings.

205

Revisiting what factors promote BIM adoption more effectively through the TOE framework: A meta-analysis

Min Tao (PhD)

SUPERVISORS Wenshun Wang

UNIVERSITY/INSTITUTE China University of Mining and Technology / School of Mechanics and Civil Engineering

Despite BIM plays a crucial role in implementing lean construction within the AEC industry, the literature remains divided on the relationship between BIM adoption and its determinants. To clarify the controversy, this meta-analysis was conducted on 62 empirical studies published between 2012 and 2023, involving 11,228 study subjects across 13 countries. The findings showed that, among the technical characteristics, compatibility proved to be the major driver. In the organizational dimension, organizational culture was considered a very crucial factor, while among the external environment, mimetic pressure stood out as a primary driver in promoting BIM adoption. This research verified that perceived usefulness and perceived ease of use mediated the influences of external factors on BIM adoption. It also showed that the national BIM maturity (eight complementary components), along with contextual factors (organization type, job level, and time span), moderates the effects of the particular pathways in the framework.

206

Enhancing Reservoir Landslide Displacement Prediction Models with Crack Width Data Integration: A Case Study of the Daping Landslide

Ningxin Weng (PhD)

SUPERVISORS Lei Fan, Bowen Xu (XJTLU)
Daniel Arribas-Bei (UoL)
Qing Wang (External)

ACADEMY/SCHOOL Design School

Existing studies on predicting reservoir landslide displacements primarily considers rainfall and reservoir water level (RWL) as the main factors influencing landslide movement. However, no predictive models in this domain have integrated crack width alongside rainfall and RWL. In response to this gap, this study investigates the predicative performance of models that combines crack width, rainfall and RWL as the input factors for predicting temporal variations in the displacements of the Daping landslide within the Three Gorges Reservoir Area. The multiple wavelet coherence (MWC) method is used to determine optimal time lags between the combined input factors and the output (i.e., displacement). Two widely used deep learning models, transformer and gated recurrent unit (GRU) architectures, are adopted for this task. Experimental results show that incorporating crack width data improves the accuracy of transient landslide displacement predictions compared to models that exclude crack width data, for both transformer and GRU models.

207

Enhancing Environmental Monitoring through Multispectral Imaging: The WasteMS Dataset for Semantic Segmentation of Lakeside Waste

Qinfeng Zhu (PhD)

SUPERVISORS Lei Fan (XJTLU)

ACADEMY/SCHOOL Design School

Environmental monitoring of lakeside green areas is crucial for environmental protection. Compared to manual inspections, computer vision technologies offer a more efficient solution when deployed on-site. Multispectral imaging provides diverse information about objects under different spectrums, aiding in the differ-entiation between waste and lakeside lawn environments. This study introduces WasteMS, the first multispectral dataset established for the semantic segmentation of lakeside waste. WasteMS includes a diverse range of waste types in lawn en-vironments, captured under various lighting conditions. We implemented a rigor-ous annotation process to label waste in images. Representative semantic segmen-tation frameworks were used to evaluate segmentation accuracy using WasteMS. Challenges encountered when using WasteMS for segmenting waste on lakeside lawns were discussed. The WasteMS dataset is available at https://github.com/zhuqinfeng1999/WasteMS.

208

Assessing the building spatial design from fire evacuation perspective by integrating BIM and VR technologies

Rong Fu (PhD)

SUPERVISORS Cheng Zhang, Yong Yue (XJTLU)
Luigi Di Sarno, Adam Mannis (UoL)

ACADEMY/SCHOOL Design School

Spatial design plays a key role in building fire evacuation. Existing studies focused on evaluating building circulation and emergency guidance systems, which overlooked the impact of layout design and emergency signage systems on visual attention and evacuation behaviour. Therefore, this project proposes a framework to evaluate evacuation routes and investigate the impact of building spatial design on evacuation efficiency. Integrating Graph Theory (GT) and Virtual Reality (VR) technology, building layouts and evacuation routes were represented as graphs and subgraphs, enabling a numerical evaluation of evacuation efficiency. An eye-tracking function was developed in a VR platform to investigate attention allocation during the wayfinding process. The findings highlighted the significant impact of route and signage characteristics on attention allocation and evacuation behaviour. This project provides emergency behaviour observations and offers a comprehensive evaluation of building layout design, contributing to supporting designers in building design assessment in terms of fire evacuation efficiency.

209

Experimental investigation and development of shear models for RC Deep beams focusing on size effects

Tao Xu (PhD)

SUPERVISORS Charles Kwet Shin Loo, Jun Xia (XJTLU)
Luigi Di Sarno (UoL)

ACADEMY/SCHOOL Design School

Shear failure of RC structures often occurs in a brittle and devasting manner. Currently, there is no widely accepted shear model due to the complexity of the problem. In most building codes, shear design of RC structures is based on semi-empirical formulas, which might be unsafe with the emergence of new materials and structural types. Therefore, a mature mechanical shear model is needed to describe the physical behaviour of structures. Moreover, the problematic point of shear behaviour, the size effect, remains unsolved. This research conducted an experimental investigation on the shear behaviour of RC deep beams, taking into account factors such as shear span to depth ratio, size effects, and the influence of stirrups. Validation and development of existing shear models that consider size effects are performed based on experimental results. Additionally, finite element analysis of the shear behavior of deep beams is performed and compared with the experimental results.

210

Evaluation of Low-Temperature Cracking Resistance in Multi-Scale Hot In-Place Recycled Asphalt Mixtures

Tianyi Sang (PhD)

SUPERVISORS Aihong Kang

UNIVERSITY/INSTITUTE Yangzhou University /
College of Architectural Science and Engineering

Hot in-place recycling (HIR) is an effective method for rehabilitating asphalt pavements, reducing the need for virgin materials. However, the low-temperature cracking resistance of HIR mixtures remains a concern. This study evaluates the cold cracking resistance of HIR mixtures with reclaimed asphalt pavement (RAP) content ranging from 60% to 100%. Multi-scale direct tension tests were performed on binder, mastic, fine aggregate matrix (FAM), and asphalt mixtures. Results show a clear correlation between RAP content and low-temperature cracking resistance, with performance dropping significantly at 90% RAP. Fracture energy density decreases with higher RAP content, and the strongest correlation was found between FAM and the mixture scale. These findings offer insights into optimizing HIR mixtures for improved low-temperature performance and more sustainable pavement practices.

211

The feasibility of traditional materials and passive strategies for developing sustainable, low-carbon homes in Zambia

Tusankine Salasini (Master)

SUPERVISORS Jianli Hao (XJTLU)

ACADEMY/SCHOOL Design School

This study explores the use of traditional materials and passive design strategies for sustainable housing in Zambia. By surveying residents in informal housing areas, the research identifies housing needs and proposes a design using local materials like grass thatch and earth bricks, combined with passive elements such as strategic window placement and solar shading. Simulations show the design improves thermal performance, reduces indoor temperatures, and lowers energy costs. Life Cycle Assessments reveal that it has a smaller environmental footprint than conventional methods. The study finds that integrating these approaches boosts energy efficiency, reduces costs, and minimizes greenhouse gas emissions. It recommends promoting these practices through policy support, community education, and further research to expand their use, offering a promising solution to Zambia's housing challenges.

212

Gender Mainstreaming in the Context of the Sustainable Development Goals: Analyzing the Impact of Gender Disparities on Global Development Outcomes

Wansong Liu (Master)

SUPERVISORS Jianli Hao (XJTLU)

ACADEMY/SCHOOL Design School

This paper examines the impact of gender differences on achieving the Sustainable Development Goals (SDGs). Despite global commitments to gender equality, significant gaps between genders remain across many sectors. These disparities hinder progress on key SDGs such as poverty alleviation, education, health, and economic empowerment. This paper addresses gaps in understanding how gender differences limit development outcomes, and how incorporating gender considerations into policies can lead to more inclusive and effective implementation of the Sustainable Development Goals. The research uses a mixed-methods approach, combining a literature review, case study analysis, and statistical evaluation. The paper concludes with policy recommendations to improve gender mainstreaming efforts, highlighting the need for intersectional approaches and multi-stakeholder collaboration. The paper highlight the importance of gender equality, not just as a standalone goal, but also as a key factor in achieving the wider SDG agenda.

213

In-fire material properties of high-strength aluminium alloys

Wen Cheng (PhD)

SUPERVISORS Kang Chen, Guobin Gong, Charles Kwet Shin Loo Chin Moy (XJTLU)
Luigi Di Sarno, Adam Mannis (UoL)

ACADEMY/SCHOOL Design School

Fire is a significant threat to aluminium alloy structures, as they can lose material strength rapidly when exposed to elevated temperatures. To understand the in-fire material response, an experimental investigation on structural high-strength aluminium alloy 7075-T6 at elevated temperatures is presented in this paper. A testing programme including a series of in-fire steady-state and transient-state material tests was carried out on at elevated temperature levels ranging from 20 ℃ to 550 ℃, to obtain the in-fire material responses. The key temperature-dependent material properties, mainly including the stiffness and strengths, were derived from the obtained stress – strain curves and normalised by their room-temperature counterparts, resulting in a set of in-fire retention factors. They were adopted to analyse how elevated temperatures affect the residual stiffness and strengths of high-strength aluminium alloys. The design in-fire retention factors, as specified in the European, American and Chinese design codes, were also evaluated quantitatively and qualitatively based on the test data. The results of the design analyses reveal that the codified retention factors are very inaccurate when used for high-strength aluminium alloys. To address this issue, a set of new predictive models was developed, to provide more accurate predictions of the residual strengths and stiffness of high-strength aluminium alloys in fire.

214

Refractory superalloys with ultra-high hardness

Wen Su (PhD)

SUPERVISORS Tianhong Gu, Wei Chen (XJTLU)
Haifei Zhang (UoL)

ACADEMY/SCHOOL Design School

Nickel-based superalloys are limited in mechanical response under ultra-high temperatures due to Ni's rather low melting point. Simultaneously, the confined high-temperature oxidation resistance in the existing superalloys further restricts their application in industry scenarios. Hence, in this research, the refractory alloying element Tungsten and ternary TiFe system are introduced into the researched superalloys to compensate for the drawbacks of Ni-based superalloys. Ball milling took the active energy of metal powder for densification during the sintering process to form nano-crystallized microstructures with body cubic center (BCC)+ B2 phase. The B2 phase induced by the TiFe ternary system enhanced the solid solution and strengthened precipitation to obtain ultra-high hardness during the aging durations. The researched alloy remained after the oxidation heating with the metal loss being 0.1% wt, showing high oxidation resistance. Advanced metallurgy and new attempts at superalloy design will be examples of superalloy fabrication with a high degree of application in a strict service environment.

215

Experimental and numerical research on structural behaviour of ultra-high performance concrete under fire conditions

Xiaodong Cheng (PhD)

SUPERVISORS Jun Xia, Theofanis Krevaikas (XJTLU)
Luigi Di Sarno, Adam Mannis (UoL)

ACADEMY/SCHOOL Design School

In construction, Ultra-High Performance Concrete (UHPC) attracts significant attention for its excellent mechanical properties and durability, and its application in flat components is expanding. However, its dense microstructure leads to easy explosive spalling at high temperatures. This research aims to combine experimental and numerical methods to investigate UHPC thin panel performance under high temperatures or fire. First, an optimal mix proportion will be prepared with lab materials, and fibres/aggregates will be added to improve fire resistance. Then, thin UHPC panels of different sizes will be protected with fireproof coatings or insulation, and their post-high-temperature structural performance will be analysed. Finally, based on experimental results, finite element simulation will be used for parametric analysis to develop an innovative panel cross-section, reducing UHPC usage while maintaining fire resistance. This research will offer suggestions for UHPC thin slab fire protection in design guidelines, promoting its wider and more efficient application in construction.

216

A lattice-Boltzmann study on the effect of porous media morphology on immiscible displacements

Xiaoxuan Peng (PhD)

SUPERVISORS Konstantinos Papadikis, Stephen Shaw (XJTLU)
Ming Li, Yan Zhou (UoL)

ACADEMY/SCHOOL Design School

The understanding of immiscible two-phase flows in porous media, i.e. fluids that displace but do not mix with each other, is of critical importance in numerous physical and industrial operations such as, enhanced oil recovery, geologic carbon dioxide sequestration, geothermal energy extraction, groundwater supply and remediation and many others. Recent investigations have shown that apart from the physical properties of the displaced immiscible fluid phases, e.g. density and viscosity ratios, the morphological characteristics of the porous media also play a major role on the distribution and hydrodynamic behaviour of the fluid phases. This computational project aims to systematically investigate the effect of porous media morphology, through a set of morphological descriptors called the Minkowski functionals, on the hydrodynamic behaviour of the fluid phases and fluid transmission capacity of porous media.

217

CECA: An Intelligent Large-Language-Model-Enabled Method for Accounting Embodied Carbon in Buildings

Xierong Gu (PhD)

SUPERVISORS Lei Fan (XJTLU)
Ron Mahabir (UoL)

ACADEMY/SCHOOL Design School

The construction sector significantly contributes to global carbon emissions, with embodied carbon accounting for 40% of its total and over 50% in net-zero energy buildings. Traditional life cycle assessment methods are time-intensive, hindering rapid evaluations. This study proposes a novel construction-embodied carbon assessment method using large language models for intelligent semantic parsing, achieving a matching accuracy of 0.8412. Validation across 18 real-world cases shows that the method, leveraging Claude-3.5, achieves comparable accuracy to traditional approaches (MAPE=13.02%) while enhancing computational efficiency by 216 times. Additionally, it identifies carbon contributions of materials and components, supporting carbon optimization during design. By integrating large language models into embodied carbon assessment, this method offers a rapid, accurate, and automated solution to meet the growing demand for efficient carbon evaluation in construction projects.

218

Study on human thermal comfort and heat stress in deep underground environment

Xingming Wang (PhD)

SUPERVISORS Yijiang Wang

UNIVERSITY/INSTITUTE China University of Mining and Technology / School of Mechanics and Civil Engineering

Field experiments and human trial were conducted to examine the environmental parameters within a U-shaped tunnel at a depth of -1015 m, evaluate the physical characteristics and environmental assessment of 112 workers, investigate human thermal responses in 29 and 32 ℃ environments. The results demonstrate that the dry bulb temperature, relative humidity, and, air velocity in the underground space ranged from 25.3–32.8 ℃, 79.1% – 88.5%, and 1.45 – 0.6 m/s, respectively. The average and maximum metabolic rates of workers were 217.8 and 256.3 W/m². The 32 ℃ hot-humid environment resulted in a rapid increase in the subjects' thermal psychological and physiological parameters, particularly with maximum values of 35.99 ℃, 37.62 ℃, 111.2 bpm, and 4.57 for mean skin temperature, core temperature, heart rate, and physiological strain index, respectively. The findings provide a basis for exploring the extent and mechanism of thermal responses in deep underground environments.

219

Developing Defect Embedded Masonry H-BIM Using Deep Learning-Based Detection and Segmentation

Xinyu Tong (PhD)

SUPERVISORS Cheng Zhang (XJTLU)

ACADEMY/SCHOOL Design School

The surface of ancient masonry structures is prone to various defects over time. H-BIM assists in defect inspection digitally, which improves efficiency and saves the labor force. However, existing H-BIM of masonry structures still has limitations of low defect complexity and ideal geometric shape, and the defect information is not integrated with corresponding masonry units, lacking accurate and comprehensive prediction in structural analysis. The developed model presents detailed and realistic masonry units fused with defect information and could be used for numerical simulations. A YOLOv8 model is used to detect and segment defects in masonry structures. K-fold cross-validation is employed during model training to mitigate the impact of category imbalance in the dataset. The YOLO model has also been employed to segment masonry units and extract their contours. The defect information is integrated with masonry units based on their positions. A case study was carried out in an ancient city wall in Suzhou, China. The generated masonry H-BIM assists the current and future protection of the structures, highlighting the feasibility of the method for the analysis of masonry structures.

220

Magnetically separable quaternary g-C3N4/Fe3O4/AgBr/rGO nanocomposite for enhanced photocatalytic degradation of ofloxacin in water under visible light irradiation

Xiyang Liu (PhD)

SUPERVISORS Pow Seng Yap, Konstantinos Papadikis, Graham Dawson (XJTLU)

ACADEMY/SCHOOL Design School

In this study, a new photocatalytic-magnetic hybrid quaternary nanocomposite (g-C3N4/Fe3O4/AgBr/rGO) was prepared by ultrasonication-assisted wet chemistry method. Various advanced characterization techniques were employed to comprehensively characterize the nanocomposite. The photocatalytic degradation efficiency of the as-synthesized nanocomposite was investigated by using ofloxacin (OFL) as the model pollutant. The results indicated the photocatalytic degradation efficiency was 100% under conditions (pH 6.65, 0.1 g/L g-C3N4/Fe3O4/AgBr/rGO nanocomposite and 10 mg/L OFL) within 5 hours of visible-light irradiation, with a notable pseudo-first-order kinetic constant of 1.1832 h-1. The effect of different catalysts, catalyst dosage, initial concentrations of OFL and initial solution pH had been systematically investigated. The quenching experiments revealed that • O2- served as the dominant radical involved in the reaction. In addition, the g-C3N4/Fe3O4/AgBr/rGO nanocomposite demonstrated robust stability and easiness in magnetic separation from the solution in five cycles. The superior performance of the quaternary nanocomposite can be attributed to the enhanced visible-light absorbance capabilities and creation of Z-scheme heterojunctions which had resulted in the improved separation of charge carriers. Consequently, this nanocomposite is anticipated to have tremendous potential for efficiently eliminating emerging organic contaminants from the aqueous solutions.

221

Investigation on the Crack Resistance of Fiber-Reinforced Asphalt Mixtures Utilizing Digital Image Correlation Technique

Xueyang Jiu (PhD)

SUPERVISORS Aihong Kang

UNIVERSITY/INSTITUTE Yangzhou University / College of Architectural Science and Engineering

Cracking in asphalt pavements is a major issue in China, leading to frequent maintenance. Incorporating fibers into asphalt mixtures can enhance their anti-cracking performance by bridging and reinforcing the mixture. However, past research has mainly focused on macroscopic properties, with limited investigation into the cracking process itself. This study used the semi-circular bending (SCB) test with digital image correlation (DIC) technology to analyze the effects of different fiber types on asphalt mixtures. It also considered factors like aggregate gradation and testing conditions. Fibers increased optimal asphalt content, with basalt fiber (BF) and glass fiber (GF) showing lower increments than polyester fiber (PF). DIC technology was validated, and SCB tests showed fibers significantly improved fracture energy and flexibility index, with BF > GF > PF. Cracking processes were divided into three stages, and fibers reduced crack propagation speed, extending stable crack development. Factors like particle size, asphalt mortar strength, loading rate, and temperature also affected anti-cracking performance. Fibers made cracking paths more tortuous. This study provides a scientific foundation for optimizing fiber-reinforced asphalt mixtures, enhancing pavement performance and service life.

222

Assessing the Impact of Carbon Tax on the Sustainability of the Construction Industry in China

Xutong Han (Master)

SUPERVISORS Jianli Hao (XJTLU)

ACADEMY/SCHOOL Design School

A carbon tax denotes an environmental policy tool that utilizes market mechanisms based on an economic reality that charges carbon emitters. This policy could improve energy efficiency and hasten the introduction of sustainable building materials. Since the construction industry is a highly energy-consuming industry and a major contributor to carbon emissions, the construction industry's attitude towards carbon taxes becomes very important. Instead, the carbon tax can promote the greening and low-carbon transformation of the construction industry and provide an impetus for its industrial upgrading and technological innovation. China has not yet enacted a national carbon tax policy, so studying its economic and environmental impact on the construction industry is necessary. The study, therefore, attempts to analyze the immediate short- term burden of the carbon tax policy against the prospects of sustainable development in the future through the case of China's construction industry. Using industry data, a computable general equilibrium (CGE) model is constructed to delve into the broad impact of a carbon tax on the construction industry. This includes a shift of the cost structure, corporate investment behaviour modifications, material selection changes, and incentives for technological innovations. The experiences of Sweden and the United Kingdom are also taken note of. This includes an in-depth look at the specific efforts by these countries regarding taxation on tax design, revenue distribution, and industry adjustments. On this basis, this study considers the feasibility of these experiences in China and the possible implications for policy. The findings say that various carbon tax policies could raise production costs for high-carbon materials, such as cement and steel, during the initial phase and thereby impose additional operating burdens on businesses; however, this price mechanism can effectively stimulate demand for low-carbon materials and promote energy-saving technologies research, development, and diffusion. In the long term, the full implementation of a l carbon tax will help meet the carbon reduction targets of the construction industry and improve the overall competitive position of the construction industry itself.

223

Investigation of the Basalt Fiber Type and Content on Performances of Cement Mortar and Concrete

Ye Wang (PhD)

SUPERVISORS Aihong Kang

UNIVERSITY/INSTITUTE Yangzhou University / College of Architectural Science and Engineering

In this study, a bundle spliced basalt fiber (BSBF) and two kinds of SCBF with surface modifiers were selected. The properties of BF and BF-reinforced cement mortar were tested, and the optimum content of BSBF with a length of 12mm was determined by concrete performance tests. The tensile strength of BSBF decreases after alkali corrosion, but it can still maintain a high level. BSBF has a significant benefit over SCBF in terms of increasing the early strength and flexural toughness of cement mortar. The slump of the concrete progressively reduces as the BSBF-12 content increases, and the mechanical properties reveal a trend of first rising and then reducing. The optimal BSBF-12 content is 0.3 vol.%, which increases compressive strength, split tensile strength, flexural strength, and bending toughness index of concrete by 10.39%, 61.16%, 13.33%, and 50.85%, correspondingly. Furthermore, various BSBF-12 contents improve the durability of the concrete to differing degrees.

224

A Dialectical Systems Framework for Developing Business Models in Construction and Demolition Waste Management

Yi Yang (PhD)

SUPERVISORS Jianli Hao (XJTLU)
Luigi Di Sarno (UoL)
Jingfeng Yuan (SEU: Southeast University)

ACADEMY/SCHOOL Design School

The construction and demolition waste (CDW) business model is a key management approach for enhancing the sustainability of the construction industry. However, its complex and dynamic operational mechanisms present significant challenges. The study constructs a dialectical framework based on three dimensions: concept, value, and methodology, to explore the intricate dynamics within the CDW business model. A review of 83 studies published in 13 leading journals from 2020 to 2024 clarifies the core meanings of CDW management and business models. Integrating strategies from circular and platform economies, the research examines value creation, delivery, and capture from the perspectives of stakeholders, products, and platforms. The findings highlight conflicts between economic incentives and environmental responsibilities, as well as value distribution issues and policy design gaps. The framework extends the theoretical lens of business model research and offers valuable guidance for understanding the complex interdependencies and multidimensional value creation processes in CDW business model.

225

Enhancing Building Inspection Automation with Dynamic Environmental Perception and 3D Reconstruction

Ying Lo (PhD)

SUPERVISORS Cheng Zhang, Min Chen (XJTLU)
Luigi Di Sarno (UoL)

ACADEMY/SCHOOL Design School

Building inspections are vital for maintaining existing structures, ensuring safety, and mitigating risks to occupants and the public. Systematic evaluations of older buildings help identify potential issues, confirm compliance with modern codes, and preserve structural integrity. However, traditional manual inspections are inefficient, time-consuming, and prone to human error. Advancements in automation and robotics offer faster, safer alternatives, but integrating these technologies faces challenges due to the diverse and complex nature of buildings. To address this, a framework is proposed to evaluate 3D reconstruction tools, such as LiDAR, critical for automating inspections. The framework assesses accuracy, reliability, and adaptability, enabling tools to handle complex geometries and environmental data effectively. This approach improves the integration of robotic sensors and automates inspection workflows, enhancing precision and efficiency while addressing the limitations of manual methods, ultimately supporting safer and more reliable building inspections.

226

Temporal Equilibrium for Electrified Ride-Sourcing Markets Considering Charging Capacity and Driving Fatigue

Yuhao Liu (PhD)

SUPERVISORS Zhibin Chen

UNIVERSITY/INSTITUTE New York University Shanghai / Tandon School of Engineering

Electric vehicles (EVs) are now being introduced to the ride-sourcing market to catalyze the realization of sustainable transportation. Given their demand for charging, ride-sourcing EV drivers may have distinct work schedules from gasoline vehicle (GV) drivers, yielding significant impacts on the market supply when their penetration becomes high. Driving fatigue is another factor affecting ride-sourcing drivers' work schedules. This paper proposes an equilibrium modeling framework based on a time-expanded network to describe the work schedules of EV and GV drivers considering their driving fatigue and EVs' charging opportunities subject to the limited charging infrastructure. To solve the equilibrium model, we develop a gap function-based method coupled with the column generation scheme in which a non-additive shortest path (NSP) problem appears as a subroutine. Numerical examples reveal that the temporal equilibrium of the electrified ride-sourcing market is moderated by the charging capacity, EV penetration and the competition among drivers.

227

Microstructure and Mechanical Property Prediction in Additive Manufacturing Using Machine Learning

Yuxiang Ji (PhD)

SUPERVISORS Charles Kwet Shin Loo (XJTLU)
Weijian Han
(JITRI: Yangtze River Delta Advanced Materials Research Institute)

ACADEMY/SCHOOL Design School

Laser Additive Manufacturing (LAM) has become one of the significant repair methods for ships, pipelines, and other high-strength alloy components in unconventional environments. During the process of addition, the laser parameters directly impact the transient temperature of the base material to be repaired, and the transient temperature distribution plays a significant role in the morphology of the heat-affected zone, microstructure formation, residual stresses, and fatigue properties. To deeply investigate the influence of laser process parameters on the nucleation and growth process of crystalline microstructures during the additive process, it is necessary to couple the macroscopic temperature field based on the exact shape of the heat source distribution using the microscopic simulation method of cellular automata. A machine learning-based transient temperature distribution prediction provides a unique microstructure simulation approach. In this study, half of the specimen was modeled in Abaqus and combined with a dual ellipsoidal heat source to simulate the process of laser additive repair on highstrength alloy materials. The correlation between the input laser parameters and the output transient temperature field was realized by training a physical-embedded machine learning model. Furthermore, the output temperature field was coupled using a cellular automata approach to simulate the microstructure evolution during the solidification process after laser melting of the base material, considering the competitive mechanism of boundary columnar crystal growth and the isometric crystal transformation. Based on the multi-fidelity model theory, this study uses the temperature history of the additive process captured and extracted by infrared imaging in the experiments as high-fidelity data to optimize the low-fidelity data generated by the simulation. Combined with the coupling of cellular automata algorithms, a surrogate model with input laser parameters and repair position was built for fast and accurate prediction of the melt pool microstructure. The results show a close consistency by comparing and analyzing the microstructure morphology with the pictures taken from physical experiments. This method reduces the experimental cost and improves the research efficiency while significantly reducing the dependence on physical experiments for microscopic studies in additive manufacturing processes. In addition, a user-friendly recommendation mechanism is created to pre-demonstrate the possible effects of different laser parameters on microstructure morphology, thereby targeting the optimal laser parameters in advance. The experimental results validate the effectiveness of this method for transient temperature field computation and microstructure prediction for laser additive manufacturing and have the potential to be extended to other manufacturing processes.

228

Exploring the microscopic mechanism of elongation fluctuations in high-pressure die-cast AlSi7MnMg alloy

Zhen Zheng (PhD)

SUPERVISORS Guobin Gong (XJTLU)
Xue Zhang (UoL)
Shiyao Huang
(JITRI: Yangtze River Delta Advanced Materials Research Institute)

ACADEMY/SCHOOL Design School

The heterogeneity microstructure of the high-pressure die-casting (HPDC) Al-Si alloy leads to stress concentrations during deformation, resulting in randomness of cracks and fracture paths. Therefore, it is necessary to establish a mapping relationship between the microstructure and the macroscopic stress concentration phenomenon. In this paper, HPDC Al-7Si-Mn-Mg alloy was taken as the research object. Scanning electron microscopy (SEM) and high-resolution digital image correlation (HR-DIC) were used to characterize the heterogeneity strain and fracture modes of castings and representative volume element(RVE) models were established based on electron back scatter diffraction(EBSD) data. The effectiveness of the RVE model can be verified by comparing the tensile results of experiment and simulation. A large number of specified microstructure models were constructed to explore the effects of microstructural changes on the performance of castings. According to the simulation results, there is a competitive relationship between porosity and Fe-rich phase on the microscopic strain field, including their size, shape and density. This RVE model can provide reference for multi-scale simulation of other casting alloys or manufacturing process alloys.

229

On the value of orderly electric vehicle charging in carbon emission reduction

Zhi Li (PhD)

SUPERVISORS Zhibin Chen

UNIVERSITY/INSTITUTE New York University Shanghai /
Computer Science and Engineering

In this study, a bi-level model is developed to quantify the value of orderly electric vehicle (EV) charging in carbon reduction. Specifically, the upper-level model optimizes each EV driver's charging schedule to diminish the total carbon emissions without impacting their travel plans, and the lower-level problem aims to fulfill electricity demands with minimal electricity dispatch cost. Based on real-world operation data obtained from 3,777 battery EVs (BEVs) in Shanghai over 11 months and local power plant data, the total carbon emissions generated by BEVs in Shanghai is calculated as 1,176,637 tons over this period, averaging 73 gCO2 /km per BEV. By administering charging control to all BEVs in Shanghai, the above emission could be curtailed by 39%. Sensitivity analyses uncover that augmenting battery capacity and integrating wind power can significantly enhance emission reductions, while increasing the flexibility of the power plant might diminish the effectiveness of orderly EV charging.

230

Prediction of wave-current induced pore water and seabed liquefaction around twin-piles using WCSSI model

Ziheng Huang (PhD)

SUPERVISORS Wei Zhang, Xiaonan Tang (XJTLU)
Ming Li, Yan Zhou (UoL)

ACADEMY/SCHOOL Design School

In marine engineering, the stability of sizeable vertical pile foundations is crucial for the safety of marine structures. Designing safe offshore structures entails addressing a series of dynamic seafloor responses caused by waves scouring pile foundations. Regarding numerical simulation, recent research has focused on building wave-structure-seabed interaction (WSSI) models. The WSSI model is developed based on OpenFOAM software, which consists of a wave model (Wave2Foam) and Biot's poroelastic model [1]. Previous work only considered the impact of wave scouring on the cylinder but ignored the role of currents [1, 2]. Therefore, future work will develop further on the WSSI model and construct a wave-current-structure-seabed interaction (WCSSI) model to study the migration in the riverbed caused by the simultaneous action of waves and currents. Furthermore, the model will be used to explore the seabed response around twin-piles foundations and multi-pile foundations.

231

Influencing Factors of Human-Artificial Intelligence Interaction Satisfaction: An Experimental Study of Cuban Red Culture Knowledge Chatbot

Amalia Isabel Rivero Chavez (PhD)

SUPERVISORS Wencheng Su

UNIVERSITY/INSTITUTE Jiangsu University / School of Management

This research aims to measure and understand users' experiences when interacting with the Cuban Red Culture Knowledge (CRCK) Chatbot and identify factors affecting users satisfaction or dissatisfaction through a questionnaire. An eye movement tracking method was introduced to record eye movement data during the user interaction with CRCK and written text, enhancing our understanding of visual attention, user engagement, usability, cognitive load, and user preferences, providing valuable data-driven insights into the interaction experience. A questionnaire was conducted to identify influencing factors that affect user satisfaction, and the result data was analyzed by regression and correlation analysis. Our analysis confirmed that emotional state, user experience, task, services satisfaction, knowledge dissemination efficiency, time, and tiredness can affect Human Artificial Intelligence interaction (HAI) satisfaction. The findings suggest that these factors are captious in determining how satisfied users are overall with HAI.

232

Enhancing usability with virtual imagery: insights into feedback mechanism from a BCI-VR integrated system

Annan Lu (PhD)

SUPERVISORS Rui Yang, Mengjie Huang, Steven Guan (XJTLU)
Floriana Grasso (UoL)

ACADEMY/SCHOOL School of Advanced Technology

This study explores the integration of haptic feedback in motor imagery (MI)-based brain-computer interface (BCI) and virtual reality (VR) systems to improve user interaction. It introduces a novel approach combining pseudo-haptic feedback (illusory touch through visual and auditory stimuli) with traditional physical feedback. Using a within-subjects experimental design, the study evaluates the effects of various feedback combinations on haptic perception, workload, and satisfaction. Results show that combining both feedback types significantly enhances user satisfaction (M=2.25, SD=0.46) and perceived vibration level (M=9.25, SD=1.03), but also increases workload. These findings suggest that a balanced integration of pseudo-haptic and physical feedback can optimize usability and improve the overall user experience of MI-based BCI-VR systems.

233

Exploring Test-Time Style Transfer for Improving Cross-Organ Domain Generalization in Pathology Imaging

Biwen Meng (PhD)

SUPERVISORS Jingxin Liu (XJTLU)
Bei Peng (UoL)

ACADEMY/SCHOOL School of AI and Advanced Computing

In computational pathology, the variability of organ morphology causes significant domain shifts, posing a challenge to the development of generally applicable deep learning models. In this paper, we propose a new test-time style transfer (T3s) method to enhance cross-organ domain generalization by dynamically adapting to the style of unseen domains during model inference. Leveraging a base model framework with a bidirectional projection mechanism, T3s aligns style features between source and target domains, effectively reducing the difference. This is further supported by the Cross-domain Style Diversity Module (CSDM), which enhances adaptability by diversifying style representations. Results on a dataset of six adenocarcinomas show that T3s outperforms current methods in terms of intersection over union (IoU) and Dice coefficient metrics, with 180 source and 120 target domains. This study not only advances generalization in the field of pathology, but also has potential application value in clinical diagnosis.

234

Towards Robust Medical Image Segmentation: A Text Prompt-Driven Weakly Supervised Approach with Segment Anything Models

Bolin Ren (PhD)

SUPERVISORS Angelos Stefanidis, Zhengyong Jiang, Jionglong Su (XJTLU)
Anh Nguyen (UoL)

ACADEMY/SCHOOL School of AI and Advanced Computing

This paper presents a novel weakly supervised medical image segmentation framework, CLIPedSAM, which integrates the strengths of CLIP and SAM models. We fine-tune a powerful pre-trained CLIP model, MedCLIP, achieving state-of-the-art performance in medical image analysis. To enhance interpretability, we incorporate an edge detection method that improves segmentation precision and clarity. Additionally, we construct Med100k, a comprehensive dataset aggregating a large number of public medical imaging datasets. Our approach demonstrates robust and efficient segmentation capabilities, paving the way for practical and interpretable applications in medical imaging.

235

ADDNet: Mitigating Concept Drift in Stream Environment by Knowledge Distillation

Borong Lin (PhD)

SUPERVISORS Nanlin Jin, Xiaohui Zhu (XJTLU)
Tulika Saha (UoL)

ACADEMY/SCHOOL School of Advanced Technology

For data stream forecasting tasks where batch training is impractical, the phenomenon of concept drift can deteriorate model performance over time. Traditional concept drift detection methods aim to explicitly identify concept drift, such as detecting the exact time of drift and resetting the model accordingly. This approach results in the wasting of valuable knowledge acquired prior to the drift. Recently, there has been an increasing focus among researchers on the development of concept drift adaptation strategies that implicitly adjust to changes in the data concept. These efforts have concentrated on enhancing model architectures with various adaptation modules. In response to this, we introduce the Adaptive Distillation Network (ADDNet), which retains the previously learned knowledge through a teacher network and transfers it to a student network via knowledge distillation. This study elaborates on a Non-linear Knowledge Matching (NKM) module designed to dynamically balance the pre-learned and newly acquired knowledge, thus enabling self-adaptation. Experimental results indicate that ADDNet achieves a 29\% improvement in average performance, as measured by Mean Squared Error (MSE) Loss, when compared to baseline methods in streaming forecasting tasks. The code for this research will be made available at the provided “https://github.com/sniperrifle71/TSKD”.

236

A Knowledge-Informed Deep Learning Paradigm for Generalizable and Stable Car-Following Models

Chengming Wang (PhD)

SUPERVISORS Dongyao Jia, Wei Wang (XJTLU)
Bei Peng (UoL)
Dong Ngoduy (MON: Monash University)

ACADEMY/SCHOOL School of Advanced Technology

Car-following models (CFMs) are crucial for traffic flow analysis and advancing autonomous technologies. While physics-based and data-driven CFMs excel in modeling human driving behaviors, their reliance on specific datasets limits adaptability in new scenarios, reducing real-world reliability. To address this, we propose the knowledge-informed deep learning (KIDL) paradigm, which distills pre-trained Large Language Model (LLM) knowledge into lightweight neural models. This approach mitigates LLM challenges such as intractability, high computational costs and erroneous outputs (e.g., hallucinations) while preserving generalization capabilities. The KIDL model also incorporates local and string stability constraints to optimize traffic flow. Validated across NGSIM-I80, NGSIM-US101, and highD datasets, KIDL outperforms physics-based, data-driven, and hybrid CFMs in both empirical accuracy and theoretical stability. These results highlight KIDL's potential as a robust, generalizable solution for real-world traffic applications.

237

A Mathematical Modeling-Inspired Architecture for Addressing Cross-Device Challenges in Motor Imagery

Chengxuan Qin (PhD)

SUPERVISORS Rui Yang, Huiqing Wen, Mengjie Huang (XJTLU)
Xiaowei Huang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The distribution of electroencephalogram (EEG) data generally varies across datasets due to the huge difference between the physical structure of brain-computer interface devices, known as cross-device variability. Such variability poses great challenges in EEG decoding and hinders the standardized utilization of EEG datasets. In this study, we explore a new issue concerning the cross-device variability problem, pointing to the gap in the existing studies facing cross-device variability. To tackle this challenge, our paper is the first to model the cross-device variability problem through a sequentially comprehensive formula and a spatial comprehensive formula. Inspired by this modeling, a novel deep domain adaptation network named neural network is proposed, incorporating replaceable EEG feature extraction backbones with a novel structure. To show the effectiveness of the proposed neural network, systematic experiments are conducted across four different EEG-based motor imagery datasets under 48 cases. The experimental results highlight the superior performance of the proposed neural network over commonly used approaches with an average classification accuracy improvement of over 1.51% across many cases, laying a foundation for research in large-scale EEG models.

238

AI-assisted Ultrasound Diagnosis of Atypical Breast Cancer

Chenhao Wang (Master)

SUPERVISORS Yong Yue (XJTLU)
Jiangang Chen (ECNU: East China Normal University)

ACADEMY/SCHOOL School of Advanced Technology

Introduction: Breast cancer has surpassed lung cancer as the most common malignancy worldwide and is the leading cause of cancer-related death among women. In breast cancer, distinguishing between types 3 and 4 is vital, because this is related to the doctor's different treatment methods for patients, minimally invasive follow-up or puncture tests, ultrasound images appear similar. The objective is to employ machine learning image classification algorithms to differentiate breast cancer ultrasounds and obtain category information. The method is using The multi-scale convolutional neural network model which is to be used to confirm the location of the nucleus by segmentation and then classify and calculate the target data to obtain the results. The training is conducted through 2000 ultrasound images and clinical observation data information, and the classification of information is determined by molecular typing and other techniques. And we want create an effective data model will be obtained with high accuracy in identifying three categories - breast cancers types 3, 4A, and 4B. Technical skills required: Python familiar with Computer vision, Panda, Numerical Python library call code knowledge; Familiar with breast cancer related knowledge and ultrasound image discrimination related knowledge; Convolution model creation and construction knowledge and model parameter design knowledge.

239

Counterfactual Contrastive Learning for Fine Grained Image Classification

Chenke Yin (PhD)

SUPERVISORS Jia Wang, Wei Wang, Qiufeng Wang (XJTLU)
Xiaowei Huang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The Fine-Grained Causal Contrastive Network(FCCN)addresses challenges in fine-grained image classification by integrating causal inference with contrastive learning.Unlike traditional methods, FCCN focuses on causal relationships between features and labels,enhancing discrimination.It introduces backdoor adjustment for feature decoupling,reducing irrelevant context impact and purifying feature space.Tested on CUB-200-2011,Stanford Cars,and WM-811K,FCCN shows significant improvements in accuracy and robustness.

240

Multi-sensor Fusion Perception for Intelligent Transportation Systems

Fengyufan Yang (PhD)

SUPERVISORS Ka Lok Man, Eng Gee Lim, Erick Purwanto (XJTLU)
Jeremy Smith (UoL)
Yutao Yue (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

Understanding and reasoning the complex 3D environments are crucial for safe and efficient intelligent transportation systems. 3D occupancy perception offers a more holistic representation for describing the surroundings with geometric volumes and semantic labels. Existing methods often struggle with maintaining fine-grained geometric details due to the inherent limitations of camera-based image features. Meanwhile, 3D sensors such as LiDAR are suffering from the sparsity of their generated point cloud. This study proposes M2DG-TPV, a novel model that incorporates a matrix-based view transformation for efficient 2D-to-3D feature mapping, a masked 2D Gaussian recovery method to enhance voxel features in occluded areas, and a cross-attention-based module to integrate image and voxel features. Evaluated on the nuScenes dataset, M2DG-TPV achieves a 6% improvement in mIoU over the baseline TPVFormer, with more precise and robust geometric boundary prediction results under various scenarios.

241

A Design Space of Visual, Auditory, and Haptic Cues for Attention Guidance in AR

Fuqi Xie (PhD)

SUPERVISORS Lingyun Yu, Yu Liu (XJTLU)
Floriana Grasso (UoL)
Hai-Ning Liang (HKUST: The Hong Kong University of Science and Technology Guangzhou)

ACADEMY/SCHOOL School of Advanced Technology

This work explores effective visual, auditory and haptic methods for guiding attention when navigating or searching for a particular target, by indicating target location, the path to reach it, and tracking task progress. Often, individuals lack access to this information, leading to inefficiencies. Existing approaches are primarily implemented on mobile devices, limiting direct guidance within real-world environments. To address these limitations, we apply AR techniques to embed visual cues directly into real-world contexts, while employing audio devices for auditory cues and wearable devices for haptic cues. We conducted an ideation workshop to identify four design dimensions -What(Modality), How(Presentation), Where(Positioning) and When(Dynamics) -across scenarios: locating targets, following paths, and tracking progress. Further, we developed a prototype system and conducted a quantitative user study to evaluate user performance with the system. As a result, we provide design suggestions for attention guidance, emphasizing the integration of multi-sensory channels, as well as considering the real-world contexts.

242

MA-KANet: Enhancing Retinal Vessel Segmentation through Multi-scale Attention and Feature Fusion

Guojie Li (PhD)

SUPERVISORS Fan Zhang, Muhammad Ateeq (XJTLU)
Anh Nguyen (UoL)
Anwar P.P. Abdul Majeed (SUNWAY: Sunway University)

ACADEMY/SCHOOL School of Robotics

Accurate segmentation of blood vessels for vessel image is crucial for diagnosing and managing ophthalmic conditions. The current study introduces Multi-scale Attention Kolmogorov-Arnold Networks (MA-KANet) to address challenges in retinal vessel segmentation, including low contrast, small-scale vessels, and complex backgrounds. MA-KANet is a novel U-shaped encoder-decoder network that integrates Multi-scale Dynamic Fusion and Scale-Context Attention Fusion modules, enhancing its ability to detect vessels of varying sizes and complexities. By employing Kolmogorov-Arnold Networks in its final layers, our MA-KANet captures global non-linear features, significantly improving performance on thin and low-contrast vessels. Through extensive experiments on the DRIVE and CHASEDB1 datasets, MA-KAet demonstrates superior performance compared to the state-of-the-art methods, with notable improvements in sensitivity, specificity, and accuracy. To summarize, our MA-KANet establishes a robust approach for automated retinal vessel segmentation, offering potential for advancing diagnostic precision in ophthalmology.

243

Communication Strategy on Macro-and-Micro Traffic State in Cooperative Deep Reinforcement Learning for Regional Traffic Signal Control

Hankang Gu (PhD)

SUPERVISORS Dongyao Jia, Eng Gee Lim (XJTLU)
Michele Zito (UoL)
Shangbo Wang (External)

ACADEMY/SCHOOL School of Advanced Technology

Adaptive Traffic Signal Control (ATSC) has become a popular research topic in intelligent transportation systems. Regional Traffic Signal Control (RTSC) using the Multi-agent Deep Reinforcement Learning (MADRL) technique has become a promising approach for ATSC due to its ability to achieve the optimum trade-off between scalability and optimality. Most existing RTSC approaches partition a traffic network into several disjoint regions, followed by applying centralized reinforcement learning techniques to each region. However, the pursuit of cooperation among RTSC agents still remains an open issue and no communication strategy for RTSC agents has been investigated. In this paper, we propose a Graph Attention Layer(GAT) based communication strategy. We first justify the evolution equation of the RTSC process is Markovian via a system of store-and-forward queues. Next, based on the evolution equation, we propose two GAT-Aggregated (GA2) communication modules---GA2-Naive and GA2-Aug to extract both intra-region and inter-region correlations between macro and micro traffic states. While GA2-Naive only considers the movements at each intersection, GA2-Aug also considers the lane-changing behavior of vehicles. Two proposed communication modules are then aggregated into two existing novel RTSC frameworks---RegionLight and Regional-DRL. Experimental results demonstrate that both GA2-Naive and GA2-Aug effectively improve the performance of existing RTSC frameworks under both real and synthetic scenarios. Hyperparameter testing also reveals the robustness and potential of our communication modules in large-scale traffic networks.

244

Distributed and Graph-based Learning for Artificial Intelligent Internet of Things (AIoT) in Smart Cities

Hanyue Xu (PhD)

SUPERVISORS Wei Wang (XJTLU)
Jeremy Smith (UoL)

ACADEMY/SCHOOL School of Advanced Technology

In smart cities, the integration of AI and IoT has driven the development of AIoT systems to enhance urban infrastructure and services. However, training deep learning models in these systems faces challenges such as data privacy concerns and communication delays from large-scale IoT devices. Multi-level split federated learning (SFL) addresses these issues by combining the strengths of split learning (SL) and federated learning (FL). This framework introduces a multi-level aggregation architecture that reduces communication delays, enhances scalability, and mitigates system and statistical heterogeneity in non-IID environments. Using the MQTT protocol, IoT devices are clustered geographically, while edge and fog layers handle initial parameter aggregation. Simulation experiments demonstrate that multi-level SFL outperforms traditional SFL by improving model accuracy and convergence speed in large-scale, non-IID scenarios. This paper highlights how multi-level SFL enhances the robustness and scalability of AIoT systems while preserving data privacy, making it ideal for smart city applications.

245

Updatable Signature and Application

Haotian Yin (PhD)

SUPERVISORS Jie Zhang, Eng Gee Lim, Yuji Dong (XJTLU)
Dominik Wojtczak (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The Updatable Signature (US) allows valid signatures to be updated by an update token without accessing the newly generated signing key. Cini et al. (PKC'21) formally defined this signature and gave several constructions. However, their security model requires the secrecy of the update token, which is not applicable in many common application scenarios in Web3, where secret computing is expensive. In addition, one can use the same token to update both the signing key and signatures and all signatures can be updated by a single token, whereas the adversarial signature generated by an adversary might also be updated. This work explores the (im)possibility of constructing an Updatable Signature with public tokens (USpt). Specifically, we define the updatable signature with public tokens and present its security model. Then, we present a concrete USpt scheme based on the BLS signature.

246

A Dataset and Model for Realistic License Plate Deblurring

Haoyan Gong (PhD)

SUPERVISORS Hongbin Liu (XJTLU)

ACADEMY/SCHOOL School of AI and Advanced Computing

Vehicle license plate recognition is a crucial task in intelligent traffic management systems. However, the challenge of achieving accurate recognition persists due to motion blur from fast-moving vehicles. Despite the widespread use of image synthesis approaches in existing deblurring and recognition algorithms, their effectiveness in real-world scenarios remains unproven. To address this, we introduce the first large-scale license plate deblurring dataset named License Plate Blur (LPBlur), captured by a dual-camera system and processed through a post-processing pipeline to avoid misalignment issues. Then, we propose a License Plate Deblurring Generative Adversarial Network (LPDGAN) to tackle the license plate deblurring: 1) a Feature Fusion Module to integrate multi-scale latent codes; 2) a Text Reconstruction Module to restore structure through textual modality; 3) a Partition Discriminator Module to enhance the model's perception of details in each letter. Extensive experiments validate the reliability of the LPBlur dataset for both model training and testing, showcasing that our proposed model outperforms other state-of-the-art motion deblurring methods in realistic license plate deblurring scenarios. The dataset and code are available at https://github.com/haoyGONG/LPDGAN.

247

Multi-Instance Learning for Parkinson's Tremor Level Detection with Learnable Discriminative Pool

Haoyu Wu (PhD)

SUPERVISORS Jun Qi, Yong Yue (XJTLU)
Alexei Lisitsa (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Parkinson's disease (PD) is a neurodegenerative disorder characterized by tremors as its most typical symptom. Wearable accelerometer sensors, along with corresponding ma- chine learning algorithms, can effectively assist in the diagnosis of PD tremors. However, due to the variations in disease progression and symptoms caused by individual differences among PD patients, it is challenging for existing algorithms to eliminate label noise and accurately identify and extract disease-related features across diverse patient data. In this study, we propose a Learnable Discriminative Instance Pool (LDIP) algorithm based on multi-instance learning, which integrates the concept of learnable shapelets. This method transforms the traditional DIP algorithm into a learnable instance pool that can be adaptively adjusted according to discriminative criteria, thereby enhancing the separability between different classes after bag mapping. We evaluated the proposed method on two clinical datasets using three different machine learning classifiers, achieving a maximum 73% accuracy for 5-class classification. The experimental results demonstrate that our proposed method consistently outperforms current baselines across various settings.

248

Strongly recurrent configurations of the Abelian sandpile model and prime graphical parking functions

Haoyue Zhu (PhD)

SUPERVISORS Thomas Selig, Steven Guan (XJTLU)
Linglong Yuan (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The Abelian sandpile model (ASM) is a dynamic process where grains of sand move around on an underlying graph. Of central importance to ASM research are the states that appear infinitely often in this process, which are called recurrent. On the other hand, graphical parking functions are an extension of a classical parking functions to graphs. There is a duality between recurrent states of the ASM and graphical parking functions that has been well studied in the literature. Our goal is to study this duality when restricting ourselves to so-called prime parking functions. These are (classical) parking functions which are in some sense indecomposable. We extend this concept to graphical parking functions, proposing a definition of primeness for these. We show that from the ASM perspective, prime graphical parking functions correspond to a new subset of recurrent states, which we refer to as strongly recurrent.

249

Towards a Unified Image Stitching Framework

Huajun Yuan (PhD)

SUPERVISORS Siqi Huang (XJTLU)

ACADEMY/SCHOOL School of AI and Advanced Computing

Image stitching is a key technique in computer vision to create seamless panoramic images from multiple overlapping images. However, current approaches are often constrained by limited datasets and fragmented frameworks that hinder scalability and consistent performance. In this study, we present a comprehensive real-world dataset derived from real-world scenarios with accurate ground truth annotations addressing the shortcomings of existing datasets. In addition, we propose a unified pipeline that integrates all stages of the image stitching into a single coherent framework. Through extensive experimentation, we verify its potential for enhancing stitching quality and robustness in different scenarios. These advances address key limitations in current methods and pave the way for more reliable and flexible image stitching applications.

250

A Lightweight and Responsive On-line IDS towards Intelligent Connected Vehicles System

Jia Liu (PhD)

SUPERVISORS Wenjun Fan (XJTLU)
Alexei Lisitsa (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The current intelligent connected vehicles (ICV) system of- ten shares the detected intrusion event to the cloud for further collabora- tive investigation. The upstream channel leading to the Internet of Vehi- cles (IoV) cloud is typically vendor-proprietary and costly, and the con- gestion caused by false alarms even exacerbates the situation. Machine learning (ML) can improve intrusion detection performance by reducing the false alarm rate. However, as a computation-intensive approach, tra- ditional ML is not appropriate for real-time detection. Therefore, this paper proposes a lightweight and responsive on-line intrusion detection approach aiming for the ICV system requiring real-time detection. More specifically, we design a model termed Machine Learning integrated with Blacklist Filter (ML-BF), which leverages the feature engineering and the Bloom filter techniques built on ML to enhance both detection and real-time performances. To evaluate the proposed solution, several ex- periments are conducted by using the Car-Hacking and CIC-IDS-2017 datasets. The experimental results show that our approach can detect intrusion at a microsecond level with a lower computational cost as well as a lower false positive rate than that in the state-of-the-art.

251

Mu-nopoly: Design and Evaluation of a Board Game for Museum Edutainment

Jiachen Liang (PhD)

SUPERVISORS Yue Li (XJTLU)
Richard Koeck (UoL)
Hai-Ning Liang (HKUST: The Hong Kong University of Science and Technology Guangzhou)

ACADEMY/SCHOOL School of Advanced Technology

Edutainment, namely, education and entertainment, has become an important part of the museum experience. Previous research has discussed the significance of edutainment in museums, but there is still a need to explore the effectiveness of edutainment activities through specific system designs and evaluations in real-world museum contexts. This study focuses on board games as an edutainment means. We identified three types of activities that are highly relevant to a board game: playing, learning, and socializing, and proposed a Playing-Learning-Socializing (PLS) framework for museum edutainment. Based on this framework, we designed a board game, Mu-nopoly, and evaluated the edutainment effectiveness of two board game mediums, Card and Augmented Reality (AR). We conducted a between-group experimental study evaluating the use of Card and AR in Mu-nopoly, measuring users' perceptions of playfulness, learning effectiveness, and social presence. With a comprehensive evaluation, the results provided detailed insights into the edutainment effectiveness of both conditions, showing that the Card condition better supported the sensory and imaginative immersion and allowed a greater sense of flow. This study provides design guidelines and brings insights into the interaction design and edutainment research in museums and cultural heritage.

252

Salience-Enhanced Network for Metal Artifact Reduction in CT Imaging

Jiahao Wang (PhD)

SUPERVISORS Jingxin Liu (XJTLU)

ACADEMY/SCHOOL School of AI and Advanced Computing

Computed Tomography (CT) is widely used in clinical diagnosis; however, metal implants often introduce significant artifacts in CT images. To address this issue, metal artifact reduction (MAR) techniques have emerged. In the image domain, existing MAR methods have made some progress, but few have focused on utilizing artifact information to guide models effectively. To bridge this gap, we propose a salience-enhanced metal artifact reduction network . The framework is comprised of two stages: In the first stage, a Siamese network extracts common artifact features from different datasets while distinguishing non-artifact features, and Grad-CAM is utilized to generate heatmaps that highlight salient artifact features. In the second stage, a Restormer network based on a transformer module, guided by these salience maps, concentrates on artifact regions for precise artifact correction. We evaluated our model's performance using Peak Signal-to-Noise Ratio (PSNR) and Structural Similarity Index (SSIM). The experimental results achieved state-of-the-art performance, demonstrating the efficacy of the proposed method.

253

SyncMalloc: A Synchronized Host-Device Co-Management System for GPU Dynamic Memory Allocation across All Scales

Jiajian Zhang (PhD)

SUPERVISORS Fangyu Wu, Qiufeng Wang, Eng Gee Lim (XJTLU)
Guangliang Cheng (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Dynamic memory allocation on GPUs, increasingly crucial for ap- plications with dynamic computational patterns, encounters sig- nificant challenges due to the complex calculations with intricate branches and substantial memory resources consumed by meta- data from massive thread allocations. Despite the current research, there is a lack of a scalable and flexible solution that effectively manages dynamic memory allocation while minimizing memory usage on GPUs. This paper introduces SyncMalloc, a synchro- nized Host-Device Co-Management system that is specifically de- signed to adeptly handle dynamic memory allocations of diverse magnitudes. Through the integration of pipelining and producer- consumer mechanisms, SyncMalloc effectively reduces communi- cation overhead and resolves architectural mismatches, further en- hancing its capability through synergistic integration with CUDA's unified memory to facilitate oversubscription. Moreover, SyncMal- loc advances slab-based memory management to enhance the effi- ciency of small allocations, reducing conflict probabilities and over- head in high-activity scenarios. Finally, we present a comprehensive performance evaluation, expanding benchmarks and measurement dimensions to reflect the performance of real-world applications more accurately. The experimental results demonstrate the effec- tiveness of SyncMalloc in supporting dynamic GPU allocations scaled from 4 to 200 from multiple perspectives. Our source code is available at https://github.com/jjZhang94/SyncMalloc.

254

PPKI: A Photovoltaic Physical Knowledge-Informed Model for Short-Term Power Prediction

Jialong Pei (PhD)

SUPERVISORS Ka Lok Man, Chun Zhao, Jieming Ma (XJTLU)
Martin Gairing (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Accurate short-term photovoltaic (PV) power forecasting is essential for energy management and resource scheduling. However, existing models have difficulty in balance physical consistency and the flexibility of data-driven approaches due to environmental uncertainties. This research proposes a photovoltaic physics knowledge-informed (PPKI) model. The model employs a novel parameterized explicit method to extract PV module characteristics and utilizes an information-sharing network to optimize high-dimensional features captured by an A-CNN-LSTM model. Through a hybrid network structure, the PPKI model achieves collaborative optimization of physical and data-driven features, reducing data uncertainty and distribution imbalance. Experimental comparisons with six short-term prediction models show that the PPKI model has more stable predictions under power fluctuations and abrupt changes. Compared to state-of-the-art models, the proposed method improves root mean square error by an average of 17.02%.

255

Multimodal learning in medical diagnostic applications

Jianfeng Wang (PhD)

SUPERVISORS Pengjing Xu (XJTLU)
Anh Nguyen (UoL)

ACADEMY/SCHOOL School of AI and Advanced Computing

This research focuses on constructing an innovative multimodal learning framework, aiming to integrate medical images, medical texts and medical knowledge graphs to enhance the ability of medical assisted diagnosis. Through designing a unified representation learning method for the three modalities of medical images, medical texts and medical knowledge graphs, and adopting a self-supervised learning strategy, this research fully exploits the abundant information in unlabeled medical data. Then, combined with the multimodal chain-of-thought process, it strengthens the model's cognitive and reasoning abilities in medical diagnosis. This framework is expected to provide strong decision-making support for clinicians, assist in early disease diagnosis, condition monitoring and treatment plan formulation. Eventually, it will promote the improvement of the intelligent level of medical diagnosis, improve the quality of medical services and facilitate the optimal allocation of medical resources.

256

Frequency Domain-DQN for Flexible Photovoltaic Power Point Tracking under Noisy Operating Condition

Jiang Rong Yuan (PhD)

SUPERVISORS Jieming Ma (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

Due to the variability of environmental parameters, photovoltaic (PV) systems frequently operate under noisy operating conditions (NOC). The existing Flexible Power Point Tracking (FPPT) algorithms face challenges maintaining a stable power output in these noisy conditions, particularly when irradiance levels change rapidly. This paper presents a Frequency Domain-Deep Q-Network (FD-DQN) approach to FPPT by incorporating frequency domain analysis through the Fourier transform, which decomposes irradiance signals to capture dynamic changes caused by noise. Additionally, a novel Signal Quality Factor (SQF) is introduced to quantify noise and refine the learning process, minimizing overfitting in the presence of noisy data. The FD-DQN enables more accurate and stable power tracking by analyzing the influence of different frequency components on system performance. The experimental results demonstrate that the proposed approach yields at least 5% improvement in tracking error compared to traditional methods in simulated and experimental conditions characterized by noisy irradiance.

257

Selecting Key Points for Pose-Agnostic Anomaly Detection

Jiejie Liu (PhD)

SUPERVISORS Quan Zhang, Eng Gee Lim (XJTLU)
Jeremy Smith (UoL)

ACADEMY/SCHOOL School of Advanced Technology

With the rapid development of industrial automation, anomaly detection plays an increasingly important role in product quality control. However, traditional anomaly detection algorithms face challenges when dealing with multi-angle defect detection tasks, especially in the absence of multi-pose views and pose annotations. To address this issue, this study proposes a new key point search strategy and sampling point selection strategy based on the MAD (Multi-Pose Anomaly Detection) dataset and benchmark. We introduce Laplacian transformation to en- hance the detection accuracy of key points and adopt an interest region-based mode during the sampling phase to improve the representation of the sampled data. Through these improvements, our method has achieved SOTA (state-of-the-art) results at both the image level and pixel level, significantly enhancing the performance of multi-angle anomaly detection. Our work not only advances the field of pose-agnostic anomaly detection but also provides effective technical support for automated quality control in practical industrial applications.

258

AI-Empowered Graph-based Multimodal Situation Awareness System

Jieli Chen (PhD)

SUPERVISORS Chee Shen Lim (XJTLU)
Jeremy Smith (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Situational awareness (SA) is critical in disaster response, providing essential insights into dynamic environments. Social media serves as a valuable source of real-time information during such events. While existing SA systems excel at extracting disaster-related information, they often focus on single-modal data, limiting their effectiveness. We introduce a Multimodal Hierarchical Graph-based Situational Awareness (MHGSA) system to enhance disaster event classification. The MHGSA system utilizes a hierarchical graph where nodes represent disaster events, with features extracted from corresponding images and acoustic data. Multibranch feature extraction modules for vision and audio generate hierarchical node features, supporting both coarse- and fine-granularity classification tasks. Graph Convolutional Neural Networks learn relationships between multimodal disaster events, enabling effective feature fusion. Experimental results demonstrate the superior performance of the proposed system in single-modal scenarios and its success in integrating visual and audio data for robust disaster classification.

259

Machine Consciousness: A Comprehensive Review of Definitions, Theoretical Models, and Applications

Jingjing Mu (PhD)

SUPERVISORS Steven Guan, Eng Gee Lim (XJTLU)
Prudence Wong (UoL)
Yutao Yue (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

This paper presents a comprehensive review of machine consciousness, a rapidly evolving and multifaceted field within artificial intelligence. It explores widely accepted definitions, classifications, structural frameworks, and theoretical models while examining potential applications. Machine consciousness integrates self-awareness and environmental perception, making it a cornerstone for advanced AI research. The review begins by contextualizing consciousness within computer science, followed by a precise definition of machine consciousness. Key theoretical models and technological advancements are analyzed, alongside recent interdisciplinary findings. This paper highlights significant technological, ethical, and safety challenges in realizing machine consciousness. Potential applications in domains such as autonomous vehicles, service robotics, and human-machine interaction are critically assessed, emphasizing their transformative potential. The study concludes by addressing core issues of machine autonomy and controllability. Despite its nascent stage and inherent controversies, machine consciousness provides a unique lens for unraveling the complexity of intelligent systems and advancing AI research.

260

ST-GCN: A Spatiotemporal Graph Convolution Neural Network for EEG Motor Imagery Signal Decoding

Jingzhou Xu (PhD)

SUPERVISORS Jun Qi (XJTLU)
Junqing Zhang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Motor imagery (MI) is a mental process extensively used in the experimental paradigm for brain-computer interfaces (BCIs) across various basic science and clinical research studies. Despite its widespread use, accurately decoding intentions from MI poses significant challenges due to the complex nature of brain patterns and the limited sample sizes typically available for machine learning. This paper introduces a Spatiotemporal Graph Neural Network (ST-GCN) for MI classification. First, we use the spatial-temporal convolution layer to extract features from raw EEG data. The mixed depthwise convolution extracts temporal features, and the following spatial filtering convolution decomposes the EEG signal. We then utilize A graph convolution module employing the max relative aggregator to explore the relationships between the spatially decomposed EEG components. In the final step, under the combined supervision of cross-entropy and our proposed channel selection loss, the ST-GCN achieves feature extraction that enhances interclass dispersion and intraclass compactness. We compare ST-GCN with several benchmark EEG decoding methods on two MI datasets: the BCI Competition III Dataset IVa and the BCI Competition IV Dataset 1. ST-GCN outperforms the deep learning benchmark methods by achieving an accuracy of 78.11\% and 71.94\%, respectively, in 10-fold cross-validation.

261

Quantum Dot-Enhanced Dual-modality Heterojunction Optoelectronic Synapse for Neuromorphic Computing

Junyan Li (PhD)

SUPERVISORS Ka Lok Man, Chun Zhao, Sang Lam (XJTLU)
Xin Tu (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Developing optoelectronic sensory synaptic devices that emulate the multifaceted capabilities and efficiency of natural visual systems is of paramount importance in the realm of artificial vision technology. This study introduces a cost-effective, entirely solution-based approach to integrate CdSe/CdSexS1-x quantum dots with InOx semiconductor, forming a heterojunction that allows synaptic transistors to perceive both light and electrical stimuli. These Quantum Dot-Enhanced Synaptic Transistors (QDETs) demonstrate a wide-ranging photosensitivity, covering a spectrum of light from 395 to 808 nm, in conjunction with their reactivity to electrical signals. Furthermore, the incorporation of lithium ions into the dielectric layer has resulted in a tenfold increase in gate capacitance, markedly enhancing the devices' channel modulation and memory retention properties. A demonstration of an artificial visual perception system based on QDETs is also presented, highlighting their potentials in pattern recognition and the development of energy-efficient, high-performance neuromorphic computing systems.

262

Four Dimensional Adjustable Electroencephalography Cap for Solid gel Electrode

Junyi Zhang (PhD)

SUPERVISORS Yue Li (XJTLU)
Heba Lakany (UoL)
Weihua Pei (Jiangsu JITRI Brain-Machine Fusion Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

Currently, the electroencephalogram (EEG) caps is limited to a finite number of sizes based on head circumference, lacking the mechanical flexibility to accommodate the full range of skull dimensions. This reliance on head circumference data alone often results in a poor fit between the EEG cap and the user's head shape. To address these limitations, we have developed a four-dimensional (4D) adjustable EEG cap. This cap features an adjustable mechanism that covers the entire cranial area in four dimensions, allowing it to fit the head shapes of nearly all adults. The system is compatible with 64 channels or lower electrode counts. We conducted a study with numerous volunteers to compare the performance characteristics of the 4D caps with the commercial (COML) caps in terms of preparation time, wearing impedance, and performance in brain-computer interface (BCI) applications. The 4D cap demonstrated the ability to adapt to various head shapes more quickly, reduce impedance during testing, and enhance measurement accuracy, signal-to-noise ratio (SNR), and comfort. These improvements suggest its potential for broader application in both laboratory settings and daily life.

263

Focus-Driven Augmented Feedback: Enhancing Focus and Maintaining Engagement in Upper Limb Virtual Reality Rehabilitation

Kai-Lun Liao (PhD)

SUPERVISORS Rui Yang, Mengjie Huang, Min Chen (XJTLU)
Meng Fang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Integrating biofeedback technologies like eye-tracking has advanced virtual reality (VR) rehabilitation, offering personalized therapy options. The Focus-Driven Augmented Feedback (FDAF) system was developed to enhance patient focus and maintain engagement during upper limb VR rehabilitation by adjusting visual feedback based on the patient focus. This study investigates the FDAF system's effectiveness in sustaining focus and engagement across healthy participants and patients with upper limb rehabilitation needs. Controlled experiments assessed the impact of different feedback levels on user experience and performance. Preliminary findings indicate optimal feedback levels vary by user group, with adjustments necessary to maintain comfort and engagement. Results highlight the potential of eye-tracking technology to adapt VR environments in real time, enhancing therapeutic outcomes. This research offers insights for developing more personalized VR rehabilitation systems and suggests promising future directions for therapeutic VR applications.

264

Identification for First Arrivals of Acoustic Logging Signals Based on Transformer Network

Li Zhu (PhD)

SUPERVISORS Hui Li

UNIVERSITY/INSTITUTE Xi'an Jiaotong University /
School of Information and Communication Engineering

In the field of acoustic logging, the use of deep learning methods to extract first arrivals of array acoustic logging signals can solve the limitations of traditional methods of processing acoustic logging signals and is of great significance for the interpretation of acoustic logging data. In this thesis, intelligent first arrivals extraction of P-, S- and Stoneley waves in array acoustic logging signals based on Transformer is carried out. The results show that the intelligent first arrivals pickup process based on the transformer has the advantages of high efficiency, and high accuracy, and doesn't depend on manual extraction experience. And that shows the Transformer network can effectively overcome the shortcomings of the traditional first arrivals extraction methods, such as time-consuming and low accuracy, and are beneficial to the subsequent interpretation and processing of acoustic logging data.

265

Human-Vehicle Risk Level Prediction for Human-Machine Co-driving Control

Lin Zhou (PhD)

SUPERVISORS Yong Yue (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

Traffic accidents demonstrate that driving is a high-risk activity, with risky driving behaviors being the primary cause of such accidents. Before the fully autonomous driving systems become mature, the human is still in loop of vehicle control. Due to the immaturity of detecting human status, excising research has limitations by taking the human as an indirect fact. This project aims to mitigating safety hazards caused by risky driving behaviors of drivers with the following objectives. My research has introduced, implemented, and validated a proactive risk driving behavior prediction model using XGBoost. Previous studies focused solely on identifying distracted driving behaviors, neglecting their impact on vehicle risk. Subsequent work addresses uncertainties in vehicle risk analysis due to overlooking driver attributes. A driver-centric risk prediction model is proposed to enhance model generalization. For human-machine co-driving decisions in intelligent vehicles, a control handover strategy based on human-vehicle risk status is suggested, ensuring timely control transfer and mitigating safety risks from risky driving behaviors.

266

Tangible Progress: Employing Visual Metaphors and Physical Interfaces in AI-based English Language Learning

Mei Wang (PhD)

SUPERVISORS Lingyun Yu (XJTLU)
Guangliang Cheng (UoL)

ACADEMY/SCHOOL School of Advanced Technology

This study explores an interactive system integrating visual metaphors, AI-powered essay scoring techniques, and tangible feedback to enhance English language learning. AI significantly impacts this area by improving Automated Essay Scoring (AES) systems. Traditional AES often provides text-based scores lacking depth and engagement. We propose a system using AI-powered AES with visualization to address the limitations. Our system features an AI scoring algorithm, a visualization interface translating scores into metaphors, and tangible postcards displaying scores. To evaluate the usage of our system, we conducted domain expert interviews and a three-stage user study. Results show that progressive visual feedback and tangible postcards increased practice frequency and significantly boosted motivation. Tangible visual feedback positively affected progressive learning. This study highlights the potential of combining AI, visual metaphors, and tangible feedback to encourage continuous and active learning in English education.

267

Sensorless beta-particle-filter strategy for optimizing solar trackers under partial shading conditions

Ming Huang (PhD)

SUPERVISORS Ka Lok Man, Jieming Ma, Steven Guan (XJTLU)
Xue Zhang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The solar tracking system is one of the effective methods to enhance Photovoltaic (PV) power generation efficiency. However, existing systems struggle to manage power losses when PV panels are partially shaded, leading to longer tracking times and lower average power output. In this study, we propose a sensorless solar tracking method called Beta-Particle-Filter (BPF), which introduces a Beta parameter to establish a restricted search area and avoid unnecessary global searches. Additionally, a shadow identification process is incorporated, enabling the system to adjust the initial tracking range based on the degree of shading, significantly reducing the search time. Simulations and experiments demonstrate that the proposed solar tracking method increases the power generation by 60% under the Partial Shading Conditions (PSC) compared to the fixed PV panel and achieves an 8% improvement in power generation compared to the latest particle filter method.

268

Dynamic integration and early warning model for analyzing patients with severe ICU sepsis based on biochemical indicators and medical history

Mingyu Zhang (Master)

SUPERVISORS Yong Yue (XJTLU)
Jiangang Chen (ECNU: East China Normal University)

ACADEMY/SCHOOL School of Advanced Technology

The main research background of this project is that the patients in the intensive care unit are in serious condition, their vital signs change rapidly, and the various indicators fluctuate greatly, which is easy to send malignant time, and even reduce the probability of survival in severe cases. This study mainly monitors the various biochemical indicators (including but not limited to blood pressure, blood lactate concentration, qSOFA score, etc.) of elderly patients with severe sepsis in the ICU, and supplements with the patient's medical history. Through the existing dynamic Bayesian network model algorithm, deep learning, regression model analysis, support vector machine algorithm, and data filling of relevant missing data, a data set for patients with severe sepsis and a large model for predicting and analyzing the disease trend are established. This model is expected to solve the problem that doctors cannot predict and analyze the disease trend due to the lack of support from time series data, and further play an early warning role in the possibility of worsening of the disease.

269

State of Charge Estimation for Lithium-Ion Batteries Based on Informer-LSTM Hybrid Network

Ningfei Song (PhD)

SUPERVISORS Ka Lok Man (XJTLU)
Jeremy Smith (UoL)
Yutao Yue (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

Accurate State of Charge (SoC) estimation is essential for efficient battery management systems (BMS). In this study, we propose a novel hybrid neural network architecture, combining the Informer and Long Short-Term Memory (LSTM) networks. Our hybrid network captures temporal dependencies and nonlinear characteristics inherent in battery data, enhancing sequence integration capabilities and computational efficiency. Experimental results on battery datasets demonstrate the effectiveness of our approach, with the proposed method achieving a maximum Mean Absolute Error (MAE) of 1.395% and a maximum Root Mean Square Error (RMSE) of 1.593%. Our findings suggest that the Informer-LSTM hybrid network holds promise for improving battery SoC estimation accuracy and enhancing battery management systems.

270

Industrial Network Data Injection Detection Method Using Predictive Modeling Based on Markov State Transition Matrix

Qi Yu (PhD)

SUPERVISORS Yichuan Jiang

UNIVERSITY/INSTITUTE Southeast University /
School of Cyber Science and Engineering

This paper proposes an industrial network data injection detection method using predictive modeling based on the Markov state transition matrix. Focusing on industrial networks within the Industrial Internet, we employ a Markov state transition matrix to establish state prediction models. By using this method promptly identify potential false data injection and data tampering. This method ensures effective identification of data injection attacks with low computational overhead, thereby enhancing the security and robustness of industrial network systems. Experimental results demonstrate that the proposed approach achieves high detection accuracy and real-time performance in various data injection attack scenarios.

271

Clustering-driven state embedding for reinforcement learning under visual distractions

Rongrong Wang (PhD)

SUPERVISORS Xuesong Wang

UNIVERSITY/INSTITUTE China University of Mining and Technology /
School of Information and Control Engineering

Visual reinforcement learning (VRL) optimizes policies using information from visual inputs. To address issues with high dimensionality and sample efficiency, many studies have employed self-supervised learning to create latent state representations. However, these methods can be sensitive to irrelevant distractions like changes in background, color, or camera angles. We introduce Clustering-driven State Embedding for Reinforcement Learning under visual distractions (CSE-RL), designed to learn more robust state representations. CSE-RL uses the Student's t distribution for clustering assignments, defining reward centers by reinforcing the target distribution. It incorporates state embeddings, rewards, and centers into a clustering function, while the Sinkhorn-Knopp algorithm ensures balance across clusters. This approach enhances the understanding of relationships between states and filters out redundant information, leading to efficient representations that are less affected by distractions. Experimental results show that CSE-RL performs comparably or better than several state-of-the-art VRL algorithms in challenging visual environments.

272

A Novel Hybrid Macroscopic Fundamental Diagram-informed Deep Learning Method for Lane-level Traffic Prediction

Ruiyuan Jiang (PhD)

SUPERVISORS Dongyao Jia (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

Lane-level traffic prediction forecasts traffic conditions at the lane level, offering detailed insights into traffic flow, congestion, and vehicle behavior on individual lanes. This enhanced granularity enables autonomous vehicles (AVs) to perceive the surrounding traffic environment with greater precision, supporting autonomous driving functions like car following and lane change decisions. However, current research faces challenges that require further investigation. First, most studies utilize data-driven methods for lane-level traffic prediction, which are prone to common issues such as overfitting and limited generalization. Second, the existing prediction methods often fail to model the spatiotemporal correlations between lanes deeply, limiting their ability to fully capture the dynamic nature of traffic. To address these issues, we propose a novel hybrid macroscopic fundamental diagram (MFD)-informed deep learning method (MFD-IDL) for lane-level traffic prediction. By integrating the MFD to represent the physical relationship between traffic flow and density, we embed this correlation within our deep-learning model training framework to mitigate the influence of historical data quality on prediction accuracy and bolster model generalization ability. Moreover, we introduce a multi-scale graph fusion technique to fully model the spatiotemporal features of traffic data across lanes by using multi-source traffic states and lane-level traffic network topology. Experimental results demonstrate MFD-IDL significantly outperforms state-of-the-art methods in both prediction accuracy and generalization.

273

Remanufacturing flexible job shop scheduling via graph neural network and reinforcement learning

Runjing Wang (PhD)

SUPERVISORS Yufan Zheng (XJTLU)

ACADEMY/SCHOOL School of Intelligent Manufacturing Ecosystem

This study addresses the complexity of the remanufacturing scheduling problem by transforming it into a sequential decision-making problem using a multi-phase flexible job shop scheduling model. A Markov Decision Process (MDP) framework is employed to solve the problem, which involves disassembly, reprocessing, and assembly phases. Based on the novel graph representation of remanufacturing states, the proposed graph neural network architecture combined with multi-action Proximal Policy Optimization (PPO), demonstrates performance improvements, particularly in large-scale instances, by reducing the makespan and computation time effectively. Our approach outperforms traditional metaheuristic algorithms and priority dispatching rules, showcasing the potential of the DRL method in handling complex and large-scale combinatorial optimization problems. The study not only offers a novel solution for remanufacturing scheduling but also paves the way for future research in complex scheduling optimization.

274

Energy-Efficient Proof-of-Work Mechanism for Blockchain

Shasha Yu (PhD)

SUPERVISORS Yanan Qiao

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Computer Science and Technology

Proof-of-Work (PoW) is a consensus mechanism widely applied in blockchain applications such as Bitcoin and Ethereum. In PoW, only the first miner solving the PoW puzzle wins the reward. Thus, PoW-powered cryptocurrencies have become increasingly energy inefficient due to the fierce competition among the participants. Additionally, PoW cause centralization in blockchain networks. To address these challenges, this research proposes an incentive mechanism named EPoW. EPoW has been proven to generally benefit the conservation of energy in Bitcoin mining by disincentiving miners no to devote a higher hash rate. Moreover, EPoW is an instrument for decentralization by discouraging the collusion among miners. Then, a dual security verification mechanism is proposed to enhance the security of blockchain networks. Finally, extensive comparative experiments are conducted to validate the effectiveness of EPoW in energy efficiency. The research indicates that EPoW eliminates the miner's incentive to devote a higher hash-rate than all their counterparts.

275

Physics informed deep learning approach for inverse kinematics of a high degrees of freedom mobile manipulator

Shihui Fang (PhD)

SUPERVISORS Min Chen (XJTLU)
Guangliang Cheng (UoL)
Jinghua Wu (JITRI: Robotics and Intelligent Equipment Institute)

ACADEMY/SCHOOL School of Advanced Technology

Mobile manipulators have been increasingly applied in warehousing and logistics industry since they can provide a broad workspace and additional flexibility to perform more complex tasks by using redundant degrees of freedom (DOFs). The inverse kinematics (IK) of mobile manipulators is a crucial issue of manipulator control, which mapping from joint angles to desired end-effector position and orientation. Due to the difficulty of derivation, high computational complexity, redundancy, and singularity-related issues, traditional inverse kinematics approaches have to face numerous challenges to operate mobile manipulators. Deep learning algorithms have been shown to be effective in manipulator control. However, these methods face dilemmas in interpretability and physical consistency. To address these challenges, this paper proposes a novel approach by embedding kinematic principles into the deep learning model, enabling the model to learn the mapping between joint angles and end-effector position and orientation while respecting the underlying physics constraints. The experimental results show that the proposed method can solve the IK problem for mobile manipulators accurately and efficiently, effectively avoiding multiple solutions and singularities issues, highlighting its potential for high-DOF robotic applications.

276

Rethink Cross-Domain Data Management with Large Language Models

Shiyao Zhang (PhD)

SUPERVISORS Yuji Dong, Jie Zhang, Yong Yue (XJTLU)
Terry Payne (UoL)

ACADEMY/SCHOOL School of Internet of Things

The emergence of near-human cognitive capability in LLMs grabs a rising attention on rethinking of how AI systems can conduct cognitive tasks that were considered only human can do. Some recent studies have demonstrated viability using LLMs with Retrieval Augmented Generation (RAG). However, existing RAG systems assume complete and reliable knowledge ready for retrieval, which is often not the case in cross-domain systems. To address this issue, a position of using LLMs for cross-domain data management will be discussed, with an existing study using LLMs on ontology alignment to demonstrate the challenge.

277

Robust Offline Actor-Critic with On-policy Regularized Policy Evaluation

Shuo Cao (PhD)

SUPERVISORS Yuhu Cheng

UNIVERSITY/INSTITUTE China University of Mining and Technology / School of Information and Control Engineering

Offline reinforcement learning (ORL) is a promising approach for sequential decision-making, enabling learning task-solving policies from static datasets without costly real-world interactions. To mitigate extrapolation errors and instability inherent in off-policy Q-learning (QL) on static datasets, we propose the robust offline Actor-Critic with On-Policy Regularized policy evaluation (OPRAC). With the SARSA-style bootstrapping, OPRAC integrates a conservative on-policy Q-function and a penalty term for matching on-policy and off-policy actions to regularize the off-policy Q-function, thereby introducing on-policy pessimistic conservatism to stabilize the Q-value estimate. Theoretically, OPRAC guarantees convergence and controls the bias upper bound between the learned and true Q-values, even under limited data. Empirically, OPRAC outperforms state-of-the-art offline RL methods on the D4RL Gym-Mujoco benchmark by at least 15%, demonstrating its ability to learn robust, effective task-solving policies rapidly.

278

What-Ifs: Enhancing Exploratory Visualization for Spatial Data Analysis

Shuzi Zou (PhD)

SUPERVISORS Lingyun Yu, Yue Li (XJTLU)
Floriana Grasso (UoL)
Hai-Ning Liang (HKUST: The Hong Kong University of Science and Technology Guangzhou)

ACADEMY/SCHOOL School of Advanced Technology

In this work, we explore the essential components of an exploratory visualization environment for spatial data analysis. Domain experts often face challenges during the initial analysis of complex data, lacking insight into unknown attributes and patterns. This can hinder the efficiency of data exploration. To address this, we focus on overcoming challenges such as unfamiliar data, unclear goals, and ambiguous results. We analyzed and identified key components for building an effective exploratory environment. We then designed and enhanced the environment in two steps: integrating components for exploring spatial data, including spatial-temporal data and molecular data, and conducting an elicitation study to observe users' interactions with unfamiliar data. This study helped us identify the interactions they performed to move closer to their findings and the strategies they used. To evaluate effectiveness, we interviewed various types of target users. Through this work, we recognized the importance of natural interactions, flexible inquiry methods, and visual feedback within the exploratory visualization process, and we propose design guidelines based on these findings.

279

Web3.0 Literary Landscape: Deep Learning and Blockchain for Nobel Prize Predictions

Sida Huang (PhD)

SUPERVISORS Yuji Dong, Jie Zhang (XJTLU)
Terry Payne (UoL)

ACADEMY/SCHOOL School of Internet of Things

This research introduces a cutting-edge Web3 literary analysis platform, harnessing the power of blockchain and deep learning technologies. By employing the immutable and transparent nature of blockchain, the platform ensures robust copyright protection while offering readers enhanced interactive features. It applies deep learning techniques for comprehensive analyses of sentiment, topic, and stylistic elements, which are instrumental in predicting potential Nobel Prize laureates. This methodology not only enhances the accuracy of predictions but also sheds light on the evaluation criteria and historical trends associated with the Nobel Prize. Moreover, the platform adopts a directed graph model alongside the struc2vec algorithm to create text vectors for comparative studies, uncovering similarities between works that have won awards and those that have been nominated. Utilizing the LESS model for detailed content examination, the platform delves into sequence relationships within semantic networks, thus improving interpretability and visualization. The integration of blockchain technology guarantees access to unbiased datasets, enabling more precise literary analyses and predictions. This innovative approach has been validated using works that have either won or been nominated for the Nobel Prize, proving its efficacy in identifying the textual characteristics favored by the Nobel Prize committee.

280

Data-driven approach to predict the fatigue properties of ferrous metal materials using the cGAN and machine-learning algorithms

Sigeng Li (PhD)

SUPERVISORS Min Chen (XJTLU)
Guangliang Cheng (UoL)
Weijian Han (JITRI: Yangtze River Delta Advanced Materials Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

The stress-life curve (SN) and low-cycle strain-life curve (EN) are the two primary representations used to characterize the fatigue behavior of a material. These material fatigue curves are essential for structural fatigue analysis. However, conducting material fatigue tests is expensive and time-intensive. To address the challenge of data limitations on ferrous metal materials, we propose a novel method that utilizes the Random Forest algorithm and transfer learning to predict the S-N and E-N curves of ferrous materials. In addition, a data-augmentation framework was introduced using a conditional generative adversarial network (cGAN) to overcome data deficiencies. By incorporating the cGAN-generated data, the accuracy (R2) of the Random Forest algorithm-trained model was improved by 0.3 – 0.6. It was proven that the cGAN can significantly enhance the prediction accuracy of the machine-learning model and balance the cost of obtaining fatigue data from the experiment.

281

DiffClick: Click-Differentiated Enhancement Network for Interactive Segmentation

Siqi Song (PhD)

SUPERVISORS Limin Yu, Jimin Xiao (XJTLU)
Xiaowei Huang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Click-based interactive segmentation aims to achieve precise segmentation using min- imal positive and negative clicks. Existing methods often overlook the differences between positive and negative clicks. They have different objectives, and the number of negative clicks is far less than the number of positive ones. This leads to inadequate background refinement in the absence of negative clicks. In response, we propose Dif- fClick, a novel framework that processes positive and negative clicks in different en- hancementmodules. Startingfromtheinitialsegmentationresultsderivedfromthefirst click, both our Foreground Enhancement Module and Background Enhancement Mod- ule utilize a weight fusion module to augment features based on the type of guidance received. The Foreground Enhancement Module refines foreground features guided by positive clicks. Similarly, the Background Enhancement Module processes negative clicks and improves background segmentation by incorporating weight maps of back- ground regions. Additionally, this module includes a non-target prototype to provide supplementary background guidance, ensuring effective segmentation even when neg- ative clicks are lacking. Extensive experiments show that DiffClick beats most existing methods, especially when negative clicks are absent.

282

Mind the Gap: Promoting Missing Modality Brain Tumor Segmentation with Alignment

Tianyi Liu (PhD)

SUPERVISORS Haochuan Jiang (XJTLU)

ACADEMY/SCHOOL School of Robotics

Brain tumor segmentation is often based on multiple magnetic resonance imaging (MRI). However, in clinical practice, certain modalities of MRI may be missing, which presents an even more difficult scenario. To cope with this challenge, knowledge distillation has emerged as one promising strategy. However, recent efforts typically overlook the modality gaps and thus fail to learn invariant feature representations across different modalities. Such drawback consequently leads to limited performance for both teachers and students. To ameliorate these problems, in this paper, we propose a novel paradigm that aligns latent features of involved modalities to a well-defined distribution anchor. As a major contribution, we prove that our novel training paradigm ensures a tight evidence lower bound, thus theoretically certifying its effectiveness. Extensive experiments on different backbones validate that the proposed paradigm can enable invariant feature representations and produce a teacher with narrowed modality gaps. This further offers superior guidance for missing modality students, achieving an average improvement of 1.75 on dice score.

283

Knowledge Base-enhanced Multilingual Relation Extraction with Large Language Models

Tong Chen (PhD)

SUPERVISORS Jionglong Su, Zhengyong Jiang (XJTLU)
Procheta Sen (UoL)

ACADEMY/SCHOOL School of AI and Advanced Computing

We propose a novel framework to address the challenges in relation extraction (RE): context unawareness, schema misalignment, world knowledge ignorance. It consists of two stages, entity linking and relation inference, that fully leverage the efficacy of KBs and LLMs in this task. The key contributions of this work are summarized as follows: We review the key literature on LLM-based RE thoroughly, and we argue that well-behaved RE models should be contextually aware, schema-aligned, and world knowledge-considered. We propose a novel framework for RE, consisting of two stages: entity linking and relation inference, to fully leverage the efficacy of KBs and LLMs in the RE task. Experimental results under a multilingual setting demonstrate the effectiveness and generalizability of our method across diverse linguistic contexts with substantial improvements over state-of-the-art baselines.

284

Spatial-temporal fusion adaptive gated graph convolution networks for short-term residential load forecasting

Tong Zhang (PhD)

SUPERVISORS Wenhua Jiao

UNIVERSITY/INSTITUTE China University of Mining and Technology / School of Information and Control Engineering

Enhancing the prediction of volatile electric loads is crucial for the efficient operation of modern power grids. Conventional deep learning models often fail to capture both temporal dependencies in historical loads and spatial correlations between residential units, resulting in suboptimal forecasting performance. To address these issues, we propose Spatial-Temporal Fusion Adaptive Gated Graph Convolution Networks (STFAG-GCN) for short-term residential load forecasting. STFAG-GCN integrates spatial-temporal fusion graph construction and a gated adaptive fusion mechanism to dynamically model spatial-temporal correlations. By combining a Gated Temporal Convolutional Network (Gated TCN) with multiple STFGCN layers, it effectively handles long sequences. Experimental results on real datasets demonstrate STFAG-GCN's superior accuracy and robustness, outperforming four state-of-the-art methods. Ablation studies further validate the framework's efficacy and reveal its advantages in capturing complex spatial-temporal dependencies.

285

Improved Video-Based Probabilistic Multi-Object Tracking Algorithms for Maritime Multi-Object Tracking

Xiaoyu Huang (PhD)

SUPERVISORS Yong Yue, Xiaohui Zhu, Eng Gee Lim (XJTLU)
Angel Garcia Fernandez (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Maritime multi-object tracking (MOT) is essential for surveillance, autonomous navigation, and search and rescue. While most video-based MOT research focuses on non-probabilistic methods, probabilistic approaches have been overlooked due to their complexity and performance constraints. This paper presents several improvements to probabilistic MOT algorithms, including incorporating Intersection over Union (IoU) and feature-based gating, integrating feature and IoU likelihoods, confidence-based hierarchical matching, camera motion compensation, and enhanced trajectory maintenance and estimation. These improvements enhance the effectiveness of video-based tracking. On both the Singapore Maritime and SeaDronesSee datasets, the proposed improved MHT (Multiple Hypothesis Tracking) algorithm achieves state-of-the-art (SOTA) results among probabilistic-based multi-object tracking methods. These contributions advance probabilistic multi-object tracking for video-based MOT and provide a solid foundation for future research in this area.

286

GA-YOLO: Enhancing the Small Object Detection on Traffic Monitoring

Xinyue Zhang (PhD)

SUPERVISORS Ka Lok Man, Eng Gee Lim, Yuxuan Zhao (XJTLU)
Jeremy Smith (UoL)
Yutao Yue (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

Intelligent Transportation Systems (ITS) represent a cornerstone in modern traffic management strategies, leveraging surveillance cameras as primary visual sensors to monitor road conditions. However, the static nature of public surveillance setups coupled with the inherent limitations in image resolution pose significant challenges for Small Object Detection (SOD) in traffic surveillance. This project introduces Ghost-Attention YOLO (GA-YOLO), an enhanced YOLOv8 model tailored for SOD. A novel channel-spatial attention mechanism is proposed to allocate focus to critical features and small targets. Additionally, the CSP-based Ghost Bottleneck with Attention (CGBA) module, integrating attention into CSP blocks, enhances feature extraction and fusion within the FPN-PAN structure. This presentation will outline the GA-YOLO architecture, experimental design, and results, demonstrating its potential to efficiently improve spatial detection performance and its applicability for integration into a Video Anomaly Detection (VAD) framework for ITS perception.

287

ResponsiveView: Enhancing 3D Artifact Viewing Experience in VR Museums

Xueqi Wang (PhD)

SUPERVISORS Yue Li (XJTLU)
Han-Mei Chen (UoL)
Hai-Ning Liang (HKUST: The Hong Kong University of Science and Technology Guangzhou)

ACADEMY/SCHOOL School of Advanced Technology

The viewing experience of 3D artifacts in Virtual Reality (VR) museums is influenced by factors like pedestal height, viewing distance, and object scale. These factors can vary subjectively among users, making a universal solution challenging. This paper gathers empirical data on user preferences for optimal VR museum viewing experiences. By analyzing users' viewing behaviors, we develop predictive functions to configure pedestal height, calculate optimal viewing distance, and adjust object scale. This led to our innovative design, ResponsiveView, which automatically adjusts these parameters in the VR environment, akin to responsive web design for different screen sizes. ResponsiveView has been validated using two common VR inputs: controller-based interactions and hand tracking, showing improved viewing experiences in VR museums.

288

High-Order Reward Prioritization: Self-adaptive High-quality Augmented Prioritized Experience Replay for Goal-Oriented Navigation

Xueyan Yao (PhD)

SUPERVISORS Matilda Isaac, Yuji Dong (XJTLU)
Dominik Wojtczak (UoL)

ACADEMY/SCHOOL School of Internet of Things

Recent advancements in autonomous navigation have seen the shift away from rule-based controls to more advanced deep reinforcement learning (DRL) methods. Prioritized Experience Replay (PER) can be useful, yet its reliance on TD-error may lead to biased sample selection that inhibits long-term learning. To address this challenge, we introduce SHAPER (Self-Adaptive High-quality Augmented Prioritized Experience Replay), an innovative framework inspired by the impact of high-order rewards on the human learning process in the biological field. SHAPER integrates both high-order reward and TD-error into its experience sampling process, dynamically balancing them via policy entropy to allow adaptive exploration. It is compatible with multiple off-policy DRL algorithms like TD3 and SAC. Our experimental results demonstrate that SHAPER improves performance and enhances sampling efficiency, providing a robust strategy to accelerate off-policy algorithms in goal-oriented navigation tasks. By expanding beyond vanilla PER, SHAPER opens new avenues for prioritization strategies within DRL as well as showing the promise of integrating high-order rewards for more effective learning.

289

RDSA: A Robust Deep Graph Clustering Framework via Dual Soft Assignment

Yang Xiang (PhD)

SUPERVISORS Chengtao Ji, Yong Yue, Xiaoying Pang (XJTLU)
Tulika Saha (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Graph clustering is an essential aspect of network analysis that involves grouping nodes into separate clusters. Recent developments in deep learning have resulted in graph clustering, which has proven effective in many applications. Nonetheless, these methods often encounter difficulties when dealing with real-world graphs, particularly in the presence of noisy edges. Additionally, many denoising graph clustering methods tend to suffer from lower performance, training instability, and challenges in scaling to large datasets compared to non-denoised models. To tackle these issues, we introduce a new framework called the Dual Adaptive Assignment Approach for Robust Graph-Based Clustering (RDSA). RDSA consists of three key components: (i) a node embedding module that effectively integrates the graph's topological features and node attributes; (ii) a structure-based soft assignment module that improves graph modularity by utilizing an affinity matrix for node assignments; and (iii) a node-based soft assignment module that identifies community landmarks and refines node assignments to enhance the model's robustness. We assess RDSA on various real-world datasets, demonstrating its superior performance relative to existing state-of-the-art methods. Our findings indicate that RDSA provides robust clustering across different graph types, excelling in clustering effectiveness and robustness, including adaptability to noise, stability, and scalability.

290

Review of Multi-modal Emotion Recognition in Conversation

Yangu Zhou (PhD)

SUPERVISORS Huakang Li (XJTLU)

ACADEMY/SCHOOL School of AI and Advanced Computing

Traditional emotion recognition or sentiment analysis, which focuses on sentence level or only considers text modality. However, human will judge the speaker's emotion statement by combining signals from different modalities such as facial expressions and tone of voice in real world scenarios. In addition, compared with simple sentence level emotion recognition, emotion recognition in conversation needs to integrate contextual information and the relationship information between speakers to obtain accurate emotion recognition results. Therefore, emotion recognition in conversation is a very complicated and challenging task. Therefore, this survey aims to (a) give a comprehensive understanding of current research in multimodal emotion recognition in conversation task; (b) summarize the mainstream methods and problem entry point in current ERC tasks; (c) evaluate current research results and compare the advantages and disadvantages of different methods; (d) explore the research challenges and future research directions of multi-modal emotion recognition in conversation.

291

Create3DHistory: Creating and Customizing Historical Timelines with AI-Generated Content

Yejuan Xie (PhD)

SUPERVISORS Chengtao Ji, Lingyun Yu (XJTLU)
Tulika Saha (UoL)
Hai-Ning Liang (HKUST: The Hong Kong University of Science and Technology Guangzhou)

ACADEMY/SCHOOL School of Advanced Technology

In the digital era, traditional methods of historical learning are undergoing a transition, as there is a growing demand for intuitive and visually engaging approaches. Visualization, particularly timeline-based visualization, is critical in bridging the gap between extensive and complex historical events and history learners due to its intuitive features. Despite the advances in existing timeline visualization tools, they often face challenges: visualization creators spend much time in the materials preparation stage, especially for designers unfamiliar with the history; the lack of flexible interaction limits users from designing customized representations, which decreases the user's interest. To address these issues, we have developed Create3DHistory, a system that leverages the advanced Artificial Intelligence Generated Content and visualization technologies, enabling users to easily generate historical events content and create 3D and 2D historical event timeline representation. Users only need to input the name of a historical event, and the system will automatically generate corresponding content and deploy it onto the timeline representation. Moreover, users can edit the generated content or upload self-prepared multimedia materials for customized event visualization. The user study has demonstrated that Create3DHistory can effectively assist users in customizing personalized historical event timelines. Overall, the proposed tool simplifies the timeline creation process using AIGC technology, providing an overview and detailed information on-demand functions for various tasks.

292

Collaborative AI Learning with Improved Adversarial Neural Networks for Multi-modalities Data

Yibo He (PhD)

SUPERVISORS Chee Shen Lim, Jingxin Liu (XJTLU)
Bei Peng (UoL)
Kah Phooi Seng (External)

ACADEMY/SCHOOL School of Advanced Technology

With the widespread adoption of Generative Adversarial Networks (GANs) for sample generation, this paper aims to enhance adversarial neural networks to facilitate collaborative Artificial Intelligence (AI) learning which has been specifically tailored to handle datasets containing multi-modalities. Currently, a significant portion of the literature is dedicated to sample generation using GANs, with the objective of enhancing the detection performance of machine learning (ML) classifiers through the incorporation of these generated data into the original training set via adversarial training. The quality of the generated adversarial samples is contingent upon the sufficiency of training data samples. However, in the multimodal domain, the scarcity of multimodal data poses a challenge due to resource constraints. In this paper, we address this challenge by proposing a new multimodal dataset generation approach based on the classical audiovisual speech recognition task, utilizing CycleGAN, DiscoGAN, and StyleGAN2 for exploration and performance comparison. Audiovisual Speech Recognition (AVSR) experiments are conducted using the LRS2 and LRS3 corpora. Our experiments reveal that CycleGAN, DiscoGAN, and StyleGAN2 do not effectively address the low-data state problem in AVSR classification. Consequently, we introduce an enhanced model, CycleGAN*, based on the original CycleGAN, which efficiently learns the original dataset features and generates high-quality multimodal data. Experimental results demonstrate that the multimodal datasets generated by our proposed CycleGAN* exhibit significant improvement in Word Error Rate (WER), indicating reduced errors. Notably, the images produced by CycleGAN* exhibit a marked enhancement in overall visual clarity, indicative of its superior generative capabilities. Furthermore, in contrast to traditional approaches, we underscore the significance of collaborative learning. We implement co-training with diverse multimodal data to facilitate information sharing and complementary learning across modalities. This collaborative approach enhances the model's capability to integrate heterogeneous information, thereby boosting its performance in multimodal environments.

293

Multimodal sentiment analysis structure based on transformer

Yifan Gao (PhD)

SUPERVISORS Yushan Pan (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

My work proposes a novel multimodal sentiment analysis structure based on the transformer architecture. By integrating textual, visual, and audio modalities, our model aims to capture comprehensive emotional cues from multimedia data. The transformer's self-attention mechanism enables effective fusion and alignment of multimodal features, enhancing the model's ability to understand and interpret complex emotional expressions. This work highlights the potential of transformer-based models in advancing multimodal sentiment analysis and provides insights for future research in this field.

294

Multi-modality learning approach in Alzheimer's disease: Review

Yifan Guan (PhD)

SUPERVISORS Jun Qi, Wei Wang, Jianjun Chen (XJTLU)
Meng Fang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Alzheimer's disease (AD) is a prevalent neurodegenerative disorder that poses significant challenges for early diagnosis and treatment. The advent of multimodal data analysis has introduced new avenues for understanding and diagnosing AD by combining various diagnostic modalities. And following the evolution of network structure, the development of neural network frame requires more concern on the details understanding and classification. We revolve two phases to display the core phases: introduce the multimodal data which are utilized in AD research; discuss the classification of current multimodal analysis method, from both traditional machine learning and deep learning views. Finally, we give a discussion about the future development direction and some possible challenges in the area research.

295

A Survey on Applications Involving Multi-Device Interaction with Smartwatches

Yihan Liu (PhD)

SUPERVISORS Yu Liu, Yong Yue (XJTLU)
Guangliang Cheng (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Smartwatches have gained popularity due to their portability and data collection capability. Previous research has demonstrated the potential of smartwatches in multi-device environments to enhance user experiences and application capabilities. However, there are no systematic reviews summarizing how smartwatches interact with multiple devices across various contexts. To understand how smartwatches utilized within multi-device ecosystems, we conducted a systematic review of 52 multi-device applications presented at seven leading HCI conferences—CHI, DIS, ISS, MobileHCI, TEI, UbiComp, and CSCW—up to 2023. Our analysis identified 11 device types commonly paired with smartwatches, categorized seven distinct roles they play within multi-device systems, explored application contexts, and summarized evaluation methods. Building on these findings, we discussed existing limitations in the field of smartwatch-integrated multi-device systems and proposed six key directions for future research to expand their application scenarios and functionalities.

296

Business Compliance Detection of Smart Contracts in Electricity and Carbon Trading Scenarios

Yin Wu (PhD)

SUPERVISORS Haijun Wang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University /
School of Cyber Science and Engineering

Business compliance in smart contracts for blockchain-based electricity and carbon trading (B-ECT) remains unexplored. We propose an automated Business Compliance Detection tool for smart contracts (BCDetection) in B-ECT to address this gap. Our innovation encompasses the creation of a benchmark dataset containing both compliant and non-compliant smart contracts, coupled with the deployment of Agent-based Large Language Models (LLMs) to align smart contract codes with prevailing business regulations. The BCDetection tool employs a structured agent for compliance verification, including pre-judgment, feature extraction, fine-grained feature alignment, and consistency judgment. A case study demonstrates its effectiveness. As the field evolves, our approach shows promise for enhancing security and compliance.

297

City2Scene: Improving acoustic scene classification with city features

Yiqiang Cai (PhD)

SUPERVISORS Shengchen Li, Yong Yue (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

Acoustic scene recordings are often collected from a diverse range of cities. Most existing acoustic scene classification (ASC) approaches focus on identifying common acoustic scene patterns across cities to enhance generalization. In contrast, we hypothesize that city-specific environmental and cultural differences in acoustic features are beneficial for the ASC task. In this paper, we introduce City2Scene, a novel framework that leverages city features to improve ASC. City2Scene transfers the city-specific knowledge from city classification models to a scene classification model using knowledge distillation. We evaluated City2Scene on the DCASE Challenge Task 1 datasets, where each audio clip is annotated with both scene and city labels. Experimental results demonstrate that city features provide valuable information for classifying scenes. By distilling the city-specific knowledge, City2Scene effectively improves accuracy for various state-of-the-art ASC backbone models, including both CNNs and Transformers.

298

Multimodal Data Approach for Predicting Sentinel Lymph Node Metastasis in Breast Cancer

Yiyi Miao (PhD)

SUPERVISORS Angelos Stefanidis, Zhengyong Jiang (XJTLU)
Anh Nguyen (UoL)

ACADEMY/SCHOOL School of AI and Advanced Computing

This study explores the effectiveness of a multimodal data approach to predict sentinel lymph node (SNLN) metastasis in breast cancer. Utilizing a dataset labeled 'merged_data2', which includes clinical traits, additional ultrasound (AUS), and Radiomics features, we aim to classify the presence of metastasis. Notably, the dataset is bifurcated into training and test groups with exclusive metrics like TENON scores and MSKCC probabilities applied to the latter. Decision Curve Analysis (DCA) is employed to assess the predictive performance of these metrics at specific thresholds. Our research emphasizes the integration of diverse medical data types to enhance predictive accuracy and clinical utility, demonstrating the potential of advanced data analytics in cancer prognosis.

299

Perceptive Salience in Audio Event Recognition: Exploring the Gap between Human and Model Perception

Yizhou Tan (PhD)

SUPERVISORS Shengchen Li, Jimin Xiao (XJTLU)
Guangliang Cheng (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Audio Event Recognition (AER) typically detects and identifies audio events, but existing models treat all events equally, neglecting their varying significance in different contexts. This leads to discrepancies between model outputs and human auditory perception. Although addressing this issue is critical, it remains underexplored in the DCASE community due to its complexity. This paper introduces the concept of salient audio events, which are the sounds that humans focus on first. To investigate this, a Multi-Annotated Foreground Audio Event Recognition (MAFAR) dataset is created, containing labels from 10 annotators. By analyzing labeling frequency and variance, the dataset quantifies audio salience. Comparing human annotations with predictions from ensemble pre-trained models reveals a gap between human perception and model inference. Experimental results show that humans tend to overlook subtle events, while models are more sensitive to noisy events.

300

Multimedia Modelling and Analytics with Embedded AI Internet of Things

Yuanxin Su (PhD)

SUPERVISORS Yihong Wang (XJTLU)
Jeremy Smith (UoL)

ACADEMY/SCHOOL School of Advanced Technology

This research explores Binary Neural Networks (BNNs) and FPGA-based hardware acceleration. It starts with a discussion on BNNs, focusing on the challenge of the non-differentiable sign function and proposing the hard tanh function for stable backpropagation. The use of the FINN framework for efficient FPGA deployment of BNNs is also covered, detailing both software and hardware optimization techniques. Additionally, an efficient FPGA architecture for image super-resolution is introduced, using mixed-precision and SIMD to reduce computational complexity. The final part presents a Neural Architecture Search (NAS) framework for automating BNN structure design, incorporating L1 and L2 regularization to improve stability and reduce model size. These contributions aim to enhance the performance and resource efficiency of BNNs on embedded systems.

301

Affordance-based human-AmI interaction framework

Yue Li (PhD)

SUPERVISORS Yuji Dong, Yong Yue (XJTLU)
Terry Payne (UoL)

ACADEMY/SCHOOL School of Internet of Things

This research explores the design of multi-sensory human-computer interactions in Ambient Intelligence (AmI) environments. By integrating the concept of bi-directional affordance, it moves beyond traditional one-directional perception cues toward a framework where humans and intelligent systems mutually adjust behaviors and interpretations to achieve cognitive consistency. The study investigates how sensory modalities—such as touch, sight, and sound—can be orchestrated and how human and system affordances can align to create intuitive and cohesive interactions. Through iterative prototyping, user studies, and evaluations, this research aims to derive principles and interaction patterns that inform the design of future AmI systems. The ultimate goal is to enable richer, more meaningful, and universally accessible user experiences where humans and AmI systems seamlessly collaborate, fostering an environment in which sensory information and interaction cues flow bidirectionally to enhance understanding, usability, and satisfaction.

302

A Survey on RL-Based Approaches for Traffic Signal and Joint Vehicle-Signal Control

Yuli Zhang (PhD)

SUPERVISORS Dongyao Jia (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

With the rapid increase in urban vehicular traffic, the need for intelligent traffic management systems has become critical to improve road safety, alleviate congestion, and reduce carbon emissions. Traffic Signal Control (TSC) systems have advanced significantly, leveraging technologies to optimize signal timing and coordination. Data-driven approaches are transforming transportation, robotics, IoT, and power systems. Integrating these techniques into traffic management is essential to tackle modern urban mobility challenges. This paper surveys recent applications of deep reinforcement learning (RL) in traffic control, focusing on TSC and vehicle speed control (VSC) to optimize urban traffic flow and safety. We provide an overview of core deep RL concepts, examine RL models for TSC and vehicle speed control, and highlight their advantages. The survey also explores key RL-based TSC components—state representation, action spaces, and reward structures—that affect performance. Additionally, we discuss challenges and innovations, emphasizing advancements and future pathways for reinforcement learning in vehicle-light coordination systems.

303

Model Security in Music Information Retrieval

Yuxuan Liu (PhD)

SUPERVISORS Shengchen Li (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

Adversarial attacks in Music Information Retrieval (MIR) aim to produce audio samples that sound similar to the original tracks yet cause models to misclassify. Traditional adversarial attack methods often constrain perturbations using simple mathematical norms, which fail to capture the complexities of human auditory perception. Evaluating the auditory similarity between adversarial and original samples is thus crucial not only for improving attack imperceptibility but also for strengthening adversarial defenses. To address this gap, we conducted a human listening test and found that commonly used audio quality metrics in MIR—such as Signal-to-Noise Ratio (SNR), Fréchet Audio Distance (FAD), Log-Spectral Distance (LSD), and PEMO-Q—poorly correlate with human judgments of adversarial perturbations. Motivated by these findings, we trained a perceptual auditory model specifically tailored for adversarial evaluation. Leveraging a multi-scale discriminator pre-trained on an inpainting task and fine-tuning it with limited human auditory ratings, we integrate an attention mechanism to focus on perceptually critical time-frequency regions. Our perceptual model achieves a Spearman correlation coefficient of 0.66 between its outputs and human auditory ratings, surpassing traditional metrics. We further demonstrate its effectiveness in both adversarial attack generation—ensuring perturbations remain imperceptible—and in developing adversarial defenses that better align with human perception. This approach lays a foundation for more perceptually grounded adversarial methodologies in MIR, ultimately contributing to more robust and listener-aligned MIR systems.

304

Integrating Diffusion Models for Enhanced Depth Estimation and Generalization

Yuzheng Feng (PhD)

SUPERVISORS Hongbin Liu (XJTLU)

ACADEMY/SCHOOL School of AI and Advanced Computing

This study aims to enhance the generalization capabilities of advanced depth estimation models by enabling their adaptation to diverse datasets. The work focuses on modifying data preprocessing pipelines, optimizing training configurations, and incorporating intermediate depth outputs for improved interpretability. To address hardware limitations, efficient resource management strategies were employed to facilitate large-scale training on limited computational resources. This research contributes to the development of versatile and efficient depth estimation frameworks capable of handling varying data domains, providing a foundation for robust applications in real-world scenarios.

305

Machine Learning-Based Extraction of Mechanical Properties from Multi-Fidelity Small Punch Test Data

Zhengni Yang (PhD)

SUPERVISORS Rui Yang (XJTLU)
Weijian Han
(JITRI: Yangtze River Delta Advanced Materials Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

We developed a machine learning model using Small Punch Test (SPT) data to predict mechanical properties of steel and aluminum alloys, accounting for different material thicknesses. By integrating low-fidelity Finite Element Method (FEM) data with high-fidelity experimental SPT data, our multi-fidelity model optimizes prediction accuracy. This approach efficiently extracts mechanical properties, offering a practical alternative to traditional, time-consuming tests. It enhances versatility for real-world applications where material thickness varies, advancing material characterization and performance prediction in diverse scenarios.

306

Enhancing Object Detection in Adverse Weather Conditions through Entropy and Guided Multimodal Fusion

Zhenrong Zhang (PhD)

SUPERVISORS Hongbin Liu (XJTLU)
Anh Nguyen (UoL)

ACADEMY/SCHOOL School of AI and Advanced Computing

Robust scene interpretation in autonomous driving requires integrating diverse sensing modalities, but adverse weather and lighting conditions often degrade performance. This paper presents a domain-adaptive object detection framework leveraging deep transfer learning to generalize from labeled clear-weather data to unlabeled adverse-weather conditions. The framework features a Patch Entropy Fusion Module (PEFM) that dynamically integrates sensor data, emphasizing critical information while minimizing distractions. A Weighted Decision Module (WDM) further optimizes detection accuracy by adjusting sensor contributions based on environmental conditions. To address domain discrepancies, we incorporate a domain alignment loss during training, reducing feature map differences between clear and adverse weather datasets. Our framework is evaluated on ExDark, Cityscapes, and Dense datasets, achieving state-of-the-art performance across all benchmarks. By addressing sensor fusion and domain adaptation challenges, this approach significantly enhances object detection under complex real-world conditions.

307

Multi-Agent Reinforcement Learning for Dynamic Benchmark-Driven Portfolio Management

Zhepeng Li (PhD)

SUPERVISORS Jionglong Su, Angelos Stefanidis, Zhengyong Jiang, Siqi Huang (XJTLU)
Angel Garcia Fernandez (UoL)

ACADEMY/SCHOOL School of AI and Advanced Computing

As reinforcement learning (RL) grows more popular, portfolio management increasingly uses RL frameworks. Traditionally, benchmarks guide both active and passive investing. We propose a new approach combining multi-agent RL and benchmark construction. A primary agent oversees multiple sub-agents, each representing a distinct investment style, and trains them with RL to adapt strategies to changing market conditions. The primary agent coordinates capital distribution, forming a benchmark portfolio from their learned strategies. Furthermore, the RL-based benchmark serves as a dynamic reference for each style, enabling sub-agents to adapt, optimize returns, and manage risk more effectively. Our method offers a more agile, advanced solution for portfolio management.

308

FinBPM: A Framework for Portfolio Management-based Financial Investor Behavior Perception Model

Zhilu Zhang (PhD)

SUPERVISORS Jionglong Su (XJTLU)
Procheta Sen (UoL)

ACADEMY/SCHOOL School of AI and Advanced Computing

FinBPM takes both the factor pertaining to the impact on operations of the company and the factor of the irrational investment of the speculator into consideration. For our experimentation, we randomly selected 12 stocks from the Dow Jones Industrial Index to construct our portfolio. The experimental results reveal that, in comparison to conventional reinforcement learning methods, our approach with at least 13.26% increase over other methods compared. Additionally, it achieved the best Sharpe ratio of 2.77, effectively maximizing the return per unit of risk.

309

Modeling on the UHSS Resistance Spot Welding Process Based on Data Mining and Machine Learning Algorithms

Zhongjie Yue (PhD)

SUPERVISORS Jia Wang (XJTLU)
Baoru Huang (UoL)
Weijian Han
(JITRI: Yangtze River Delta Advanced Materials Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

This project will use artificial intelligence methods to study resistance spot welding systems. Based on data collection, physical testing, and simulation testing, machine learning methods will be used to predict welding results. It is expected that the results of this research will include an accurate resistance spot welding process prediction model, which can provide reasonable welding parameters for welders to achieve the best welding effect on ultra-high-strength steel.

310

An experimental and numerical study of the role of node fillet on the fatigue strength of lattice materials

Zhouyi Xiang (PhD)

SUPERVISORS Min Chen, Konstantinos Papadikis (XJTLU)
Maulik Patel (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Additive manufacturing (AM), particularly Selective Laser Melting (SLM), enables the development of lattice structures with unique properties. Despite the large body of studies on the mechanical response of specific lattice structures, there is limited study on the fatigue property of subdivided lattice structures. This work investigates the fatigue property of subdivided lattice structures experimentally and numerically. The uni-axial tensile fatigue test of subdivided lattice structure is carried out to obtain the fatigue life, and the fractography of the specimen is analysed through Scanning Electron Microscopy (SEM). Finite Element Analysis (FEA) is employed to predict the crack initiation time of lattice structure. In the case of unknown loading history, Melan's shakedown theorem is adopted to predict the loading capacity. This research provides a reference for the fatigue property evaluation of subdivided lattice structures.

311

ZeroDiff: Solidified Visual-semantic Correlation in Zero-Shot Learning

Zihan Ye (PhD)

SUPERVISORS Xiaobo Jin (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

Zero-shot Learning (ZSL) aims to enable classifiers to identify unseen classes. This is typically achieved by generating visual features for unseen classes based on learned visual-semantic correlations from seen classes. However, most current generative approaches heavily rely on having a sufficient number of samples from seen classes. Our study reveals that a scarcity of seen class samples results in a marked decrease in performance across many generative ZSL techniques. We argue, quantify, and empirically demonstrate that this decline is largely attributable to spurious visual-semantic correlations. To address this issue, we introduce ZeroDiff, an innovative generative framework for ZSL that incorporates diffusion mechanisms and contrastive representations to enhance visual-semantic correlations. ZeroDiff comprises three key components: (1) Diffusion augmentation, which naturally transforms limited data into an expanded set of noised data to mitigate generative model overfitting; (2) Supervised-contrastive (SC)-based representations that dynamically characterize each limited sample to support visual feature generation; and (3) Multiple feature discriminators employing a Wasserstein-distance-based mutual learning approach, evaluating generated features from various perspectives, including pre-defined semantics, SC-based representations, and the diffusion process. Extensive experiments on three popular ZSL benchmarks demonstrate that ZeroDiff not only achieves significant improvements over existing ZSL methods but also maintains robust performance even with scarce training data.

312

Is your model really a good math reasoner? Evaluating mathematical reasoning with checklist

Zihao Zhou (PhD)

SUPERVISORS Qiufeng Wang, Wei Wang (XJTLU)
Xiaowei Huang (UoL)
Kaizhu Huang (DKU: Duke Kunshan University)

ACADEMY/SCHOOL School of Advanced Technology

Exceptional mathematical reasoning ability is one of the key features that demonstrate the power of large language models (LLMs). How to comprehensively define and evaluate the mathematical abilities of LLMs, and even reflect the user experience in real-world scenarios, has emerged as a critical issue. Current benchmarks predominantly concentrate on problem-solving capabilities, presenting a substantial risk of model overfitting and fails to accurately measure the genuine mathematical reasoning abilities. In this paper, we argue that if a model really understands a problem, it should be robustly applied across a diverse array of tasks. To this end, we introduce MathCheck, a well-designed checklist for testing task generalization and reasoning robustness, as well as an automatic tool to generate checklists efficiently. MathCheck includes multiple mathematical reasoning tasks and robustness tests to facilitate a comprehensive evaluation of both mathematical reasoning ability and behavior testing. Utilizing MathCheck, we develop MathCheck-GSM and MathCheck-GEO to assess math textual reasoning and multi-modal reasoning abilities, respectively, serving as upgraded versions of benchmarks including GSM8k, GeoQA, UniGeo, and Geometry3K. We adopt MathCheck-GSM and MathCheck-GEO to evaluate 26 LLMs and 17 MLLMs. Our results demonstrate that while frontier LLMs like GPT-4o continue to excel in various abilities on the checklist, many other model families exhibit a significant decline. Further experiments indicate that, compared to traditional math benchmarks, MathCheck better reflects true mathematical abilities and represents mathematical intelligence more linearly, thereby supporting our design. Using MathCheck, we can efficiently conduct informative behavior analysis to deeply investigate models. Finally, we show that our checklist paradigm can easily extend to other reasoning tasks.

313

Detecting Conversational Mental Manipulation with Intent-Aware Prompting

Zimu Wang (PhD)

SUPERVISORS Wei Wang, Qiufeng Wang, Qi Chen (XJTLU)
Anh Nguyen (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Mental manipulation severely undermines mental wellness by covertly and negatively distorting decision-making. While there is an increasing interest in mental health care within the natural language processing community, progress in tackling manipulation remains limited due to the complexity of detecting subtle, covert tactics in conversations. In this paper, we propose Intent-Aware Prompting (IAP), a novel approach for detecting mental manipulations using large language models (LLMs), providing a deeper understanding of manipulative tactics by capturing the underlying intents of participants. Experimental results on the MentalManip dataset demonstrate superior effectiveness of IAP against other advanced prompting strategies. Notably, our approach substantially reduces false negatives, helping detect more instances of mental manipulation with minimal misjudgment of positive cases.

314

FFR: Frequency Feature Rectification for Weakly Supervised Semantic Segmentation

Ziqian Yang (PhD)

SUPERVISORS Quan Zhang (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

Image-level Weakly Supervised Semantic Segmentation (WSSS) has garnered significant attention due to its low annotation costs. Current single-stage state-of-the-art WSSS methods mainly rely on ViT to extract features from input images, generating more complete segmentation results based on comprehensive semantic information. However, these ViT-based methods often suffer from over-smoothing issues in segmentation results. In this paper, we identify that attenuated high-frequency features mislead the decoder of ViT-based WSSS models, resulting in over-smoothed false segmentation. To address this, we propose a Frequency Feature Rectification (FFR) framework. Quantitative and qualitative experimental results demonstrate that our FFR framework can effectively address the attenuated high-frequency caused over-smoothed segmentation issue and achieve new state-of-the-art WSSS performances. Codes will be released.

315

A Multiple Case Study to Evaluate Usability of Current Unmanned Surface Vehicle system

Zitian Peng (PhD)

SUPERVISORS Yong Yue, Xiaohui Zhu, Mengjie Huang (XJTLU)
Prudence Wong (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Unmanned Surface Vehicles (USVs) hold great potential across diverse missions, yet complex aquatic environments still require human oversight and present unique challenges in Human-Robot Interaction (HRI) design. To identify these challenges and contribute to effective HRI in USV systems, we conducted in-depth interviews with key stakeholders and observed multiple field operations, using inductive methods to evaluate current USV usability. Our findings reveal existing limitations and outline three common USV use cases with critical evaluation criteria, providing valuable insights into operators' mental models.

316

Multi-sensor fusion on autonomous driving perception: A comprehensive survey

Zixuan Chu (PhD)

SUPERVISORS Hongbin Liu (XJTLU)
Xiaowei Huang (UoL)

ACADEMY/SCHOOL School of AI and Advanced Computing

This paper reviews recent advancements in multi-sensor fusion for autonomous driving (AD) perception. While sensors like cameras and LiDAR have significantly improved perception, their limitations—such as the lack of depth in RGB images and LiDAR's reduced performance in complex environments—necessitate multi-modal fusion. The review examines key open-source datasets, the types of sensors (camera, LiDAR, millimeter-wave radar), and the perception tasks they support. It evaluates the performance of single-modality perception and highlights the advantages of integrating these technologies through fusion. The paper innovatively categorizes fusion algorithms from both technical and task-oriented perspectives, moving beyond traditional stage-based models. In conclusion, it identifies current research gaps and proposes future directions to advance the development of AD perception systems, aiming for greater accuracy and robustness in diverse driving conditions.

317

A Decentralized Fair Data Trading Ecosystem Based on Verifiable Proxy Re-Encryption

Ziyang Ji (PhD)

SUPERVISORS Jie Zhang (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

Data trading has become a vital aspect of commerce in the digital age, offering significant economic opportunities. Blockchain technology enables decentralized data trading, granting users full control over their data and facilitating direct peer-to-peer transactions. However, this also introduces fairness challenges, such as sellers refusing to deliver correct data or buyers failing to pay. To address these issues, this paper proposes a decentralized fair data trading ecosystem leveraging cryptography and smart contracts. A novel Verifiable Proxy Re-Encryption (VPRE) scheme is introduced, ensuring transactions succeed only if the seller provides a valid re-encryption key and the buyer pays correctly. Experiments demonstrate the system's effectiveness in ensuring fairness and security at an affordable cost.

318

Cyberbullying Detection in Session-Scenario

Ziyu Ye (PhD)

SUPERVISORS Huakang Li (XJTLU)

ACADEMY/SCHOOL School of AI and Advanced Computing

The development of the Internet and social media platforms has provided people with unlimited access to information, and greatly facilitated their daily lives. However, the Internet has brought about some negative impacts including cyberbullying. This work introduces the scenario of cyberbullying detection in most recent research, which is comment-level scenario. Most research uses supervised learning and is based on classification of comment task, which means previous research does not concentrate on interaction between users. In real world, cyberbullying happens between user interactions, and cyberbullying detection needs to recognize the user interaction pattern. Thus, this work introduces a session-level scenario for cyberbullying detection.

319

Integrating Technological Innovations in Collaborative Music Making Among Professional Musicians

Ziyue Zhang (PhD)

SUPERVISORS Yushan Pan (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

Computer-Supported Cooperative Work (CSCW) has a longstanding tradition of facilitating collaboration among individuals, including in music creation. However, most studies in music creation primarily focus on music generation and individual interaction with supportive software for music writing. Despite the potential usefulness of current technology, it remains unclear how technology can effectively support teams in collaboratively creating music, leaving ample room to explore how musicians actually work in their everyday workplace. Through a design ethnographic perspective, this project unveils the work practices of a band, providing detailed descriptions of the music creation process. The project contributes to our understanding of music creation from several dimensions, including creative synergy, communication, repository building, and privacy protection. In conclusion, we offer reflections on implementation to inform future designs that may better support musicians with suitable technological solutions. This highlights the importance of the CSCW perspective in bridging the gap between academia and industry, emphasizing the need for collaborative efforts in advancing technology for music creation.

320

Revitalizing psychological counseling through AI intervention

Bowen Li (PhD)

SUPERVISORS Samiullah Paracha (XJTLU)
Maria Limniou (UoL)

ACADEMY/SCHOOL Academy of Future Education

My study hopes to discuss the impact of AI on users' social networks from a social psychological perspective. If AI has the ability to become a source of social support for users, then to some extent AI also has some characteristics of an independent individual, which is useful to explore the ethical rules of AI counseling in depth. Regarding the research method, this study hopes to adopt a mix method research approach by designing an experiment of long duration, simulating the process of real counseling and collecting data through scales.

321

Increasing Learning Motivation among Vocational College Students: A Case Study of Constructivist Teaching Practices Based on Self-Determination Theory

Chang Liao (Master)

SUPERVISORS Ting Ting Tay (XJTLU)

ACADEMY/SCHOOL Academy of Future Education

In China, vocational college students are a large population of young learners, and many educators and researchers have commented on low-motivated vocational college students (Shen & Chen, 2017). Integrating self-determination theory (SDT) and constructivist teaching practice (CTP), the author designed a mixed method study with the Chinese version of the Motivated Strategies for Learning Questionnaire (MSLQ-C) and a semi-structured interview. The aim of the study was to explore the effectiveness of the intervention and the associated challenges. Two classes of 48 students from a local vocational college participated in this study. The students completed the survey before and after the six-week intervention. The author conducted paired sample t-tests for both classes and found that the results showed statistical significance in the improvement of learning motivation. Qualitative results from interview highlighted the students' positive performance during intervention and presented challenges for educators of using CTP at vocational colleges in China.

322

Supervision Across Cultures: Exploring Doctoral Relationships in a Transnational University Context

Cheng Cui (PhD)

SUPERVISORS Qian Wang, Jeong Jin Yu, Rong Yan (XJTLU)
Martin Gough (UoL)

ACADEMY/SCHOOL Academy of Future Education

The rapid expansion of Transnational Higher Education (TNHE) calls for a deeper exploration of doctoral education within this unique context. TNHE academic culture is not a mere transfer or superficial blend of education systems but a dynamic space where diverse cultures interact to form new institutional norms. These cultural complexities significantly shape supervisor-supervisee relationships, distinguishing them from those in monocultural, homegrown institutions. This study adopts a narrative inquiry approach, using semi-structured interviews with 4 pairs of supervisors and doctoral students at a Chinese-based transnational university to examine their reflections on these relationships. Anchored in a conceptual framework that integrates critical pedagogy, Foucault's theory of power, and multicultural education, the study investigates culturally bound supervision practices and power dynamics in these interactions. Findings reveal the nuanced role of academic culture in shaping supervision practices and relationships, highlighting the need for culturally responsive approaches. The study provides actionable recommendations, such as enhancing supervisors' cultural intelligence and fostering intercultural dialogue, to improve the quality of doctoral education in multicultural TNHE environments.

323

Professional Quality Expectations of Freshmen: A Systematic Literature Review of Chinese College Art Teachers' Perspectives

Chenye Zhang (PhD)

SUPERVISORS Ting Ting Tay, Jeong Jin Yu (XJTLU)
Victorina Gonzalez Diaz (UoL)

ACADEMY/SCHOOL Academy of Future Education

This systematic literature review investigates the expectations of Chinese college art teachers regarding the professional quality of incoming freshmen. Specifically, it examines the expectations teachers have for students aspiring to enter their programs and how they address the gaps between these expectations and students' actual abilities. Through a comprehensive synthesis of existing studies, this review highlights that Chinese art teachers expect freshmen to demonstrate foundational artistic skills, creativity, and discipline. However, significant gaps in students' practical skills, conceptual understanding, and artistic maturity often emerge. Teachers employ various strategies, including diagnostic assessments, tailored remedial courses, and mentoring programs, to bridge these gaps and align students' capabilities with academic and professional standards. The findings provide insights into the evolving demands of art education in China and offer recommendations for refining curricula and teaching methods to better support incoming students' development.

324

Unveiling the Role of Distributed Leadership in Shaping Teacher Digital Literacy and Well-being: Insights from a Sino-Foreign Collaborative Educational Setting

Chunxi Liu (PhD)

SUPERVISORS Peng Liu, Youmin Xi (XJTLU)
Gayle Brewer (UoL)

ACADEMY/SCHOOL HeXie Academy

This study explores the role of distributed leadership in shaping teacher digital literacy and its subsequent impact on teacher well-being. In the context of Sino-foreign cooperative higher education institutions, the research examines how distributed leadership practices, which emphasize collaboration and empowerment, foster teacher digital competence. By integrating both quantitative and qualitative methods, this study investigates whether teacher digital literacy mediates the relationship between distributed leadership and teacher well-being. Findings suggest that distributed leadership enhances teacher digital literacy, which, in turn, improves job satisfaction, psychological well-being, and professional fulfillment. This research offers valuable insights into how leadership practices can promote teacher well-being through digital competence, providing practical implications for improving teacher performance and institutional effectiveness in higher education settings.

325

When the Body, Heart, and Mind are All Involved in Learning - That is True Engagement! Exploring Faculty Perspectives on Student Engagement within Classrooms

Di Liu (PhD)

SUPERVISORS Samiullah Paracha, Jeong Jin Yu (XJTLU)
Sam Saunders (UoL)

ACADEMY/SCHOOL Academy of Future Education

While student engagement has received increasing attention in the field of education, limited research has explored faculty perceptions of student engagement in classrooms in higher education, especially within the context of technology-assisted learning. Therefore, this qualitative research interviewed 12 academic staff in one Sino-foreign university in China to explore their perceptions of student engagement in classrooms, and the data was analyzed using thematic analysis. This could be specific to the challenges, effective teaching strategies, the most perceived technologies, and the benefits and pitfalls of using Student Response Systems (SRSs). The results presented a comprehensive and broad picture of academic staff's challenges and strategies in fostering student engagement in higher education. The results provide a step forward to support academic staff in the challenges of student disengagement in tech-assisted classroom learning, which could be a foundation for further experimental research.

326

A Longitudinal Study on Students' Perception Change of Employability: A Social-psychology Perspective

Hanlihui Ma (PhD)

SUPERVISORS Qian Wang (XJTLU)
Gemma Wattret (UoL)

ACADEMY/SCHOOL Academy of Future Education

Employability is central to higher education's mission and curriculum development. So far, the commonly used definition of the term comes from society and industrial expectations of talent. Few studies investigate students' understanding of employability and what influenced their understanding. Grounded in the Field Theory, this research conducted two rounds of interviews during two-year intervals with 13 college students in a work-integrated learning program. The study found that, for students with higher agency and critical reflection ability, they proactively refer to habitus from the macro-environment of industry to make meaning of employability. Habitus from their target field in industry later impacted those students' evaluation of their personal capital and confidence in employment preparedness. The study offers valuable insights for HE policymakers and practitioners in curriculum design and pedagogical practice to enhance student employability.

327

Why commitment becomes difficult: a qualitative study on the ruminative career exploration experience

Huaiyuan Zhang (PhD)

SUPERVISORS Youmin Xi, Xiaojun Zhang (XJTLU)
Gayle Brewer (UoL)

ACADEMY/SCHOOL Academy of Future Education

Career identity, as a significant component in student employability, is formed through a process of transition from career exploration to career identity commitment. However, it is widely observed that people could be stuck in ruminative exploration, engaging with extensive career explorations while worrying about making a firm commitment to a certain possible identity. While acknowledging the important role that contextual social factors play in one's identity formation, current studies give limited explanation on why certain people experience difficulties transiting from career exploration to career commitment other than attributing to personal characteristics. This study explains career identity formation as a social learning process and use qualitative methods to describe the characteristics of the ruminative exploration experience among students in the transition from higher education to the workplace. The findings reflects the contextual factors that contribute to the difficulties in career identity commitment-making. Indications are discussed.

328

Empowering Later Life: An Analysis of Senior Universities in Suzhou

Hui Li (PhD)

SUPERVISORS Qiuling Chao, Yu Song (XJTLU)
Susan Pickard (UoL)

ACADEMY/SCHOOL Academy of Future Education

Amidst China's rapidly aging population, senior education is a pivotal tool for active aging. This study investigates the social structural issues within senior universities in Suzhou, focusing on the context, policies, and mechanisms that shape these institutions. By examining how senior universities empower older adults, the research seeks to identify strategies that can lead to social empowerment. The aim is to foster a more inclusive and equitable society by addressing and understanding the power dynamics and social inequalities present in this educational setting.

329

Exploring the metacognition of self-directed informal learning on social media platforms: Taking time and social interactions into consideration

Huijin Lu (PhD)

SUPERVISORS Youmin Xi, Xiaojun Zhang (XJTLU)
Maria Limniou (UoL)

ACADEMY/SCHOOL Academy of Future Education

Social media has been recognized as a promising online communication environment that supports self-directed informal learning activities outside educational institutions. Development of metacognition is necessary for self-directed learning. Nevertheless, most studies have focused on the use of social media for formal learning. To fill this gap, we consider the specific nature of informal learning on social media and conduct an empirical study targeting individuals who initiate informal learning on one of the most popular social media platforms in China (Bilibili). We derive a new term, Metacognitive Involvement (MCI), to consider multiple facets of metacognition and examine how MCI patterns change over time and their associations with social interactions based on Social Network Analysis (SNA). In total, 2,434 comments are manually coded and analyzed from one of Bilibili's most popular learning channels. Our findings reveal that unlike in formal learning where learners do not divulge regarding metacognition, in an informal learning environment they are more active in sharing MCI across time. Furthermore, MCI plays the role of, among others, triggering interactions and MCI-related patterns. It highlights that informal learning on social media is turning MCI development from a static reflection by individuals to a highly dynamic and ongoing process impacted by others. The implications of this study are related to a further understanding of learners' MCI development as well as how the dynamic mechanisms of informal learning on social media could promote personal development.

330

Students' engagement in virtual internationalization: Enacting the students as partners in virtual mobility

Jiajun Li (Master)

SUPERVISORS Irina Shcheglova (XJTLU)

ACADEMY/SCHOOL Academy of Future Education

The rapid development of virtual internationalization (VI) programs in universities, accelerated by the COVID-19 pandemic, has offered students unprecedented opportunities for cross-cultural learning. However, research on student engagement in VI programs, especially at non-elite universities in China remains limited. This study explores students' perceptions of engagement in VI programs at a non-elite university in Shanghai. Data were collected through semi-structured interviews with twelve students enrolled in VI programs with various academic backgrounds. The findings indicate that students valued the flexibility of online learning and the opportunity for collaboration with teachers and peers across diverse backgrounds in VI programs. Additionally, responsive teaching and tailored feedback were recognized to enhance engagement. The study highlights the need for a supportive, participatory learning environment and contributes to the literature on VI programs and student engagement in non-elite universities and offers insights on improving program design in such contexts.

331

Components constitute the language assessment literacy of Chinese EFL teacher educators in international K-12 schools

Jingjing Fu (PhD)

SUPERVISORS Xiaojun Zhang, Youmin Xi (XJTLU)
Gayle Brewer (UoL)

ACADEMY/SCHOOL Academy of Future Education

Teacher's AL is an essential part of teachers' competence (Popham, 2009; DeLuca et al., 2016), ample empirical evidence is indicating that such literacy appears insufficient (e.g. DeLuca & Klinger, 2010; Lam, 2015; Vogt & Tsagari, 2014; Volante & Fazio, 2007). Importantly, how teachers conceptualize assessment is found to influence their uptake of assessment knowledge and implementation of assessment practices (Brookhart, 2011; Deneen and Boud, 2014; Barnes et al., 2015; Fulmer et al., 2015; Xu and Brown, 2016). Despite the crucial role of assessment in education in general and in language assessment in specific, research on language teachers' assessment literacy (LAL) is still in its infancy. Additionally, while increasingly research insights are available on components that constitute LAL, how such components interrelate is largely unexplored. The study was developed in response to the need for quality K-12 classroom assessment practice and low levels of language teachers' assessment literacy that has persisted for decades (DeLuca & Johnson, 2017; Popham, 2009; Stiggins, 1991).

332

Beyond Compliance: The Next Era of ESG among Chinese Cosmetics Companies

Jingwen Xia (PhD)

SUPERVISORS Peng Liu, Youmin Xi (XJTLU)
Urmila Thakur (UoL)

ACADEMY/SCHOOL HeXie Academy

In the last two decades, global cosmetics companies have taken ESG (Environmental, Social, Governance) as an opportunity to promote the paradigm shift of sustainable business and establish a leading edge. Compared with international cosmetics companies, the ESG transformation of Chinese cosmetics companies is still in the preliminary stage, which places high emphasis on ESG compliance. The qualitative research method is used to review the hotspots of domestic and foreign literature on the current macro environment of China's ESG development and conclude through grounded theory. The conclusion points out that Chinese cosmetics companies should not only stay in the preliminary stage of ESG transformation but also strive to move to the next stage, which goes beyond ESG compliance. Also discussed and analyzed are the major initiatives of upgrading from ESG compliance to ESG value creation. The findings will benefit entrepreneurs, managers, regulators, practitioners, and investors in the Chinese cosmetics industry to develop a deeper understanding of and take more effective actions on ESG.

333

另开生面，以心解锁 The influence of achievement goal orientation and perception of a university's learning culture ecosystem on student intent to volunteer for entrepreneurial service-learning

Joseph Eugene Iesue (PhD)

SUPERVISORS Jinjin Lu, Xiao Wang (XJTLU)
Kirsty Morrin (UoL)

ACADEMY/SCHOOL Academy of Future Education

This research investigates how students' achievement goal orientations and the university's learning culture, framed by Achievement Goal Theory, Dimensions of Learning Organizations, and Ecological Systems Theory, influence engagement in entrepreneurial service-learning. Focusing on university settings, this research observes the crucial role of perceived university learning environments and student achievement goals, informed by a sociological perspective, in enhancing student engagement in activities that raise their community entrepreneurial situational awareness. Utilizing mixed-methods methodology, the research combines quantitative analyses of goal orientations and learning culture with qualitative insights into student perceptions and objectives. The results will provide insights into how university learning cultures impact student prosocial behavior willingness and actionable recommendations for enhancing entrepreneur service-learning programs within higher education. Future research opportunities can focus on achievement goals, prosocial engagement, and improving entrepreneurial activities by advancing educational sociology theoretical frameworks.

334

Artificial Intelligence Literacy Education: A Scoping Literature Review from 2020-2024

Ling Xia (PhD)

SUPERVISORS Xiaojun Zhang (XJTLU)
Tunde Varga-Atkins (UoL)

ACADEMY/SCHOOL Academy of Future Education

AI literacy education is crucial for preparing students to engage with an increasingly AI-driven world. This study presents a scoping literature review of AI literacy education research from 2020 to 2024. The analysis of 47 relevant papers shows that while Generative AI (GenAI) is gaining prominence, its impact on AI literacy education is not evident yet. The review also highlights a growing body of research on developing valid measurement tools for AI literacy. In addition, there has been an emergence of age-appropriate curricula and more evaluation methods of the effectiveness of AI literacy courses and workshops. This review also offers several recommendations for future studies in AI literacy education.

335

The Privileged Path: Live-In-Home Tutors in Chinese Affluent Families

Lu Liu (PhD)

SUPERVISORS Lixin Ren (XJTLU)
Daniela Tepe-Belfrage (UoL)

ACADEMY/SCHOOL Academy of Future Education

In recent years, China has been witnessing a new trend in childrearing: an increasing number of high-income families are hiring live-in-home tutors as part of their strategy for their children's development. The involvement of live-in-home tutors reshapes the process of cultural capital transmission and reproduction, thereby influencing existing educational inequalities and social structures. Despite its growing prevalence, this practice remains under-researched. Using an ethnographic approach, this study explores the diverse habitus among affluent families, highlighting the distinct role live-in-home tutors play in their childrearing practices. These findings not only contribute to research on the circulation and transformation of cultural capital but also enrich the ongoing scholarly debate about the relative importance of parents' resources and values in shaping childrearing practices. This research offers a new perspective on how educational inequality is being redefined in China.

336

The role of language in algebraic learning: a bilingual training experiment

Qi Zhou (PhD)

SUPERVISORS Jike Qin, Jeong Jin Yu (XJTLU)
Daniel Roberts (UoL)

ACADEMY/SCHOOL Academy of Future Education

The role of language in mathematical thinking has received increasing attention, with convincing evidence suggesting that natural language plays a key role in arithmetic. However, it remains unclear whether this relationship extends to other math subdomains, such as algebra. This study investigated whether the language of learning influenced algebraic learning using a bilingual training paradigm. Thirty-nine Chinese-English bilingual undergraduates were trained in either language to solve arithmetic and algebra problems, then tested in both languages. Results revealed a dissociation between arithmetic and algebra: responses were faster in the trained language compared to untrained language (language switch effect) for arithmetic but not for algebra. Additionally, analysis of the foil type of algebra problem suggested that algebraic learning follows an "operator-first"principle, where participants tend to learn the rule of operators prior to operands. These findings indicate that algebraic learning is language-independent and rule-based, contrasting with the language-dependent nature of arithmetic.

337

Beliefs and Opinions of Chinese Kindergarten Educators on Outdoor Environments

Tian Hong (PhD)

SUPERVISORS Ting Ting Tay, Marco Cimillo, Jinjin Lu (XJTLU)
David Chow (UoL)

ACADEMY/SCHOOL Academy of Future Education

This study focuses on understanding the beliefs and opinions of kindergarten educators in Guangdong Province, China, regarding the outdoor environment in kindergartens. Kindergarten educators, including principals and teachers, are crucial in shaping young children's educational and developmental experiences. The research seeks to explore their perceptions of what constitutes an effective outdoor environment and how these perceptions influence the design and use of such spaces in kindergartens. The methodology involves collecting data primarily through interviews with the educators. Grounded theory will be employed to analyze the interview data, allowing for the identification of common themes and patterns in educators' beliefs and opinions. This approach will help uncover how principals' perspectives and teachers' roles contribute to developing and utilising outdoor environments in kindergartens. The study aims to provide insights into what educators consider essential for creating effective outdoor learning environments and how these environments can support child development. By understanding these beliefs and opinions, the research hopes to inform future practices and policies related to the design and implementation of outdoor spaces in early childhood education settings.

338

Value Cohesion in the 21st Century: Reassembling British Higher Education Transnational Education Provision in China

Ting Zhang (PhD)

SUPERVISORS Yiran Zhao, Xiaojun Zhang (XJTLU)
Charlotte Branchu (UoL)
Michael James Day (UoG: University of Greenwich)

ACADEMY/SCHOOL Academy of Future Education

Under neoliberalism and internationalisation, Transnational education (TNE) has proliferated in the global higher education (HE) frame. Over the past two decades, Sino-British joint venture universities have been increasingly established through TNE partnerships in China. The apparent significance of this undertaking is promoting cultural exchange between the East and the West. Yet, inviting British HE into the Chinese HE system to establish joint venture universities is highly complex. It raises a critical question of how authentic the student experience is within joint venture universities and whether it can genuinely reflect global HE values. This project studies the cross-cultural complexity and power dichotomies within Sino-British HE contexts. It explores challenges in how TNE partnerships catalyse pedagogy, leadership, and technology shifts in this post-digital area. It offers an interdisciplinary approach to navigating this complex landscape and informs future practices for global universities to build meaningful educational transformation.

339

From Logic Assimilation to Logic Contraction: A case study of Deinstitutionlization in Transnational Higher Education in China

Weiran Zheng (PhD)

SUPERVISORS Xiaojun Zhang (XJTLU)

ACADEMY/SCHOOL Academy of Future Education

This study examines the active assimilation of an emerging logic—Western higher education ideas into a comprehensive Chinese university through transnational higher education (TNE). Intriguingly, the collaboration between two universities evolved in a remarkably healthy manner over a decade, marked by teaching excellency, remarkable students' outcomes and financial stability. However, it abruptly contracted, leading to the partnership termination and the rejection of the emerging logic. Employing the institutional logics perspective, the study proposed an analytical model to reveal the emerging logic's developmental changes—from assimilation, elaboration, expansion to contraction, eventually rejection—based on in the interplay of individual, organizational and societal levels. It highlights how an emerging logic was introduced and evolved into a mature organization within the framework of Chinese higher education over a decade. It underscores the significance of logics interactions and contestations across multi-levels, offering a nuanced understanding of the dynamics at play in the field of TNE in China.

340

The role of organizational support, emotion regulation ability, technostress for faculty's digital professional competence

Xiaochen Lin (PhD)

SUPERVISORS Qian Wang (XJTLU)
Maria Limniou (UoL)

ACADEMY/SCHOOL Academy of Future Education

Digital transformation in higher education institutions promotes equitable education. As the higher education content provider, faculty should develop digital teaching competence to use digital technologies effectively. However, limited research has investigated how to facilitate faculty's digital teaching competence from an emotional perspective. This research filled this gap by linking faculty's emotion regulation abilities and techno-eustress with digital teaching competence. Using data from 336 Chinese faculty, this research adopted the partial least squares structural equation modeling method (PLS-SEM) for analysis. Results showed that faculty's emotion regulation abilities and techno-eustress positively predict digital teaching competence; faculty's techno-eustress moderates emotion regulation abilities and digital teaching competence. This research provides practical implications for cultivating the faculty's digital teaching competence.

341

The Impact of Social Media Use (Red) on College Students' Self-Efficacy and Perception of Academic Stress

Xilin Jin (Master)

SUPERVISORS Run Wen (XJTLU)

ACADEMY/SCHOOL Academy of Future Education

In recent years, academic stress has become a significant issue among college students in China, with growing attention on the influence of social media usage. This study aims to investigate the impact of Red usage on academic self-efficacy and academic stress among Chinese college students. The sample comprised 620 participants, nfemale = 374, nmale = 246, aged between 17 and 35 years old. A quantitative cross-sectional design was adopted, with data collected through Red usage questionnaire, Academic Self-efficacy Scale (ASE), and Academic Stress Scale (PAS). Data were analyzed by using SPSS, and hypotheses were tested through different analysis. The findings showed that Red usage was positively correlated with both academic self-efficacy and academic stress, suggesting that Red play a role in enhancing students' academic confidence while also contributing to increased stress. These results offer valuable insights for students and educators, suggesting that Red usage can be leveraged to enhance self-efficacy.

342

Trajectories of Children' s Reading Ability and the Longitudinal Associations with Teacher and Parental Engagement across Elementary School Years

Xin Han (PhD)

SUPERVISORS Jeong Jin Yu, Qian Wang (XJTLU)
Raluca Petrican (UoL)

ACADEMY/SCHOOL Academy of Future Education

Reading ability of early childhood is instrumental in shaping various facets of a child's development. Previous research mainly focuses on the components, development, and challenges of children's reading ability. Little is known about the predictive factors of the heterogeneous developmental trajectories of children's reading ability, and the dyadic longitudinal associations between these factors and children's reading ability. This study aims to explore the developmental trajectories of children's reading ability, assess the predictive effects of child-, teacher-, and parent-related factors, and investigate the reciprocal effects of teachers' instructional activities and parental engagement on reading ability. Data is taken from The Early Childhood Longitudinal Study (ECLS-K:2011) by the National Center for Education Statistics.

343

Strategy as Space: How Powerful Authorities Introduce New Competing Institutional Logics into Existing Mature Institutional Environments

Xin Xu (PhD)

SUPERVISORS Xiaojun Zhang, Youmin Xi (XJTLU)
Kirsty Morrin (UoL)

ACADEMY/SCHOOL Academy of Future Education

This study explores how powerful authorities at meso-level introduce new institutional logics into existing mature institutional environments to initiate fast but radical change. Institutional theorists consider multiple logic driven organizational change as a long-term evolutionary process which can't interpret the situation that powerful authorities take quick and purposely strong actions to make the change happen in a short period of time. Building on an in-depth qualitative study of the paradigm transformation in Chinese universities initiated by the central government, we conceptualize organizational strategy as a space where new and existing logics clash and are actively manipulated by organizational actors. Additionally, we analyze the varying degrees to which competing new logic has penetrated the areas of objective, process, and supporting system within. Our findings reveal a designed approach to organizational change driven by institutional logics and enrich the typology of space by conceptualizing organizational strategy as a space for interactions between divergent logics. We also contribute to research in strategy by reconsidering the role of mid-term strategy in organizational change as a space for the battle between multiple institutional logics.

344

Intergenerational transfer of tacit knowledge and its role in shaping role identity of successors in Chinese family firms

Xingyu Zhou (PhD)

SUPERVISORS Peng Liu, Youmin Xi (XJTLU)
Chao Fang (UoL)

ACADEMY/SCHOOL HeXie Academy

This study examines the intergenerational transfer of tacit knowledge in Chinese family businesses, focusing on the impact of different types of tacit knowledge on the role identity formation of second-generation successors. The qualitative research method was applied in this study, including in-depth interviews with second-generation successors, the research identifies various forms of tacit knowledge transferred from first-generation founders. It explores the specific roles of different types of knowledge, such as business strategies, management practices, and family-specific values, in shaping the successors' role identity. The study emphasizes how the transfer of tacit knowledge affects the role identity of successors and highlights the varying influences of different types of tacit knowledge on the formation of their identities. This research provides valuable insights into the dynamics of tacit knowledge transfer in Chinese family businesses and its role in enhancing leadership capacity and role identity.

345

Proposing new directions on the research of language teacher emotion labor: A systematic review from 2015 to 2024

Xinyu Hui (PhD)

SUPERVISORS Qian Wang, Jeong Jin Yu (XJTLU)
Anthony Edwards (UoL)

ACADEMY/SCHOOL Academy of Future Education

This systematic review explores research on emotion labor in language teaching, analyzing 56 empirical studies from 2015 – 2024. It highlights the dominance of qualitative methodologies, with interviews being the primary tool, and categorizes emotion labor strategies into surface acting, deep acting, and genuine emotional expression. Antecedents such as teacher identity,emotional intelligence, and institutional support shape how teachers experience and navigate emotional challenges. Outcomes range from burnout and job dissatisfaction to resilience, professional growth, and enhanced emotional capital. The review identifies gaps in quantitative research, mixed methods, and regional representation (e.g., Africa, South America). It emphasizes the importance of teacher agency and reflective practices in managing emotion labor and recommends future research on longitudinal studies, broader geographical focus, and the impact of institutional policies and digital teaching. This study provides a roadmap for understanding and advancing emotion labor research in language teaching.

346

Exploring the Home Math Environment: A Comparative Study of Time Diaries and Questionnaires in Predicting Young Children's Math Performance

Xinyun Lyu (PhD)

SUPERVISORS Jike Qin (XJTLU)
Leonardo De Pascalis (UoL)

ACADEMY/SCHOOL Academy of Future Education

We conducted three studies to assess the efficacy of integrating time dairies with a home math environment questionnaire to predict young Chinese children's mathematical performance. In Study 1, 190 3- to 5-year-old Chinese children and one of their parents participated. Children underwent a battery of numerical tests while parents completed a home math environment questionnaire. Study 2 expanded the cohort with 110 additional children, wherein their parents provided time diary records alongside the questionnaire. Study 3 involved another 174 children, where a battery of numerical tests was administered to children and their parents provided both time diaries and questionnaire responses. Our findings revealed that consistent with prior research, advanced formal math activities reported in the questionnaire were the strongest predictors of children's counting and numeration skills, even after controlling for children's age and their family's socioeconomic status (SES). This predictive power holds even when time diary data was considered, indicating that parent-reported information from the questionnaire alone suffices to predict children's early math performance.

347

Digitization and compulsory education in China: A Social imaginary-Governmentality analysis

Xuhui Jiao (PhD)

SUPERVISORS Juming Shen, Rining Wei (XJTLU)
Junqing Wu (UoL)

ACADEMY/SCHOOL Academy of Future Education

Educational digitization has been developing rapidly all over the world. Mainland China has also set its own agenda for educational digitization as response to the changes while its initial actions can be traced all the way back to the "Opening and Reform" in 1980s. As most of the educational reforms and programmes in China are underpinned and enhanced by top-down educational policies, this paper will conduct a policy analysis to explore the motivation, purpose, and implementation of the policies related to educational digitization. Moreover, this paper adopts 'Social imaginary' - stated by Taylor and 'Governmentality' - proposed by Michel Foucault as analytical framework, to conduct the policy analysis to investigate the rationale and technology of the policies, which is derived from the historical, social, cultural backgrounds. In this way, the paper tends to offer some critique to the policy-making and policy implementation process.

348

Longitudinal Analysis of Marital Conflict: Between- and Within-Couple Dynamics and the Moderating Effect of First-Time Parenthood

Xuyan Meng (PhD)

SUPERVISORS Jeong Jin Yu (XJTLU)

ACADEMY/SCHOOL Academy of Future Education

Although longitudinal studies have explored marital conflict exchanges among spouses at a few measurement points, efforts to distinguish between- and within-couple effects have been limited. Furthermore, no existing study has compared longitudinal marital conflict between first-time and experienced parents while disentangling these effects. This study aims to fill these gaps. Using nationally representative, annual data collected over eight waves, the study included 2,072 South Korean heterosexual couples following childbirth. The mean ages were 31.34 (SD = 3.72) for mothers and 33.89 (SD = 4.04) for fathers. Our findings revealed significant reciprocal exchanges of marital conflict at the between-couple level. At the within-couple level, mothers and fathers exhibited unidirectional marital conflict at earlier and mid-timepoints, respectively, which transitioned to bidirectional at later timepoints. No significant differences were observed between first-time and experienced parents. Our findings emphasize the cyclical, interdependent nature of marital conflict, highlighting the need for early, dyadic intervention strategies.

349

The Forgotten Isolated Island: A Study on the Mechanisms of the Digital Divide among Older Parents Who Have Lost Their Only Child and Countermeasures

Yajing Liu (PhD)

SUPERVISORS Youmin Xi, Peng Liu (XJTLU)
Susan Pickard (UoL)

ACADEMY/SCHOOL HeXie Academy

In the context of a low internet penetration rate among the elderly population, the increasing number of Shidu parents and the development of information technology have exacerbated the digital divide and social isolation faced by bereaved elderly individuals. Studying the digital divide faced by bereaved elderly individuals and addressing their actual needs is of significant importance for helping this group integrate into the digital age, enhancing their well-being, and promoting the construction of a digitally inclusive aging society. This article uses data from the 2018 and 2020 China Longitudinal Aging Social Survey (CLASS) to analyze the impact of bereavement on the digital divide among the elderly. The study finds that bereavement significantly reduces broadband access among the elderly but increases the diversity of their internet activities. Bereavement exacerbates the digital divide by reducing "social interaction," "economic purchasing power," and "satisfaction with healthy living." Male and urban residents are more affected by bereavement. Although community infrastructure and elderly care services have limited effects in mitigating the negative impacts, active participation in social activities by the elderly can significantly alleviate these effects. It is recommended that the government, enterprises, communities, and families collaboratively design interactive mechanisms to guide bereaved elderly individuals to actively participate in social activities, improve their life satisfaction and well-being, and fully enjoy the benefits of the digital age.

350

Studies on Language Teachers' Beliefs and Emotions: Current Status and Future Directions

Yanchen Liu (PhD)

SUPERVISORS Yang Gao

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Foreign Studies

This paper provides a historical overview of research on language teachers' beliefs and emotions, examining how studies on teacher emotions have influenced research on beliefs and classroom practices. Using bibliometric analysis, we mapped trends and paradigms in the literature, focusing on significant developments in this field. Our findings reveal a notable increase in publications on language teacher beliefs, particularly since 2018, indicating growing academic interest. Highly cited studies predominantly emphasize the emotional aspects of teaching, signaling a broader shift in research focus from cognitive to emotional dimensions, commonly referred to as the "emotional turn". The analysis also identifies influential authors and institutions, with the USA, China, and the UK leading in contributions. Research themes have evolved over time, moving from foundational beliefs and teaching practices to more complex areas like teacher psychology, with particular attention to emotional regulation, identity, and agency in language teaching. Finally, we offer insights for future research, aiming to further explore the intricate relationship between teachers' beliefs and emotions.

351

Investigating the Impact of AI on Learning Readiness, Academic Emotions, and Academic Burnout among University Students in China

Yanyi Chen (PhD)

SUPERVISORS Sam Zare, Qiuling Chao (XJTLU)
Meng Fang (UoL)

ACADEMY/SCHOOL Academy of Future Education

In the AI era, rapidly advancing technology is reshaping university students' learning experiences. This study explores the relationships between learning readiness, academic emotions, and academic burnout among university students in China, examining variations across gender, region, school type, and major. The study, involving 1,500 students, uses random sampling for diverse representation. A mixed-methods approach combines quantitative data from standardized scales and qualitative insights from interviews to explore students' experiences in the AI context. The findings will provide valuable insights into how AI impacts students' learning readiness, emotions, and burnout, offering empirical evidence to guide educational policies, teaching practices, and higher education management. Ultimately, this research aims to improve learning efficiency and support the development of AI-driven educational strategies.

352

Overcoming the challenges: the transition model of undergraduate students in a transnational context

Yimei Mi (PhD)

SUPERVISORS Youmin Xi, Xiaojun Zhang (XJTLU)
Shuang Gao (UoL)

ACADEMY/SCHOOL Academy of Future Education

Student transition is a critical and heated issue within the higher education field, their changing transitions is crucial for the successful transition in university. Although it is well known that university students are regarded and required as independent leaners with standard academic skills and capacities by faculty and institutions, there is limited study focusing on students' perspectives regarding their changing transitions in a transnational context, such as sojourner learners who study abroad who experience different stages of self-transitions. To response this, this study applied qualitative research including semi-structured interviews to explore how students overcome challenges during their transitions. The findings revealed that students adopt different strategies to overcome challenges and difficulties externally and internally. This research provides the practical implications for universities to manage the students' transitions, guide and interfere students to better transit themselves. Keywords: student transition, higher education, transnational education, sojourners.

353

Shadow education as a social emotional space: evidence from middle school English tutoring centers in Runzhou District, Zhenjiang

Yingying Bai (Master)

SUPERVISORS Xiaojun Zhang (XJTLU)

ACADEMY/SCHOOL Academy of Future Education

Shadow education, an extension of formal education, has gained global attention. While its impact on academic achievement is well-researched, its role in students' social-emotional learning (SEL) remains underexplored. This qualitative study, conducted in a shadow education institution in Zhenjiang with 10 middle school students, their parents, and an English teacher, employed semi-structured interviews and classroom observations analyzed using grounded theory. Findings reveal that teacher-student relationships, characterized by meaningful interactions, personalized support, and emotional feedback, enhance students' emotional regulation, self-management, and social skills, thereby improving academic performance. Unlike the static task evaluation emphasized in expectancy-value theory, the emotional-cognitive collaboration mechanism underscores the dynamic interplay between emotions and cognition, further strengthening students' motivation and task control, ultimately contributing to their success. These findings offer valuable insights into the role of shadow education in fostering SEL and academic growth, providing practical guidance for educators and policymakers.

354

Professional Development of Expatriate Higher Education Faculty Through Informal and Incidental Learning on Social Media

Yinyin Zhou (PhD)

SUPERVISORS Qian Wang, Xiaojun Zhang (XJTLU)
Michelle Tornquist (UoL)

ACADEMY/SCHOOL Academy of Future Education

While formal, digital-technology-based professional development for higher education faculty has been extensively studied, informal and incidental learning (IIL) within this area remain underexplored. Integrating the Broaden-and- Build Theory with the Informal and Incidental Learning framework, this study examines how positive emotions influence faculty's social media engagement and trigger work-related IIL, which subsequently enhances professional learning. Interviews were conducted with nine expatriate faculty at a Sino-British transnational university. The narrative analysis reveals how social media engagement, facilitated by positive emotions, connects personal interests with professional needs to generate self-directed professional development. This study highlights the value of social-media- based learning by distinguishing nuances between informal learning and incidental learning. Findings suggest that social-media- based IIL addresses individualised, real-world challenges like cross-cultural competencies. Implications for higher education policymakers emphasise the need for building a holistic professional learning environment where faculty's self-initiated IIL is possible through digital platforms to meet their diverse, tailored needs for professional growth.

355

A measurement model for the elegant-formality of written Chinese words based on deep learning

Yipu Wang (PhD)

SUPERVISORS Bo Hong

UNIVERSITY/INSTITUTE Capital Normal University / School of Literature

The degree of elegant-formality is an important attribute of Chinese written register and vocabulary, an attribute signifying the degree of solemnity and elegance of Chinese language expression. This study introduces a deep learning model to measure the degree of elegant-formality. Utilizing an Artificial Neural Network (ANN) and Bayesian Optimization, the model analyzes a labelling training set of 150 million words with seventeen feature categories, and after ten-fold cross-checking achieves an accuracy of 89.8%. Key correlation features influencing the model include the ratio of typical words, lexical richness and syntactic complexity. In the research, the model outperforms traditional machine learning models and offers applications in stylistic-register grammar research, Chinese teaching, and language information processing. This innovative approach enhances measurement efficiency, reduces subjectivity, and provides a more objective tool for analyzing the stylistic features of Chinese written language.

356

Digital Literacy Development of Chinese Undergraduate Students at Transnational Universities in China

Yiqun Sun (PhD)

SUPERVISORS Rong Wang, Zhoulin Ruan (XJTLU)
Tunde Varga-Atkins (UoL)

ACADEMY/SCHOOL Academy of Future Education

This study investigated the factors influencing digital literacy development among first-year Chinese undergraduate students in transnational universities in China. The mixed-method study collected 341 survey responses and 20 interviews and utilised Astin's I-E-O model as a theoretical framework. Findings revealed that students' digital literacy was influenced by their input, such as gender, socio-economic status, and their experiences in the first-year study, particularly through engagement with blended learning. Prior technology-enhanced learning experiences in high school, however, did not moderate the relationship between blended learning engagement and digital literacy development. This suggests that merely exposure to technology-enhanced learning does not necessarily lead to improved digital literacy. The study also found that students developed their digital literacy significantly during the first year of study through engaging in university learning experiences and influence from their peers and family, further highlighting the importance of university experiences and peer and parental impact in digital literacy development.

357

An Empirical Study on Self-efficacy and academic competence of English postgraduates

Yu Cui (PhD)

SUPERVISORS Yaru Meng

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Foreign Studies

With the development of globalization, the development of English postgraduates' academic competence has aroused wide attention. The study investigates the relationship between English postgraduates' self-efficacy and English academic competence through quantitative and qualitative method. Participants are 204 English postgraduates from three universities. The results reveal that self-efficacy and English academic competence (language competence, knowledge competence and research competence) are in medium level. Moreover, self-efficacy is significantly positively correlated to and is the indicator of three dimensions of English academic competence. The results, to some degree, enriches the research of academic competence so as to so as to provide references to improve English postgraduates' academic competence.

358

Navigating Transitions: A New Model for Student Success in Transnational Higher Education

Yu Wang (PhD)

SUPERVISORS Rong Wang (XJTLU)
Maria Limniou (UoL)

ACADEMY/SCHOOL Academy of Future Education

The transition into higher education is a pivotal phase that significantly impacts student success, yet it remains under-theorized, particularly in transnational contexts. This study aims to bridge this gap by exploring the transition experiences of students in a transnational university in China. Utilizing a robust theoretical framework that integrates sociocultural theory, learner identity theory, and foreign language anxiety theory, this research seeks to develop a comprehensive model of student transition tailored to the unique challenges of transnational education. Semi-structured interviews with 12 staff and 21 students, analyzed using NVIVO12 Plus, reveal several key perception differences: students prioritize support in cultural adaptation and institutional transition, while staff focus on academic integration and resources. Influential factors such as cultural background, language anxiety, and identity formation critically shape transition experiences. The findings contribute a new framework for understanding student transition, offering insights for higher education administrators and educators to enhance student support and institutional accountability.

359

Exploration of family communication patterns and main conflicts in the context of intergenerational succession in Chinese family businesses

Yuan Yue (PhD)

SUPERVISORS Peng Liu, Youmin Xi (XJTLU)
Leonardo De Pascalis (UoL)

ACADEMY/SCHOOL HeXie Academy

This study adopts the perspective of second-generation successors and applies family communication theory to systematically examine the main conflicts, family communication patterns, and their evolving mechanisms in the context of Chinese family business succession. This study adopts an exploratory multi-case study method to identify three key stages of intergenerational succession and reveal the characteristics and evolutionary pathways of the main conflicts at each stage. The study further explores the dynamic evolution of family communication patterns and their role in conflict resolution throughout the succession process. The findings fill existing literature gaps on the longitudinal development of intergenerational conflicts and communication patterns, providing theoretical and practical guidance for managing conflicts and optimizing communication strategies in family businesses.

360

Does far transfer exist beyond curriculum learning? A processing study about undergraduates' EAP learning outcomes, learning strategies and transferable skills development

Yuchen Lu (PhD)

SUPERVISORS Rong Wang, Rining Wei, Jinjin Lu (XJTLU)
Maria Limniou (UoL)

ACADEMY/SCHOOL Academy of Future Education

Educators always expect their students to apply what they've learned beyond the classroom. However, students often struggle to transfer their knowledge to new, seemingly unrelated situations. This challenge highlights the importance of transfer in education. "Transfer of Learning" is the ability to apply knowledge from one context to new ones. It can be "near transfer," where skills and knowledge are used in similar situations, like applying homework strategies to exam problems. "Far transfer" involves applying skills in very different contexts, such as using chess strategies in investment or politics. In this project, "far transfer" refers to developing transferable skills by synthesizing prior knowledge from curriculum learning and English for Academic Purposes (EAP) training. The relationship between Chinese undergraduates' English language proficiency and their transfer process from curriculum to transferable skill development. This study is ongoing, and this presentation will share some findings from year four students in this kind of universities.

361

The Professional Development of Teachers in Chinese-Foreign Joint Universities

Yuchen Wang (PhD)

SUPERVISORS Ting Ting Tay, Shuangshuang Xu (XJTLU)
Adrian Gough (UoL)

ACADEMY/SCHOOL Academy of Future Education

The professional development of teachers in higher education institutes is essential as it necessitates continuous knowledge acquisition and skill enhancement among the faculty. In the Chinese-foreign joint universities, the situation is more critical due to challenges faced by faculty in their teaching, research, and interaction with students. However, existing studies often concentrate on comparisons between Chinese and foreign teacher quality and the development of bilingual teachers. There is a need for deeper exploration of the professional development needs of teachers in Chinese-foreign joint universities. This study analyzes existing literature and official documents on teacher development within these universities to better understand the current state of professional development in Chinese-foreign joint universities and the development strategies used to enhance their faculty professional development and improve teaching quality.

362

Exploring the Application of Artificial Intelligence in Mental Health Education for Chinese Children: A Qualitative Study from the Perspective of Schools

Yue Xi (PhD)

SUPERVISORS Samiullah Paracha (XJTLU)
Caroline Hands, Ioannis Angelakis (UoL)

ACADEMY/SCHOOL Academy of Future Education

Over the past few years, there has been an increase in the utilisation of Artificial Intelligence (AI) in mental health education. However, thus far, there has been limited attention in the literature regarding the perspectives of schools, teachers and children in China on this particular topic. The purpose of this study is to learn more about how teachers and mental health professionals working in primary and secondary schools view applying AI in mental health education for Chinese children. We used a cross-sectional qualitative descriptive design to explore the views of schoolteachers and mental health professionals. Potential participants contacted the first author to learn more about the study and scheduled an online interview. Transcripts were uploaded to NVivo 12 software for coding and thematic analysis. Based on our preliminary observations and the analysis of the interview data, the development of applying AI in mental health education in public schools is unsatisfactory. Although the application of AI in higher education is widespread, it is still in its infancy in primary and secondary education. Educators and education authorities in China have recently been experimenting with AI technology in the classroom, but empirical research on the use of AI in mental health remains scarce. The results of this study unveil the grave state of mental health education in China. It provides insights into the potential benefits and drawbacks of using AI in mental health education for Chinese youth, as well as guidance on effectively integrating this technology into mental health education in China.

363

Teachers' perspectives on the quality of AI-Enabled student assessments at Xi'an Jiaotong-Liverpool University in China

Yutan Li (Master)

SUPERVISORS Anisa Vahed (XJTLU)

ACADEMY/SCHOOL Academy of Future Education

This study explores the use of Artificial Intelligence (AI) in student assessments at Xi'an Jiaotong-Liverpool University (XJTLU), highlighting its potential to enhance precision, efficiency, and personalized feedback. Despite these benefits, limited data exists on AI-enabled assessments at XJTLU. Using a descriptive cross-sectional case study within a qualitative framework, interviews were conducted with seven teachers from the Department of Educational Studies at the Academy of Future Education (XJTLU). Thematic analysis revealed that while AI tools improve feedback efficiency, they must align with grading rubrics. Continuous skill development through educational training in AI usage is necessary for teachers. Furthermore, the university must address ethical concerns and data security issues related to AI. Ultimately, combining AI, human judgment, and collaborative efforts is essential for creating a "smart" and digitally empowered campus.

364

Unveiling heterogeneity in cognitive development trajectories from late childhood to young adulthood: Evidence from 12 Years of nationally representative data in China

Yuxin Chen (PhD)

SUPERVISORS Jeong Jin Yu (XJTLU)
Leonardo De Pascalis (UoL)

ACADEMY/SCHOOL Academy of Future Education

Evidence on cognitive development progression and its heterogeneity from late childhood to young adulthood remains limited and inconclusive. This study focuses this period and employs latent class growth analysis (LCGA) to identify distinct cognitive development trajectories, explore influencing factors, and examine their impact on subsequent depression. Four-wave data of the China Family Panel Study (CFPS), a nationally representative longitudinal survey in mainland China, were used, covering 3,362 participants' data (49.3% female) across their 10 to 27 years. The average cognitive growth trajectory reveals rapid development followed by growth deceleration, while LCGA further identifies three distinct trajectory groups with varying patterns of cognitive development. Specifically, males, younger individuals, minorities, having more siblings, and those with lower parental cognitive levels more likely belong to low cognitive development trajectories. Moreover, individuals in low cognition latent classes exhibited an increased risk of depression. Implications for supporting cognitive growth and mitigating depression are discussed.

365

Unlock Pose Diversity: Accurate and Efficient Keypoint-based Spatiotemporal Diffusion for Audio-driven Talking Portrait

Chaolong Yang (PhD)

SUPERVISORS Jie Sun (XJTLU)
Guangliang Cheng (UoL)
Kaizhu Huang (DKU: Duke Kunshan University)

ACADEMY/SCHOOL School of Advanced Technology

Audio-driven single-image talking portrait generation plays a crucial role in virtual reality, digital human creation, and filmmaking. Existing approaches are generally categorized into keypoint-based and image-based methods. Keypoint-based methods effectively preserve character identity but struggle to capture fine facial details due to the fixed points limitation of the 3D Morphable Model. Moreover, traditional generative networks face challenges in establishing causality between audio and keypoints on limited datasets, resulting in low pose diversity. In contrast, image-based approaches produce high-quality portraits with diverse details using the diffusion network but incur identity distortion and expensive computational costs. In this work, we propose KDTalker, the first framework to combine unsupervised 3D keypoint with a spatiotemporal diffusion model. Leveraging unsupervised 3D keypoints, KDTalker adapts facial information densities, allowing the diffusion process to model diverse head poses and capture fine facial details flexibly. The custom-designed spatiotemporal attention mechanism ensures accurate lip synchronization, producing temporally consistent, high-quality animations while enhancing computational efficiency. Experimental results demonstrate that KDTalker achieves state-of-the-art performance regarding lip synchronization accuracy, head pose diversity, and execution efficiency.

366

An integrated transfer learning approach with multi-source dataset based on physics guided neural networks for fatigue life prediction of adhesive bonded joints

Chendi Wei (PhD)

SUPERVISORS Min Chen (XJTLU)
Maulik Patel (UoL)
Qiuren Chen (JITRI: Yangtze River Delta Advanced Materials Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

In various industries where structural integrity is critical, predicting the fatigue life of adhesive bonded joints is essential, especially when employing new adhesive materials. Traditional analytical approaches are constrained by limited data and the complexity of muti-material joint combinations, necessitating the development of an advanced predictive model. This study introduced a data-driven predictive framework for predicting the fatigue life of adhesive joints guided by physical knowledge. This framework integrates a fully connected neural network (FCNN) and transfer learning (TL). It incorporats the multi-source dataset, including numerical datasets from Finite Element Analysis (FEA), experimental datasets from material characterization, mechanical and fatigue performance tests, as well as physics-guided theoretical datasets derived from the J-integral fatigue model alongside fracture mechanics. Furthermore, a TL-FCNN model was constructed based on general features and fine-tuned to adapt to LS(Lap-shear) joints in new adhesive materials with minimal additional data. The robustness of this model is evident in its ability to provide precise predictions for any new adhesive material, with a squared correlation coefficient (R^2) exceeding 0.95 and a mean absolute percentage error (MAPE) of approximately 0.01. The proposed framework enhances predictive generalization and accuracy and significantly reduces computational and experimental overhead, thereby advancing the field of fatigue life prediction in automotive adhesive joints.

367

3D object generation

Chengrui Zhang (PhD)

SUPERVISORS Jie Sun (XJTLU)
Yi Huang (UoL)
Kaizhu Huang (DKU: Duke Kunshan University)

ACADEMY/SCHOOL School of Advanced Technology

This paper delves into the study of 3D point cloud reconstruction from a single image. Our objective is to develop the Consistency Diffusion Model, exploring synergistic 2D and 3D priors in the Bayesian framework to ensure superior consistency in the reconstruction process, a challenging yet critical requirement in this field. Specifically, we introduce a pioneering training framework under diffusion models that brings two key innovations. First, we convert 3D structural priors derived from the initial 3D point cloud as a bound term to increase evidence in the variational Bayesian framework, leveraging these robust intrinsic priors to tightly govern the diffusion training process and bolster consistency in reconstruction. Second, we extract and incorporate 2D priors from the single input image, projecting them onto the 3D point cloud to enrich the guidance for diffusion training. Our framework not only sidesteps potential model learning shifts that may arise from directly imposing additional constraints during training but also precisely transposes the 2D priors into the 3D domain. Extensive experimental evaluations reveal that our approach sets new benchmarks in both synthetic and real-world datasets. The code is included with the submission.

368

Laser Vibrometer using CD/DVD OPUs for MEMS Vibration Measurement

Fengji Yang (PhD)

SUPERVISORS Ping Zhang, Wen Liu (XJTLU)
Ian Sandall (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The measurement of mechanical vibrations in micorelectromechanical systems (MEMS) is critical for research and industry. While laser Doppler vibrometers provide exceptional accuracy, their high cost, bulkiness, and limited accessibility present significant barriers. Optical pickup units (OPUs) from CD, DVD, Blue-ray technologies emerge as a compelling alternative due to their compact design, affordability, and technical sophistication. Originally engineered for high-resolution data retrieval, OPUs possess the capability to measure vibrations at micrometer and nanometer scales. This study investigates the adaptation of OPUs as a low-cost, portable solution for MEMS vibration analysis, delivering measurement precision comparable to traditional vibrometers while minimizing financial and spatial constraints. OPU-based instruments also demonstrate operational flexibility in vacuum and ambient environments, which are suitable for diverse applications such as MEMS gyroscopes require vacuum conditions where conventional instruments are nonviable. This approach enables widespread adoption of high-precision vibration measurement solutions across various engineering domains.

369

Extraction of interstitial fluid using hollow microneedle for real-time detection of glucose and pH

Gang Chen (PhD)

SUPERVISORS Jie Sun (XJTLU)
Yongyong Li
(JITRI Organic Functional Materials and Applied Technology Institute)

ACADEMY/SCHOOL School of Advanced Technology

Skin interstitial fluid (ISF), produced by the capillary filtration of blood, has become an important source of rapid testing. ISF contains bioanalytes along with blood. Microneedles (MNs) can be an extraction platform for painless extraction of ISF. In this study, a 3D printed MNs patch was designed to collect 30-60 μL of ISF from an agarose simulated skin model within 2 minutes. In addition, the negative pressure created by the suction syringe allows the biomolecules in the ISF to react with the chromogenic test paper for immediate analysis, which can be used to easily and directly analyse glucose and pH. By pre-filling the MNs substrate with analytically responsive sensing units, including lateral flow test strips, chemiluminescent and colorimetric sensing papers, the MNs patch can be used as a platform for building a versatile sensing system for instant analysis of ISF.

370

Cooperative Non-inertial Frame Based Swarm Robot Control

Ge Wan (PhD)

SUPERVISORS Jie Sun (XJTLU)
Yanjun Cao (HIZJU: Huzhou Institute of Zhejiang University)

ACADEMY/SCHOOL School of Advanced Technology

This research presents a solution for swarm UAV control in cooperative multi-robot systems, which can be used in various scenarios such as leader-following, landing on a moving base, or specific relative motion with a target. We control the UAV in the target coordinate frame, without making motion assumptions about the target. In detail, we present a strategy to control the swarm UAV in non-inertial frame, which aims to give a better performance and keep a formation while tracking. Furthermore, we conducted considerable real robot experiments, employing laboratory motion-capture systems or relative localization methods implemented outdoors, to validate the applicability and feasibility of the proposed approach..

371

Mapless Navigation for Amphibious Turtle Robots Using Deep Reinforcement Learning and Machine Vision

Ge Wang (PhD)

SUPERVISORS Shenhong Wang, Sze-Hong Teh (XJTLU)
Heba Lakany (UoL)

ACADEMY/SCHOOL School of Robotics

This PhD research focuses on enhancing the perception and navigation capabilities of amphibious turtle robots, aiming to reduce navigation time across three application scenarios: indoor and outdoor no-map navigation, beach-like amphibious switching environments, and rivers with flow. Traditional SLAM navigation faces significant limitations in expansive and dynamic outdoor settings, including high computational demands, difficulty in map construction without enclosed spaces, and reduced accuracy in large, reference-scarce areas. In contrast, mapless navigation offers greater adaptability by eliminating dependence on pre-built maps. Over the past year, the research has achieved successful navigation in real environments using only 2D floor plans or overhead images, enabling directional choices at critical intersections through surrounding visual information and incorporating human guidance in complex settings. Additionally, a mapless navigation method utilizing a single camera and deep reinforcement learning was developed in simulation. In the upcoming year, the study will integrate deep reinforcement learning-based mapless navigation with existing approaches in real environments and use machine vision to calculate obstacle gaps in amphibious environments, thereby optimizing path planning and further shortening navigation time.

372

On the use of sky images for intra-hour solar forecasting benchmarking: Comparison of indirect and direct approaches

Guoping Ruan (PhD)

SUPERVISORS Eng Gee Lim, Xiaoyang Chen (XJTLU)
Lin Jiang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The transient stability of the grid is challenged by short-term photovoltaic output fluctuations, which are mainly caused by local clouds. To address this issue, intra-hour solar forecasting has been widely adopted. Sky images have been proved as promising sources to produce intra-hour solar forecasts. To incorporate with cloud dynamics, sky images are typically embedded into solar forecasting models either indirectly or directly. While the performance of these methods varies across different forecasting environments, a detailed analysis on indirect and direct approaches have not been investigated yet. In this research, we conduct a comprehensive study on the performance of 7 commonly-used sky image-based solar forecasting approaches, including four indirect and three direct models. A total of 72 forecasting settings are established to evaluate the performance of these models. Three critical parameters are specially considered, namely image resolution, image sequence length, and forecast horizon. Results show that among these forecasting models, the stacking ensemble learning and the convolutional neural network + long short-term memory network model typically show the best forecasting performance for indirect and direct workflows, respectively. Compared with the direct approaches, the indirect approaches advance at detecting ramp events with an average the ramp score of 21.65W/(m^2 · min). The direct approaches, on the other hand, outperform the indirect approaches on forecasting accuracy with an average forecast skill of 24.62%. The results of this work can be used as a general guideline for intra-hour solar forecasting benchmark selection.

373

Core-shell ZIF-8/Au nanoparticles as labels for lateral flow assays via thiol-functionalization and seed-mediated growth

Haibo Ma (PhD)

SUPERVISORS Pengfei Song (XJTLU)
Kai Hoettges (UoL)
Xinyu Liu
(Jiangsu JITRI Micro-Nano Automation Technology Institute)

ACADEMY/SCHOOL School of Advanced Technology

In this study, we successfully synthesized composite nanoparticles with a ZIF-8 core and a gold shell by introducing thiol groups onto the surface of ZIF-8 particles and employing a seed-mediated growth method. These nanoparticles were applied to the screening of Clostridium difficile infections. By optimizing the amount of thiol modifier, we successfully introduced an appropriate amount of thiol groups onto the particle surface while maintaining the morphology and crystal structure of the ZIF-8 particles. Subsequently, the gold shell was successfully coated on the surface of the ZIF-8 particles through optimization of the gold shell deposition process. The resulting ZIF-8/Au nanoparticles were successfully applied to detect Clostridium difficile biomarkers, including toxin A, toxin B, and GDH, with sensitivities of 7 pg/mL, 115 pg/mL, and 27 pg/mL, respectively. These results demonstrate the promising potential of this nanoparticle-based platform for lateral flow assays.

374

Optimized Stress Transfer Interfaces Enable High Sensitive Wearable Tribo-Electronics for Precise Physiological Monitoring

Hao Lei (PhD)

SUPERVISORS Chun Zhao, Eng Gee Lim (XJTLU)
Xin Tu (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Accurate detection of physiological signal via tribo-electronics is crucial for wearable warning systems but faces challenges under pre-stress. Here, we improve the detection accuracy of tribo-electronics under pre-stress by optimizing stress transfer at both the triboelectric and the sensor-skin interface. The construction of mountain-like microstructures at the triboelectric interface expands the high-sensitivity range of the interfacial engineering-based triboelectric sensor (IETS) to 12 kPa, enabling detection of detailed pulse characteristics under pre-stress. Additionally, the incorporation of piezo-pillars at the sensor-skin interface not only facilitates the transfer of stress induced by pulse beats but also generates piezoelectric charges. Such mechano-electric coupling effect endows IETS with a high sensitivity of 4.28 V/kPa. Integrated with deep learning, a wearable tribo-electronics system based on IETS allows for drivers' health and fatigue assessment via pulse wave analysis, offering an effective approach to prevent road accidents caused by sudden cardiovascular diseases and fatigue driving.

375

NPC Three-Level Inverter Open-Circuit Fault Diagnosis Based on Adaptive Electrical Period Partition and Random Forest

Hong Wan (PhD)

SUPERVISORS Xuesong Wang

UNIVERSITY/INSTITUTE China University of Mining and Technology / School of Information and Control Engineering

Among the converters in the power system, Neutral Point Clamped (NPC) three-level inverter is most commonly used to drive electric motors. In this paper, a new approach for open-circuit fault detection and location of the NPC three-level inverter for a shifting process using a constant voltage-to-frequency ratio is proposed. In order to diagnose open-circuit fault in as short a time as possible, an adaptive electrical period partition (AEPP) algorithm is proposed to pick single electrical periods from real-time three-phase current signals. The Maximum Overlap Discrete Wavelet Transformation (MODWT) and Park's Vector Modulus (PVM) are used for feature analysis and normalization of electrical period signals. The statistical characteristics of the electrical period signals are extracted, and a random forest model is constructed to realize the state classification. Compared with the traditional fault diagnosis method, the proposed algorithm finds fault locations quickly and accurately.

376

The research on the impact of socio-economic development to power network expansion for developing countries

Hong Xie (PhD)

SUPERVISORS Lurui Fang (XJTLU)
Lin Jiang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

In the context of carbon neutrality goals, the long-term planning of power systems in developing countries faces challenges arising from regional economic disparities, which also lead to inconsistencies in the long-term growth of power demand across different regions. However, existing studies on power demand forecasting and grid upgrades have not adequately addressed the economic differences between regions and their impact on power systems. This study address those problems by three steps. The first step is developing a demand forecasting model that incorporates the characteristics of regional economic in developing countries, drawing on the experiences of developed countries to analyze the dynamic effects of regional competition and industrial shifts on power demand. Second, a balanced strategy of virtual and physical investments is proposed to enhance grid upgrades based on varying regional economic levels. Building on this, finally a comprehensive mid-and long-term investment plan for developing countries is designed to balance regional adaptability with carbon reduction targets, providing a scientific basis for policy formulation.

377

Urban Autonomous Electric Vehicles Fleet Operation Strategy—From the Perspective of Operators

Huayu Zhang (PhD)

SUPERVISORS Bing Han, Fei Xue (XJTLU)
Lin Jiang (UoL)
Shaofeng Lu (SCUT: South China University of Technology)

ACADEMY/SCHOOL School of Advanced Technology

The complex traffic environment and severe emis sions pollution increasingly challenge urban development. The electrified autonomous mobility-on-demand (EAMoD) system is expected to address these issues and promote sustainable urban development. This paper proposes a mixed-integer linear programming (MILP) model designed to optimize the operation of an autonomous electric vehicle (AEV) fleet under the dilemma of passenger orders selection when facilities are limited. This model comprehensively optimizes the received and abandoned passenger orders, rebalancing operation, as well as charging and discharging of AEVs from the perspective of the AEV fleet operator under time-varying travel demands. The effectiveness of the proposed strategy was verified on a 25-node transportation network, and the operation profit of the AEV fleet under the proposed strategy was 44% higher than the benchmark. Furthermore, the result showed that various factors, such as rebalancing operations, driving speed, fleet size, charging pile size, charging rate, driving range, and electricity usage type, significantly impact the AEV fleet operator's profits.

378

Research on integrated design of multi-spectrum compatible stealth metasurface

Huiting Sun (PhD)

SUPERVISORS Jiafu Wang

UNIVERSITY/INSTITUTE Air Force Engineering University / Suzhou Laboratory / Fundamental Department

With the diversification of detection and reconnaissance methods, the equipment for single frequency band stealth is difficult to adapt to the increasingly complex modern reconnaissance and detection system. In order to improve the camouflage capability of modern equipment in the complex electromagnetic environment, in this study, multi-spectrum compatible camouflage research was carried out in three frequency bands of microwave, infrared and visible light based on the powerful electromagnetic control capability of the metasurface. From the perspective of resonance decoupling, the functional layers of metasurface in different spectrum are simplified from multi-layer to single-layer. The study is of great significance to the miniaturization and integration of multi-spectrum metasurface. A new way is paved for the large-scale engineering application of metasurface in stealth equipment.

379

Machine Learning Enhanced Paper-based Microfluidic Devices

Jia Zhu (PhD)

SUPERVISORS Quan Zhang (XJTLU)
Kai Hoettges (UoL)
Sanghyuk Lee (External)

ACADEMY/SCHOOL School of Advanced Technology

The integration of paper-based microfluidics with deep learning significantly advances diagnostic capabilities. This paper presents a novel method that improves paper-based ELISA performance by training temporal sequence colorimetric data instead of static data. We developed a temporal sequence enhanced paper analytical device (TimePAD) that records continuous video data of ELISA reactions, capturing dynamic colorimetric changes. Using the YOLOv8 model and Rabbit IgG for ELISA, we reduced analysis time by 33%, processing signals within 20 minutes instead of 30, and achieving a 94.1% accuracy at 20 minutes compared to 93.5% at 30 minutes. This method speeds up result interpretation and boosts diagnostic efficiency, ideal for urgent point-of-care testing. Additionally, applying this technique to cTnI biomarker detection achieved 98.1% accuracy in 10 minutes, surpassing traditional methods.

380

Disentangling Tabular Data Towards Better One-Class Anomaly Detection

Jianan Ye (PhD)

SUPERVISORS Xi Yang (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

Tabular anomaly detection under the one-class classification setting poses a significant challenge, as it involves accurately conceptualizing "normal" derived exclusively from a single category to discern anomalies from normal data variations. To address this issue, we presume that attributes related to others in normal samples can be divided into two non-overlapping and correlated subsets, defined as CorrSets, to capture the intrinsic correlation effectively. Accordingly, we introduce an innovative method that disentangles CorrSets from normal tabular data.

381

A Fully Automated Paper-Based smartphone-assisted Microfluidic Chemiluminescence Immunoassay Platform

Jihong Sun (PhD)

SUPERVISORS Pengfei Song, Mark Paul Leach (XJTLU)
Kai Hoettges (UoL)
Xinyu Liu
(Jiangsu JITRI Micro-Nano Automation Technology Institute)

ACADEMY/SCHOOL School of Advanced Technology

we developed a newly designed μPAD for CL immunoassays, leveraging smartphone-based image capture, app-driven result analysis, and component control to enable fully automated detection. We have fully automated the entire sensing process, achieving a "sample in, answer out" workflow, and an app was developed to control the entire process, maximizing the convenience of smartphones. The device's effectiveness was calibrated using rabbit IgG as a model, achieving a limit of detection (LOD) of 62.4 pg/mL, which represents an improvement compared to the colorimetric ELISA method with a LOD of 20 pM. We then applied the device to detect tau protein, a biomarker associated with Alzheimer's disease and achieved a detection limit of 26.1 pg/mL, whereas the clinical cut-off value for tau protein is typically 522 pg/mL. Our device achieves complete automation and integrates the versatility of μPADs with the precision of CL immunoassays, providing a practical improvementof POCT technologies.

382

Quantum dots modified high response metal oxide synapses for optoelectronic vision recognition

Jinwei Zhang (PhD)

SUPERVISORS Eng Gee Lim, Chun Zhao (XJTLU)
Xin Tu (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Artificial synaptic transistors have emerged as a promising avenue in the development of efficient and low-energy neuromorphic computing devices that can mimic the human brain. This study presents a light-sensitive artificial optoelectronic synapse that utilizes the multi-modal modulation capability of artificial synapses to overcome the limitations of conventional Von Neumann architectures. The device, based on In2O3 and CsPbBr3, can simulate long-term potentiation (LTP) and long-term depression (LTD), which are essential for synaptic learning function. Through photo-electric modulation, realizing the photo"writing"-electrical "erasing" mechanism, which mimics the learning-forgetting process in artificial neural networks. A three-layer artificial neural network (ANN) was constructed by exploiting the device's response to optoelectronic pulses and trained on the MNIST dataset for handwritten digit recognition, achieving 95% accuracy in neuromorphic computing inspired by biological vision. This work paves the way for advanced optoelectronic visual recognition systems with promising applications in artificial intelligence and machine learning.

383

Topology Optimization of Additive Manufactured Microchannel Heat Exchangers considering Manufacturability Constraints

Junjia Zou (PhD)

SUPERVISORS Long Huang, Yi Chen, Konstantinos Papadikis (XJTLU)
Joseph Camm, Volfango Bertola, Olivier Cadot (UoL)

ACADEMY/SCHOOL School of Intelligent Manufacturing Ecosystem

This study focuses on vapor-liquid two-phase flow distribution and phase change heat transfer to enhance the geometric optimization of parallel flow microchannel heat exchangers. As traditional design methods reach their limits, Additive Manufacturing (AM), particularly metal 3D printing, offers new opportunities to create complex topological structures that improve heat exchanger performance. However, computer-optimized geometries often face significant manufacturability constraints, limiting their practical application. This project addresses these challenges by integrating manufacturability constraints into the topology optimization process, ensuring that optimized designs are both theoretically efficient and practically manufacturable. Additionally, machine learning models are introduced to reduce the computational cost of heat transfer simulations, enabling faster and more efficient optimization. By combining advanced optimization techniques with machine learning and leveraging the capabilities of metal 3D printing, this research aims to develop highly efficient and manufacturable microchannel heat exchanger designs, pushing the boundaries of current thermal management technologies.

384

Wireless power and communication for implantable applications

Kai Xie (PhD)

SUPERVISORS Mark Paul Leach (XJTLU)
Yi Huang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

This project aims at developing a novel wireless power transfer (WPT) system to supplement battery operating time for wearable devices. The proposed system will consist of three systems: a transmitter based in a power bank, a SWIPT (Simultaneous Wireless Information and Power Transfer) receiver in the wireless device, and a controller, the Wireless Body Area Network server, usually a mobile phone. Power is delivered via a beam steerable antenna optimally directed via feedback from the wearable device. The WPT will be designed at 5.8 GHz with the size of 44 mm×42 mm. To obtain high gain, a rampart structure is applied. According to simulation results, the gain of the receiving antenna is 7.6 dBi.

385

Distribution wthin microchannel heat exchanger

Keliang Zhang (PhD)

SUPERVISORS Long Huang, Yi Chen (XJTLU)
Joseph Camm (UoL)
Suxin Qian (XJTU: Xi'an Jiaotong University)

ACADEMY/SCHOOL School of Intelligent Manufacturing Ecosystem

Two-phase flow maldistribution within the microchannel heat exchangers (MCHXs), specifically evaporators, impacts the thermal systems' performance and efficiency. Recent studies have predominantly been focusing on the maldistribution of the flat tubes within the header while considering uniform phase and flow rate distribution as the benchmark. This paper aims to extend the maximum possible heat transfer capacity by optimizing the distribution of each port within a flat tube to match the uneven air-side heat flux. A distributed parameter model, validated against experimental data from the literature under evaporation conditions, was developed to evaluate the heat transfer performance of MCHXs. The optimal distributions of various operational condition are determined using a genetic algorithm combined with numerical simulations. The results show that the optimal port-level distribution can increase the heat transfer capacity by 0.4% to 5.9%. These findings improve the understanding of port-level distribution under non-uniform heat flux and provide insights into the capacity potential of MCHXs.

386

High-Performance Boundary Control for NPC-DAB Converters: Multi-Trajectory Natural Switching Surface Derivation and Implementation

Lanbo Dai (PhD)

SUPERVISORS Huiqing Wen (XJTLU)
Lin Jiang (UoL)
Yong Yang (SCU: Soochow University)

ACADEMY/SCHOOL School of Advanced Technology

As the preferred topology for medium or high voltage applications, neutral-point-clamped dual-active-bridge (NPC-DAB) converters have recently received widespread attention. The main objectives of NPC-DAB converters include high steady-state efficiency, DC-bias elimination, fast dynamic characteristics, constant-power-load (CPL) stability, and midpoint voltage balance. NPC-DAB converters may also experience various complicated operating conditions, such as start-up, sudden reference voltage and load change. Originating from the concept of natural switching surfaces (NSS), this article proposes a multi-trajectory NSS boundary control (MNBC) to address these issues for the first time. Firstly, the NSS mathematical models under various operating states of NPC-DAB converters were derived, laying a theoretical foundation for the proposed MNBC. With the proposed MNBC, elliptical and circular NSS will be used to flexibly adjust the dynamic trajectory of NPC-DAB converters in the geometric domain. Especially by switching the elliptical NSS, the charging and discharging states of capacitors in NPC-DAB converters can be changed without affecting the output waveform. This article provides a detailed analysis and derivation process of the proposed MNBC algorithm, as well as simulation and experimental evaluations. The results indicate that the algorithm performs well in terms of efficiency, dynamic response, and stability under various operating conditions.

387

A 2-DoF Switchable Variable Stiffness Actuator for Legged Walking Robots

Lei Yu (PhD)

SUPERVISORS Yuqing Chen (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

The legged walking robots equipped with variable stiffness actuators (VSAs) show advantages in energy efficiency and various terrain. However, the energy cost to modulating and maintaining stiffness is still substantial, as the deflected spring and the stored potential energy would prevent stiffness modulation, requiring extra amount of energy, especially for high stiffness output. In this paper, we presents a novel Switchable Variable Stiffness Actuator (SVSA) with 2 Degrees-of-Freedom (DoFs) for legged walking robots, capable of modulating output stiffness without changing potential energy stored in spring and overcoming spring force, to perform energetically conservative legged locomotion. We introduce two independently controlled motors to drive both ends of a lockable spring along the shank and thigh, and the locking module consists of globoid worm and worm gear for rigid locking, along with a solenoid to actively control the engagement of the spring with fast speed. Experiments validate the locking robustness and efficiency of the lockable spring, verifies the energy efficiency of the proposed SVSA. Finally, the applicability of the proposed SVSA to legged walking robot is comprehensively explored to propose energy efficient locomotion strategy.

388

Research on dry-out characteristics and two-phase flow heat transfer in irregular micro-channel

Luyao Guo (PhD)

SUPERVISORS Long Huang, Yi Chen (XJTLU)
Volfango Bertola, Joseph Camm (UoL)

ACADEMY/SCHOOL School of Intelligent Manufacturing Ecosystem

This study investigates the critical limiting factor affecting system performance and reliability—the dryout phenomenon in micro-channel flow boiling. Dryout occurs when the liquid film fully evaporates, resulting in elevated wall temperatures and reduced heat transfer. Current research explores the onset and underlying mechanisms of dryout, while also seeking to enhance the Critical Heat Flux (CHF) through improved geometric designs. Experiments on R410A flow boiling in micro-channel flat tubes, conducted under varying mass flux, heat flux, and saturation temperature conditions, provide valuable insights into dryout behavior. A comparison of the experimental data with empirical correlations highlights the accuracy and applicability of various predictive models. Notably, the Kim and Mudawar correlation offers reliable predictions in the pre-dryout region, and incorporating dryout effects into this model using the approach of Jige et al. significantly improves prediction accuracy under dryout conditions. These findings offer strategic guidance for mitigating dryout and strengthening thermal management systems.

389

GaN-based Power device

Maoqing Ling (PhD)

SUPERVISORS Wen Liu (XJTLU)
Ivona Mitrovic (UoL)

ACADEMY/SCHOOL School of Advanced Technology

In this work, we propose a novel Au-free Ti/Al/Ni/TiC Ohmic contact for AlGaN/GaN high electron mobility transistors (HEMTs) and compare it with traditional Au-based Ti/Al/Ni/Au and Ti/Al/Ni/TiN electrodes. Unlike the traditional Ti/Al/Ni/Au electrodes, which achieve excellent contact performance through a direct connection between Au-wrapped TiN island and the 2DEG, the proposed Ti/Al/Ni/TiC Ohmic contact achieves comparable perfor mance through thermionic field emission of carriers. Due to the absence of Au-wrapped TiN islands, the contact resistance (Rc) of the proposed Ti/Al/Ni/TiC Ohmic contacts remains stable even at measuring temperatures of up to 200°C. Based on this property, HEMTs with Ti/Al/Ni/TiC electrodes show significantly lower ON resistance degradation (1.54 times) at high operating temperatures compared to Ti/Al/Ni/Au electrodes (2.21 times). Additionally, the proposedTi/Al/Ni/TiC electrodes exhibit excellent surface morphol ogy, with an RMS roughness of 4.363 nm, which is significantly lower than that of Ti/Al/Ni/Au (122.9 nm) and Ti/Al/Ni/TiN (17.12 nm) electrodes. Results from scanning electron microscopy (SEM) and energy-dispersive X-ray (EDX) analysis indicate that due to the high melting point (3160°C) and hardness (Mohs: 9 – 9.5) of the TiC cap layer, it better suppresses the upward diffusion of the under lying metals during annealing, without exhibiting any island-like or groove-like morphology. Therefore, the proposed Ti/Al/Ni/TiC electrode is a promising alternative to existing commonly used Au based and Au-free electrodes.

390

Federated Learning-Driven Edge Resource Allocation for IoT Applications

Medhav Kumar Goonjur (PhD)

SUPERVISORS Bintao Hu, Matilda Isaac, Hengyan Liu (XJTLU)
Miguel Lopez-Benitez (UoL)

ACADEMY/SCHOOL School of Internet of Things

Artificial Intelligence (AI)-enhanced Internet of Things (IoT) systems have transformative impacts across various domains, including smart cities, electronic health systems, Industry 4.0, autonomous vehicle technologies, and beyond. The proliferation of IoT devices, such as sensors, has led to a surge in the interconnectivity of communication networks, resulting in a vast volume of raw data that necessitates analysis, processing, and transmission. This expansion introduces new challenges in terms of latency, communication reliability, privacy preservation, and the limitations of traditional centralized cloud processing. Mobile Edge Computing (MEC) has emerged as a scalable solution to address these challenges. Furthermore, to tackle security and privacy concerns more effectively, Federated Learning (FL) is employed as a decentralized machine learning (ML) paradigm. In this approach, each local device participates in the collaborative training of a shared model without the need to expose raw data. This paper/poster offers a comprehensive overview of the advantages of FL-integrated MEC within the context of smart IoT systems.

391

Hydrogel Microneedle Technology for Delivering Exosomes in Skin Anti-Aging

Min Yu (PhD)

SUPERVISORS Jie Sun (XJTLU)
Lin Jiang (UoL)
Yongyong Li
(JITRI Organic Functional Materials and Applied Technology Institute)

ACADEMY/SCHOOL School of Advanced Technology

This study explores the use of hydrogel microneedle technology for delivering exosomes to combat skin aging. Exosomes, secreted by cells, contain bioactive molecules that can enhance cell regeneration. We extracted exosome-rich hydrogels and utilized microneedles to deliver them into the skin's dermis layer, a method that improves drug bioavailability and efficacy. Our findings show that hydrogel microneedle-delivered exosomes significantly boost skin cell vitality, reduce wrinkles,and enhance elasticity by promoting collagen synthesis. This approach outperforms traditional topical treatments in anti-aging efficacy. This research establishes a foundation for hydrogel microneedle technology in skin anti-aging,paving the way for innovative product development. Future studies will delve into exosome mechanisms to refine anti-aging therapies.

Keywords: Hydrogel microneedle technology;Exosomes; Skin anti-aging; Cell regeneration; Collagen synthesis.

392

Flexible Mesh Electrodes with In-Situ Gelled Hydrogel Interface for Long-Term EMG Monitoring

Mingxuan Zhang (PhD)

SUPERVISORS Yi Chen, Qifeng Lu (XJTLU)

ACADEMY/SCHOOL School of Intelligent Manufacturing Ecosystem

Real-time and long-term Electromyography (EMG) monitoring is essential for human-machine interaction and healthcare. However, traditional EMG electrodes lack flexibility, limiting their ability to provide stable signals, especially in multi-channel monitoring. To address this, a flexible mesh electrode with in-situ gelatinized hydrogel was developed. The combination of low Young's Modulus mesh and high adhesion from the in-situ gel enables better skin contact, with adhesion three times stronger than conventional electrodes. The hydrogel also reduces impedance, achieving a high signal-to-noise ratio of 26.28 dB. Additionally, the electrodes retain water well, losing only 10% over five days, making them suitable for long-term use. These electrodes successfully monitored EMG signals during various gestures and prolonged sitting, showing potential for applications in smart medical devices.

393

Data Driven Wind Energy Forecasting model using novel automated DBSCAN with XGBoost

Muhammad Armoghan Khan (PhD)

SUPERVISORS Jianxue Wang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Electrical Engineering

Accurate forecasting of wind power is essential for effective integration into the electrical grid, as it helps mitigate the intermittency of wind generation. The performance of wind power forecasting models relies on high-quality meteorological data and robust feature selection. This study proposes a two-stage methodology to improve forecasting accuracy. First, we develop a density-based spatial clustering algorithm (DBSCAN) to remove outliers from raw data. In the second stage, recursive feature elimination is used to identify optimal features, which are then fed into an XGBoost model for wind power prediction. The proposed model is evaluated using real-time SCADA data from a commercial wind farm. This approach can enhance resource management and grid stability, offering practical benefits for the wind energy industry in forecasting and operational planning.

394

Vehecle behaviour recognition based on radar-camera information fusion

Ningwei Ouyang (PhD)

SUPERVISORS Ming Xu (XJTLU)
Waleed Al-Nuaimy (UoL)
Yutao Yue (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

We proposed a query centric behaviour recognition method in an end-to-end manner, following the detection-tracking-recognition pipeline. Queries serve as the interface through the detection, tracking and behaviour recognition module. The behaviour recognition module leverages the queries and their corresponding visual feature via time steps to model the motion of tracked objects, and classifies different maneuvers based on the historical information.

395

High-Accuracy Thermal Resistance Measurement Method for GaN HEMTs based on Harmonic Pulse Width Sub-Threshold

Ningyu Luo (PhD)

SUPERVISORS Huiqing Wen (XJTLU)
Lin Jiang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The study on the junction temperature and thermal resistance of GaN HEMTs becomes essential in order to ensure high operating reliability.Among different categories of thermal resistance measurement methods, the temperature-sensitive electrical parameter (TSEP) method exhibits unique advantages in terms of online implementation, accuracy, and applicability. After reviewing current TSEP methods for GaN HEMTs, this article proposes a high-accuracy thermal resistance measurement method for GaN HEMTs based on a heating power modulation strategy, which is named the harmonic pulse width sub-threshold (HPWS) method.

396

An Innovative Approach for Vehicle Speed Recognition through Noise Emission Analysis by Using Machine Learning

Pengfei Fan (PhD)

SUPERVISORS Xinheng Wang (XJTLU)
Shangbo Wang (Sussex: University of Sussex)

ACADEMY/SCHOOL School of Advanced Technology

This paper presents a comprehensive methodology for identifying vehicle speed ranges based on the characteristics of vehicle noise emissions. In the process of speed recognition, we introduce the innovative SoundSpeedBi-GRU model, which effectively integrates critical components such as frequency selection, feature extraction, and speed classification of vehicle noise. During the feature extraction phase, we conduct a detailed analysis of the distribution characteristics of frequency features across different speed intervals to identify the most significant intervals for further exploration. Through rigorous comparative analysis, we establish the most effective method for noise feature extraction, enabling the precise extraction of key features that reflect vehicle speed information. Utilizing a bidirectional gated recurrent unit (Bi-GRU) for speed classification, our approach demonstrated superior classification accuracy, ultimately achieving a noteworthy accuracy rate of 96.93\%. These results underscore the potential of the SoundSpeedBi-GRU model in the domain of vehicle speed recognition, offering an efficient and reliable solution for speed classification based on noise characteristics.

397

Solar Forecasting Based on Sky Imagery

Qi Su (PhD)

SUPERVISORS Xiaoyang Chen, Eng Gee Lim, Lurui Fang (XJTLU)
Lin Jiang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Photovoltaic (PV) technology utilising solar energy is becoming the way forward in order to reduce carbon emissions. In distribution grids, most solar PV systems operate behind the meter, and utilities are unable to directly monitor generation. With the increasing penetration of behind-the-meter solar PV systems, the intermittent and fluctuating nature of the energy source raises a great challenge to the stability of the conventional grid operation and the electricity market. The aim of this project is to attempt to accomplish high-quality short-term solar forecasting using graph-structured deep learning models.

398

Improving the rated voltage of electric vehicle traction inverter circuit through circuit design

Qiwen Zheng (PhD)

SUPERVISORS Ye Wu, Chun Zhao (XJTLU)
Jiafeng Zhou (UoL)

ACADEMY/SCHOOL School of Advanced Technology

GaN devices have broad application prospects in on-board chargers (OBCs) and DC-DC converters for electric vehicles (EVs) due to their high switching speed and low losses. However, due to the low breakdown voltage of GaN HEMTs, their application in circuits such as traction inverters for EVs is limited. This article compares various methods for increasing the rated voltage of circuits and their advantages and disadvantages, and proposes a method to increase the rated voltage of circuits through circuit design. A commercial GaN HEMT with a breakdown voltage of 650V is used for 800-V system for EVs, and voltage balance is also considered.

399

Vibrational analysis of mesh structure in Vibrating Mesh Atomizer

Roopitha Kaimal (PhD)

SUPERVISORS Kean How Cheah

UNIVERSITY/INSTITUTE University of Nottingham Ningbo China /
School of Science and Engineering

Vibrating mesh atomizers (VMAs) have gained significant attention in a wide range of applications, especially in the medical industry, due to their efficiency in aerosolizing fluids into fine mist droplets. This technology is particularly relevant in the context of drug delivery systems, where precise control over droplet size is critical for optimal therapeutic efficacy. This study investigates the vibrational characteristics of a VMA mesh subjected to both sine wave and Lorentz pulse waveforms at 20 kHz. This research offers insights into manipulating VMA performance by tailoring input waveforms.

400

Sliding mode based fault diagnosis and tolerant control in PMSM drives for electric vehicles

Runze Guo (PhD)

SUPERVISORS Suneel Kommuri, Huiqing Wen (XJTLU)
Jiafeng Zhou (UoL)

ACADEMY/SCHOOL School of Advanced Technology

A novel sensor fault-tolerant-control (FTC) mechanism for permanent magnet synchronous motor (PMSM) drives is investigated to ensure the PMSM can continue operating in the event of an encoder fault. Integral terminal sliding mode (ITSM) control law has been employed for current and speed control loops to provide more accurate and efficient tracking performance. Unlike existing sliding mode observers (SMOs), a hyperbolic tangent function is proposed in the observer design to attenuate further the chattering phenomenon that usually exists in the speed and position estimation quantities in PMSM drives. Indeed, a threshold-based fault detection algorithm is considered to detect and isolate the faulty speed sensor with the help of accurate estimation of speed information obtained using the proposed observer design. The proposed FTC mechanism is validated experimentally on a PMSM using a DSP processor, considering possible faults, such as abrupt, intermittent, and incipient.

401

Deep Reinforcement Learning-Driven Simultaneous Navigation and Task Allocation for Social Swarm Robots in Airport

Ruxin Xiao (PhD)

SUPERVISORS Xinheng Wang, Limin Yu (XJTLU)
Miguel Lopez-Benitez (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Task allocation and navigation are crucial for swarm robots to execute homogeneous and heterogeneous tasks, especially in large-scale environments. Generally, the swarm robot system design aims to achieve effective and comprehensive collaboration and work service in logistic transportation, emergency rescue, and construction. Unlike the separated task allocation in the warehouses, crowds and complex layouts increase the complexity of decision-making in the airports. Hence, the task allocation and navigation of swarm robots must be simultaneous and dynamic. In this work, a maskable DRL-based system achieves the fast response and effective capability to handle flexible tasks simultaneously. Also, a new double-level DRL structure trains task allocation and path planning in one common reward function to achieve a comprehensive decision-making process.

402

Warpage model of reflow soldering and molding process for high-power IGBT modules

Sanli Liu (PhD)

SUPERVISORS Min Chen (XJTLU)
Maulik Patel (UoL)
Guohua Fan (Key Laboratory for Ligh-weight Materials)

ACADEMY/SCHOOL School of Advanced Technology

Reflow soldering and molding process are crucial process in SiC module packaging manufacture. Warpage of IGBT modules occurs after soldering and molding, which can degrade device performance and lifespan. This study establishes a finite element model of the reflow soldering and molding processes to predict warpage and residual stresses. Reflow soldering experiments were conducted on IGBT modules to examine the shape of the lower surface of the baseplate before and after soldering, and these experimental results were used to validate the model. The findings provide valuable insights into optimizing process conditions to minimize warpage and enhance the reliability of SiC modules. This research is essential for improving the performance and lifespan of power modules in power electronics applications.

403

Energy-efficient motion control of a turtle-like biomimetic amphibious robot

Shufan Wang (PhD)

SUPERVISORS Sze-Hong Teh, Shenhong Wang (XJTLU)
Heba Lakany (UoL)

ACADEMY/SCHOOL School of Intelligent Manufacturing Ecosystem

Most amphibious bionic robots adapt to various environments by altering their materials and movement mechanisms. However, this approach significantly consumes energy, reducing the energy efficiency of these robots. Therefore, the project will construct an amphibious bionic turtle robot based on the green sea turtle as the bionic model. This robot can adapt to both aquatic and terrestrial environments without changing its materials or movement mechanisms, and it has multiple gaits suitable for both environments. Additionally, the team will continuously optimize the its movement methods to improve its energy efficiency.

404

A low-profile air material based semi-cylinder metamaterial millimeter-wave luneburg lens antenna using transformation-optics

Silin He (PhD)

SUPERVISORS Zhao Wang (XJTLU)
Yi Huang (UoL)
Pengjian Gong
(JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

A low-profile semi-cylinder Luneburg lens (LL) made of novel air material is proposed using the transformation-optics (TO) technique. A air material which maintains its low dielectric constant (ε_r=1.5) and low dielectric loss (tanδ=0.0008) in the millimeter-wave (mm-wave) band is applied to build the proposed LL. Traditional flat TO-based Luneburg lenses typically offer limited size reduction, require substrates with higher permittivity, and suffer from long focal lengths, significant reflections, and a narrow beam-scanning range (BSR). In contrast, the proposed semi-cylinder LL achieves a near-surface focal point while reducing the volume by half. To account for practical fabrication, the effects of discretization and approximations on the radiation performance of the semi-cylinder LL were investigated and analyzed. A mm-wave semi-cylinder LL with a 30 mm radius is designed. The resulting LL antenna is compact, with a near-surface focal plane and a wide BSR, demonstrating potential for applications in radar and mm-wave wireless communications.

405

An Efficient MPC-based Motion Planning and Control Framework for Autonomous Vehicles

Siying Qin (PhD)

SUPERVISORS Yuqing Chen (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

This poster presents a novel motion planning and control framework for autonomous vehicles, integrating Model Predictive Control (MPC) with Hierarchical Quadratic Programming (HQP). The proposed framework utilizes a simplified dynamic vehicle model with a linear tire model for motion planning, enabling efficient handling of dynamic obstacles and energy optimization.

406

MvP-Diff: Multivariate yet Precise Diffusion for Anomaly Images Synthesis and Segmentation

Siyue Yao (PhD)

SUPERVISORS Eng Gee Lim, Siyue Yu (XJTLU)
Huynh Nguyen (UoL)

ACADEMY/SCHOOL School of Advanced Technology

This paper delves into the simultaneous synthesis of anomaly image samples and their corresponding segmentation labels, addressing the challenge of limited anomaly training data. Previous generative approaches relied heavily on the fixed and sparse input masks available from the small existing dataset to guide the synthesis of anomaly images. This reliance restricted the variety of the guidance masks, leading to a lack of diversity in the synthesized anomalous areas. Furthermore, the simplistic strategy of directly employing guidance masks as labels for synthesized images has frequently led to the mask label drift issue. To overcome these constraints, we introduce the Multivariate yet Precise Diffusion model (MvP-Diff). This model initiates the synthesis process by producing a diverse array of random bounding boxes. Within these boxes, MvP-Diff further creates multivariate anomalous regions with varying sizes, shapes, and patterns based on anomaly-free images. By comparing the differences between the anomaly and normal images, more precise mask labels are obtained for the anomalous regions, effectively mitigating the mask label drift phenomenon. Extensive experiments indicate that MvP-Diff surpasses existing methods in generating realistic and diverse anomaly samples, leading to approximately 5\% IoU improvement in anomaly detection methods.

407

Enhancing Automated Guided Vehicle Navigation with Multi-Sensor Fusion and Algorithmic Optimization

Taoyu Wu (PhD)

SUPERVISORS Limin Yu, Fei Ma (XJTLU)
Linglong Yuan (UoL)
Yutao Yue (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

Automated Guided Vehicles (AGVs) are improving operational efficiency in industrial settings. However, traditional 2D-Lidar-based navigation and obstacle avoidance lack the ability to classify obstacles. To address this, our paper integrates a MobileNet-based Yolo object detection algorithm for identifying pedestrians and obstacles, enhancing avoidance performance. Additionally, many SLAM algorithms focus on mapping accuracy but overlook relocalization speed, which is crucial in industrial applications. This paper proposes an enhanced relocalization strategy based on the Cartographer SLAM algorithm, using a multi-level dimensional extraction approach to improve the accuracy of GridMap in vision-based SLAM with 3D point clouds. Incorporating a dual-laser Lidar extrinsic calibration reduces the relocalization time by 35%. These improvements ensure AGV safety and stability in specialized tasks.

408

Spatial-Temporal Perception with Causal Inference for Naturalistic Driving Action Recognition

Wei Dai (PhD)

SUPERVISORS Limin Yu, Fei Ma (XJTLU)
Linglong Yuan (UoL)
Yutao Yue (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

Naturalistic driving action recognition is essential for vehicle cabin monitoring systems. However, the complexity of real-world backgrounds presents significant challenges, and previous approaches have struggled with practical implementation due to their limited ability to observe subtle behavioral differences and effectively learn inter-frame features from video. In this paper, we propose a novel Spatial-Temporal Perception (STP) architecture that emphasizes both temporal information and spatial relationships between key objects, incorporating a causal decoder to perform behavior recognition and temporal action localization. Without requiring multimodal input, STP directly extracts temporal and spatial distance features from RGB video clips. Subsequently, these dual features are jointly encoded by maximizing the expected likelihood across all possible permutations of the factorization order. By integrating temporal and spatial features at different scales, STP can perceive subtle behavioral changes in challenging scenarios. Additionally, we introduce a causal-aware module to explore relationships between video frame features, significantly enhancing detection efficiency and performance. We validate the effectiveness of our approach using two publicly available driver distraction detection benchmarks. The results demonstrate that our framework achieves state-of-the-art performance.

409

Photographed document analysis

Weiguang Zhang (PhD)

SUPERVISORS Qiufeng Wang, Wei Wang (XJTLU)
Xiaowei Huang (UoL)
Kaizhu Huang (DKU: Duke Kunshan University)

ACADEMY/SCHOOL School of Advanced Technology

Photographed documents are prevalent but often suffer from deformations like curves or folds, hindering readability. Consequently, document dewarping has been widely studied, however its performance is still not satisfied due to lack of real training samples with pixel-level annotation. To obtain the pixel-level labels, we leverage a document registration pipeline to automatically align warped-flat documents. Unlike general image registration works, registering documents poses unique challenges due to their severe deformations and fine-grained textures. In this paper, we introduce a coarse-to-fine framework including a coarse registration network (CRN) aiming to eliminate severe deformations then a fine registration network (FRN) focusing on fine-grained features. In addition, we utilize self-supervised learning to initialize our document registration model, where we propose a cross-reconstruction pre-training task on the pair of warped-flat documents. Extensive experiments show that we can achieve satisfied document registration performance, consequently obtaining a high-quality registered document dataset with pixel-level annotation.

410

Compact Distance-Adaptive Wireless Power Transfer Using a Reconfigurable Auxiliary Coil

Weijun Hong (PhD)

SUPERVISORS Jingchen Wang, Eng Gee Lim, Mark Paul Leach (XJTLU)
Yi Huang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Abstract—This letter proposes a distance-adaptive wireless power transfer (WPT) system using a reconfigurable transmit ter. The proposed transmitter incorporates a main coil and an auxiliary coil with adjustable currents. The auxiliary coil can be configured to directly control the coupling strength, which can mitigate excessive or insufficient coupling caused by distance variations. The distance adaptation capability of the proposed WPT system is verified through both simulations and experiments. Measurements of transmission coefficients show maximum increases of 64% at close-range (15mm) and 57% at long-range (110 mm). The overall effective transmission range has been improved by 59%. The proposed design offers a simple yet effective approach to distance adaptation while maintaining compact system dimensions.

411

An Integrated Electrochemical Sensor for Sensitive Detection of Carcinoembryonic Antigen (CEA) in Gastrointestinal Fluids

Wenjun He (PhD)

SUPERVISORS Mark Paul Leach, Pengfei Song (XJTLU)
Jiafeng Zhou (UoL)

ACADEMY/SCHOOL School of Advanced Technology

This study presents an innovative electrochemical sensor designed for the sensitive detection of carcinoembryonic antigen (CEA) in gastrointestinal fluids, incorporating a signal amplification mechanism and an internal reference standard for enhanced reliability. The sensor employs gold nanoparticles (AuNPs) functionalized with Fc-DNA to amplify the electrochemical signal upon CEA binding, significantly lowering detection limits. Additionally, ruthenium hexamine ($[Ru(NH_3)_6]^{3+}$) is integrated into the MXene surface as a stable internal standard, providing consistent reference signals to eliminate environmental noise, such as pH and temperature fluctuations, without requiring external solutions or complex setups. This integrated design simplifies the operation to a single-electrode platform, making the system highly efficient and portable for point-of-care testing (POCT) applications. The system offers a reliable and simplified solution for early-stage cancer detection in complex biological samples.

412

Density and Impurity based Supervoxel Selection for Active Point Cloud Semantic Segmentation

Xianglin Qiu (PhD)

SUPERVISORS Jimin Xiao (XJTLU)
Waleed Al-Nuaimy (UoL)

ACADEMY/SCHOOL School of Advanced Technology

In order to alleviate the labor of anno tation, active point cloud semantic segmentation uses supervoxel regions as the basic annotation unit and selects the most informative supervoxel samples for manual annotation and model training. Previous methods mainly considered the diversity of samples to avoid redundant annotations by selecting dissimilar supervoxels. However, we find that the representativeness of selected training supervoxels are also critical to the active learning efficiency. Considering this, we propose a region Density and class Impurity based Supervoxel Selection (DISS) method, which selects diverse samples in the feature space that are close to high-density areas. These samples are representative and can effectively model the distribution of original data. Meanwhile, to prevent the training bottleneck issue, we further select supervoxels with high class impurity as the hard samples to promote the model learning.

413

CNC: Cross-modal Normality Constraint for Unsupervised Multi-class Anomaly Detection

Xiaolei Wang (PhD)

SUPERVISORS Jimin Xiao (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

Existing unsupervised distillation-based methods rely on the differences between encoded and decoded features to locate abnormal regions in test images. However, the decoder trained only on normal samples still reconstructs abnormal patch features well, degrading performance. This issue is particularly pronounced in unsupervised multi-class anomaly detection task. We attribute this behavior to 'overgeneralization' (OG) of decoder: the significantly increasing diversity of patch patterns in multi-class training enhances the model generalization on normal patches, but also inadvertently broadens its generalization to abnormal patches. To mitigate 'OG', we propose a novel approach that leverages class-agnostic learnable prompts to capture common textual normality across various visual patterns, and then apply them to guide the decoded features towards a 'normal' textual representation, suppressing 'over-generalization' of the decoder on abnormal patterns. To further improve performance, we also introduce a gated mixture-of-experts module to specialize in handling diverse patch patterns and reduce mutual interference between them in multi-class training. Our method achieves competitive performance on the MVTec AD and VisA datasets, demonstrating its effectiveness. The code will be released soon.

414

Template-Driven LLM-Paraphrased Framework for Tabular Math Word Problem Generation

Xiaoqiang Kang (PhD)

SUPERVISORS Qiufeng Wang, Xiaobo Jin (XJTLU)
Xiaowei Huang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Solving tabular math word problems (TMWPs) has become a critical role in evaluating the mathematical reasoning ability of large language models (LLMs), where large-scale TMWP samples are commonly required for LLM fine-tuning. Since the collection of high-quality TMWP datasets is costly and time-consuming, recent research has concentrated on automatic TMWP generation. However, current generated samples usually suffer from issues of either correctness or diversity. In this paper, we propose a Template-driven LLMparaphrased (TeLL) framework for generating high-quality TMWP samples with diverse backgrounds and accurate tables, questions, answers, and solutions. To this end, we first extract templates from existing real samples to generate initial problems, ensuring correctness. Then, we adopt an LLM to extend templates and paraphrase problems, obtaining diverse TMWP samples. Furthermore, we find the reasoning annotation is important for solving TMWPs. Therefore, we propose to enrich each solution with illustrative reasoning steps. Through the proposed framework, we construct a highquality dataset TabMWP-TeLL by adhering to the question types in the TabMWP dataset, and we conduct extensive experiments on a variety of LLMs to demonstrate the effectiveness of TabMWP-TeLL in improving TMWP solving performance.

415

A Dual-Network, Antibacterial, Healable and Hot-Humid Tolerant Strain Sensor based on MXene Conductive Hydrogel for Wearable Electronics

Xiaoyan Wang (PhD)

SUPERVISORS Pengfei Song (XJTLU)
Kai Hoettges (UoL)

ACADEMY/SCHOOL School of Advanced Technology

In this study, we developed a wearable, antibacterial, healable, and hot-humid tolerant strain sensor based on a dual-network hydrogel system. The first network is formed by the mixture of MXene with PVA and TOCNF, and the second network is introduced by incorporating di-Borax into the system. The dual-network structure endows the hydrogel with enhanced temperature tolerance (−80°C) and hot-humid stability (32°C and 70% Relative Humidity (RH) for 24h, and 38°C and 52% RH for 6h), which is crucial for maintaining functionality in harsh environments. By turning the component ratio of MXene, the optimized hydrogel sensor exhibits strain sensitivity (GF 7.79, strain 800%). In particular, the integration of MXene into the hydrogel endowed it with unparalleled antibacterial properties, achieving a 100% efficacy in inhibiting the proliferation of both E. coli and B. subtilis.

416

Investigations on key techniques of wireless power transmission using metamaterials

Xiaozhe Ji (PhD)

SUPERVISORS Jingchen Wang, Ka Lok Man, Eng Gee Lim (XJTLU)
Jiafeng Zhou (UoL)
Yutao Yue (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

This project explores a metamaterial (MTM) array with negative effective permeability used as an intermediate power focusing element in a wireless power transmission (WPT) network. The four-coil WPT link consists of spiral coils. The MTM is comprised of split ring resonators fabricated on FR-4 substrate with a thickness of 0.5 mm. The proposed MTM was modelled and simulated using CST Studio Suite with the effective permeability reduced from its S-parameters. By applying the proposed MTM to a WPT link, an improvement in power transfer efficiency (PTE) and magnetic field distribution can be achieved. When the overall distance between the transmitter and receiver is 120 mm, the PTE improves from 26% to 59.3%, representing a 33% enhancement at 13.56 MHz.

417

Research on the dynamic lifespan of cable under cyclic load variation

Yanxi Lyu (PhD)

SUPERVISORS Lurui Fang, Eng Gee Lim (XJTLU)
Lin Jiang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The thermal effects of electrical loads on cables directly influence their lifespan – it is known as thermal aging. The design lifespan of a cable is traditionally calculated based on the temperature under steady-state loads; however, in practice, the load carried by cables is typically cyclic. This study investigates the impact of cyclic loads on cable lifespan, acknowledging that variations in load profiles lead to corresponding changes in lifespan. By analyzing different load profiles, this research aims to provide insights into the relationship between dynamic load variations and cable thermal aging behavior. The findings will contribute to the optimization of cable usage and lifespan prediction under realistic operating conditions, offering valuable guidance for the design and management of power systems.

418

Impedance Decoupled Secondary Control Based on a Consensus Prototype for All-Electric Ships

Yi Zhu (PhD)

SUPERVISORS Huiqing Wen (XJTLU)
Lin Jiang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The stability of DC grids in All-Electric ships is affected by power fluctuations of propulsion systems caused by in- and-out-of-water effect. This paper proposes a decoupled droop control to decouple the converters' output impedance with the steady-state operating point and voltage control loop. As a result, the output impedance is decreased and the voltage fluctuations are reduced. Then a impedance regulation secondary control strategy is proposed to ensure the accurate power sharing among the distributed sources. The control system design is verified by PLECS AC sweep results. Experiments are also conducted to verify the control strategies. The experimental results show that the proposed control strategies can achieve accurate power sharing according to the related power of the distributed sources and low output voltage fluctuations simultaneously regardless of the mismatched cable impedance.

419

Impact Assessment of Distributed Secondary Control Schemes for Autonomous AC Microgrids under Multipoint FDI Attacks on Q-V Droop

Yifeng Huang (PhD)

SUPERVISORS Chee Shen Lim, Fei Xue (XJTLU)
Lin Jiang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Following the gradual maturity of the autonomous AC microgrid technology, the security and robustness of power electronic-based distributed energy resources are becoming increasingly important. Cyberattack on the microgrid hierarchical control layers is a growing concern. In this paper, the impacts of False Data Injection (FDI) cyber-attacks onto the secondary control layer that is comprised of the well-established distributed consensus control schemes, i.e., distributed dispatch control and distributed virtual output impedance (VOI) control, are compressively assessed respectively. The assessment focuses on FDI attacks on the Q-V droop structure, which is rarely investigated to date. The analysis is benchmarked against the centralized control scheme. All the considered schemes shared to the widest possible extent the same inner voltage and current control loops, thereby improving the validity of comparison and discussion. Disturbances of the point of common coupling's phase voltage magnitude and reactive power are discussed.

420

Subspace regularization for few-shot class incremental learning

Yijie Hu (PhD)

SUPERVISORS Qiufeng Wang (XJTLU)
Xiaowei Huang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Few-shot Class Incremental Learning (FSCIL) presents a challenging yet realistic scenario, which requires the model to continually learn new classes with limited labeled data (i.e., incremental sessions) while retaining knowledge of previously learned base classes (i.e., base sessions). Due to the limited data in incremental sessions, models are prone to overfitting new classes and suffering catastrophic forgetting of base classes.

421

A topological and interfacial microstructure-based bilayer Bi/Al resistive switching memristor

Yiming Liu (PhD)

SUPERVISORS Wei Chen, Qifeng Lu (XJTLU)

ACADEMY/SCHOOL School of Robotics

Non-volatile memory (NVM) has emerged as a potential technology for neuromorphic computational systems because of its excellent storage and parallel computing capabilities. However, the conventional two-terminal NVM devices, with a forming process, lead to stochasticity in devices and transistor-based NVM devices needing a complex design. This study introduces a resistive switching memory device based on a topological bilayer structure of semi-metallic bismuth (Bi) below and metallic aluminum (Al) above. The electrical measurements under an applied sweeping voltage, cause Bi particles to migrate in the interfacial microstructure and subsequent modulation of the resistive states, which supports reversible transitions between high-resistance (HRS) and low-resistance states (LRS). The device exhibits performances, including consistency, repeatability, ON/OFF ratio of $>3\times10^3$, endurance >2000 cycles, retention, and multi-state storage. This research provides an alternative solution for designing simple-structured NVM devices and advancing hardware for artificial intelligence applications.

422

Continual Segmentation with Disentangled Objectness Learning and Class Recognition

Yizheng Gong (PhD)

SUPERVISORS Jimin Xiao, Siyue Yu (XJTLU)
Waleed Al-Nuaimy (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Most continual segmentation methods tackle the problem as a per-pixel classification task. However, such a paradigm is very challenging, and we find query-based segmenters with built-in objectness have inherent advantages compared with per-pixel ones, as objectness has strong transfer ability and forgetting resistance. Based on these findings, we propose CoMasTRe by disentangling continual segmentation into two stages: forgetting-resistant continual objectness learning and well-researched continual classification. CoMasTRe uses a two-stage segmenter learning class-agnostic mask proposals at the first stage and leaving recognition to the second stage. During continual learning, a simple but effective distillation is adopted to strengthen objectness. To further mitigate the forgetting of old classes, we design a multi-label class distillation strategy suited for segmentation. We assess the effectiveness of CoMasTRe on PASCAL VOC and ADE20K. Extensive experiments show that our method outperforms per-pixel and query-based methods on both datasets.

423

Research on LPBF-Ti-6Al-4V parts defect detection method based on Printing Window

Yuanzhe He (PhD)

SUPERVISORS Min Chen, Konstantinos Papadikis (XJTLU)
Guangliang Cheng (UoL)
Qi Chao (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

Titanium alloy Ti6Al4V is widely used in aerospace, medical, and automotive industries due to its superior properties. Additive manufacturing (AM), particularly Laser Powder Bed Fusion (L-PBF), offers an effective approach for producing complex Ti6Al4V components with high performance. However, L-PBF is prone to defects, including porosity, cracks, and microstructural inconsistencies, which compromise material strength and fatigue resistance. This study investigates the identification and classification of defects in Ti6Al4V parts produced via L-PBF using 2D and 3D imaging techniques, such as optical microscopy and X-ray computed tomography. Machine learning algorithms, including artificial neural networks and K-means clustering, are employed to classify defects based on geometric features. The research aims to optimize processing parameters and enhance defect detection, contributing to the improvement of AM quality control and the reliability of Ti6Al4V components in critical applications.

424

GRASP-SLAM: Gmapping-augmented DRL for Active SLAM using Policy Gradient

Yue Zhang (PhD)

SUPERVISORS Xinheng Wang, Limin Yu (XJTLU)
Junqing Zhang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Traditional Simultaneous Localization and Mapping (SLAM) passively receives sensor information for mapping and positioning, while active SLAM systems allow robots to acquire environmental information actively. The combination of deep reinforcement learning (DRL) and SLAM allows the robot to become a truly autonomous agent. However, most active SLAM algorithms now use the discrete strategy of DRL, and the robot can only act according to the preset speed and angle. GRASP-SLAM, an active SLAM framework implemented by building a DRL continuous policy framework that conforms to active SLAM principles. We designed relevant data formats to enable the robot to independently select actions and termination times. Reward functions are also designed to allow the robot to reduce collisions and draw a more accurate map. GRASP-SLAM can still achieve a higher degree of map completion in a shorter time than other methods and can be exploited in a loop closure to reduce its uncertainty.

425

Multi-objective optimization of control parameters in motor servo system by AMOGOA for industrial application

Yunfei Xie (PhD)

SUPERVISORS Xuchen Wang (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

Tuning control parameters for motor servo systems (MSS) using classical methods is cumbersome, inefficient, and imprecise, while optimization techniques are often limited by intelligent algorithms getting stuck in local optima. To address these challenges, this paper introduces a novel Adaptive Multi-objective Grasshopper Optimization Algorithm (AMOGOA) for control parameter tuning through multi-objective optimization. AMOGOA adaptively adjusts the attenuation coefficient c during iterations to balance global search and local exploration, preventing convergence to local optima. Firstly, key control parameters are defined, and a multi-objective optimization model is established to minimize steady-state error, overshoot, and settling time. The proposed AMOGOA is then used to solve the model, generating a Pareto solution set. Finally, the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method is applied to select the optimal solution.

426

Dynamic Performance Analysis of Ultra-fast Inverter based on Tri-gate AlGaN/GaN MIS-HEMTs

Yunsong Xu (PhD)

SUPERVISORS Wen Liu, Jiangmin Gu (XJTLU)
Ivona Mitrovic (UoL)

ACADEMY/SCHOOL School of Advanced Technology

This work demonstrates dynamic response characteristics of the tri-gate AlGaN/GaN high electron mobility transistor (HEMT) direct coupled FET logic (DCFL) inverter. The threshold voltage of the inverter is 2.74 V, the rise and fall time are 2.6 ns and 2.0 ns respectively with 1.8 ns and 0.2 ns propagation delay for each edge. The mechanisms for the excellent switching time performance are also revealed from the perspective of the device.

427

An Integrated Mobile Robotic System for Pavement Crack Sealing Using 3D Printing

Yushi Fan (PhD)

SUPERVISORS Yufan Zheng, Yi Chen (XJTLU)
Heba Lakany (UoL)

ACADEMY/SCHOOL School of Intelligent Manufacturing Ecosystem

Cracking is a common fault in asphalt and concrete pavements, which causes water damage and further defects if not repaired in timely fashion. Traditional pavement crack repair methods heavily rely on large sealing equipment and manual labor, leading to issues such as subjectivity, high labor intensity, and low efficiency. To address these problems, this paper proposes an automated pavement crack sealing integrated mobile robot system based on 3D printing technology. The system is equipped with a six-axis robotic arm for multi-degree-of-freedom asphalt 3D printing, along with a depth camera and crack detection algorithm for precise identification and localization of pavement cracks. By combining crack detection algorithms, repair path planning algorithms, and mobile platform control algorithms, the platform can efficiently and accurately detect and locate pavement defects, enabling in-situ repair of these defects.

428

A Design of Wireless Power Transfer System Using Pattern Reconfigurable Antenna for 5G Applications

Zeyu Liu (PhD)

SUPERVISORS Jingchen Wang (XJTLU)
Yi Huang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

This project proposed a novel and easily constructed moving charging device with reconfigurable transmitting antenna and an innovative compact receiving rectenna. Transmitting antenna has two modes used as diverge towards both sides of the antenna and concentrate towards the middle of the antenna, which are both operated in 3.5 GHz, and controlled by the conduction and cut-off the two PIN diodes. The receiving antenna is also designed to be resonated at 3.5 GHz to match the transmitting antenna. The simulated power conversion efficiency (PCE) of the rectifier reaches a maximum of 79%. The total efficiency of the receiving antenna is over 90%, in addition, the gain of the receiving antenna is improved in this design. The fundamental objective of this project is to enable multiple objects to receive more energy (while receiving antenna is moving) by adjusting the angle and position.

429

Characterization and control of residual stresses in Laser Powder Bed Fusion processed metals at the microscale.

Zhaofeng Zhang (PhD)

SUPERVISORS Min Chen (XJTLU)
Maulik Patel, Karl Whittle (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The demand for intricate metal parts has driven the use of LPBF, but residual stresses in the process affect part performance. This doctoral research focuses on microscale residual stress measurement in LPBF-produced metals. It explores the ring-core method with FIB-DIC and nanoindentation. Current methods have limitations. By accurately measuring and managing stress, better control of stress distribution in the melt pool is expected for improved component integrity and lifespan.

430

Multimodal Optoelectronic Synaptic Transistors Based on DTT-TCNQ Cocrystals for Robotic Vision

Zhaohui Cai (PhD)

SUPERVISORS Chun Zhao, Eng Gee Lim (XJTLU)
Xin Tu (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Artificial synapses based on photosensitive materials are promising low-power, high-efficiency devices essential for advancing artificial intelligence vision. DTT-TCNQ cocrystal materials, due to their excellent optical waveguide properties, endow synaptic transistors with tunable optoelectronic responses. In this study, DTT-TCNQ cocrystals are used to improve the basic InOx/ZrOx artificial synaptic thin-film transistors (TFT). This enhanced device exhibits diverse pulse responses to light stimuli from 395 nm to 808 nm, with unique inhibitory postsynaptic current (IPSC) under 808 nm. Its remarkable plasticity enables applications in half-adders for "AND" and "NOR" logic functions in scenarios of optoelectronic synergies. Additionally, the device's light excitation and light inhibition characteristics support robotic intelligent recognition with high-precision. Its highly linear and symmetrical light-writing and light erasing characteristics allow it effective for CNN-based video classification, achieving recognition accuracy that surpasses human capability and offering robust anti-interference capabilities. This study demonstrates that integrating cocrystal-based synaptic transistors with multimodal optoelectronic regulation optimizes their role in neuromorphic computing.

431

Dynamic Wi-Fi fingerprint database establishment and data augmented

Zhe Tang (PhD)

SUPERVISORS Kyeong Soo Kim (XJTLU)
Jeremy Smith (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Traditional fingerprint-based localization methods are based on static methods, i.e., ignoring changes in the signal over time. However, for indoor complex electromagnetic environments, the signal variation over time is drastic, which can lead to the long-term localization accuracy of the model receiving an impact. Therefore constructing a dynamic database to include signal variations over time is a must. This study focuses on constructing a dynamic Wi-Fi fingerprint database and reducing the time and human resource overheads of database creation through reasonable data augmentation methods.

432

Acceleration research of the computational fluid dynamics (CFD) solver based on the flux reconstruction method

Zhehao Sheng (PhD)

SUPERVISORS Yan Yan, Jie Sun (XJTLU)
Youbin Zheng (UoL)
Jiahuan Cui (ZJU: Zhejiang University)

ACADEMY/SCHOOL School of Advanced Technology

The discontinuous Galerkin method (DGM) is characterized by high precision, high resolution, and efficient discontinuous processing capability in the field of Computational fluid dynamics (CFD). To address the problems of decreased convergence efficiency and increased storage cost when solving complex models or high-order problems, acceleration research based on the DGM is carried out. By using the p-multigrid method and local Mach number preprocessing technology, under the condition of constant accuracy, the computational performance and efficiency of the solver will be greatly improved. Because the explicit scheme cannot quickly eliminate low-frequency errors on the lowest order approximation, RK explicit format is used for high-order processing, and time implicit format is used for the lowest order. This research serves as a theoretical foundation and guides the enhancement of acceleration of the CFD solver based on the FR method, making it easier to be applied in the engineering problems.

433

Advanced dual-input artificial optical synapse for Neuromorphic computing

Zhengjun Liu (PhD)

SUPERVISORS Qing Liu, Chun Zhao (XJTLU)
Ivona Mitrovic (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Perovskite materials have emerged as leading candidates for optical synaptic devices due to their superior photosensitivity and tunable optoelectronic properties. However, the practical application of perovskite-based optoelectronic synaptic transistors has been hindered by issues of poor stability and high toxicity. This study developed an artificial synaptic thin film transistor (TFT) based on a Cs2AgBiBr6/InOx bilayer. The device demonstrated synaptic behavior under optoelectronic hybrid stimulation (largest wavelength ~520 nm), such as excitatory postsynaptic current (EPSC), inhibitory postsynaptic current (IPSC), paired-pulse facilitation (PPF), spike-timing-dependent plasticity (STDP), short-term memory (STM) and long-term memory (LTM). Notably, the "light writing and voltage erasing" characteristics of these devices could be utilized to construct a convolutional neural network (CNN) classifier for the CIFAR-10 dataset, demonstrating noise tolerance close to the human eye. The loss in recognition accuracy was within 1 % when Gaussian white noise and salt pepper noise were added.

434

A polymer-like ultrahigh-strength metal alloy

Zhizhi Xu (PhD)

SUPERVISORS Xiaobing Ren

UNIVERSITY/INSTITUTE Xi'an Jiaotong University /
Frontier Institute of Science and Technology

Futuristic technologies like morphing aircrafts and superstrong artificial muscles are hinged on metal alloys being as strong as an ultrahigh-strength steel yet as flexible as a polymer1-3. However, achieving such "strong yet flexible" alloys has proven challenging4-9 due to the inevitable trade-off between strength and flexibility 5,8,10. Here we report a Ti-50.8 at.% Ni strain glass alloy showing an unprecedented combination of ultrahigh yield strength σy ~1.8 GPa with polymer-like ultralow elastic modulus E ~10.5 GPa, together with superlarge rubber-like elastic strain of ~8%. As a result, it possesses the highest flexibility figure of merit σy/E ~0.17 among existing structural materials. In addition, it can maintain such property over a wide temperature range of -80 ℃~+80 ℃ and demonstrates excellent fatigue resistance at high strain. This exotic alloy with mass-producibility may open a new horizon for many futuristic technologies such as morphing aero/space vehicles, superman-type artificial muscles, and artificial organs.

435

Neuro-inspired Devices for In-memory Sensing and Computing System

Zishen Zhao (PhD)

SUPERVISORS Qing Liu, Chun Zhao (XJTLU)
Ivona Mitrovic (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The rapid advancement of artificial intelligence (AI) necessitates commensurate progress in specific hardware areas designed for intelligent applications. Neural-inspired computing chips incorporate neural morphological functionalities spanning perception, storage, and computation, thereby offering an efficient and energy-conserving solution for handling AI workloads. In-memory sensing and computing chips architecture necessitate the support of neuromorphic functions within the underlying device units. Consequently, this work encompasses research on semiconductor devices with neural capabilities and the development of their potential applications in specific areas of AI computing.

436

Wojtyła's the Acting Person: Inconsistencies in English Translation and the Concept of Experience

Bartlomiej Zbigniew Kowalczyk (PhD)

SUPERVISORS Karl Simms

UNIVERSITY/INSTITUTE University of Liverpool /
School of the Arts, Department of English

This research explores the challenges and inconsistencies encountered in translating Karol Wojtyła's philosophical work The Acting Person into English. Wojtyła's complex philosophical framework, rooted in phenomenology and personalism, presents unique challenges for translators. The study examines specific instances of translation difficulties, such as the translation of key concepts like 'person,' 'act,' and 'intentionality.' It analyses how these translations impact the overall coherence and accuracy of the English text. Additionally, this paper offers a solution to the English interpretation of the concept of 'experience'. By identifying and analysing these inconsistencies, this research aims to contribute to a deeper understanding of Wojtyła's philosophy and to improve future translations of his work.

Key words: Wojtyła, The Acting Person, translation, inconsistencies, experience.

437

The impact of different conversational generative AI chatbots on EFL learners: An analysis of willingness to communicate, foreign language speaking anxiety, and self-perceived communicative competence

Chenghao Wang (PhD)

SUPERVISORS Bin Zou, Rining Wei (XJTLU)
Christian Jones (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

Based on the Interaction Hypothesis, the study investigates the impact of different conversational Generative Artificial Intelligence (GenAI) chatbots on English as a Foreign Language (EFL) learners' willingness to communicate (WTC), foreign language speaking anxiety (FLSA), selfperceived communicative competence (SPCC) and speaking performance. Three groups of Chinese undergraduate students were recruited: a control group (CG, N = 33) and two experimental groups (EG1, N = 33; EG2, N = 33). The CG interactedwith the teacher and classmates during the speaking class. In contrast, EG1 interacted with a text- and voice-based conversational GenAI chatbot called Typebot, while EG2 engaged with a conversational GenAI chatbot that featured both text and voice interaction along with human-like avatars named D-ID Agent. Quantitative analysis using multilevel modelling revealed that EG2 showed significant improvements in WTC and SPCC and a notable reduction in FLSA levels compared to CG. However, the pre- and postspeaking test results showed no significant differences in speaking performance across the groups. Qualitative data from semi-structured interviews supported these findings, highlighting the immersive learning experience and emotional support provided by the human-like avatars. These results suggest that visually embodied GenAI chatbots can effectively enhance the emotional experience during the language learning. The study provides practical insights for language educators on integrating GenAI technologies in language teaching, emphasising the benefits of human-like avatars in fostering a more engaging and supportive learning environment.

438

An Analysis of Self-Presentation Strategies by Chinese Female Social Media Influencers On Douyin

Danni Tang (PhD)

SUPERVISORS Li Chuan Evelyn Mai, Yiqing Yang (XJTLU)
Lei Peng (UoL)

ACADEMY/SCHOOL Academy of Film and Creative Technology

The aims of this study are to investigate how female social media influencers using different self-presentation strategies to develop their celebrity value on Douyin, and to explore how their celebrity values attracting their followers. This study examines the self-presentation strategies of Chinese female social media influencers through self-presentation theory and celebrity capital theory to understand what motivates female influencers to adopt their self-presentation strategies and how the capital affects their strategies. Semi-structured interviews will be employed to collect data from Chinese female social media influencers on Douyin, in order to understand how female influencers present themselves with their strategies. This study combines the selective cases from Douyin analysing their self-presentation strategies, further explores the reasons for their use of these self-presentation strategies, dissects the relationship between capital operations in the context, and suggests the future direction of women's social media influencers in their creations.

439

''Isn't This Just a Game?'' - Unpacking Audience Engagement in Chinese Interactive Web Series: Ludification vs. Gamification

Hanxue Zhang (PhD)

SUPERVISORS Marco Pellitteri, David Herold (XJTLU)
Chris McMahon (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

This study investigates audience preferences for interactivity in interactive web series, with a particular emphasis on ludification and gamification frameworks, as determined by Goffman's Frame Theory and audience interviews. In order to explore whether gamification or ludification-based interaction designs attract Chinese viewers more effectively, this study first conducts a case study analysis of three Chinese domestic interactive web series, identifying the interactive elements present in each. The results indicate that viewers prioritise a playful and exploratory experience, with a preference for freedom and enjoyment over the pressure of consequences such as failure or the necessity of repetitive actions. According to the analysis, mechanisms that promote relaxed participation and emotional immersion (ludification) are more aligned with audience expectations than those driven by goals and challenges (gamification). Interactive web series can benefit from reducing punitive elements and increasing narrative-driven interactivity to create a more enjoyable viewing experience.

440

Can Large Language Models Provide Useful Feedback in Translation Education?

Hui Jiao (PhD)

SUPERVISORS Xiaojun Zhang, Lu Zong (XJTLU)
Bei Peng (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

This study explores integrating Large Language Models (LLMs), specifically GPT-4, into Translation Quality Evaluation (TQE) to enhance translation education. With rising student numbers and limited teaching resources, providing detailed expert feedback on student translations is challenging. Expert feedback is essential for improving translation skills but requires significant expertise and meticulous effort to address inaccuracies, grammatical errors, and stylistic issues. Existing automatic TQE metrics like BLEU, ROUGE, and METEOR often overlook nuanced aspects such as cultural appropriateness and stylistic fidelity and provide less explainable scores without detailed feedback. The proposed approach uses LLMs to generate constructive, AI-driven translation feedback. Through similarity evaluation, feedback relevance analysis, and user studies, the research demonstrates that AI-generated feedback aligns significantly with expert feedback, offering a viable solution to the feedback bottleneck in translation education. Students positively received the LLM TQE Feedback Generation Pipeline due to its flexibility, promptness, and accuracy.

441

Measuring intercultural experience and its effects on intercultural competence: A structural equation modeling approach

Jiaqi Jiang (PhD)

SUPERVISORS Jirong Guo

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Foreign Studies

With the rapid rise of globalization, communication and interaction between different social cultures become common. College students have been regarded as the subject of learning and experiencing multi-culture, and their intercultural competence (ICC) has been brought into focus by scholars. In terms of the above situation, integrating the quantitative questionnaire survey and the qualitative semi-structured interview, this study has firstly explored main factors of Chinese college students' intercultural experience. Then, it has investigated the current state of Chinese college students' intercultural competence. Besides, path analysis has been conducted through structural equation models in this study to examine the effects of Chinese college students' intercultural experience on their intercultural competence. This study also gives suggestions for colleges nailing down key points of intercultural foreign language teaching, and for the education department improving intercultural foreign language education policies according to the result of semi-structured interview.

442

Imagining Shanghai as the lost hometown: Wong Kar-wai's spatial construction in "In the Mood for Love"

Jie Sun (PhD)

SUPERVISORS Hui Miao, Xiaoling Zhang (XJTLU)
Penny Ding (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

This study explores how Wong Kar-wai's film "In the Mood for Love" (2000) employs cinematic techniques to construct an imagined hometown that evokes and encourages viewers' emotional engagement. Through an analysis of the film's visual and spatial elements, it examines how the director imagines a distant homeland, challenging the traditional portrayal of the concept in Chinese cinema. By disrupting the sense of security and naturalness of this cinematic space, the film intensifies the emotional tension within it and transforms it from a backdrop to a driving force in the narrative. This unique approach allows viewers to connect through sensory and emotional experiences rather than relying on shared cultural references. Therefore, this study argues that Wong's cinematic strategies demonstrate the power of affective cinema to foster sensory and intellectual engagement, encouraging cross-cultural understanding and enabling meaningful communication with a global audience.

443

Analysis of China-Related Discourse in Mainstream French Media: A Corpus-Based Discourse-Historical Approach

Jing Li (PhD)

SUPERVISORS Hongli Wang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Foreign Studies

This study aims to examine China-related coverage in mainstream French media from October 16, 2022, to December 31, 2023, by constructing a corpus and applying the discourse-historical approach within critical discourse analysis. The research demonstrates that China's rise has profoundly impacted the Western-dominated international communication order, and French media have shaped perceptions of China against this backdrop. The analysis is based on French-language reports from Le Figaro and Le Monde, using the AntConc 3.5.9 corpus tool for quantitative analysis to reveal overall discourse evolution patterns and their underlying sociocultural roots. By combining micro-level linguistic analysis with macro-level social context, this study offers fresh insights into how transnational media discourse influences national image formation. Additionally, it provides policy recommendations for fostering mutual understanding and trust in Franco-Chinese relations.

444

Children's Imagery in War: An Analysis Focused on Children's Imagery in the 2013 Syrian Al Ghouta Attack

Kindah Ali (PhD)

SUPERVISORS Ekaterina Balabanova

UNIVERSITY/INSTITUTE University of Liverpool / School of the Arts

Digital storytelling is complex since it affects diverse cultures. The digital age has connected cultures with varying beliefs, customs, and values. This means that what one culture considers normal, another may consider offensive. To ensure the internet, especially digital storytelling, is beneficial for everyone, there is a need for cross-cultural understanding and proper regulations to be put in place to avoid bias, stereotypes, and misunderstanding. This paper uses Walter Fisher's narrative paradigm theory to argue that people desire the natural human instincts to connect through storytelling. Thus, a well-crafted narrative will appeal to a target audience. Furthermore, it uses Guy Debord's spectacle theory to explain why the internet has blurred the lines between reality and fiction. This has led to people commodifying almost everything, including human suffering. For instance, the New York Times created The Displaced VR, which enables users to experience the Middle East conflicts, including Syria. This makes users view the conflict as a movie without taking necessary steps, such as aiding war victims. This paper includes the Syrian Civil War of 2011 as a case study to discuss the impacts of digital storytelling on cross-cultural communication. The advancements in technology in the 21st century was clear in the Syrian Civil War, which used children's imagery on social media for various purposes. The paper concludes that digital storytelling is a double-edged sword that can improve or diminish cross-cultural communication.

Keywords: digital storytelling, cross-cultural communication, artificial intelligence (AI), virtual reality (VR), Syrian Civil War, children imagery

445

The role of positive and negative contact in shaping intergroup attitudes: Evidence of secondary transfer effects among Chinese university students

Lingjie Tang (PhD)

SUPERVISORS Chang'an Zhang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Foreign Studies

This study explores the concept of secondary transfer effects (STE) in the context of intergroup contact, specifically examining whether positive and negative contact with international students influences attitudes towards two secondary outgroups: disabled individuals and homosexuals, among university students in China. The study further investigates the role of mediating variables, including social dominance orientation (SDO), intergroup anxiety, outgroup trust, and ingroup norms. A survey conducted with 2,151 Chinese university students (Mage = 22.36) revealed that positive contact with international students was correlated with increased acceptance of not only international students but also the disabled and homosexuals. The mediating effects of SDO, intergroup anxiety, outgroup trust, and ingroup norms were confirmed, indicating that these variables influence the STE across different outgroups. The study highlights the persistence of STE even when contact originated from the secondary outgroups themselves, indicating broader intergroup dynamics. Negative contact was found to have detrimental effects, reinforcing the need to consider its potential harm in promoting social harmony.

446

Decoding Paradoxical Identities: The Discourse Construction of Left-Behind Children in News Reports

Linlin Liang (PhD)

SUPERVISORS Hongli Wang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Foreign Studies

This paper presents an empirical corpus-based study on the identity of left-behind children in China, employing the discourse-historical approach (DHA) framework. It is the first study to combine Latent Dirichlet Allocation (LDA) topic modeling and reported speech analysis to examine how China Daily constructs the identity of left-behind children and explore the cultural and rhetorical factors influencing this identity construction. By integrating computational techniques and qualitative analysis methods, this study provides a comprehensive understanding of the intricate nature of identity construction for left-behind children. This interdisciplinary approach strengthens the theoretical foundations of media analysis and offers fresh insights into the dynamics of media discourse. The findings reveal that China Daily portrays left-behind children in a multifaceted and diverse manner, encompassing both positive and negative aspects, while placing emphasis on their vulnerability and passivity. Furthermore, the media employs communication techniques such as identification by sympathy, antithesis, and inaccuracies to establish emotional resonance and foster audience identification, ultimately influencing the audience's perspectives on these children.

447

''Never seen Chinese people and Korean people try to learn each other's language so hard'': Scaling multilingualism in online conflict

Mengdi Liu (PhD)

SUPERVISORS Luk Van Mensel (XJTLU)
Robert Blackwood (UoL)
Songqing Li (UM: University of Macau)

ACADEMY/SCHOOL School of Humanities and Social Sciences

Drawing on sociolinguistic scaling as a critical, metapragmatic approach (Blommaert, 2007, 2021), this paper aims to illustrate how netizens stage multilingualism to navigate and negotiate polylogal (multi-party) online conflictual interactions. The data are taken from comments on two controversial videos from Li Ziqi's YouTube channel. The videos, showing how to pickle vegetables, fuelled cultural debates over the origin and ownership of one dish, coined as either 'spicy Chinese cabbage' or 'kimchi'. Our analysis shows how interactants flexibly deploy scaling strategies, of and on multilingualism, to make meanings and relations. Multilingualism is leveraged for further (dis)association and conflict mitigation. Language can also generate a battlefield of itself where languages and language practices are appraised. 'Learning other's language(s)' is both supported in cross-cultural communication while being selectively avoided in conflictual interactions. Our observations confirm the dynamics of (ethno)linguistic ideologies in shaping digital nationalism (Ahmad, 2022; Mihelj & Jiménez-Martínez, 2021).

448

The impact of mobile phone vernacular photography on aesthetics appreciation among practitioners in daily life

Qi Wang (PhD)

SUPERVISORS Marco Pellitteri, David Herold (XJTLU)
Michelle Henning (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

This study investigates whether and how the everyday practice of vernacular photography among mobile phone practitioners impacts their long-term aesthetic taste in identifying and appreciating beauty in everyday moments. This is grounded in Susan Sontag's work ''On Photography'' (1980), which proposed that photographs set the standards for beauty. This presentation will explore the question of to what extent mobile phone photography, as a technologically accessible technique, extends practitioners and users themselves and sensory, and whether this media itself shapes or limits individuals' visual perception and engagement with beauty. This research employs semi-structured interviews with 38 participants with different cultural and educational backgrounds. Interviews with mobile phone practitioners will gain their insights and concepts of aesthetics appreciation. This study hypothesises that mobile phone photography extends practitioners' bodies in different ways, which also extends users' visual perception by how they perceive and capture moments.

449

An Investigation into Chinese IELTS Learners' Motivation and its Effect on Learning Outcomes

Qingyue Zhang (PhD)

SUPERVISORS Kelechukwu Ihemere, Qianqian Zhou (XJTLU)
Shuang Gao (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

Motivation is widely recognized as a pivotal factor influencing learners' outcomes, particularly in the context of Chinese English as a Foreign Language (EFL) learners. Chinese EFL learners' motivation types have demonstrated variations based on diverse backgrounds, as evidenced by Dörnyei's Second Language Self-Motivation System (L2MSS). This study investigates the relationship between motivation and learning outcomes specifically within IELTS preparation. Using a mixed-method approach that includes focus group interviews and a questionnaire, the research shows that those participants in an IELTS course draw motivation from various aspects of the L2MSS, with differing influences on emotions and IELTS scores. In addition, the study examines the relationship between motivation and gender. By analyzing IELTS test achievement and motivation questionnaires, this research aims to provide a comprehensive understanding of Chinese EFL learners' motivation in high-stakes contexts.

450

Vietnamese media and the Russia-Ukraine war

Thi Kim Quy Hoang (PhD)

SUPERVISORS Tabe Bergman, Dharmananda Adhikari (XJTLU)
Vera Slavtcheva-Petkova (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

There is widespread recognition that the Russia-Ukraine war is taking place not only on the battlefield but also in the informational sphere. However, scholarship on the war's media coverage has significantly focused on big-sized and more influential countries while lacking attention to small-sized countries, particularly Latin America, Asia, and Africa. To partly fill this gap, my project focuses on how Vietnamese media cover the war and examines the relationship between that coverage and its national foreign policy. Vietnamese news during the first two years of the Russia-Ukraine war is evaluated on both macro and micro levels by adopting the conceptual framework of the political economy of communication and methodology of thematic analysis and interviews with Vietnamese journalists. The research aims to enrich scholarship about the Russia-Ukraine wars and media-foreign policy relations and extend the discussion of Vietnamese media in academic research.

451

Exploring how cultural immersion in museums shapes visitor experience

Tianyi Chen (PhD)

SUPERVISORS Li Chuan Evelyn Mai (XJTLU)

ACADEMY/SCHOOL Academy of Film and Creative Technology

Museums play a vital role in promoting cultural understanding and appreciation by providing immersive experiences, such as using the environment in the exhibition hall to create a unique atmosphere and connect visitors with different artistic and cultural narratives. This study aims to explore how the immersive cultural shaping of museums located in London and Shanghai affects visitor experience based on Falk and Dierking's museum experience theory as a theoretical framework, focusing on the interaction between exhibition design, collection display, spatial layout, atmosphere and context shaping, and visitor participation. It is also committed to finding similarities and differences through empirical research on museum visitor experience in different cultural contexts. Through the analysis of case studies and semi-structured interviews with visitor feedback, this study will explore how different cultural and artistic themes in museum collection resources and exhibition design shape visitors' aesthetic perceptions and emotions and how museum elements such as interactive displays and multi-sensory environments enhance visitors' cultural understanding and emotional resonance. The research results will emphasize the importance of inclusiveness and innovation in exhibition planning, which can establish meaningful connections with cultural heritage while meeting the needs of different audiences. This research highlights the transformative potential of museums as spaces for cultural dialogue and experiential learning, providing insights for enhancing visitor experiences in an increasingly globalized and interconnected world. These insights will also enable museum practitioners to understand better and meet visitors' diverse needs and expectations.

452

The Role of English in the Linguistic Landscape of Luang Prabang

Xiaochen Wang (PhD)

SUPERVISORS Yang Gao

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Foreign Studies

This paper investigates the use of English within the linguistic landscape of Luang Prabang through a combination of photographs and interviews. The study finds that: First, English is frequently used alongside Lao, particularly in bilingual signs, and it is also used alongside other languages within multilingual sign combinations. English predominantly appears in areas heavily frequented by consumers, where it is utilized for economic benefit. Second, English primarily fulfills the following roles in the linguistic landscape: cultural heritage bearer, tourism information provider, cultural exchange facilitator, economic opportunities creator, educational resource provider, and international image broadcaster. Third, shop owners and consumers generally express satisfaction with the presence of English in Luang Prabang's linguistic landscape, believing that English promotes economic development, cultural exchange, and brand establishment. However, some interviewees also highlight shortcomings, such as concerns over traditional culture and unfriendliness towards non-native English speakers.

453

The impact of mobile-assisted language learning (MALL) on EFL learners' listening skills and strategy use

Xiaojie Ni (PhD)

SUPERVISORS Hui Yin, Rining Wei (XJTLU)
Penny Ding (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

Effective listening strategy use is essential for English as a Foreign Language (EFL) learners as it supports listening comprehension. This study aims to examine the impact of mobile-assisted language learning (MALL) on enhancing listening skills and listening strategy use among EFL learners. A quasi-experimental design was employed with 70 undergraduate students. The experimental group participated in a 10-week MALL-based instructional program, while the control group followed traditional learning methods. Pre-test and post-test questionnaires were used to evaluate students' use of top-down and bottom-up strategies. Additionally, semi-structured interviews with five participants were conducted to gain deeper insights into their L2 listening strategies. The results indicated that the experimental group outperformed the control group in listening post-test scores. Learners in the MALL-based program showed greater use of top-down strategies. Overall, the findings suggest that a MALL-based instructional program positively impacts EFL learners' listening skills and strategy use.

454

An Upcoming War or an Escalating Tension? The Run-up to the Russia-Ukraine War in the Times of India and Hindustan Times

Yifang Yuan (PhD)

SUPERVISORS Tabe Bergman, David Herold (XJTLU)
Antal Wozniak (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

The media representation of the United States' allegations regarding Russia's attack on Ukraine, particularly by non-Western news organizations, remains understudied. This article addresses this gap by analyzing how two Indian mainstream newspapers covered the lead-up to the war, focusing on the U.S. allegations. A content analysis was conducted to identify and quantify the sources used by the newspapers, followed by a close reading to uncover the major narratives and assess their alignment with Western perspectives. The findings reveal that while the newspapers heavily relied on Western sources, they demonstrated some independence by citing Russian perspectives as counter-narratives, offering contextual insights into the conflict, and advocating for peace. This nuanced approach underscores the dual dynamic: the influence of Western narratives and the newspapers' effort to provide alternative viewpoints, shedding light on the complexities of non-Western media coverage.

455

Navigating Filial Caregiver' role and Digital Engagement: The Influence of Living Arrangements on Short Video Addiction among Retired Elderly

Yimin Lin (PhD)

SUPERVISORS Li Chuan Evelyn Mai, Yiming Chen (XJTLU)
Lei Peng (UoL)

ACADEMY/SCHOOL Academy of Film and Creative Technology

In China's aging crisis, the relationship between intergenerational caregiving dynamics and elderly digital engagement requires careful examination. This study explores how filial caregiver influences short video addiction among retired elders across three living arrangements: cohabitation with children, residence in nursing homes, and independent living. The methodology combines surveys and in-depth interviews with 45 elderly participants to identify that elders living with their children often resort to short videos to alleviate emotional gaps caused by caregiver fatigue, while those in nursing homes use them to build social connections. Independently living elders exhibit the highest levels of digital addiction, primarily driven by feelings of loneliness and isolation. Although Short video platforms provide emotional relief, they also exacerbate the risk of digital addiction through algorithmic mechanisms. The study highlights the need for intergenerational digital literacy and platform governance tailored for the elderly to mitigate their psychological and social vulnerabilities.

456

Discursive investigation of Chinese student returnees' cultural identity reconstruction in the workplace

Ying Jiang (PhD)

SUPERVISORS E. Dimitris Kitis, Pawel Zygadlo (XJTLU)
Lyndon Way (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

Sociolinguistic perspectives on identity studies inspired this research to investigate the cultural identity reconstruction of Chinese student returnees in the workplace as constituted by reactions to cultural conflicts. Yet existing research is either methodologically homogeneous in addressing the reacculturation process or theoretically generalising in neglecting the complex nature of cultural identity formation, the performed cultural identity constituted in fact through the intersectional interaction of multiple identities, including gender, social, professional, and national (Collins, 1993). To fully understand the reconstruction of cultural identity, this research employs an intersectional approach to discursively explore the working experiences of Chinese student returnees within the social constructionism framework. Reflecting on the 389 pieces of social media posts regarding working experience in China from Zhihu, this research argues that the public discourse reflects traits aligned with a neoliberal identity (David, 2017) in self-reliance and self-branding while also demonstrating a critical stance departure from the alienation of neoliberalism.

457

Digital narratives: WeChat Public Accounts and the bicultural identities of second-generation Chinese immigrants in Spain

Yuan Yao (PhD)

SUPERVISORS Qingning Wang, Xiaoling Zhang (XJTLU)
Ros Southern (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

This study investigates how WeChat's public account Southern Metropolis Weekly shapes the bicultural identity and cross-cultural integration of second-generation Chinese immigrants in Spain. Guided by Bicultural Identity Integration Theory, it examines how origin-country media narratives influence cultural orientations toward Chinese and Spanish identities. Data were collected through semi-structured interviews with ten second-generation Chinese immigrants born in Spain who subscribed with Southern Metropolis Weekly. The findings reveal that daily exposure to Chinese content on WeChat strengthens participants' identification with Chinese cultural values while reducing their integration into Spanish society. Participants reported a gradual drift away from Spanish social engagement, favouring connections with local Chinese communities. This shift was accompanied by intensified perception of discrimination, suggesting that digital media narratives can reinforce cultural boundaries and mediate cultural integration. The findings reveal the dual potential of digital narratives. While it fosters in-group solidarity, it also risks deepening intercultural divides and social isolation.

458

Is Suzhou a Classical Woman or a Masculine Man? A Case Study of Image Highlighting in Suzhou's Bilingual Promotional Video

Yuanxin Yang (PhD)

SUPERVISORS Hui Wang, Julie Bilby (XJTLU)
Aiqing Wang (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

Contemporary China, now a dynamic player on the global stage, has prioritised the construction of a positive international image. This paper develops the multifaceted images of Suzhou in an official bilingual promotional video, focusing primarily on the highlighting strategies employed to construct and promote the city's image. Utilising a multimodal discourse analysis approach, the study examines the video's linguistic, visual, and auditory resources, uncovering how different highlighting techniques are used to emphasise both Suzhou's traditional/feminine and modern/masculine aspects. The findings reveal that while the Chinese and English subtitles adopt distinct highlighting strategies due to cultural symbolism and audience familiarity, these differences do not impede the overall comprehension of the city's multifaceted identity due to the joint efforts of various visual and acoustical highlighting strategies. However, the use of certain gender-related highlighting techniques reinforces gender stereotypes, thus resulting in a negative impact on the city's and government's image.

459

Tracing foreign language emotion dynamics of Chinese senior secondary school students

Yuqing Wang (PhD)

SUPERVISORS Qianqian Zhou, Zhoulin Ruan, Kelechukwu Ihemere (XJTLU)
Nektaria Kourtali (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

The present study aims to investigate the dynamic changes in enjoyment, boredom and anxiety experienced by Chinese English as a Foreign Language (EFL) learners in senior secondary schools over time. A longitudinal design will be employed, with quantitative data to be collected using a composite questionnaire measuring students' foreign language enjoyment (FLE), foreign language boredom (FLB), foreign language anxiety (FLA), and their self-perceived English proficiency at three intervals across one semester. The study will involve approximately 300 senior secondary students from China, a context that has been underexplored in existing research. Data will be analysed quantitatively to explore the levels of FLE, FLB, and FLA, their intercorrelations, and their relationship with language achievement. The findings are expected to offer both theoretical and pedagogical contributions to the field of emotion research in second language acquisition (SLA), providing new insights into foreign language education in China.

460

A Pilot Study on Translation Process Research: How Prior Knowledge Plays a Role Among Student Translators?

Yuxin Deng (PhD)

SUPERVISORS Wan Hu, Thomas Duggett, Dawei Wei (XJTLU)
Nektaria Kourtali (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

This study explores how different types of prior knowledge—domain-specific, experiential, conceptual, and procedural—affect student translators' cognitive processes and translation quality. Drawing on Vygotsky's sociocultural theory, it examines how socio-culturally shaped knowledge influences translation decision-making and the communication of culturally significant content. Despite existing research on translation competence models and quality, there is limited exploration of how these specific types of prior knowledge impact student translators. This study aims to fill that gap, contributing to our understanding of how sociocultural contexts influence emerging translators as mediators of intercultural communication. The research will identify and rank the most influential types of prior knowledge through a triangulated approach, combining questionnaires, eye-tracking data, think-aloud protocols, and post-translation interviews. The participants will be undergraduate translation students, and the texts will include policy documents and media articles. The findings will inform instructional strategies, enabling educators to more effectively support the development of student translators.

461

Fragmented Narratives and Observational Approaches: Exploring the Moving Image Practices of Yang Di and Yang Dingliu

Zitong Zhu (PhD)

SUPERVISORS Laura Sava, Xiaoling Zhang (XJTLU)
Angela Becher (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

This research presentation examines Yang Di and Yang Dingliu's gallery film practice, two of the case studies within the larger doctoral research project entitled Moving Image Practice in Contemporary China: Intersections between Contemporary Art and Film. The two artists will be treated as emblematic of two distinct trends within contemporary Chinese moving image works: a narrative approach that integrates elements of interactivity and a non-intrusive observational approach informed by a painterly sensibility. Yang Di's works Café Crush (2023) and Drifting Memorial (2024) create immersive environments for narrative fragments, whereas in Bird (2019-2020) and Main Switch (2024), Yang Dingliu focuses on capturing the subtle dynamics of natural landscapes and human perception. Drawing on recent interviews with the two artists, this research contextualizes their practice with reference to the prevalent models of artistic production, distribution and exhibition as well as in connection to Nicolas Bourriaud's concept of 'relational aesthetics', contributing to a broader understanding of the genre's evolution in the Chinese context.

462

Effect of island area on quality and quantity of information about predators

Agnishikhe Munipapa Reddy Ashok Kumar (PhD)

SUPERVISORS Eben Goodale (XJTLU)
Jakob Bro-Jorgensen (UoL)

ACADEMY/SCHOOL School of Science

An open question in ecology is whether species diversity influences public information that animals can observe, including cues and signals about predators. Although several mechanisms suggest a positive relationship through 1) sampling effect, 2) redundancy effect or 3) complementary effect, these hypotheses have not been empirically tested. Hence, in this study we examined information about predators in the mobbing behaviour of birds across an island area gradient, correlated with species diversity. Information quantity (call rate) and quality (latency to call and frequency range) improved with island area indicating a positive relationship. Social network analysis showed the sampling effect was not the primary contributor, as important species changed with community composition. Acoustic analysis revealed that information was complementary, as species differed in the acoustic characteristics of mobbing calls. The result indicates that fragmentation can lead to public information loss, with organisms in smaller fragments suffering high cost to acquire personal information.

463

Antibiotic dispensing for Tuberculosis Patients: Cross sectional study in Pakistan using Standardized Patient at Community Pharmacies

Ali Hassan Gillani (PhD)

SUPERVISORS Yu Fang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Pharmacy

Study Aims: Patients frequently obtain antibiotics straight from community pharmacies in Pakistan. Therefore, our goal was to evaluate antibiotic dispensing, using the standardized patients at pharmacies in Pakistan. Methods: Cross-sectional study using two standardized patient cases in three Punjab cities. Case 1 is two- to three-week cough (Presumed Tuberculosis); Case 2 is microbiologically confirmed (Confirmed TB). The ideal way to treat Cases 1 and 2 is to refer them to a doctor without using antibiotics or steroids Results: We recorded ideal management in 115 (37.7%) of the 305 Case-1 interactions and 130 (48.1%) of the 270 Case-2 interactions. Antibiotic dispensing was higher in Case-1, with 71 out of 305 instances (23.3%), than in Case-2 interactions, with 27 out of 270 instances (10.0%). Conclusion: The presence of confirmed diagnosis slightly changes the behavior in the correct management of patients and less dispensing of antibiotics.

464

Real-time Characterization of Bioaerosols Under Different Air Quality Conditions

Baifeng Zhu (PhD)

SUPERVISORS Peng Zhao (XJTLU)
Andy Morse (UoL)

ACADEMY/SCHOOL School of Science

Bioaerosols are airborne particles of biological origin, including bacteria, fungi, viruses, pollen, and other microorganisms, which can impact both human health and environmental processes. Despite extensive research, there is a limited understanding of how bioaerosol characteristics respond to varying air quality conditions. This study compares the real-time characterization of fluorescent bioaerosol particles under different air quality conditions. Data were collected at XJTLU, Suzhou, using the WIBS-5 (Wideband Integrated Bioaerosol Sensor-5) with UV-LIF (Ultraviolet light-induced fluorescence) technology. Multiple correlation and regression analyses were carried out to provide insights into bioaerosol concentration and size distribution. Preliminary results indicate significant differences in some bioaerosol profiles, highlighting the impact of air quality on bioaerosol dynamics. These findings can inform strategies for air quality management and public health protection.

465

Unforeseen Minimum Wage Consequences

Davidmac Olisa Ekeocha (PhD)

SUPERVISORS Giuseppe De Feo

UNIVERSITY/INSTITUTE University of Liverpool /
University of Liverpool Management School

This study uses manufacturing facilities as a natural experiment to investigate firms' response to exogenous shocks from minimum wage policies, using linked facility-level data. In high-profit-capital-intensive industries, toxic release intensities rose through air emissions and surface water discharge, even in highly regulated chemical domains, spanning competitive markets. Conversely, both low- and high-profit-labour-intensive industries exhibit contrary effects. Given output and profit objectives, green material substitution, process and equipment modifications, inventory management and operational practices are the key channels, governed by the factor-substitution, and crowding-out effect hypotheses. The results are robust to worker mobility spillover and a falsification test from catastrophic events.

466

Pharmacists' Concerns regarding Physicians' Opioid Prescribing, Provision of Opioid Stewardship Interventions and Barriers in Providing these Interventions: A Cross-Sectional Study from Pakistan

Hafsa Arshad (PhD)

SUPERVISORS Yu Fang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Pharmacy

Study Aim: Pharmacist are well-positioned to combat opioid misuse. Aim of study was to evaluate pharmacists' concerns regarding physician opioid prescribing habits, provision of opioid stewardship interventions, and barriers during opioid stewardship interventions. Methods: A 32 itemed self-administered questionnaire was used to collect data from community and hospital pharmacists. Cross-sectional study was conducted in five cities of Punjab, Pakistan using convenient sampling. Descriptive statistics applied for nominal and continuous variables. Results: A total 498 pharmacists, 48.4% were concerned about physician prescription to patients suspected of opioid misuse and 64.5% were concerned prescription is to patients who did not need opioid. Highest intervention provided by pharmacist was educating patients on judicious use of opioids (90.3%). Almost 58.0% responded lack of training resource had high impact on opioid stewardship intervention provision. Conclusion: Pharmacists are concerned about physicians prescribing and mostly provide opioid-related training and interventions, but they also mentioned barriers to provision.

467

Comparative Assessment of Eight Global Fire Emission Inventories: Long-Term Trends and Case Studies

Hanyue Zheng (PhD)

SUPERVISORS Peng Zhao, Qing Mu, Zheng Chen (XJTLU)
Michael Peacock (UoL)

ACADEMY/SCHOOL School of Science

Wildfires not only degrade air quality but also significantly harm human health by causing respiratory illnesses and exacerbating asthma. As climate change and extreme weather intensify, wildfires have become an increasingly serious global issue. However, wildfire emission inventories are poorly constrained, resulting in a high level of uncertainty in understanding their impacts. This study provides a comprehensive comparison of eight major fire emission inventories—FINNv1.5, FINNv2.5, QFEDv2.5, QFEDv2.6, GFED4, GFED5, GFAS, and FEER v1.0-G1.2—evaluating their performance in capturing extreme wildfire events and long-term trends. Key aspects analysed include annual totals, annual averages and seasonal variations of injection height, burned area, and emissions of pollutants and greenhouse gases. Preliminary findings highlight significant differences in emission estimates, driven by variations in emission factors, fuel loading, and land cover data. This work provides insights into the strengths and limitations of each inventory, offering valuable guidance for their application in wildfire assessments.

468

Revealing Millimeter-Scale Disturbances: Automated High-Resolution Insights into Wetland Carbon Emissions

Hao Liu (PhD)

SUPERVISORS Zheng Chen (XJTLU)
Roy Goodacre (UoL)

ACADEMY/SCHOOL School of Science

Wetlands are integral to the global carbon cycle, serving as major carbon sinks and sources of greenhouse gases. While organic carbon inputs, decomposition, and greenhouse gas emissions in wetlands are well studied, the influence of millimeter-scale physical disturbances at the soil-water interface on carbon dioxide and methane emissions remains unclear. We hypothesize that small-scale disturbances significantly alter emission rates and patterns driven by organic carbon input. Using leaf litter and plastic films as natural and anthropogenic organic carbon sources, we tested these effects in controlled microcosms. To achieve precise measurements, we developed a Cartesian robot with modular tools for automated gas flux measurement, liquid/soil sampling, and in-situ physicochemical characterization. Employing this automated approach, we monitored emissions and physicochemical properties in response to millimeter-scale changes in leaf litter burial depth and sub-millimeter disturbances induced by plastic films.

469

Ni encapsulated within Mo-doped CNT arrays derived from water hyacinth: A sustainable carbon source for efficient water electrolysis

Hennayaka Mudiyanselage Charitha Madusanka Jayawardana (PhD)

SUPERVISORS Min Chen

UNIVERSITY/INSTITUTE Jiangsu University /
School of Chemistry and Chemical Engineering

Water hyacinth (Eichhornia crassipes) (WH), one of the world's most invasive aquatic species, was explored as a sustainable carbon source for catalyst synthesis. WH-derived carbon was used to produce Ni-encapsulated carbon nanotube (CNT) catalysts via pyrolysis at 750 °C, followed by Molybdenum (Mo) doping through secondary pyrolysis at 450 °C to create WH CNTs450. The catalyst exhibited a high surface area and abundant active sites, enhancing catalytic performance. N-doping enhanced conductivity, wettability, and intermediate interaction, enabling N-WH CNTs450 to achieve low overpotentials of 78 mV hydrogen evaluation reaction (HER) and 283 mV oxygen evaluation reaction (OER) at 10 mA cm-2 in alkaline media with over 100-h stability, while also facilitating overall water splitting (OWS) at 1.61 V with durability exceeding 250-h. In an anion exchange membrane water electrolyzer (AEMWE), the catalyst achieved 2.03 V at 250 mA cm-2, demonstrating the potential of WH as a sustainable and efficient carbon source for advanced catalysts.

Keywords: Water hyacinth, sustainable carbon source, carbon nanotube, overall water splitting, anion exchange membrane water electrolyzer

470

Ecological baselines drive local people's perception of ecosystem restoration in socio-ecological systems

Huxuan Dai (PhD)

SUPERVISORS Li Li, Johannes Knops (XJTLU)
Mark Riley (UoL)
Zhi Lv (PKU: Peking University)

ACADEMY/SCHOOL School of Science

Community engagement underpins the success of ecosystem restoration. As the first step, however, local people's adaptation depends on the way they perceive the trajectories of ecosystem degradation and recovery. We conducted photo-based survey to investigate pastoralists' perceptions of grassland degradation and restoration of the Qinghai – Tibetan Plateau. The study reveals that local perceptions are significantly influenced by the intrinsic characteristics of the local ecological system: the concern about degradation and perceived restoration urgency are higher when landscape heterogeneity is high, and lower when the ecosystem is unstable in terms of inter-annual fluctuations in productivity. We also found a tendency of local pastoralists to postpone the restoration regardless of the current status of grassland degradation. Policymakers and restoration managers should recognize the impact of ecological baseline conditions on perceptions of ecosystem degradation and adaptive strategies, in order to better design restoration projects that enhance community participation. Adaptive management at local scales and social learning are essential for addressing uncertainties and achieving effective restoration outcomes.

471

Research on Species Diversity in Global Mixed-species Bird Flocks and their Information Flows

Jiahao Wu (PhD)

SUPERVISORS Eben Goodale (XJTLU)
Jakob Bro-Jorgensen (UoL)
Qiang Zhang (External)

ACADEMY/SCHOOL School of Science

Birds make alarm calls in response to high-risk predators like hawks and mobbing calls to low-risk predators like owls during daytime. Our study aims to investigate the impact of local species diversity on the total amount of public information available at the community-level. Through behavioral experiments conducted over the past year across a network of 10 sites on a latitudinal gradient, we found that the greater the local species diversity, the higher number of species that emit mobbing calls; the impact on alarm calls was also positive, but not as strong. Birds of the babbler and tit family are the core of the mobbing community, and their simultaneous presence attracts the most birds. They are also the only primary callers of alarm calls in mixed-species bird flocks. Therefore, the composition of bird communities and species diversity are crucial to anti-predator behaviors.

472

Mechanisms of social innovations in an urban living lab: a case study on the development of Nature-based Solutions in Outdoor Research and Teaching Space

Jiawei Tong (PhD)

SUPERVISORS Uromi Goodale, Li Li (XJTLU)

ACADEMY/SCHOOL School of Science

Urban Living Labs (ULLs) are pivotal experimental places fostering sustainability transitions in urban areas. While extensive research in Europe and North America explores the link between social innovation in ULLs and urban sustainability, there is limited focus on their role in rapidly urbanizing regions like China. This study investigates how ULLs can drive innovation and sustainability in such contexts, focusing on the Outdoor Research and Teaching Space (ORTS) ULL at Xi'an Jiaotong-Liverpool University (XJTLU). We examined the iterative mechanisms through which diverse user preferences promote social innovation and multifunctionality within ORTS. Utilizing the Q-method, we classified user preferences based on Q-sentences extracted from semi-structured interviews with local and international scholars and staff. Additional in-depth interviews and participatory action mapping helped categorize the types of social innovation within ORTS and summarize the operational processes. Our findings reveal that the diversity of users' multifunction preferences, approaches, and multicultural backgrounds enhances social innovation through shared preferences and coordinated space usage. This multifunctionality drives the innovation within the ULL, creating a cyclical effect where increased users engagement further enhances multifunctionality. Pre-existing shared values, such as environmental care and waste reduction, common goal natural-based solutions such as no chemicals alongside specific place-based conditions—like ORTS's proximity to indoor research facilities and a canal for irrigation—encourage innovative behaviors that conserve resources and the environment. This study suggests that the ORTS ULL demonstrates how user multifuntional preferences, shared values and common goal can foster innovation and sustainability in urban experimental spaces. Future research should explore similar ULLs across different contexts and scales to validate whether this iterative cycle process operates as a broader mechanism for innovation diffusion, offering sustainable solutions for urban spaces Nonetheless, our findings highlight ORTS as a case where experimental spaces effectively support sustainability transitions in urban areas.

473

Porous ionic liquid for oxidative desulfurization

Jie Yin (PhD)

SUPERVISORS Hongping Li

UNIVERSITY/INSTITUTE Jiangsu University / School of the Environment and Safety Engineering

Porous ionic liquids have been highlighted with special interest for their desirable catalytic activity and extraction properties. Ionic liquids, especially Brønsted acidic ionic liquids, have been reported useful as catalysts. Herein, we have developed the concept of "Brønsted acidic porous ionic liquids". In this work, porous ionic liquids (denoted UiO-66-BAPILs) were synthesized by dispersing UiO-66 into a pyridinium-based Brønsted acidic ionic liquid for oxidative desulfurization. The permanent cavity of UiO-66 moiety in UiO-66-BAPILs was validated well-preserved by gas uptake experiments and molecular size simulations. Under the optimum reaction conditions, the sulfur removal could reach up to 99.5%. A possible mechanism has been proposed in Scheme 1 that UiO-66-BAPILs extract the aromatic sulfur compounds via π···π and C-H···π interactions and meanwhile oxidize them with peroxysulfonic acids and ·OH radicals. These findings will open up new avenues to facilitate the catalytic oxidation performance by constructing Brønsted acidic porous ionic liquids.

474

Evaluation and influence of coal mining on groundwater resources in arid mining areas

Jingzhong Zhu (PhD)

SUPERVISORS Wenping Li

UNIVERSITY/INSTITUTE China University of Mining and Technology / School of of Resources and Geosciences

A sharp contradiction between mineral resources exploitation and groundwater resources protection is a concerned issue nowadays. Understanding the impact level of mining on groundwater is essential for water-preserved mining. In this research, we select four indexes to evaluate the impact of mining activities on the lower and upper sections of the Xishanyao Formation aquifers, arid mining areas Western China. Using Entropy-TOPSIS method, weights are assigned to four indexes, and four thematic maps are merged to identify the division of the damaged groundwater for multi-coal mining. The impact levels are classified into level I to level IV, corresponding basically unaffected to serious affected. Finally, recommendations are applied to the different impact levels, such as backfill mining, reducing mining height, and underground reservoir systems construction. The research can provide a reference for the evaluation and prediction of the groundwater protection in high-intensity mining areas with a lack of water resources.

475

Spatial pattern and controlling factors of riverine methane (CH4) emissions: A case study in Suzhou

Junyue Zhou (PhD)

SUPERVISORS Peng Zhao (XJTLU)

ACADEMY/SCHOOL School of Science

CH4 is the second most important greenhouse gas (GHG), with a higher global warming potential than carbon dioxide. Rivers are significant sources of CH4 emission, but the controlling factors influencing the spatial pattern of riverine CH4 emissions remains unclear. This study utilized in-situ surveys of the Wusong River in Suzhou to investigate the spatial pattern of CH4 emissions and its potential controlling factors. The average CH4 fluxes (fCH4) and dissolved CH4 concentration (dCH4) were 11.97±9.09 mmol · m-2 · d-1 and 0.79±0.51 mmol · L-1, respectively. The highest CH4 emission were observed in urban areas. Urban development was the important factors for increasing CH4 emissions, exceeding the effects of agricultural and mixed land use. Carbon inputs showed the good prediction capacity and hydrological factors are also significant. These findings highlight that land use management and carbon input control are recommended strategies to mitigate riverine CH4 emissions.

476

The relationship of legal and illegal wildlife trade

Lan Luo (PhD)

SUPERVISORS Lingyun Xiao (XJTLU)
Jakob Bro-Jorgensen (UoL)
Emilio Pagani Nunez (ENU: Edinburgh Napier University),
Zhi Lv (PKU: Peking University)

ACADEMY/SCHOOL School of Science

China is currently implementing 'supply-side' approach for wildlife conservation, which encourages captive breeding and legal wildlife trade to suppress illegal trade. This approach has been practiced in different countries, but there is a research gap in examining the effectiveness of this method in China. We collected verdicts of illegal wildlife trade cases and utilization licenses for commercial use of wildlife in China from 2014 to 2019 to study the relationship between legal and illegal trade. We extracted species information of trades and licenses to compare species in two market, to determine whether the species in two market are the same. We also explored the correlation of species' traits and their trade status. For further analysis, we will use ivory ban as an example to find out whether relevant trade bans can effectively curb illegal trade. This research will enable our wildlife management efforts to be more targeted and effective.

477

High performance of N-doped cobalt oxide (N-CoOx) for peroxymonosulfate activation and the application potential of catalytic membrane system

Meiling Liu (PhD)

SUPERVISORS Wendong Wang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University /
School of Human Settlements and Civil Engineering

In this study, the emergence of Co-Nx sites effectively improved peroxymonosulfate (PMS) activation efficiency (above 5.8 times), leading to higher pollutant decomposition rate (95.8 % at 30 min) and kinetics constant (above 4.1 times). N introduction changed main facets of material and elevated adsorption energy (Eads) (from -1.81 eV to -3.71 eV) between catalyst and PMS. Co atoms at Co-Nx sites could donate larger quantity of electrons (from 1.088 e to 1.583 e) to PMS, therefore, contributed to stretching and breaking O-O bonds of PMS molecules to form reactive species. As a result, both radical and electron transfer pathway (ETP) were enhanced in the oxidation processes. Ultimately, the catalytic membrane coated with N-CoOx maintained 100% treatment towards continuous antibiotic wastewater at environmentally relevant concentration (μg/L), realizing purification as well as separation of catalyst. This work unravels the underlying mechanism to inspire further study to metal-Nx tailored catalysis.

478

Umbrella, Keystone, or Flagship? An Integrated Framework for Identifying Effective Surrogate Species

Minyi Kau (Master)

SUPERVISORS Juan Li (XJTLU)

ACADEMY/SCHOOL School of Science

The global biodiversity crisis necessitates conservation strategies that maximize impact despite limited resources. Surrogate species approaches, using umbrella, keystone, and flagship species, offer practical tools for conservation planning but are often constrained by conceptual ambiguities and inconsistent methodologies. To address these challenges, we developed an integrative framework combining Multi-Criteria Decision Analysis (MCDA) with big data to identify effective surrogate species. The framework quantifies conservation potential using three indices: the Umbrella index (habitat overlap via Area of Habitat data), Keystone index (predator-prey network analysis), and Flagship index (public interest from Google Trends and Baidu Index). These indices are aggregated into a composite Effectiveness index using the Multi-Attribute Utility Theory model, with sensitivity analysis for robustness. Applied to Three-River-Source National Park in the Qinghai-Tibetan Plateau, our results identified the snow leopard (Panthera uncia) as the most effective surrogate for other mammals. This transparent, data-driven approach enhances surrogate species selection for impactful conservation.

479

Unveiling the dynamic impact and mechanisms of economic growth and renewable energy adoption on carbon emission in Developing countries

Naila Rafique (PhD)

SUPERVISORS Zhe Liu

UNIVERSITY/INSTITUTE Xi'an Jiaotong University /
School of Public Policy and Administration

This study examines the dynamic effects of economic growth and renewable energy adoption on carbon emissions in Bangladesh and Pakistan from 1990 to 2022. Using the Method of Moments Quantile Regression (MMQR) model, the findings reveal that economic growth significantly increases energy-driven carbon emissions across all quantiles, highlighting its adverse environmental impact. However, renewable energy adoption effectively reduces emissions, showcasing its potential as a sustainable solution. The study also finds that control of corruption negatively impacts carbon emissions, emphasizing the importance of governance in mitigating environmental deterioration. Additionally, causality is observed among the variables, suggesting the need for integrating renewable energy into economic strategies. Policy recommendations include developing renewable energy infrastructure, promoting energy efficiency, and aligning urban and industrial strategies with environmental goals. Strengthening governance frameworks and reducing corruption are essential for achieving balanced economic growth and environmental sustainability in these developing countries.

Keywords: Economic growth; Renewable energy adoption; control of Corruption; Carbon emissions.

480

A Review of Controlled Nuclear Fusion and the Energy Trilemma: Insights from ITER and Non-ITER Member Countries

Qilin Jian (PhD)

SUPERVISORS Feng Dong

UNIVERSITY/INSTITUTE China University of Mining and Technology /
School of Public Administration

Controlled nuclear fusion is a transformative technology poised to address the global "energy trilemma"—energy security, equity, and sustainability. By harnessing deuterium and tritium—widely available and non-monopolizable fuel sources—fusion technology provides a sustainable energy supply, reduces dependence on energy imports, and promotes the diversification of energy structures in resource-based economies. This study highlights the disparities between International Thermonuclear Experimental Reactor (ITER) member and non- ITER member countries, emphasizing fusion's potential to lower operational costs, provide high energy density, and support modernized energy infrastructure in developing countries. Its zero-carbon emissions and stable output also complement renewable energy, ensuring reliable baseload power. However, challenges in development and commercialization persist, especially for non-ITER member countries with limited resources. Strengthening international collaboration, phased commercialization, and targeted financial and technological support are critical to advancing fusion technology as a cornerstone for global sustainable energy transitions.

481

A systematic review of urban bird conservation within urban planning and design

Ruochen He (PhD)

SUPERVISORS Li Li (XJTLU)

ACADEMY/SCHOOL School of Science

Rapid urbanization poses huge challenges to the conservation of urban bird diversity, which is closely related to land cover type. How to rationally plan urban configuration and structure has been one of the most significant links in the future sustainable development of a city. This review summarized research on planning and design for protecting urban birds. And we analyzed research focuses from the perspectives of ecologists and planners, explored the possibility of their cooperation. Results showed that developing countries have become a solid force in protecting urban birds, but bird data in some areas have not been systematically utilized. Most studies recognized the habitat fragmentation, loss, and degeneration was an important cause of bird diversity loss, but there were no corresponding countermeasures for some threats. The differences between ecologists and planners focused on ecological concepts and the understanding of biodiversity, but they had similar development objectives and strategies.

482

Impacts of urbanization on wild bees' food acquisition and reproduction rate

Shasha Zou (PhD)

SUPERVISORS Yi Zou (XJTLU)
Jenny Hodgson (UoL)

ACADEMY/SCHOOL School of Science

Wild pollination plays a crucial role in ecosystems. Several factors threaten the urban existence of wild bees, including food shortages, pesticide exposure, and competition with honeybees. Food resources are essential for survival, growth, and reproduction, as a limited diet composition can influence key behaviors such as foraging, nesting, and reproduction. The rapid urbanization in China has significantly altered habitats for wild bees, underscoring the importance of conservation efforts in urban environments. However, the effects of varying intensities of urbanization on insect diversity and the availability of food and nesting resources for wild bees at actual spatial scales remain poorly understood. In this study, we collected data on Osmia food acquisition and nesting in urban agricultural land, urban parks, and wetland parks. Our research aimed to evaluate how urbanization influences Osmia's food sources, dietary composition, nesting behavior, and reproductive success, providing insights into their adaptability within urbanized ecosystems.

483

Current Status and Future Prospects of Research on Wind Dispersal of Seeds in Orchidaceae

Siqi Liu (PhD)

SUPERVISORS Uromi Goodale, Bailiang Li (XJTLU)
James Hartwell (UoL)

ACADEMY/SCHOOL School of Science

Wind dispersal is a critical dispersal vector for seed dispersal. It is influenced by multiple factors, such as seed morphology, community structure, landscape, and climate. Among all wind-dispersed seeds, orchid seeds belong to the category of dust seeds. Orchids refer to the species from the family Orchidaceae, which have high ecological, cultural, and economic value. The research regarding orchid seed dispersal was on genetic distribution and evolutionary aspects. There is a gap in the orchid seed wind tunnel experiment on the relationship between seed traits and dispersal ability. This study will focus on how climate factors impact orchid seed traits and influence wind dispersal.

484

Exploring the Sources, Abundance, Distribution, and Variability of Atmospheric Microplastics in Ningbo, China

Taiseer Hussain Nafea (PhD)

SUPERVISORS Jun He

UNIVERSITY/INSTITUTE University of Nottingham Ningbo China /
School of Science and Engineering

The study analyzed the abundance of suspended atmospheric microplastics (SAMPs) and their variations in coastal urban environment of Ningbo. Sampling was done in urban centre and urban-rural fringes near the coast. SAMP abundance ranged from 0.017 to 0.430 items m^{-3}, averaging 0.145±0.09 items m^{-3}. The urban centre had 70% more SAMPs than the urban-rural fringe, suggesting impact of urabn centers on SAMPs pollution. Fibers were predominant at both sites, but urban areas revealed higher proportion of other shapes. The main polymers were rayon and polyethylene terephthalate, which were linked to local industry. The SAMPs ranged in size from 20 µm to 4,984.4 µm, with over 60% below 1,000 µm. Correlation analysis revealed the relationship between environmental factors and SAMPs pollution. Backward trajectory analysis showed that oceanic air masses carried fewer SAMPs than terrestrial air, diluting coastal concentrations. The findings underscore the need for targeted strategies to mitigate atmospheric microplastic pollution.

485

Dynamic processes of Fe-bound organic carbon formation at soil-water interface

Xiao Shu (PhD)

SUPERVISORS Zheng Chen (XJTLU)
Pascal Salaun (UoL)

ACADEMY/SCHOOL School of Science

Wetlands are major reservoirs of organic matter (OM), storing approximately one-third of soil carbon (ca. 600 Gt) globally. Since 1990, emerging studies have found that mineral-associated organic carbon (MAOC) constitutes 8 – 55% of soil organic carbon (SOC) in wetlands, and reactive minerals exert a strong influence on SOC stability. Iron, as an abundant and highly reactive element in soil, plays a dominant role in the formation of MAOC. Changes in Fe-bound organic matter under redox fluctuations have received extensive attention. However, different from redox fluctuations, the role of microorganisms in the soil during prolonged inundation will become non-negligible. Microorganisms significantly contribute to the persistent SOC pool through iterative processes of cell generation, population growth, death, decay, and necromass formation. The dynamic formation process of Fe-bound organic matter in the redox region of the soil-water interface at (mm)-scale spatial resolution need to be further studied.

486

Assessment of Carbon Resilience Dynamics in Urban Ecosystems Based on Early Warning Signals

Xueqing Wang (PhD)

SUPERVISORS Shaoliang Zhang

UNIVERSITY/INSTITUTE China University of Mining and Technology /
School of Public Administration

Enhancing the resilience of carbon cycling systems in urban ecosystems is crucial for achieving sustainable urban development and carbon neutrality goals. However, the long-term trends and potential drivers of urban carbon cycling system resilience remain elusive. Inspired by the concept of resilience, this paper introduces the new concept of "carbon resilience". Using net carbon emissions as a key parameter and incorporating early warning signals (autocorrelation, standard deviation, skewness, kurtosis), the dynamic characteristics of carbon resilience were analyzed for 364 cities in China from 1992 to 2023. The study found that the resilience of the carbon cycling systems in about 60% of the cities in China has changed significantly under external disturbances. The evolution of early warning signals and their correlation with potential driving factors indicates that the response of carbon resilience to driving factors differs across regions, with human factors playing a key role in regulating urban carbon cycling states. This study presents a new method for assessing the resilience of urban carbon cycling systems and early warning signals of abrupt changes, providing valuable insights for policymaking aimed at achieving carbon neutrality goals.

487

Novel indicator of soil degradation states: two small molecular organic phosphorus species

Yaqin Wang (PhD)

SUPERVISORS Zheng Chen (XJTLU)

ACADEMY/SCHOOL School of Science

Organic phosphorus (Po) is one of the main forms of phosphorus pool in soil, and mounting evidence suggests that Po has significant ecological and environmental impacts on wetland systems. Organic matter, primarily derived from algae and aquatic plant debris, may influence the transformation of Po in natural soils. In this study, we employ Ion Chromatography coupled with Inductively Coupled Plasma Mass Spectrometry (IC-ICP-MS) to characterize Po species. By cultivating soil samples from Kunshan, we investigate the conversion of various phosphorus compounds, including P150 (an unknown P species), glucose-6-phosphate (glu-6-P), α-glycerophosphate (α-gly-P), β-glycerophosphate (β-gly-P), orthophosphate (P(V)), and other unidentified phosphorus species. Additionally, we analyzed soils from the Qinghai-Tibetan Plateau, which exhibit varying degrees of degradation, to illustrate the relationship between phosphorus fractions and different organic matter contents. Additionally, an obvious declining trend in the concentrations of P150 and α-gly species was observed as degradation progressed, offering a novel indicator of soil quality.

488

Performance assessment of solar photovoltaic-based constructed wetland for sustainable rural wastewater treatment

Ye Yang (PhD)

SUPERVISORS Wendong Wang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University /
School of Human Settlements and Civil Engineering

Water pollution poses a significant challenge to the development of rural human settlements in China, necessitating the development of wastewater treatment systems tailored to the local economic conditions and discharge characteristics. This study introduces a novel wastewater treatment process, namely solar photovoltaic power generation-constructed wetland (SPPG-CW) and conducts a comprehensive evaluation of its performance on rural domestic sewage treatment. Long-term monitoring experiments confirm that the SPPG-CW efficiently treats real wastewater. Post-treatment, the SPPG-CW reduces COD and petroleum concentrations to as low as 5.49 mg/L and 0.02 mg/L, respectively, meeting the irrigation water quality standards. The average removal rates for TN and total phosphorus TP were 88.38% and 79.41%, respectively. The SPPG-CW, incurring only 20.37% of the total cost of existing rural wastewater treatment facilities, demonstrates promise for applications in areas endowed with abundant solar energy resources.

489

Screening, characterization, and evaluation of selenium-and zinc-enriched probiotics

Yidan Wang (PhD)

SUPERVISORS Linxi Yuan (XJTLU)

ACADEMY/SCHOOL School of Science

This study aims to screen, identify, and evaluate probiotic strains capable of enriching selenium and zinc. A total of 16 probiotic strains were isolated and their tolerance to selenium and zinc was assessed. The results showed that these strains achieved a maximum selenium conversion rate of 85%, with a biomass of up to 3 g/L, demonstrating strong bioaccumulation capacity. Further evaluations of antibiotic resistance, survival under simulated gastrointestinal conditions, and antioxidant activity indicated that these probiotics possess significant potential for selenium and zinc bioaccumulation. These findings suggest that these strains could be developed into probiotics that not only exert beneficial effects but also facilitate the conversion and storage of selenium and zinc, offering promising applications in human nutrition and environmental remediation.

490

Degradation of tetracycline in aqueous solution by electron beam: performance and degradation pathway

Yingying Dong (PhD)

SUPERVISORS Wendong Wang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Human Settlements and Civil Engineering

Tetracycline (TC) is a common human and veterinary antibiotic that is widely found in water. The traditional methods have some limitations for the removal of tetracycline. Therefore, the electron beam degradation of TC was explored systematically in this study. After 4 kGy irradiation, 50 mg/l of TC could be degraded by 85%. The effects of pH, inorganic anions (Cl−, NO3−, HCO3−, CO32−, SO42−), humic acid, H2O2, Na2S2O8, gas and different water bodies (pure water, tap water, groundwater, river water) were investigated. The results showed that the degradation effect of TC was better in acidic environment. Inorganic anions and organic matter in water inhibited the degradation of TC to varying degrees. Adding H2O2, Na2S2O8 and N2O bubbling significantly promoted the degradation of TC. The degradation intermediates were also determined and the TC degradation pathway was explored. In summary, electron beam irradiation could be applied to remove TC effectively in aqueous solution.

491

Are there dose-dependent or dose-molar ratio-dependent interaction effects between antimony and selenium in selenium hyperaccumulator Cardamine hupingshanensis?

Yuhua Duan (PhD)

SUPERVISORS Linxi Yuan (XJTLU)
Roy Goodacre (UoL)

ACADEMY/SCHOOL School of Science

Antagonism between antimony (Sb) and selenium (Se) has been demonstrated in rice and maize. However, a mutual suppression pattern for Sb and Se has not been identified. To fill this knowledge gap, the Se hyperaccumulating plant Cardamine hupingshanensis was selected and the interaction effects between Sb and Se were investigated on the plant growth, accumulation and transportation of Sb and Se in C. hupingshanensis under wide range of Sb-Se molar ratios from 0.01 to 100 via hydroponic experiments. The results showed that the application of exogenous Se reduced the uptake and transport of Sb, whereas exogenous Sb facilitated Se absorption. However, the changes of antagonism between Sb and Se were less correlated with the changes in their concentrations but the molar ratios of Sb/Se (R (Sb/Se)). When the R (Sb/Se) was approximately equal to 1, the absolute values of the changes in Sb and Se concentrations, transfer factors, plant growth characteristics, root morphology, and photosynthesis parameters, in shoots and roots of the C. hupingshanensis compared to the control groups reached the lowest values simultaneously. In addition, Se supply could effectively alleviate the toxicity of high Sb level at R (Sb/Se) greater than 10 in the physiological levels of C. hupingshanensis. Thus, this study revealed that the accumulation and translocation of Sb and Se in C. hupingshanensis depend on R (Sb/Se) rather than their individual doses, which may be related to the formation of soluble Sb-Se complexes in roots and shoots. This study provided new insights into a plausible explanation of the interactions between Sb and Se and contributed to the remediation and treatment of combined Sb and Se pollution in farmland systems.

492

Effects of atmospheric stability upon impact threshold velocity of sand

Zeheng He (PhD)

SUPERVISORS Bailiang Li (XJTLU)
James Cooper (UoL)

ACADEMY/SCHOOL School of Science

The impact threshold velocity is defined as the shear velocity at which saltation can sustain itself indefinitely downwind of a disturbance. This parameter is influenced by various factors, including the size and density of sand particles, as well as the density of air. The effects of varying thermal atmospheric stability conditions on the transport of sedimentary particles present an intriguing area of research within atmospheric sciences. Changes in atmospheric stability can significantly alter vertical velocities, thereby influencing the lift force. Consequently, atmospheric stability can have a profound effect on the threshold velocity. In the study presented, a laser Doppler anemometer was employed within the Trent Environmental Wind Tunnel Laboratory to investigate the impact of thermal layers on the impact threshold velocity. This approach enables a detailed examination of how thermal stratification in the atmosphere influences the impact threshold velocity .

493

Challenges of Grassland Restoration on the Qinghai-Tibetan Plateau: Declining Soil Health and Microbial Fragility Highlight the Urgency of Native Grassland Protection

Ziao Liu (PhD)

SUPERVISORS Li Li, Zheng Chen (XJTLU)
Raj Whitlock (UoL)

ACADEMY/SCHOOL School of Science

The Qinghai-Tibetan Plateau's alpine meadows face significant degradation, with over 70% affected, including 11 million hectares of severe black-soil-type degradation. Since 2000, large-scale restoration efforts have been implemented, but their long-term effectiveness is debated. Using a space-for-time sampling design, we found that restored grasslands showed a significant decrease in soil organic matter ($p < 0.01$) and nitrogen ($p < 0.05$) compared to non-degraded grasslands, potentially reducing soil fertility and carbon sequestration. Nitrogen fixation was suboptimal, likely due to nutrient leaching and plant uptake. Bacterial diversity remained stable, while fungal diversity increased in the 5 – 6 years post-restoration. The degradation process is worsened by land use and climate fluctuations. Pedosphaeraceae and plant growth-promoting rhizobacteria (PGPRs) aided recovery, while Aspergillus contributed to degradation. The study advocates for prioritizing native grassland protection over relying on restoring degraded areas.

494

Methane Generation Driven by Soil Reactive Oxygen Species during Wet-Dry Alternation

Ziyan Liu (PhD)

SUPERVISORS Zheng Chen (XJTLU)
Haifei Zhang (UoL)

ACADEMY/SCHOOL School of Science

Wetlands and rice paddies are major global sources of methane (Ch_4) emissions, traditionally attributed to biogenic processes, particularly the release of pore-trapped Ch_4 following drainage. However, emerging evidence points to oxic methane production (OMP) as a contributing factor to these post-drainage emissions. This talk focuses on the role of abiotic reactive oxygen species (ROS), especially hydroxyl radicals ($\cdot OH$), in driving OMP in oxygenated wetland and paddy soils. Through microcosm experiments, we demonstrated the potential for $\cdot OH$-mediated Ch_4 formation and its correlation with prior flooding conditions. Recognizing abiotic Ch_4 production as a significant source has profound implications for methane management strategies, suggesting that mitigation efforts must account for both biotic and abiotic pathways. These findings emphasize the need for a comprehensive approach to Ch_4 reduction, addressing the complex interplay of factors driving emissions in these critical ecosystems.

495

Augmented Reality in Chinese museums: a case study on visitor experience

Guangyi Wu (PhD)

SUPERVISORS Nuno Bernardo, Cheng Zhang (XJTLU)
Konstantinos Tsakalidis (UoL)

ACADEMY/SCHOOL Design School

This study explores the role of Augmented Reality (AR) technology in shaping museum visitor experiences, focusing on its potential to enhance engagement, interaction, and satisfaction. Using a mixed-methods approach, the research examines how AR applications transform traditional exhibition formats into dynamic and immersive experiences that resonate with diverse visitor profiles. Data collected from 420 museum visitors combines quantitative insights with qualitative feedback, offering an overview of user responses to AR integration. By analyzing visitor interactions with AR technology, this study identifies user preferences that contribute to successful AR implementation in museums. The findings aim to suggest strategies for creating meaningful user-centered digital experiences, addressing the challenges of accessibility and technological familiarity. This work offers practical recommendations for museums looking to integrate AR effectively, emphasizing the importance of aligning technological innovation with visitor needs and expectations.

496

Design for improved acceptance of wearable medical devices for elderly diabetic patients

Haojun Zhi (PhD)

SUPERVISORS Mariia Zolotova, Richard Appleby (XJTLU)
Kai Hoettges (UoL)

ACADEMY/SCHOOL Design School

The ageing population will lead to a rapid rise in demand for wearable medical devices among the elderly. The traditional hospital-centric face-to-face healthcare model is shifting to a home-centric telemedicine model. China has the largest base of diabetics, and the demand for diabetic wearable medical devices continues to grow. However, the elderly still show low acceptance of wearable devices. There is a gap between elderlys' perceived and actual utility of technology adoption. This project will use qualitative and quantitative methods to determine the psychological cognitive mechanisms of acceptance among elderly diabetic users, identify key user needs and specific design elements to build a design strategy model to guide design practice. The expected outcomes of this research are a series of prototypes demonstrating different degrees of acceptance of wearable medical devices by elderly diabetics. The research experience will be summarised as guidelines for designing wearable medical devices.

497

Enhancing the Experience of Senior Citizens in Medical Service Scenarios through Hybrid Digital-Physical Interaction.

Lei Mao (PhD)

SUPERVISORS Cheng-Hung Lo, Ivan Parati, Sami Hajjaj (XJTLU)
Roberta Piroddi (UoL)

ACADEMY/SCHOOL Design School

Digital technologies have become integral to the provision of healthcare services. This evolution, however, has led to a technological gap, often referred to as the "digital divide," particularly impacting senior patients. Given that the ageing population represents a significant segment of healthcare recipients, this project aims to delve into the perceptions and expectations of senior citizens towards digital healthcare. Adopting a hybrid research methodology examines the challenges encountered in Human-Computer Interaction (HCI) within medical service contexts. Furthermore, this project proposes an integrated approach to implementing age-friendly design principles alongside hybrid digital-physical interaction solutions. This project aims to facilitate a more seamless integration of senior citizens into digital healthcare services, culminating in the articulation of a series of user-friendly design guidelines tailored to healthcare service devices aimed at the elderly demographic.

498

AI for sustainability: promoting sustainable behavior through image recognition

Xiaoyan Liu (PhD)

SUPERVISORS Yang Luo, Yi Chen (XJTLU)
Xiaowei Huang (UoL)
Anwar P.P. Abdul Majeed (SUNWAY: Sunway University)

ACADEMY/SCHOOL School of Intelligent Manufacturing Ecosystem

Human activities such as excessive consumption and irresponsible waste disposal have intensified environmental degradation, posing threats to ecosystems and the well-being of future generations. Therefore, innovative approaches are required to address these unsustainable behaviors to mitigate global environmental impact. With the advancements of information technologies, artificial intelligence (AI) offers promising opportunities to tackle these challenges more effectively. This study will utilize image recognition technology to promote sustainable behavior. An image recognition model will be built and validated through case studies in fields such as waste management and resource consumption. Additionally, a user interface will be developed to evaluate the user experience and behavior change potential of the model. By integrating AI-driven image recognition with user-centered approaches, this research aims to bridge the gap between technological innovation and sustainable design, contributing to practical and scalable solutions for global sustainability.

499

Gamification in Design Education: An Educational Technology Perspective

Yubin Guo (PhD)

SUPERVISORS Luis Felipe Moreno Leyva (XJTLU)
Floriana Grasso (UoL)
Massimo Imparato (CUD: Canadian University Dubai)

ACADEMY/SCHOOL Design School

This project aims to identify key challenges in design education and explore the integration of gamification and educational technology as solutions. While traditional design education has been valuable for establishing foundational skills, there is a pressing need for it to evolve into a student-focused, research-led, and science-based approach to address the demands of the modern industrial and information revolutions. Gamification and educational technology have the potential to meet these needs through enhancing learning experiences and optimising educational outcomes. Utilising systematic literature review and content analysis, this research identifies key challenges in design education and proposes potential future research directions and design opportunities to mitigate these challenges through gamification and educational technology. The findings provide design educators and instructional designers with a comprehensive understanding of the current design education landscape and offer valuable insights for incorporating gamification and educational technology into educational settings.

500

Evolving Dynamics in Urban Neighborhood Governance: Insights from the Yangtze River Delta region in the Post-Pandemic Era

Alessia Orazzo (PhD)

SUPERVISORS Alessandra Cappelletti (XJTLU)
David Dolowitz (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

China's rapid urbanisation and housing marketisation have intensified interest in urban neighbourhood governance, a focus further amplified during COVID-19, when grassroots organisations played a pivotal role in providing frontline assistance. This research examines neighbourhoods and subdistricts in Suzhou, Shanghai, and Nanjing as case studies, employing a mixed-methods approach. Initial findings reveal that traditional neighbourhood organisations are evolving alongside emerging structures such as the grid management system and property management committees, along with the actors engaged in these structures. Drawing on Giddens' Structuration Theory, the study seeks to complement traditional governance models—where the State retreats to create space for market and social actors—and actor-based models to capture the complexity of current dynamics, by providing an in-depth understanding of the interplay between Party/State structures and actors, highlighting variations in governance modes at the local level in the post-pandemic era.

501

Rule Competition: How American Hegemon Shapes International Rules

Leci Zhang (PhD)

SUPERVISORS Benjamin Barton, Hongyi Lai

UNIVERSITY/INSTITUTE University of Nottingham Malaysia /
School of Politics, History and International Relations

After World War II, the U.S. established a series of international institutions to set global norms and rules. Over the next 75 years, these rules faced challenges from rising powers, including Soviet Union, Japan and China. Additionally, domestic shifts within the U.S. have driven adjustments in international rules. Existing literature primarily focuses on the rule competition between the U.S. and China, without adopting a comprehensive perspective on how the U.S. has driven or modified international rules. This paper attempts to combine institutional balancing theory with neoclassical realism to propose a new theoretical framework for analyzing how U.S. hegemony responds to the rule challenges posed by rising powers through different institutional balancing strategies. This paper argues that, in responding to the rule challenges from rising powers, dominant states modify international rules through institutional balancing strategies, with the domestic institutions and economies interdependence playing a primary role in determining whether they will include the rising powers.

502

Nickel export bans and global market implications: The case of Indonesia

Venessa (Master)

SUPERVISORS Dionysios Stivas (XJTLU)

ACADEMY/SCHOOL School of Humanities and Social Sciences

In this study, I investigate how Indonesia's nickel export ban impacts its manufacturing sector (stainless steel and lithium-ion batteries (LIBs)), focusing on material production costs, global supply chains (GSCs), and Indonesia's competitiveness within the global value chains (GVCs). As one of the largest nickel suppliers in the world, Indonesia implements the ban to promote domestic production and prevent future nickel shortages. However, this policy results in significant consequences both domestically and globally. This research addresses three key questions concerning the negative impacts of the nickel export ban on Indonesia's domestic and international performance. A time-series analysis is conducted, examining international and Indonesian nickel production and prices from 2014 to 2024, as well as global price indexes for stainless steel and LIBs. Other potential influencing factors, such as government policy changes and the COVID-19 pandemic, are also considered. Despite these variables, the findings indicate that the nickel export ban has the most significant impact.

503

Navigating Hegemonic Orders: China's Engagement with Central and Eastern Europe, 2012-2024

Vladimir Milić (PhD)

SUPERVISORS Filippo Andrea Giurlando, Dragan Pavlicevic (XJTLU)
Erika Harris (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

This proposal examines China's engagement with Central and Eastern European countries from 2012 to 2024 through the lens of hegemonic ordering theory. Emphasising that their relations are developing within the context of an established Western-led regional order, the research adapts Nexon and Cooley's (2020) framework of hegemonic order transformation by examining three distinct pathways: from above (great power challenges), below (small and medium states' agency), and within (internal order dynamics). Through this theoretical lens, the study investigates the nature and implications of China-CEE interactions for regional order dynamics. The research develops a novel typology of CEE countries based on their engagement patterns with China: states pursuing comprehensive political-economic cooperation, those maintaining primarily economic relations, and those engaging in sporadic economic cooperation. Using comparative case studies of representative countries from each category, this research examines how these varying levels of engagement affect existing institutional arrangements and power dynamics. The methodology combines qualitative case analysis with process tracing, drawing on official documents, economic data, and expert interviews to identify causal mechanisms and patterns. This research contributes to both theoretical and empirical understanding of how hegemonic orders function, particularly how small states navigate and potentially influence great power competition. Beyond its empirical findings, the study aims to advance hegemonic ordering theory by testing and refining its applicability to regional contexts and identifying potential new mechanisms of order maintenance and transformation.

504

EU Digital Public Diplomacy in China during the COVID-19 Pandemic

Xiangdong Chen (PhD)

SUPERVISORS Alessandra Cappelletti, Ji You (XJTLU)
Katia Balabanova (UoL)
Evangelos Fanoulis (NUIG: University of Galway)

ACADEMY/SCHOOL School of Humanities and Social Sciences

As diplomatic activities increasingly shift to digital platforms, the COVID-19 pandemic has brought digital public diplomacy (DPD) to the forefront of academic and practical interest. This study examines the DPD practices of the EU Delegation to China on the Weibo platform, employing Foucault's concept of governmentality and post-structuralist discourse theory. It analyzes the EU's dynamic digital strategy during the global health crisis, particularly the emergence of human rights as a key issue in COVID-19 governance, highlighting the tension between public health management and EU values in its discourse. This study sheds light on how the EU constructs governance technologies through DPD, using discourse strategies to advance its values and policy goals during global crises. It offers a new perspective on the operation of power in DPD, enriching cross-cultural dialogue on public health, neoliberalism, and biopolitics.

505

Evolution of star clusters with initial bulk rotation

Abylay Bissekenov (PhD)

SUPERVISORS Xiaoying Pang, Mattheus Bartholomeus Nicolaas Kouwenhoven (XJTLU)
Thomas Mohaupt (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

When star clusters are born, they may have inherent initial bulk rotation from molecular clouds. This rotation could affect the evolution and development of the star cluster. We aim to show the effects of various initial rotation values on star cluster simulations with primordial binaries. The simulations are made via NBODY6++GPU. We find that initial rotation highly affects the early evolution of the star clusters. Highly rotating clusters show angular momentum transport from the inner part to the outside resulting in core-collapse. Angular momentum transport is accompanied by a highly elongated bar-like structure morphology. The effects of bulk rotation are reduced by the time of 2-body relaxation. Clusters with primordial binaries show higher survivability, but it may be caused by a higher number of particles in clusters with binaries. We also prepared the synthetic observation of simulated clusters for future observations.

506

Predicting Rheological Properties of HAMA/GelMA Hybrid Hydrogels via Machine Learning

Bincan Deng (PhD)

SUPERVISORS Chen Xuan (XJTLU)
Andreas Alpers (UoL)
Yuwen Cui (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Mathematics and Physics

Viscosity is an important parameter in process engineering and an important indicator of bio-ink material evaluation in 3D bioprinting. This poses an obstacle to the design of bioink materials due to the lack of reliable and generalised methods. In this study, we focus on HAMA/GelMA hybrid hydrogel and measure the viscosity of this hybrid hydrogel systematically by rheometer and establish a database. Based on this database as well as four general machine learning algorithms, a viscosity prediction model was developed and the performance metrics of each model were evaluated and discussed. Further, we established a HydroThermoMLP model based on the MLP algorithm and the general formula for viscosity calculation, which is of great significance for the interpretability of viscosity prediction of hybrid hydrogels, and is a new attempt to incorporate the physical method into machine learning algorithms.

507

Classification prediction of China's population aging situation based on generative data and ensemble learning algorithms

Chongwen Tian (PhD)

SUPERVISORS Rong Li (XJTLU)

ACADEMY/SCHOOL School of Mathematics and Physics

In past research on population aging, regression algorithms and econometrics have often become mainstream algorithms in similar studies. Due to the scarcity of relevant macro data and severe missing values, similar studies need to abandon some of the data or use specific algorithms to estimate missing values. Machine learning and other algorithms often require a large amount of data for training, so it is difficult for us to use machine learning and other algorithms in similar research. However, the emergence of generative AI provides us with another way of thinking. In this article, we use generative AI to transform a small amount of time series data related to population aging into a large amount of discrete data that follows a truncated normal distribution. With the help of generative AI, we effectively utilized all the data.

508

On Encounter Rate for Stars in Clusters

Chuang Du (PhD)

SUPERVISORS Mattheus Bartholomeus Nicolaas Kouwenhoven (XJTLU)

ACADEMY/SCHOOL School of Mathematics and Physics

Stars with planetary systems form in star clusters, where close encounters between stars can disrupt fragile planetary systems. The frequency of such encounters significantly influences the dynamical evolution of a star's orbit and its planetary system. This research presents a fully analytical method to calculate the number of encounters based on a star's orbital elements and stellar environment, offering predictions about which stars are more likely to host sustainable planetary systems. Finally we give the number of encounters as an integration over radial distance, which can be calculated numerically.

509

Iwasawa theory of fine Selmer group

Hang Chen (PhD)

SUPERVISORS Luca Demangos (XJTLU)
Oleg Karpenkov (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

Let q = p^n be a prime power and C be a smooth geometrically connected projective curve over F_q. We consider the ring of regular functions A consisting functions regular on C outside \infty where \infty is a fixed based point and a Drinfeld module \phi over K = Quot(A). Furthermore, we assume that A is a Dedekind domain containing F_q[t]. Over the constant Z_p-extension of K, we define the fine Selmer group associated to the p-torsion of \phi and we show that it is cofinitely generated over A_p and the Iwasawa invariant \mu_p(\phi) vanishes. This provides an analogue of Iwasawa's conjecture (\mu = 0) in the setting of function field.

510

The effects of multiple-parton interactions on the underlying events, minimum bias and pentaquark productions

Hao Yang (PhD)

SUPERVISORS Arthur Moraes, Mattheus Bartholomeus Nicolaas Kouwenhoven (XJTLU)
Jan Kretzschmar (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

This study investigates the MPI sensitivity of several observables of the underling event and minimum bias in pp collisions, including charged multiplicity distributions and the mean transverse momentum as a function of charged multiplicity. The MPI effects on pentaquark production are also studied for three candidates Pc(4312)+, Pc(4440)+ and Pc(4457)+, which are generated as molecular states through hadronic rescattering framework.

511

Equity-linked annuity valuation with the LRD feature in financial and mortality dynamics

Haoran Jiang (PhD)

SUPERVISORS Zhehao Zhang, Qiang Niu (XJTLU)
Corina Constantinescu (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

To characterise the LRD feature from financial and mortality dynamics on the valuation of the equity-linked annuity (EIA), we adopt the fractional Brownian motion (FBM) in modelling the dynamics of asset prices and mortality intensities, in which the compound Hawkes process captures clustering jumps. Besides, the correlated FBM to the equity price dynamic drives the interest rate dynamic. Numerical analyses show that ignoring the LRD feature and the jump component in the modelling framework may lead to a potential deficiency in reserving EIA policies, which causes capital losses for insurers.

512

SSCL-GBM: A Novel Semi-Supervised Approach for Stock Prediction

Huijia Wang (PhD)

SUPERVISORS Angelos Stefanidis, Zhengyong Jiang, Jionglong Su (XJTLU)
Angel Garcia Fernandez (UoL)

ACADEMY/SCHOOL School of AI and Advanced Computing

Accurate market feature identification and predictive modeling are critical for investment decision-making. This study introduces the SSCL-GBM model, combining semi-supervised learning with a custom loss function for stock return prediction. By generating pseudo-labels for unlabeled data in the final holding period, the model eliminates data leakage caused by future price dependency. The custom loss function balances return and risk, reducing false positives while enhancing predictive performance. Experimental results demonstrate that SSCL-GBM surpasses baseline models in cumulative returns and Sharpe ratio, showcasing its effectiveness in financial market prediction.

513

Centre of mass location, flight modes, stability and dynamic modelling of gliders

Huilin Li (PhD)

SUPERVISORS Leif Ristroph, Jinzi Mac Huang

UNIVERSITY/INSTITUTE New York University Shanghai

Falling paper flutters and tumbles through air, whereas a paper airplane glides smoothly if its leading edge is appropriately weighted. We investigate this transformation from 'plain paper' to 'paper plane' through experiments, aerodynamic modelling and free flight simulations of thin plates with differing centre of mass (CoM) locations. Periodic modes such as fluttering, tumbling and bounding give way to steady gliding and then downward diving as the CoM is increasingly displaced towards one edge. To explain these observations, we formulate a quasi-steady aerodynamic model whose force and torque coefficients are informed by experimental measurements. The dependencies on angle of attack reflect the transition from attached to separated flow and a dynamic centre of pressure, effects that prove critical to reproducing the observed motions of paper planes in air and plates in water. Because the model successfully accounts for unsteady and steady flight modes, it may be usefully applied to further problems involving actuated motions, feedback control and interactions with ambient flows.

514

The Interaction Impact of WHR and Low-level PM2.5 to Brain Structure

Jiahao Zhao (PhD)

SUPERVISORS Mu He (XJTLU)
Linglong Yuan (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

This study innovatively explores the synergistic effects of the Urban Heat Island (UHI) effect and atmospheric PM2.5 exposure on cognitive decline and develops a predictive model. Based on data from the UK Biobank, we selected 40,000 middle-aged and elderly participants and utilized environmental remote sensing data and Geographic Information Systems (GIS) to construct individualized long-term exposure models for UHI and PM2.5. Through brain MRI imaging, we analyzed the independent and interactive effects of UHI and PM2.5 on cortical thickness, brain volume, and neural network connectivity. Meanwhile, a personalized cognitive decline prediction model was developed using machine learning algorithms.The study revealed that the interaction between UHI and PM2.5 significantly affects several key brain regions (e.g., hippocampus, frontal cortex, and amygdala), accelerating cognitive decline, with the effects being more pronounced among individuals with lower socioeconomic status. A predictive model based on random forest algorithms demonstrated that combining environmental exposure variables with individual health behavior variables effectively predicts the risk of cognitive decline (AUC=0.92). This study is the first to propose incorporating environmental exposure into the predictive framework for cognitive decline, providing new scientific evidence for future precision public health policies.

515

Pricing Chinese Convertible Bonds with Learning-Based Monte Carlo Simulation Model

Jiangshan Zhu (PhD)

SUPERVISORS Rong Li, Yi Hong, Conghua Wen (XJTLU)
Linglong Yuan (UoL)
Caio Almeida
(Princeton: Princeton University, USA, Department of Economics)

ACADEMY/SCHOOL School of Mathematics and Physics

In this paper, we explore a novel model for pricing Chinese convertible bonds that seamlessly integrates machine learning techniques with traditional models. The least squares Monte Carlo (LSM) method is effective in handling multiple state variables and complex path dependencies through simple regression analysis. In our approach, we incorporate machine learning techniques, specifically support vector regression (SVR) and random forest (RF). By employing Bayesian optimization to fine-tune the random forest, we achieve improved predictive performance. This integration is designed to enhance the precision and predictive capabilities of convertible bond pricing. Through the use of simulated data and real data from the Chinese convertible bond market, the results demonstrate the superiority of our proposed model over the classic LSM, confirming its effectiveness. The development of a pricing model incorporating machine learning techniques proves particularly effective in addressing the complex pricing system of Chinese convertible bonds. Our study contributes to the body of knowledge on convertible bond pricing and further deepens the application of machine learning in the field in an integrated and supportive manner.

516

Numerical stability and convergence for nonlinear space-fractional delayed diffusion equations with mixed boundary conditions in two dimensions

Jing Chen (PhD)

SUPERVISORS Jie Chen, Fei Ma (XJTLU)
Alexander Movchan (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

Two-dimensional space-fractional diffusion equations with simple Dirichlet boundary conditions provide effective capabilities for modeling real-world applications. However, few studies have introduced a delayed term into two-dimensional problems with mixed boundary conditions for numerical schemes and investigations of quantitative properties. This motivated us to develop new stability and norm-based convergence analysis. In this study, we proposed a linear ADI -method with shifted Grunwald-Letnikov approximation operators for Reisz-type-fractional delayed Fisher equations. Under different , this approach induced Schur polynomials and error estimations dependent on eigenvalues of coefficient matrices to obtain the conditional stability and first-order norm convergence proof. Moreover, we extended a generalized case of Fisher equations discretised by centered difference operators with second-order accuracy. Numerical experiments were implemented to validate the theoretical results, where simulations for nonlinear Nicolson's blowflies equations performed better convergence. By testifying these two harmonic operators, we highlighted the interaction impacts of space-fractional derivatives in two-dimensional Fisher equations.

517

Zoonotic Emerging Infectious Diseases and Wildlife Trade

Kai Wang (PhD)

SUPERVISORS Chengxiu Ling, Ying Chen (XJTLU)
Corina Constantinescu (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Zoonotic diseases, transmitted between animals and humans, account for at least 60% of emerging infectious diseases, posing significant risks to public health, economies, and biodiversity. Wildlife trade is recognized as a major driver of pathogen spillover. Despite its importance, the relationship between wildlife trade and zoonotic disease outbreaks remains underexplored, with most studies focusing on mammals or specific regions. This study analyzes the global impact of wildlife trade on zoonotic EID risks using a spatially dynamic, country-year-level approach. We employ a Bayesian zero-inflated negative binomial joint model to examine the occurrence and frequency of zoonotic EIDs, adjusting for reporting biases and confounding factors. Additionally, we apply extreme value theory to investigate the extreme cumulative effects of wildlife trade on EIDs. Our findings highlight the significant role of wildlife trade in zoonotic EID risks, demonstrating the importance of advanced modelling techniques for understanding and mitigating the threat of future outbreaks.

518

The Influence of Hyperparameters on Physics-Informed Neural Networks (PINNs): Application to the Problem of Plane Stress

Ningjie Wang (PhD)

SUPERVISORS Luxian Li

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Aerospace Engineering

Physics-Informed Neural Networks (PINNs) represent an innovative numerical technique for solving partial differential equations (PDEs) and exhibit substantial potential for development. Nevertheless, the selection of hyperparameters in PINNs, as a black-box approach, remains a largely unresolved challenge. In this study, we investigate several key hyperparameters, including the activation function, the number of layers of the neural network, the number of neurons in the hidden layers, and the impact of the optimizer on a pure bending beam model within the context of the plane stress problem. Our findings indicate that optimal hyperparameter selection can significantly enhance solution efficiency, achieving a reduction in the relative L2 error by 90% or more with the same number of iterations. This result not only underscores the critical role of hyperparameter selection in PINNs' performance but also offers valuable insights for the broader application of PINNs in various fields.

519

Dividend and capital injection control with transaction costs and optimal exiting strategies

Ningning Feng (PhD)

SUPERVISORS Ran Xu, Jiajun Liu (XJTLU)
Corina Constantinescu (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

This paper studies the optimal dividend and capital injection control problems with exit strategies under the jump-diffusion model. A piecewise terminal payoff function is introduced, which represents the value of the stop-loss exit strategy and profit-taking exit strategy. Using the dynamic programming principle, the quasi-variational inequations (QVIs) of the optimal control problem are derived. Due to the complexity of the mixed control, it is nearly impossible to get closed - form solutions, we employ Markov chain approximation methods to approximate the value function and optimal controls by constructing a discrete-time controlled Markov chain. The proofs of the convergence of the approximation algorithms are provided. Some examples are given to illustrate the applicability of numerical methods.

520

Asymptotic Capital Allocation for Light-Tailed or Moderately Heavy-Tailed Risks based on the Higher Moment Risk Measure

Qingxin Yi (PhD)

SUPERVISORS Jiajun Liu, Fei Ma (XJTLU)
Linglong Yuan (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

In this paper, we focus on risk capital allocations with respect to the higher moment (HM) risk measure and link them to a confidence level q∈ (0,1). More specifically, we investigate the tail behaviour of capital allocation as q ↑ 1 under the framework where individual risks belong to the maximal domain of attraction of the Gumbel distribution. With different settings of the strength of dependence among risks, explicit asymptotic formulas are derived for the aforementioned risk capital allocation. Numerical studies are conducted to examine the performance of these asymptotic formulas in specific examples.

521

FAD: Feature Augmented Distillation for Anomaly Detection and Localization

Qiyin Zhong (PhD)

SUPERVISORS Gang Liu, Jimin Xiao (XJTLU)
Xiaowei Huang (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

Anomaly Detection (AD) is vital for quality control in industrial manufacturing, but obtaining sufficient anomalous data for supervised learning is challenging. Unsupervised AD methods, which use only normal data, are a practical alternative. However, these methods, including memory-bank-based and knowledge-distillation-based techniques, often misclassify rare normal textures as anomalies, a problem we term tailed texture misdirection, which we are the first to identify. To address this, we propose a Feature Augmented Distillation (FAD) framework that conducts feature augmentation for normal tailed textures. Our approach involves selecting under-fitted layers and generate Gaussian-Perturbed High Heterogeneity (GPHH) features on the selected layer to mimic the normal tailed textures. Then we conduct re-learning for the GPHH features, which improves adaptability of the model to normal tailed texture and reduces tailed texture misdirection. Experimental results on MVTec AD and ViSA benchmarks show that FAD achieves competitive performances compared to state-of-the-art approaches, particularly for detecting long-tailed normal textures. The code will be released.

522

Synthesis and Post-functionalization of Polysaccharide-based Microspheres with ordered Internal Pore Structures for Next-generation Chromatographic Technology

Rui Wang (PhD)

SUPERVISORS Chen Xuan (XJTLU)
Haifei Zhang (UoL)
Jiuzhi Xue (JITRI Smart Liquid Crystal Technologies Institute)

ACADEMY/SCHOOL School of Mathematics and Physics

At present, purification is a vital and indispensable part of the downstream processing of biologics. Column chromatography is the most widely used technique among all the purification processes. The development of chromatographic resin materials is central to the success of chromatography in biotechnology, and polysaccharide-based microspheres (regarded as resin materials) are the most widely adopted separation media. The structure and properties of the pores of a chromatographic resin play a central role in separation performance as the nanoscopic environment defined by the pores influences the diffusion or convection of solutes into the microspheres to achieve the goal of purification. Prior research has elucidated approaches leading to the control of pore structure during the pore formation or post-crosslinking steps of the resin synthesis pathway. While these approaches also have inherent limitations. Therefore, my project aims to develop new synthesis approaches and post-functionalisation that form polysaccharide-based microspheres within controlled internal pore structures.

523

Modelling of in-plane shear behaviour of woven prepregs considering viscoelasticity

Ruihan Dong (PhD)

SUPERVISORS Chen Xuan, Hao Yu (XJTLU)
Will Christian (UoL)
Zuguo Bao (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Mathematics and Physics

Compression molding offers a cost-effective and highly repeatable approach for manufacturing woven reinforced thermoset composites. Mechanical properties during molding (tension, shear, bending, and interlayer friction) were investigated in some studies [1-3], with in-plane shear identified as a primary deformation mechanism. In typical off-axis experiments, stress relaxation phenomena induced by the resin are observed. Addressing this, a fabric non-orthotropic constitutive model based on the generalized Maxwell viscoelastic model is proposed. Considerations are extended to temperature and rate factors, delving into composite deformation mechanisms and optimizing compression molding processes. Implementation of the viscoelastic constitutive model, established using Prony series, is achieved within ABAQUS/explicit. Crucially, validation against compression molding experiments underscores its accuracy, considering multifaceted factors such as temperature, rate, and blank force effects. Finally, based on the developed forming model, shear angles are accurately predicted, and optimization of process parameters is feasible.

524

The Impact and Mechanisms of Macroprudential Policies on Equity Markets: Evidence from China

Ruijun Zong (PhD)

SUPERVISORS Lu Zong, Conghua Wen (XJTLU)
Linglong Yuan (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

This study examines whether and how macroprudential policies impact stock market performance, focusing on China. Using VAR, we find that borrower-side policies have the most significant effects, with tighter borrower-side policy shocks decreasing stock returns. Additionally, we use time-varying VAR to show that loosening macroprudential policy shocks during financial crises tend to stimulate stock returns. Regression models are then applied to investigate potential transmission channels—credit conditions and equity fund flows—through which macroprudential policies impact stock markets. The results vary across different macroprudential policy tools, with borrower-side policies affecting stock returns both through the channels and directly. This research enhances understanding of the role of macroprudential policies and provides valuable insights for policymakers aiming to promote financial stability. The sample spans from 2005 to 2021, covering key financial crises, including the 2008 GFC, the 2015 China stock market crash, and the 2020 COVID-19 crisis.

525

The stability of China's insurance industry under regulatory measures

Ruina Xing (PhD)

SUPERVISORS Zhehao Zhang, Stephen Gong (XJTLU)
Corina Constantinescu (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

Financial stability is fundamental to a healthy economy, with prior studies offering diverse methods to assess default risk based on accounting and market variables: multiple discriminant analysis model, logit model, probit model, hazard model, and Black – Scholes – Merton(BSM) option-pricing model. Using the BSM model, this study explores insurers' distance to default (DD), addressing limitations in traditional accounting models and market-driven metrics. Unlike banks, which leverage forward-looking volatility via derivatives, Chinese insurers predominantly rely on historical data, with limited public disclosure and a lack of a comprehensive industry index. This paper innovatively adapts the BSM model by focusing on actual versus minimum capital, aligning with regulatory solvency measures. This approach provides a more relevant indicator of financial stability in the Chinese insurance sector, bridging gaps in research and offering critical insights into industry resilience amidst evolving economic challenges.

526

A Guided Approach to Ensuring Safety in Diffusion-Based Generative Models

Sidong Jiang (PhD)

SUPERVISORS Rui Zhang, Xinheng Wang (XJTLU)
Kaizhu Huang (DKU: Duke Kunshan University)

ACADEMY/SCHOOL School of Mathematics and Physics

The widespread adoption of large generative models has raised significant concerns about security and ethics, particularly regarding the generation of inappropriate content, including violent, explicit, or sensitive images, as well as fake images that spread misinformation. In this presentation, we introduce Guided Safe Diffusion (GSD), a novel inference-time method designed to prevent diffusion models from generating such undesirable content. GSD incorporates safety guidance during the denoising steps, modifying the predicted noise to steer the generation process away from prohibited content, as defined in a customizable content list. This approach supports controlled image generation by accepting both input images and text descriptions and, importantly, does not require retraining or fine-tuning the model. Experimental results demonstrate that GSD effectively removes unwanted content while preserving unrelated content, ensuring both safety and generative utility. Our method offers a practical solution for mitigating risks associated with diffusion models in real-world applications.

527

Point2pix-Zero: Point-Driven Refined Diffusion for Multi-object Image Editing

Siyuan Wang (PhD)

SUPERVISORS Rui Zhang, Qiufeng Wang (XJTLU)
Guangliang Cheng (UoL)
Kaizhu Huang (DKU: Duke Kunshan University)

ACADEMY/SCHOOL School of Mathematics and Physics

Semantic image editing methods employing large-scale diffusion models have made significant strides in precise and controlled image editing with text prompts as guidance. However, these models struggle to handle complex images containing hard-described objects and/or multiple objects. In this work, we introduce a novel inference-time multi-object image editing strategy, Point2pix-Zero, editing a single object with the simple guidance of clicked points and the text of target objects. We employ an interactive methodology, point-discovery, as text-free guidance to identify the semantic information of intended edited objects and generate text prompts automatically. Instead of exploiting internal cross-attention maps of diffusion models as a guide, we inject external attention maps to rectify the visual-and-semantic pairing mismatches in cross-attention maps during the denoising process. Extensive empirical evaluations demonstrate the effectiveness of our proposed inference-time method in ensuring precise editing while maintaining image fidelity. Our method showcases superior performance in single- and multi-object image editing, positioning it as a new state-of-the-art.

528

Image Augmentation with Controlled Diffusion for Weakly Supervised Semantic Segmentation

Wangyu Wu (PhD)

SUPERVISORS Fei Ma, Jimin Xiao (XJTLU)
Xiaowei Huang (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

Weakly-supervised semantic segmentation (WSSS) uses image-level labels but struggles on small datasets due to poor pseudo-label quality. We propose Image Augmentation with Controlled Diffusion (IACD), which enhances datasets by generating diverse images using existing images and labels as controls. A selection strategy minimizes noise from diffusion randomness. Experiments confirm IACD's effectiveness, outperforming state-of-the-art methods, especially with limited data.

529

BFANet: Revisiting 3D Semantic Segmentation with Boundary Feature Analysis

Weiguang Zhao (PhD)

SUPERVISORS Rui Zhang, Qiufeng Wang (XJTLU)

ACADEMY/SCHOOL School of Mathematics and Physics

3D semantic segmentation plays a fundamental and crucial role to understand 3D scenes. While contemporary state-of-the-art techniques predominantly concentrate on elevating the overall performance of 3D semantic segmentation based on general metrics (e.g. mIoU, mAcc, and oAcc), they unfortunately leave the exploration of challenging regions for segmentation mostly neglected. In this paper, we revisit 3D semantic segmentation through a more granular lens, shedding light on subtle complexities that are typically overshadowed by broader performance metrics. Concretely, we have delineated 3D semantic segmentation errors into four comprehensive categories as well as corresponding evaluation metrics tailored to each. Building upon this categorical framework, we introduce an innovative 3D semantic segmentation network called BFANet that incorporates detailed analysis of semantic boundary features. First, we design the boundary-semantic module to decouple point cloud features into semantic and boundary features, and fuse their query queue to enhance semantic features with attention. Second, we introduce a more concise and accelerated boundary pseudo-label calculation algorithm, which is 3.9 times faster than the state-of-the-art, offering compatibility with data augmentation and enabling efficient computation in training. Extensive experiments on benchmark data indicate the superiority of our BFANet model, confirming the significance of emphasizing the four uniquely designed metrics.

530

Extremes of extended tail Gini functionals with application in systemic risk variability control

Weiran Li (PhD)

SUPERVISORS Jiajun Liu (XJTLU)

ACADEMY/SCHOOL School of Mathematics and Physics

Measuring the tail risk of financial or insurance entities in response to extreme scenarios of a benchmark or systemic variable is of considerable interest to both academics and practitioners. While much of the existing literature focuses on the magnitude of extreme losses, relatively fewer attention addresses measurements on the tail risk variability and its sequential inference, despite its importance in pricing, premium principle construction and portfolio selection. Building on the tail Gini functionals, we consider the measures of tail risk variability under the extreme co-movement between systemic variable and individual losses in and of itself, where the risk preference towards the systemic risk could be controlled over a new parameter. An asymptotic result is explored via extreme value techniques as the limit behaviors of the proposed risk measures are of interest under stringent regulatory requirements. We develop estimators applicable at both intermediate and extreme levels and demonstrate the practical utility of our approach in real data analysis.

531

Regression approaches for CALT parameter estimate

Wenhan Zhang (PhD)

SUPERVISORS Xiaojun Zhu, Zili Wu (XJTLU)

ACADEMY/SCHOOL School of Mathematics and Physics

Accelerated life testing (ALT) is widely employed due to the high cost involved in testing high-quality products under normal operating conditions. For products exposed to continuously fluctuating stress in the working environment, cyclic stress tests become necessary. The Coffin – Manson model is commonly used when product failure is solely attributed to temperature changes (ΔT). However, this assumption does not always hold in many practical situations. The Norris – Landzberg model, which considers both maximum temperature and cyclic change frequency, offers much flexibility in modeling fatigue life due to cyclic temperature fluctuations. Several studies have been conducted based on the Norris – Landzberg model. However, using the multiple linear regression method without any distributional assumption may fail to provide satisfactory inferential results. This paper assumes the log-location-scale family of distributions and then shows that the weighted least-squares method based on order statistics of failure times yields the best linear unbiased estimators (BLUEs) of parameters based on complete as well as Type-II censored data. We then study some properties of these BLUEs using both theory and Monte Carlo simulations. Next, we present an illustrative example involving solder joint data to demonstrate the model and the associate inferential results developed here. Finally, the optimal design procedure is discussed.

532

Convertible bond issuance and liquidity of small cap listed companies

Xiao Lin (PhD)

SUPERVISORS Conghua Wen (XJTLU)

ACADEMY/SCHOOL School of Mathematics and Physics

Convertible bond is one of the important financing tools for companies and affect their stock market performance. We employ a Multi-period Difference-in-Differences (DID) approach to investigate the impact of convertible bond issuance on stock liquidity of listed small companies. Empirical evidence indicates that their liquidity is significantly enhanced following the issuance of convertible bonds. The issuance can facilitate greater market attention. Meanwhile, the bonds are subject to external supervision of debt credit ratings, which in turn enhances the liquidity. The heterogeneity analysis indicate that conversion dilution ratio is negatively associated with the impact of convertible bond issuance on liquidity.

533

Economic Scenario Generation (ESG) for Equity Markets

Xiaofan Xu (PhD)

SUPERVISORS Yi Hong, Youzhou Zhou, Chen Yang (XJTLU)
Linglong Yuan (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

As the second-largest economy globally, China's stock market and stock index options market hold significant importance for research. Following previous studies on the US stock and options markets, this paper aims to study on the stock and options market in China with CSI300 stock index and related options in a comprehensive manner and identify the salient characteristics of stock indices and index options between China and the U.S.. In this study, the stock market is described by stochastic model system, such as the Heston model and the Bates model. The parameters of the system are estimated by filtering approach including unscented Kalman filter and unscented Kalman smoother methods following historical research. We also apply joint estimation scheme with both stock and option data to investigate the information brought by index options. The modelling and option pricing results of CSI300 index are collected to compare with the results of SPX500 index and options from previous studies.

534

Test of Reliability in Coherent system on a Specific Time

Xuan Xu (PhD)

SUPERVISORS Xiaojun Zhu, Zili Wu (XJTLU)
Linglong Yuan (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

This paper develops non-parametric hypothesis tests to evaluate the reliability function (RF) of systems and components over a warranty period. Practical applications include manufacturers assessing system failure rates within warranty periods or comparing the performance of new components to older ones with known reliability, as well as customers evaluating system reliability over a specific time. The proposed methodology leverages system signatures and available data, enabling reliability comparisons across systems with varying structures without requiring precise distribution or lifetime details. Monte Carlo simulations are used to assess test performance, optimize power, and determine appropriate sample sizes, ensuring robust and reliable results.

535

Time-lagged Marginal Expected Shortfall

Xuannan Liu (PhD)

SUPERVISORS Jiajun Liu, Fei Ma (XJTLU)
Yi Zhang (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

While Marginal Expected Shortfall (MES) has been widely studied, most existing research focuses on static models, overlooking dynamic aspects. We define the Time-lagged Marginal Expected Shortfall (TMES) as a dynamic extension of the MES. It incorporates partial multivariate regular variation based on the ξM_Oξ-convergence framework to handle cases where the marginal distribution are light-tailed, but it is not limited to light-tailed cases. We propose TMES to account for time lags in assessing systemic risk along with a natural estimator and analyze its asymptotic properties, including its asymptotic normality. To address challenges in constructing confidence intervals for TMES, we apply the stationary bootstrap method to generate asymptotically correct confidence bounds for the TMES estimator.

536

Multiscale modelling of cellulose nano-fiber composites

Yang Zhou (PhD)

SUPERVISORS Jie Chen, Chen Xuan (XJTLU)
Linglong Yuan (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

Cellulose micro-fiber (CMF) composites represent a promising avenue for sustainable material innovation, but challenges in fiber selection and structural design hinder their broader application. This study aims to develop an advanced CMF-based composite and explore fiber-structure-property interactions using multiscale modeling approaches. Specifically, the research employs the Representative Volume Element (RVE) method to capture mesoscale structural behavior, incorporating recent advancements such as stochastic RVE generation and machine learning-enhanced RVE analysis to improve predictive accuracy and computational efficiency. These integrated methodologies enable a comprehensive understanding of the composite's performance across scales. The resulting material is anticipated to exhibit superior durability and sustainability, with applications spanning high-performance acoustic devices, biodegradable packaging, and green construction. This work pioneers the integration of state-of-the-art multiscale techniques in sustainable material development, driving innovation in environmentally friendly technologies.

537

Associations between Short-Term Exposure to Ambient Meteorological Factors and Hand Foot and Mouth Disease: An Individual-Level Case-Crossover Study in Jiangsu, China

Yifan Tang (PhD)

SUPERVISORS Chengxiu Ling (XJTLU)
Corina Constantinescu (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Hand, foot, and mouth disease (HFMD) is a significant public health issue in the Asia-Pacific region. This study uses a time-stratified case-crossover design to investigate the association between short-term exposure to meteorological factors (temperature, humidity, wind speed, radiation, surface pressure, and precipitation) and HFMD risk. Conditional logistic regression reveals that a 1-unit increase in temperature, humidity, wind speed, and precipitation over a 10-day moving average is associated with elevated HFMD risk, while radiation and surface pressure show negative associations. As exposure thresholds increase, the negative association with HFMD strengthens for temperature, humidity, wind speed, and precipitation, while radiation and surface pressure reverse their effects. These findings inform targeted prevention strategies for HFMD.

538

High-Resolution Spectral Analysis of Kinematic and Chemical Properties in LP 2442 gp1-5

Yifan Wang (PhD)

SUPERVISORS Xiaoying Pang, Mattheus Bartholomeus Nicolaas Kouwenhoven (XJTLU)
Thomas Mohaupt (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

Spectral data plays a vital role in characterizing the kinematic and chemical properties of stellar populations, offering insights into their formation and evolution. This study focuses on the spectral analysis of the hierarchical subgroups in open cluster LP 2442 region. High-resolution spectra were obtained using iSHELL@IRTF, targeting radial velocities with an expected precision of ~0.1 km/s and metallicities with expected precision of ~0.1 dex. Data reduction procedures include wavelength calibration, telluric correction and cross-correlations, aiming to extract the properties of cluster members. The reduced spectra will provide a basis for exploring the kinematic and chemical properties of these subgroups in future analyses. This work underscores the utility of high-resolution spectroscopy in advancing our understanding of young stellar systems.

539

On the clinical trial design under cure rate assumption

Yiliang Zhou (PhD)

SUPERVISORS Mu He (XJTLU)

ACADEMY/SCHOOL School of Mathematics and Physics

The main idea of this research project is to develop a new method for measuring the performance of new medicines in medical studies. A new model has been developed to evaluate the efficacy and safety of the treatment with the new drug. This new method can be applied in a double-blinded clinical trial, in which the treatment assigned to patients has been unknown to both patients and doctors. To demonstrate its advantage, the proposed model has been compared with existing models through the analysis of real medical data.

540

The Effect of Issuing Green Bonds on Corporate Financial Performance in China

Ying Xu (PhD)

SUPERVISORS Mattheus Bartholomeus Nicolaas Kouwenhoven, Conghua Wen, Jianli Hao (XJTLU)

ACADEMY/SCHOOL School of Mathematics and Physics

This study empirically investigates the impact of green bond issuance on the financial performance of listed companies in China from 2016 to 2022. Employing a difference-in-differences (DID) model, we find that issuing green bonds significantly enhances firms' financial conditions, particularly for companies in non-heavy polluting industries and those located in central and eastern China. Further analysis reveals that government subsidies and corporate R&D expenditures indirectly facilitate this effect, although these indirect mechanisms are less pronounced than the direct impact of green bonds on corporate performance. Our findings contribute to the growing literature on sustainable finance and provide valuable insights for policymakers and corporate decision-makers considering green bond issuance as a strategy to improve financial outcomes while supporting environmental initiatives.

541

Sector Sentiment, Mispricing and Future Stock Returns

Yinze Ji (PhD)

SUPERVISORS Lu Zong (XJTLU)

ACADEMY/SCHOOL School of Mathematics and Physics

We explore the relation between sector sentiment sensitivity and cross-section stock returns, using TRMI daily stock and sector sentiment. The results reveal a negative relation between stock's sector sentiment sensitivity and cross-section return for most stocks. The returns differential between stocks with low and high sector sentiment sensitivity are positive and significant for most sectors, with low-sensitivity stocks generating positive and significant returns and high-sensitivity stocks yielding near-zero and insignificant returns. It suggests that the sector sentiment premium is mainly attributed to stocks less sensitive to sentiment fluctuations. We find that less sensitive stocks tend to have large market capitalization, lower illiquidity, lower bid-ask spreads, and greater analyst coverage. Motivated by the facts, we find that the undervaluation of low-sensitivity stocks, driven by investor inattention, is a leading cause for their subsequent positive returns. Besides, the sector sentiment return premiums vary across different sectors regarding the magnitude and sign. We construct different sector-level characteristics and investigate whether sector-level characteristics could significantly affect the impact of sector sentiment on the cross-section stock returns. Our results show that highly concentrated sectors are more likely to generate lower sector sentiment return premiums.

542

Focuses on applying ANNs to predict sales volumes in live streaming based on various input variables

Yuhuan Chen (PhD)

SUPERVISORS Ran Xu (XJTLU)

ACADEMY/SCHOOL School of Mathematics and Physics

Artificial neural networks (ANNs) are particularly well-suited for predicting sales volumes in live streaming environments due to their ability to model complex, nonlinear relationships between input variables and sales outcomes. This research focuses on leveraging ANNs to analyze and predict sales performance in the dynamic and fast-paced context of live streaming commerce. By incorporating various input variables such as viewer engagement metrics, product features, streamer influence, and real-time interaction data, the study aims to develop a robust predictive model. The proposed approach not only enhances the accuracy of sales forecasts but also provides actionable insights for optimizing marketing strategies and improving decision-making processes. The findings of this research are expected to contribute significantly to the growing field of e-commerce analytics, offering a novel application of ANNs in understanding and predicting consumer behavior in live streaming scenarios.

544

Intelligent Method for Word Tokenization in Text Analysis

Yuqing Liu (PhD)

SUPERVISORS Gang Liu, Xiaoming Ding (XJTLU)
Mengyu Li (Kmerit (Suzhou) Information Technology)

ACADEMY/SCHOOL School of Mathematics and Physics

This study introduces an intelligent method for extracting information from the issuance terms of convertible bonds, which are characterized by their complex structure involving both debt and equity features. The method aims to break down these terms into modular, structured data, facilitating easier analysis and pricing. Due to the diverse expressions used in Chinese financial documents, extracting key elements such as conversion price adjustments and redemption rights presents challenges. I combine traditional text analysis methods with large language models to address this issue, ensuring accurate extraction of both simple and complex data. By applying this approach, I propose a unified bookkeeping framework for convertible bond terms that enhances data processing efficiency and accuracy, paving the way for automation in drafting, verifying, and standardizing convertible bond issuance terms.

545

Physics-Informed Neural Networks for Modeling the Dynamics of Fiberboids

Zaibo Liu (PhD)

SUPERVISORS Chen Xuan (XJTLU)
Xiaowei Huang (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

Recently, Scientific Machine Learning (SciML) in the form of Physics-informed Neural Networks (PINNs) for approximating partial differential equations (PDEs) numerically have seen significant advancements. We focus on studying the dynamics of fiberboids by using an enhanced PINNs framework. In order to guide PINNs to better solving forward, inverse and optimal control problems, we have applied several methods including the adaptive point selection strategies, dynamic loss weighting mechanisms, boundary condition constraints, and the integration of dimension reduction techniques via variable elimination. Experimental data and numerical simulations have been used for validation. The results indicate that our model has the potential to flexibly solve physical and engineering problems.

546

Paths, Pasts, or More - a High-Frequency Perspective in Cryptocurrency Volatility

Zheng Tao (PhD)

SUPERVISORS Lu Zong, Jia Zhai (XJTLU)

ACADEMY/SCHOOL School of Mathematics and Physics

We empirically study high-frequency volatility predictability in mainstream cryptocurrencies, analyzing paths dependence, past volatilities, and limit order book information. Machine learning and linear models demonstrate robust predictive accuracy across various intraday intervals, with the random forest model consistently achieving the highest ξR^2ξ. Our analysis reveals short-memory dependencies on all three aspects, but paths of returns and past volatilities exert the strongest influence on predictive accuracy. Notably, models focusing on past volatility or return paths outperform those using extensive limit order book data. This suggests a more efficient approach to measuring and observing market risk from a high-frequency perspective.

547

Semi-Template Framework for Retrosynthesis Prediction Using Graph Neural Network

Zongao Ye (PhD)

SUPERVISORS Fei Ma (XJTLU)
Linglong Yuan (UoL)

ACADEMY/SCHOOL School of Mathematics and Physics

Retrosynthesis prediction, the identification of a set of reactions available to synthesize target molecules, is a crucial task in drug discovery and organic synthesis. Recently, computer-aided retrosynthesis has gained much attention. Various deep learning-based algorithms have been proposed to assist or automate retrosynthesis analysis. However, existing approaches employ a stepwise editing strategy to translate the target molecule graph into corresponding synthons and complete them into reactants. Since chemical reactions lead to alterations in the state of some atoms and bonds between reactants and products, predicting retrosynthesis is the same as the prediction of alterations. Inspired by this view, we propose State2Edits, an end-to-end semi-template framework of retrosynthesis prediction, which sequentially edits the target molecular graph to generate the corresponding reactants. Our proposed approach involves a directed message passing neural network (D-MPNN) to predict the edits sequence.

548

Exploring the role of multidimensional poverty in antibiotic resistance among urinary tract infection patients

Iltaf Hussain (PhD)

SUPERVISORS Fang Yu

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Pharmacy

Multidimensional poverty can significantly contribute to the emergence and spread of antimicrobial resistance (AMR). This study aimed to assess the association between poverty and antibiotic resistance in patients with urinary tract infection (UTI) in Pakistan. Basing on cross-sectional study design, a sample of physician-confirmed UTI patients from three out of four provinces of Pakistan were selected using multi-stage sampling. Antibiotic susceptibility data were obtained from culture sensitivity reports, and the Multidimensional Poverty Index (MPI) was used to measure poverty levels. WASH (Water, Sanitation, and Hygiene) practices and antibiotic misuse were also assessed. Among the 698 patients, 77% were multidrug-resistant. The study revealed that poorer subgroups had a higher likelihood of multidrug resistance, with antibiotic misuse and inadequate WASH practices acting as significant mediators. The study highlights that multidimensional poverty, along with poor WASH practices and antibiotic misuse, plays a critical role in the development and spread of AMR.

549

Cost-effectiveness of aortic valve replacement in low- and intermediate-risk Chinese patients with severe aortic stenosis

Jin Peng (PhD)

SUPERVISORS Yu Fang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Pharmacy

Background: This study evaluates the cost-effectiveness of transcatheter aortic valve replacement (TAVR) versus surgical aortic valve replacement (SAVR) in low- and intermediate-risk patients with severe aortic stenosis in China. Methods: A decision-analytic model compared universal SAVR, universal TAVR, and a risk-based strategy (SAVR for low-risk, TAVR for intermediate-risk) in 75-year-old patients. Clinical inputs were derived from a meta-analysis, with cost data from Shaanxi Province (2019-2021). Quality of life was measured using EuroQoL-5D. Sensitivity analysis included one-way and probabilistic simulations (10,000 Monte Carlo runs). Results: Universal TAVR yielded the most QALYs (6.76) but was the most costly (USD 58,949). The risk-based strategy and universal TAVR had ICERs exceeding the willingness-to-pay threshold (USD 37,657). Sensitivity analysis showed TAVR would be cost-effective with significant cost reduction. Conclusions: Neither universal TAVR nor the risk-based strategy is cost-effective compared to universal SAVR in China.

550

Optimizing antibiotic prescribing practices for acute respiratory tract infections during the influenza season: utilization of diagnostic tests at primary healthcare facilities in China

Muhetaer Kadeerhazi (PhD)

SUPERVISORS Yu Fang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Pharmacy

The World Health Organization released the 4th Essential Diagnostics List in 2023, which includes recommended diagnostic tests that should be available at primary healthcare (PHC). This study aims to investigate the use of diagnostic tests in China's PHC facilities and their influence on antibiotic prescriptions. A multicenter retrospective study was conducted in the Xixian New District of Shaanxi Province, China. Clinical data was collected from 82,912 acute respiratory tract infection cases in twenty-one PHC facilities during the 2023-2024 influenza season. Nearly half of the patients underwent at least one diagnostic test. The combined use of multiple tests was common. Self-reported symptoms were found to be associated with the types of diagnostic tests administered. The complete blood count test, C-reactive protein test, and rapid influenza diagnostic test were associated with fewer antibiotic prescriptions. Incorporating diagnostic tests into routine practices could enhance the quality of antibiotic prescribing in PHC settings.

551

Factors Influencing Tuberculosis Treatment Success and Failure in Pakistan: A Retrospective Analysis

Naveel Atif (PhD)

SUPERVISORS Yu Fang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Pharmacy

Introduction: Tuberculosis (TB) remains a major public health challenge in Pakistan, with treatment gaps contributing to high morbidity and mortality. This study aims to identify the key factors leading to treatment failure in TB patients. Methods: A retrospective analysis was conducted on 375 TB patients treated between January 1, 2019, and January 31, 2019. The patients were followed until treatment completion, excluding 10 patients with unclear treatment outcomes. Statistical significance was set at $p < 0.05$. Results: The mean age of patients was 36.03 ± 15.40 years. Successful treatment was achieved in 308 patients (82.1%), while 44 (11.8%) experienced treatment failure, 18 (4.8%) discontinued treatment, and 5 (1.3%) died. Gender distribution was 51.2% male and 48.8% female, with the majority aged 21-40 years (37.3%) and weighing 50-59 kg (33.6%). Significant factors influencing outcomes included patient education, financial support, and treatment adherence. Conclusion: Enhancing patient education, providing financial support, promoting smoking cessation, and ensuring healthcare professional supervision can improve TB treatment outcomes. The use of Xpert RIF/MTB assay is recommended for accurate diagnosis and detection of drug resistance.

552

Geographical association of biodiversity with cancer and cardiovascular mortality rates: analysis of 39 distinct conditions

Qiaochu Xu (PhD)

SUPERVISORS Ying Chen, Peng Zhao, Li Li (XJTLU)
Yuan Shi (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Background: Biodiversity has been recognized as a positive contributor to human health and well-being. Cardiovascular disease and cancer, two most significant global health burdens, understanding their relationship with biodiversity forms the essential step towards promoting the biodiversity conservation and human health. Methods: The species richness of birds is a common indicator of biodiversity, given their vast numbers, distinctive distribution, and acute sensitivity to the environmental disturbances. This ecological study utilized avian observation data derived from eBird database, human health data from the International Health Metrics and Evaluation, as well as the county-level statistics, including population characteristics, socio-economics, healthcare service, residential environment, and geographic and climatic characteristics in 2014. We aimed to extensively explore the individual associations between biodiversity (i.e., avian species richness) and age-standardized cause-specific mortalities for different types of cancers (29 conditions) and cardiovascular diseases (10 conditions) across the USA. Results: Our multiple regression analyses that adjusted for a variety of socio-demographic and geographical factors showed that increased rarefied species richness of birds was associated with reduced mortality rates for three of the five most common cancers, i.e., tracheal, bronchus and lung cancer, breast cancer (in females only) and colon and rectal cancer. For cardiovascular conditions, a similar relationship was observed for ischemic heart disease and cerebrovascular disease- the two most frequent causes of mortality. This study provided extended details regarding the beneficial effects of biodiversity to human health.

553

Trajectories of Changes in Family Endowments and Fertility Decisions

Qihang Chen (PhD)

SUPERVISORS Xueyan Yang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University /
School of Public Policy and Administration

The conclusions of existing studies on the relationship between family factors and fertility decision-making are inconsistent because the examination of family factors is not systematic. In this paper, we introduce the concept of family endowment, identify the trajectory patterns of family endowment through group-based trajectory modelling based on the data from the CFPS five-period survey, and then explore the impact of the types of family endowment trends on the number of births. The study found that the trajectory of family endowment can be divided into four types: low starting point growth, middle starting point growth, middle starting point decline and high starting point decline. Among them, the middle starting point decline type has the largest number of people, followed by the starting point growth type, and finally the low starting point growth type and high starting point decline type. There is a significant correlation between the trajectory of changes in family endowments and the number of births, with the highest number of births occurring in the predominantly middle-initiation-growth childbearing age group, followed by the high-initiation-decline group. In addition, fertility inequality does exist, but it is not linearly related, and more births are possible only if family endowments are at the upper-middle level and on an increasing trend.

554

Production of narrative macrostructures in Mandarin-Speaking children with Autism Spectrum Disorder: Age, linguistic and cognitive factors

Ruijie Zhao (PhD)

SUPERVISORS Wenchun Yang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Foreign Studies

This study investigated the effects of age, linguistic factors (expressive and receptive vocabulary), and cognitive factors (working memory) on narrative macrostructure production in Mandarin-speaking children with Autism Spectrum Disorder (ASD). Sixty-three children aged 5-7 years (26 with ASD, 37 typically developing (TD)) participated in a story retelling task. The results, analyzed using a linear mixed-effects model, showed that TD children outperformed ASD children in all narrative measures. Working memory was a significant predictor of narrative macrostructure components, while age and expressive vocabulary did not predict any outcomes. Receptive vocabulary skills were found to significantly predict the use of internal state terms. These findings suggested that working memory played a critical role in macrostructure production, with narrative abilities in ASD children being less dependent on vocabulary skills but more on cognitive factors. This study enhanced our understanding of the linguistic and cognitive influences on narrative development in Mandarin-speaking children with ASD.

555

Predicting Primary Care Providers' Reading Behavior of Depression Clinical Practice Guidelines in Tibet: An Application of the Theory of Planned Behavior

Ruixue Zhao (PhD)

SUPERVISORS Wenhua Wang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Public Policy and Administration

Background: Depression is a significant public health issue globally and in China, with primary care providers (PCPs) playing a critical role in its management. Despite the availability of clinical practice guidelines (CPGs) for depression, adherence remains low, particularly in resource-limited settings such as the Tibet Autonomous Region. This study investigates the factors related to PCPs' reading behavior of depression CPGs, using the Theory of Planned Behavior (TPB) as a guiding framework. Methods: A cross-sectional survey was conducted from October to December 2023, involving 121 PCPs from 22 primary health centers (PHCs) across Shannan, Nyingchi, and Chamdo regions in Tibet. Using self-administered questionnaires, the study assessed TPB constructs—attitude, subjective norm, and perceived behavioral control—alongside demographic and professional characteristics. Descriptive statistics and binary logistic regression were employed to analyze the data and determine significant predictors of PCPs' reading behavior of depression CPGs. Results: Of the 121 surveyed PCPs, 61.16% reported having read the CPGs for depression, while 77.69% indicated they had not received formal training in depression management. Binary logistic regression analysis showed that the TPB model significantly predicted PCPs' Reading Behavior, accounting for 53.8% of the variance. Positive attitude ($\beta = 0.609$, $p = 0.022$), strong subjective norms ($\beta = 1.185$, $p = 0.028$), and high perceived behavioral control ($\beta = 1.235$, $p < 0.001$) were significantly predicted PCPs' reading behavior. Conclusions: This study highlights the crucial role of positive attitudes, social pressures, and perceived control in shaping PCPs' reading behavior of depression CPGs in the Tibetan primary care setting. These findings suggest that targeted interventions that enhance these factors may improve the uptake of depression management guidelines and ultimately the quality of mental health care provided by PCPs in resource-limited regions.

556

The association between drug shortages and prices across 74 countries: uncovering global access inequities

Shuchen Hu (PhD)

SUPERVISORS Yu Fang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Pharmacy

Background: Drug shortages are a global concern and prompt clinical crises. While lower prices are often cited as key drivers, global evidence linking shortages to prices is lacking. This research examines cases of global shortages to fill the gap. Method: We included 25 global shortage cases by reviewing publications (2013-2023). Utilizing IQVIA MIDAS® quarterly sales data from 74 countries (2011 Q3 - 2022 Q3), we defined shortage intensity as the duration of meaningful shortages. We used zero-inflated negative binomial regression, with price as the independent factor, and included GDP per capita and the number of manufacturers as covariates. Results: Out of 1,096 case-country pairs, 712 (65%) experienced meaningful shortages, with a median duration of 10 quarters. Price was not a significant predictor of shortage occurrence (P = 0.044) or intensity (P = 0.066). GDP per capita and the number of manufacturers were significantly associated with shortages. Conclusion: This study reveals inequities in drug shortages, particularly in lower-GDP countries, emphasizing the need for innovative policy solutions beyond pricing.

557

Evaluating National Essential Medicines Lists, Drug Registration, and Local Production of Anti-Cancer Medicines in South Asian Region: A Data-driven Assessment

Sundus Shukar (PhD)

SUPERVISORS Yu Fang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Pharmacy

The study evaluates the anti-cancer medicines' inclusion in NEMLs, registration, and local production in eight South Asian countries. Data was extracted on 67 anti-cancer medicines for above variables based on the 2023 World Health Organization Essential Medicines List (EML) from regulatory authorities. Findings showed that median number of these medicines listed in NEMLs/registered/locally produced was 23 (IQR 32), 45 (IQR 26), and 6.5 (IQR 39) respectively. Only three countries (37.5%) included more than 50% of 2023 WHO EML medicines in their NEMLs, and six (75%) countries registered more than 50%. Five countries locally produce, predominantly cytotoxic agents but the import is dominant. A strong positive correlation between locally produced and NEMLs' medicines (r = 0.884, P = 0.004) was observed. The region has substantial disparities in NEMLs' inclusion, and access to cancer treatment emphasizing the need for regional collaboration for local production and targeted policies to align with global standards.

558

Determinants of Disability Prevalence among Older Adults in Pakistan: Insights from Pakistan Social and Living Measurement Survey (2019-20)

Tanzeela Jamil (PhD)

SUPERVISORS Zhongliang Zhou

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Public Policy and Administration

This study explores factors contributing to health inequities among older adults in Pakistan, highlighting the lack of understanding of social determinants' impact on health vulnerabilities. The study uses Washington Group questions (WG-SS) from PSLM survey (2019-20) to analyze disability prevalence among 47,970 individuals aged 60 and above. Latent trait scores for each disability items generated by using item response theory, categorizing into no mild and severe disability, and assessing scale's consistency using Cronbach's alpha. Multinomial logistic regression was used to determine associated risk factors, with average marginal effects predicted probabilities of disability prevalence. The analysis revealed that 45% of older adults reported no disability, while 26% and 29% experienced mild and severe disabilities, respectively. Significant disparities were observed across various social, economic and environmental determinants related to disability prevalence. The findings emphasize the need for targeted interventions and policy measures to integrate vulnerable older adults into an equitable healthcare system.

559

The Long-Term Impact of Catastrophic Health Expenditure on Household Livelihoods in China: A Quasi-Experimental Analysis

Yan Zhuang (PhD)

SUPERVISORS Zhongliang Zhou

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Public Health

There is a research gap in exploring how long it takes for households to return to normal livelihoods after suffering from CHE, this study aims to provide empirical evidence. A total of 14076 household-level observations from four-wave survey data (CHARLS) were included. We applied TWFE models. The livelihood capital of households suffering from CHE in 2011 was still affected by CHE even seven years later (2018) and did not recover. The livelihood capital level of households with CHE decreased by 0.014 units of livelihood capital index (0.9%), 0.015 units (1.0%), 0.012 units (0.7%) respectively in 2013, 2015 and 2018 compared with 2011. Livelihood capital of households in rural areas, western regions, with householders aged 45-60 and with lowest income are more deeply affected by CHE. Governments should keep track of the households suffering from CHE, intervene supportive policies for most vulnerable people to reduce the continuous shock of CHE.

560

Fermi Level Dependent Reaction Pathway and Activity of Photocatalytic CO2 Reduction by g-C3N4: Importance of π-conjugated Orbital Electron Density and Lewis Structure Variation

Yang You (PhD)

SUPERVISORS John Moraros, Li Yang, Heechae Choi (XJTLU)

ACADEMY/SCHOOL School of Science

Photocatalytic CO2 reduction reaction (CO2RR) activity of g-C3N4 is known to be largely improved with defect formations, doping and heterojunctions. This study was initiated to prove a new hypothesis that the significantly changed CO2RR activities of g-C3N4 may come from the variations of the charge states of reaction intermediates and Fermi level change. Using a combination of Fermi-Dirac statistics and density functional theory (DFT) calculations, we unravel the origin of the significantly varying CH4 yield from the photocatalytic CO2RR by g-C3N4. We found that excessive electron is accumulated within the π-conjugated system of g-C3N4 and alters the charge states and the adsorption energies of important CO2RR intermediates (*COOH, *CH2OH, *CH3).

561

Mediating Role of Internet Use in Cognitive-Depressive Pathways: A Longitudinal Study in Low- and Middle-Income Country

Zhichao Wang (PhD)

SUPERVISORS Zhongliang Zhou

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Public Policy and Administration

Background: The aging population faces increasing burdens from cognitive decline and depression. This study investigated whether internet use mediates the relationship between cognitive function and depression among Chinese middle-aged and older adults. Method: Data from the Chinese Longitudinal Healthy and Retirement Longitudinal Study (2015-2020, n=9,610). The Random Intercept Cross-Lagged Panel Model (RI-CLPM) with mediation analysis was employed and subgroup analyses were conducted for middle-aged (45 – 64) and older (65+) adults. Results: Significant negative correlation between cognitive function and depressive symptoms at the between-person level. Within-person analysis revealed a bidirectional relationship: poorer cognitive function predicted increased depressive symptoms ($\beta^* = -0.126$, $p < 0.001$), and conversely, increased depressive symptoms predicted poorer cognitive function ($\beta^* = -0.031$, $p < 0.005$). Internet use partially mediated this relationship, explaining 8.18% and 4.49% of the total effects, respectively, with significant differences across age groups. Conclusions: This five-year national study found a bidirectional association between cognitive function and depression, partially mediated by internet use. Integrated interventions addressing depression, cognitive decline, and internet access are warranted for improving the mental and cognitive health of older Chinese adults.

562

Who Seeks Help and Why? Exploring Mental Health Profiles and Behavioral Preferences for Support Among University Students

Ziwei Qiang (PhD)

SUPERVISORS Xueyan Yang

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Public Policy and Administration

College students represent a population in a critical transitional phase from adolescence to adulthood. During this period, academic pressures, financial burdens, and challenges in social adaptation significantly influence their mental health. This study aims to classify the mental health of university students using Latent Profile Analysis (LPA), with a focus on exploring the multidimensional nature of both positive mental health and mental health issues within this population. Building upon the dual-factor model, the study innovatively incorporates internalizing and externalizing dimensions to discuss positive mental health, resulting in an eight-dimensional measurement framework that includes both positive and negative mental health, as well as internalizing and externalizing dimensions. This framework is designed to identify the mental health characteristics of Chinese university students in the current complex environment. Furthermore, the study examines differences in students' behavioral preferences for mental health services, specifically analyzing help-seeking tendencies and service perceptions across different mental health types. These findings provide both theoretical insights and practical guidance for optimizing mental health services for university students.

563

Poly-victimization and suicidal ideation among Chinese university and high school students: the roles of hopelessness and interpersonal relationships

Zixuan Cao (PhD)

SUPERVISORS Li Lu

UNIVERSITY/INSTITUTE Xi'an Jiaotong University / School of Public Policy and Administration

This study aimed to investigate the gender difference in the prevalence of poly-victimization (from school-, family- and cyber-bullying), suicidal ideation (SI) among Chinese university and high school students, and to assess the association between bullying exposure and SI. 17633 participants were included (55.6% female), the results showed that exposure to specific form of bullying victimization ever was positively associated with SI among all participants. Cyberbullying victimization only was significantly associated with SI in high school students. The concurrence of family and school bullying victimization showed the strongest association with SI in university students. There was a dose-response relationship observed in the number of victimization exposures and SI among males. Those with general or poor interpersonal relationships presented higher risk of bullying victimization-related SI. Hopelessness played significant mediating role. Tailored preventions and interventions should be developed and implemented to enhance the resilience of those who have endured these complex traumas.

564

Fun, Fact, or Fiction? Guiding Authenticity in the Creation of XR Experiences at Heritage Sites

Anna Vichnevetskaia (PhD)

SUPERVISORS Yiwen Wang, Yue Li (XJTLU)
Nick Webb (UoL)

ACADEMY/SCHOOL Design School

My PhD explores the impact of Extended Reality (XR) technologies on cultural heritage tourism, focusing on their capacity to enhance authenticity and visitor engagement. The notion of authenticity remains a contentious issue in heritage conservation and cultural tourism studies. My research looks at the definitions of digital authenticity and how it affects the design, curation, and visitor experience when using XR at cultural heritage sites. The main aim of this research is to enhance the quality and authenticity of on-site XR experiences at heritage sites by developing a comprehensive framework that guides experience designers and implementers in creating immersive and culturally rich XR encounters, thereby enriching visitor engagement and preserving heritage narratives for future generations.

565

To whom do we entrust the memories of our colonial past? – The dissonance of prison heritage in Qingdao and Dalian in postcolonial China

Beixi Sun (PhD)

SUPERVISORS Yiwen Wang (XJTLU)
Barry Godfrey (UoL)

ACADEMY/SCHOOL Design School

Heritage is a process of memory and construction, and this process is often selective and biased. The interpretation of heritage sites associated with colonial history are often treated as political events by governments. In some narratives of colonial heritage sites, particular aspects of the colonial past have been selectively highlighted to fulfill the political ideology or interests. Colonial prisons in China, for example, are often used as a place for invoking the collective memories of China as a victim of imperialism, a base for patriotic education and a destination of 'red tourism'—arousing Chinese nationalism and anti-Japan antagonism through tourism. However, there is also a need to curate it as a dark-tourism site, fulfilling the expectation and curiosity of young-generation thrill seekers and international visitors, performing the education and entertainment function of penal tourism, which has been long ignored in current heritage interpretation. Therefore, this research seeks to investigate the dissonance – conflicting views of different stakeholders — embodied in the colonial prisons in China and explore the socio-cultural and educational implications of this long-ignored dissonance.

566

Cooperation Industrial Park: a way to enable regional path development

Chang Luo (PhD)

SUPERVISORS Yunqing Xu, Peng Liu (XJTLU)
Olivier Sykes (UoL)

ACADEMY/SCHOOL Design School

Recently, Cooperation Industrial Parks (CIPs) have been widely recognized as an effective strategy in the regional revitalization, economic transition, and industrial development. However, the efforts to comprehensively examine the relationship between CIPs and regional economic development are very limited. This research tries to fulfill such a gap by utilizing the lens of evolutionary economic geography and regional path development to identify the role of CIPs in a region's economic evolution. By constructing a framework based on regional innovation system theory, this research deeply examined the case of Suzhou from the perspectives of agency and resource. This research proposes: Firstly, a CIP could promote the formation of enabling agencies in regional path development through influencing the regional imaginary, directions, and power relations of agents. Secondly, a CIP could also facilitate the resource mobilization in regional path development by enabling the strategic coupling between a region and global production networks.

567

How to identify urban residential spatial differentiation? Evaluation and mapping based on multidimensional residential quality at the neighborhood scale

Kui Liu (PhD)

SUPERVISORS Jinfeng Du

UNIVERSITY/INSTITUTE Xi'an Jiaotong University /
School of Public Policy and Administration

Residential spatial differentiation refers to the geospatial mapping of social stratification and housing inequality. Numerous publications have discussed residential spatial differentiation in global cities using census data. However, it is challenging for these studies to identify residential spatial differentiation that endures and intensifies over time due to the fixed location and sometimes lengthy tenure of the buildings. To fill these gaps, this study integrated various dimensions of residential quality to identify potential, persistent residential spatial differentiation and gain potential insights into neighborhood scale in the city. By investigating 4,249 neighborhoods in Xi'an, we found that commodified neighborhoods generally have higher residential quality compared to others. Work unit neighborhoods with the planned economy label are not as bad as expected, but this also restricts their access to redevelopment opportunities. The mosaic spatial patterns may help mitigate residential spatial differentiation. Furthermore, constructing affordable and resettlement housing in commodified neighborhoods contributes to improving the housing quality for low-income groups. Based on the findings, we recommend implementing various forms of urban renewal in old cities and encouraging mixed living at both the neighborhood and regional scales. Additionally, measures should be taken to eliminate segregation within neighborhoods by promoting mutual understanding and trust among different social groups.

568

Placemaking of Digital Nomads

Liyang Chen (PhD)

SUPERVISORS Lin Lin, Shih-yang Kao (XJTLU)
Stephen Jay (UoL)

ACADEMY/SCHOOL Design School

The proliferation of digital technologies and the widespread adoption of remote work paradigms have catalyzed the emergence of digital nomadism as a contemporary lifestyle phenomenon worldwide. While digital nomads enjoy flexible lifestyles, existing research often overlooks the role of technology in placemaking and the spatial dimensions of their experiences. Traditional notions of third spaces—places used for socializing outside of work—are challenged as digital nomads integrate work into these spaces. This study seeks to address key research gaps by exploring whether place matters for digital nomads and how technology influences their placemaking processes. Using a multidimensional framework by integrating economic, behavioral, and environmental psychologic theories, this research investigates three key areas: people, place, and the interaction between people and place. This study aims to offer a comprehensive understanding of digital nomad placemaking.

569

Nexus between Urban Blue-Green Space and Residents Mental Health in Dhaka, Bangladesh: A Multilevel Modeling Approach

Maruf Ahmad (PhD)

SUPERVISORS Jinfeng Du

UNIVERSITY/INSTITUTE Xi'an Jiaotong University /
School of Public Policy and Administration

Mental health and well-being benefits of urban blue-green space (UBGS) are attracting scholarly interest, yet conclusive findings have not been obtained. However, most research has focused on advanced countries, ignoring rapidly urbanizing and densely populated cities. Multilevel regression models are used to bridge knowledge gaps concerning how the existence, quality, and accessibility of UBGS affect mental health outcomes, both directly and indirectly, using 347 inhabitants from 14 representative neighbourhoods in Dhaka. The results showed that UBGS in the 301–500 m buffer is statistically significant (β=0.36***) and more consistent, while social cohesion (β=0.0559***) and physical activity (β=0.0297***) mediate the association. Luxurious neighbourhoods, educated citizens, and income (USD 228 +) had stronger correlations, whereas women and less densely populated areas did not exhibit such relationships. Thus, UBGS's effect on mental health provides robust evidence for developing nations and recommends improving inhabitants' mental health through potential urban land-use planning.

570

Regeneration of Traditional Blocks in China: Can the Replication of Exemplary Regeneration Experiences Succeed?

Qinyu Zhang (PhD)

SUPERVISORS Yunqing Xu (XJTLU)
Alex Lord (UoL)
Sheng Zhong (External)

ACADEMY/SCHOOL Design School

The regeneration of traditional blocks in China oscillates between developer-driven redevelopment due to prime locations and investment deterrence by complex ownership and diverse stakeholder interests. This highlights the necessity for an approach that balances local intrinsic appeal preservation with the modern needs of residents amidst a fluctuating property market. Local innovators and national efforts are thus pivoting towards non-traditional, property-centric revitalization strategies, aiming to identify adaptable, effective tactics. However, integrating these innovative practices within existing institutional frameworks poses challenges. Utilizing neo-institutional economics, particularly focusing on transaction costs, this study examines the efficiency of institutional arrangements in urban regeneration. High transaction costs may signal systemic inefficiencies, emphasizing the need for strategies that reduce these costs to encourage the adoption of more effective urban regeneration models. This research aims to explore the complexities of regenerating China's traditional blocks through a lens that combines institutional arrangements and transaction cost analysis, seeking pathways to replicable urban regeneration success.

571

Coordination mechanisms of integrated development of transit and land use in TOD (transit-oriented development)-based old city regeneration in China

Xiang Chen (PhD)

SUPERVISORS Yunqing Xu, Rui Wang (XJTLU)
Alex Lord (UoL)

ACADEMY/SCHOOL Design School

TOD projects need to integrate urban transport and land-use development, requiring collaboration of actors between the two fields, which is also context-based and has specific needs and challenges. It then needs to address coordination issues from multi-stakeholders with diverse objectives, interests and expertise to meet the specific needs and challenges of the projects. Hence, stakeholders coordination mechanisms (SCMs) that can motivate participation, balance interests, and complement expertise are required. Few research has focused on the processual dimensions of the projects to in-depth analyse the coordination issues arise, the coordination mechanisms used, and associated impact on project outcomes. Therefore, this research seeks to develop a framework for assessing and developing SCMs in the project processes, under which the coordination at organizational, interest, and project levels are conceptualised, the mechanisms with information efficiency and incentive compatibility are guided, and the project outcomes regarding physical, economic, social and environmental aspects are evaluated.

572

Heritage-making, Art Festivals, and Sustainability in Rural China: A Comparative Study of Wuzhen Theatre Festival and Countryside Theatre Festival

Xiaotong Guo (PhD)

SUPERVISORS Shih-yang Kao, Yiwen Wang (XJTLU)
Mark Riley (UoL)

ACADEMY/SCHOOL Design School

With 'culture' now seen as a key resource for regional development and building sustainability, the process of heritage-making is sweeping through cities and rural areas around the world. This study argues that heritage-making in rural China has generated two distinct types of arts festivals: those that seek to conform to the standards set by international organisations (such as UNESCO) or national heritage programmes, and those that seek to resist such a process of mainstream, authorised thinking. By comparing these two festivals – the Wuzhen Theatre Festival and the Countryside Theatre Festival – within the theoretical framework of the virtuous cycle, this study will reveal a mutually reinforcing relationship between social and economic sustainability in rural areas.

573

Urban investment bonds and local government financing in China

Yuxuan Ou (PhD)

SUPERVISORS Rui Wang (XJTLU)
Richard Dunning (UoL)

ACADEMY/SCHOOL Design School

The urban development model in China is complex and a key component of this model can be the funding behaviour of local governments, or the local public finance system. In recent years, a phenomenon has been attracting more and more attention that China's rapid economic development comes with growing local government debt. Recent studies proposed that local governments cover the increasing gap between development responsibility and limited fiscal revenue through issuing Urban Investment Bonds (UIBs), a bond issued by local government financing vehicles (LGFVs). This research empirically explores the relationship between the fiscal gap, the gap between fiscal expenditure and general budget revenue, and UIB issuance, and explores the implicit government guarantee beyond the pricing of UIBs. The results show that local governments would have stronger incentive to issue UIBs as the fiscal gap increases and that UIBs do carry implicit credit guarantee from local governments.

574

A Study of Land Property Rights and Rural Revitalisation in China

Zhaoqin Shi (PhD)

SUPERVISORS Xuefeng Wang, Yiwen Wang (XJTLU)

ACADEMY/SCHOOL Design School

This research will take selected rural areas in China as case studies to empirically examine the impact of imperfect land property rights (ILPRs) on the investment strategies and activities of rural residents and external capital. To address this, the research will first integrate perspectives from legal systems and institutional economics to conceptualize imperfect ILPRs as an emerging form of legally ambiguous institution, offering an explanation for the spatially uneven development in rural China. Subsequently, the study will focus on how rural residents and external capital strategically adapt their investment behaviours to navigate the constraints and uncertainties posed by ILPRs. The findings aim to deepen the understanding of land property rights regimes in rural areas of developing countries, expand the theoretical framework of property rights, and provide valuable insights to inform policymaking not only within China but also in a broader international context.

575

An analysis of blue-green space across Suzhou and its association with subjective well-being and physical activity

Zijun Guo (PhD)

SUPERVISORS Jinglu Song, Xuefeng Wang, Hyung-chul Chung (XJTLU)
Thomas Fischer (UoL)

ACADEMY/SCHOOL Design School

The global urban population continues to rise, bringing both benefits and challenges. While urbanisation enhances health and well-being, it also poses risks such as air and water pollution, respiratory issues, and increased cognitive and emotional stress. However, natural elements in urban environments can mitigate these hazards by improving air quality, reducing stress, and promoting physical activity, all crucial for enhancing health. In China, urban planning has long prioritised health, yet most research on neighbourhood environments and health focuses on developed nations, with limited studies in mainland China, particularly on blue spaces. This study investigates the quality and quantity of blue and green spaces in Suzhou's urban districts and their impact on residents' well-being and recreation. This study employs an integrated analytical framework that leverages machine learning techniques and interpretative tools to achieve robust predictive performance and insights into feature contributions, aiming to promote healthier lifestyles through improved access to blue and green spaces.