XJTLU

2022 POSTGRADUATE RESEARCH SYMPOSIUM

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ABOUT XJTLU POSTGRADUATE RESEARCH SYMPOSIUM

The annual XJTLU Postgraduate Research Symposium provides a forum for exchanging and discussing research ideas among postgraduate researchers from a wide range of disciplinary areas. Postgraduate research (PhD) students from universities all over the world are warmly welcome to join XJTLU students to showcase their latest research through poster and oral presentations, and receive feedback from academics and fellow students.

HOSTED BY

Xi'an Jiaotong-Liverpool University (XJTLU)

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INSTITUTION	ABBREVITATION
Beijing University of Chemical Technology	BUCT
Capital Normal University	CNU
China University of Mining and Technology	CUMT
Huazhong Agricultural University	HZAU
Huazhong University of Science and Technology	HUST
Jiangsu University	JSU
Nanjing Normal University	NNU
Nanjing University of Chinese Medicine	NJUTCM
Nanjing University of Science and Technology	NUST
NUS (Suzhou) Research Institute	NUSRI
Sichuan University	SCU
Soochow University	SUDA
Southeast University	SEU
The University of Edinburgh	UOE
University of Chinese Academy of Sciences	UCSA
University of Illinois at Urbana-Champaign	UIUC
University of Liverpool	UOL
University of Nottingham Ningbo China	UNNC
University of Plymouth	UOP
University of Science and Technology of China	USTC
Xi'an Jiaotong-Liverpool University	XJTLU
Xi'an Jiaotong University	XJTU
Zhejiang University	ZJU

ABSTRACTS

001

Indetermination principles of landscape translated to the architecture design process

Daniela PICO PEREZ (PhD)

SUPERVISORS Juan Carlos Dall'Asta (XJTLU)
Soumyen Bandyopadhyay (UoL)
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ACADEMY/SCHOOL Design School

The research is positioned in the existing gap of landscape discipline as a tool for contemporary architectural production. It has been identified from the existing theoretical discourse that landscape as a tool in architectural design is in a developing stage; however, case studies have been identified and analysed as a source of information to contrast it with the theoretical discourse.
This research looks at the intrinsic conditions of indeterminacy specified in landscape as a source of knowledge to identify design strategies that could be applied during the design process of architecture by recognizing and categorizing landscape qualities as principles of indeterminacy.

002

A parametric form language for fibre reinforced concrete prefabricated façade elements using 3D printed formwork

Deyan QUAN (PhD)

SUPERVISORS Davide Lombardi (XJTLU)
Rosa Urbano Gutierrez (UoL)
Christiane Margerita Herr

ACADEMY/SCHOOL Design School

This project aims to examine how material functional performance aspects can be integrated into a parametric form language to achieve geometric flexibility for architectural components. It explores a façade form language by hybrid production methods combining fibre reinforced concrete and robotically 3D printed formwork. It develops a façade form language, followed by a series of material experiment cycles to inform the design of the parametric forms which are not achievable with conventional methods. Anticipated outcomes of this project include a parametric form language, physical prototypes, a geometric façade strategy, and a structural performance database of digitally designed prefabricated façade elements.

003

Spaces for creativity: developing a methodology for integrating empirical research on embodied experience into architectural design processes

Fatemeh TAHERYSAYAH (PhD)

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ACADEMY/SCHOOL	Design School

Embedded in a cross-disciplinary research project, involving researchers from architecture, computer science and psychology, the PhD research aims at developing strategies for the integration of empirical approaches to embodied experience into architectural design processes. It will contribute to a human-centred approach to architectural design and the related discourse on embodied experience that has been initiated by architectural phenomenology but has been less considered in practice. The methodology will involve qualitative and quantitative tools and methods, i.e., biosensors, to evaluate the suitability of recent technology to measure human responses to architectural environments as they are typically generated in architectural design processes.

004

Migration of public spaces from outdoor to indoor spaces (shopping malls) in the Emirates of Dubai — The impact of Sustainability and tourism

Manju BALA (PhD)

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Over the past four decades, public spaces in the Emirate of Dubai have undergone profound transformations, evolving from communally organized, open, outdoor spaces to privately owned, indoor corporate centers of commerce and tourism in the form of shopping malls. While the process is partially explained by the opportunities afforded by technology like air conditioning and automobiles. Recent requirements around environmental sustainability and a diversification away from the oil economy are posing significant new challenges to planners and stakeholders in the region. The present study examines the spatial experience of shopping malls and proposes guidelines to develop passive strategies to promote sustainable tourism.

005

Large-scale rapid energy modelling of buildings

Mengfan JIN (PhD)

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ACADEMY/SCHOOL	Design School

Infrared (IR) cameras can gauge the overall thermal behavior of the building envelope, including the overall performance and the identification of localized discontinuities such as thermal bridges, moisture, cracks and air leakages. Unmanned Aerial Vehicle (UAV) also shows significant potential in building inspection and diagnosis, as well as in building and urban-level three-dimensional modelling by photogrammetry. The two technologies can also by combined, with UAV-mounted thermal cameras, and a number of research have been conducted and applications tested internationally in recent years.

The paper aims to review studies and applications of integrated UAV and Infrared Thermography (IRT) in building inspection, diagnosis and modelling from their historical origins to contemporary applications. Furthermore, it investigates a potential framework to advance such applications for rapid and accurate Building Energy Modelling (BEM) applicable at the large scale.

006

Space with distinction: contextualizing the creative regeneration of industrial heritage in South China

Yifei LI (PhD)

SUPERVISORS	Yiping Dong (XJTLU) Soumyen Bandyopadhyay (UoL) Teresa Hoskyns (External)
ACADEMY/SCHOOL	Design School

The regeneration of industrial heritage has met the challenges of mass tourism and gentrification, while some are inadequate in creating place identity with the public due to the stereotypical interpretation of cultural policies. This research scopes industrial heritage regeneration in South China, investigating Shenzhen's practice as a distinctive case. In Shenzhen, an event-driven regeneration strategy integrating both planning and spontaneity has been explored, actively reusing the industrial remains to shift to a creative hub. It analyses the sustainable value forming process of obsolete industrial spaces from policy & market background, architect's role, people's taste & lifestyle and spatial form change.

007

Mithormesis and UPRmt signaling modulate cisplatin sensitivity in ovarian cancer

Attila TAMAS SZENASI (PhD)

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Sonia Rocha (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Mithormesis and UPRmt signaling modulate cisplatin sensitivity in ovarian cancer

Persistent activation of mitoprotective mechanisms upon moderate mitochondrial stress, termed mitohormesis, has been described in the context of longevity and aging. Here, we demonstrate that ovarian cancer cells counteract cisplatin-induced mitochondrial damage through mitohormesis in surviving cell populations and gain drug-resistant phenotype via the activation of the mitochondrial unfolded protein response (UPRmt). This adaptive chemoresistance primes cancer cells to basally upregulate their UPRmt response post-treatment, even in the absence of cisplatin. We conclude that while healthy non-neoplastic cells use mitohormesis to extend their lifespan, cancer cells harvest these benefits by developing resistance against mitochondrial genotoxic drugs like cisplatin.

008

Dynamics of mRNA m6A methylome induced by hepatitis B virus X protein and its significance for the pathogenesis of hepatocellular carcinoma

Enakshi SIVASUDHAN (PhD)

SUPERVISORS Rong Rong, Zhiliang Lu, Jia Meng (XJTLU)
Neil Blake (UoL)

ACADEMY/SCHOOL School of Science

Chronic hepatitis B viral (HBV) infection contributes to over 80% of liver cancer cases worldwide. This study investigates the role of Hepatitis B Virus X (HBx), a crucial regulatory protein, in driving carcinogenesis by inducing epigenetic chemical modification, m6A methylation, on an mRNA level. Preliminary HBx gain and loss-of-function cell culture models, high throughput sequencing and biochemical assays suggest that HBx alters m6A methylation in liver cancer cells. We have identified two novel targets, namely, KIAA1429 methylase and HSPG2, a component of the extracellular matrix, that synergistically aid in HBx-induced liver cancer progression by inducing cell proliferation, invasion and survival. These findings herald immense potential for new therapeutic targets to combat liver cancer.

009

Tumor-promoting roles of the chromatin-associated DEK oncogene in metastatic melanoma

Gongjie WU (PhD)

SUPERVISORS Tastuhiko Kadowaki (XJTLU)
Claire Eyers (UoL)
Ferdinand Kappes (External)

ACADEMY/SCHOOL School of Science

The interplay between chromatin modifying factors and their relation to cancer has been intensely studied. DEK, a non-histone chromosomal oncogene, showed participation of global chromatin integrity by targeting of Heterochromatin Protein 1α (HP1α) to H3K9Me3, a histone mark that associated with heterochromatin. The finding that DEK is overexpressed in a number of neoplasm (e.g. melanoma) suggested an indispensable role of DEK in tumor biology. This project aims to biochemically characterize the regulation of DEK-HP1α interplay and therefore provide a novel strategy for the treatment of metastatic melanoma.

010

Hyperaccumulator plant increase selenium absorption by optimizing the microbiota in rhizosphere and regulating root-secreted key exudates

Huan ZHANG (PhD)

SUPERVISORS Xiaohu Zhao

UNIVERSITY/INSTITUTES Huazhong Agricultural University /
College of Resources and Environment

Much was known about the effect of plant-associated microbiomes on promoting Se uptake, but less was understood about whether and how the specific bacteria community of Se hyperaccumulator make effect in this process. Our results demonstrated positive effect and synergistic mechanism that rhizosphere key bacteria in hyperaccumulator plant promote Se uptake by regulating root metabolism, improving Se transport gene expression, promoting root development and increasing the Se availability in soil. This discovery provides a mechanistic underpinning for the process and reference for effective utilization of rhizosphere microbes in Se uptake by plant.

011

Construction of multifunctional mesoporous silica nanodrug and its anti-tumor research

Huixia ZHANG (PhD)

SUPERVISORS Xichuan Cao

UNIVERSITY/INSTITUTES China University of Mining and Technology / School of Chemical Engineering and Technology

With the help of nanotechnology, nanoplatforms integrate two or more drugs by physical adsorption or chemical combination, which is beneficial to avoid the deficiency of single therapy, improve the stability of drugs, improve their loading and release, and enhance the in vivo effect, so as to achieve the maximum effect of cancer treatment.Mesoporous silica nanoparticles (MSNs) or MSNs-based hybrid nanoparticles are expected as suitable candidates in nanodynamic therapies, which possesses promising properties, such as large surface area, high pore volume, excellent biosafety, and easily modified surface.

012

Therapeutics potential of designer metalloproteinase inhibitors TIMPs in Rheumatoid Arthritis (RA) and Osteoarthritis (OA) Prevention

Pengyuan ZHANG(PhD)

SUPERVISORS Meng Lee (XJTLU)
Simon Tew (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Tissue Inhibitor of Metalloproteinases (TIMPs) are the endogenous inhibitors of the zinc-dependent MMP and ADAM metalloproteinases involved in the modulation of the extracellular matrix (ECM). In this study, we aim to develop the therapeutic potential of a panel of "designer TIMPs" for the treatment of Rheumatoid Arthritis (RA) and Osteoarthritis (OA).
Two panel of TIMPs had been created for the purpose of my study:
1: Chimera TIMP "T1:Tx" engineered for the inhibition of MMP-13
2: Investigate the therapeutic potential of a panel of GPI-anchored TIMPs tailored for the inhibition of ADAM-17(TACE) and MMP-14 (MT1-MMP)against OA and RA

013

Atrazine reverses the response of population dynamics of Daphnia pulex to fish predation risk

Shanshan QIN (PhD)

SUPERVISORS Zhou Yang

UNIVERSITY/INSTITUTES Nanjing Normal University / School of Life Sciences

Atrazine in the water environment is persistent, which not only has a negative impact on individual organisms, but also may endanger the population dynamics and interspecific relationship stability. This experiment studied the response and the population dynamics of Daphnia pulex to predation cues under the influence of atrazine of different concentrations (0, 0.05, 0.10 and 1.0 mg L-1). The results showed that atrazine inhibited the promoting effect of fish kairomone on resting eggs production and the reduction of the total biomass, which indicated that atrazine reversed the direction of action of fish kairomone on population traits.

014

Quantification of faecal contamination in the major inflow rivers of Taihu Lake using Microbial Source Tracking markers

Shuang LIU (PhD)

SUPERVISORS Sekar Raju (XJTLU)
Alan McCarthy, Evelien Adriaenssens (UoL)

ACADEMY/SCHOOL School of Science

Taihu Lake is the third-largest freshwater lake in China and is connected to many inflow rivers, which contribute to the source of water and pollution. Faecal contamination from human and animal sources has been a significant reason for Taihu inflow river water deterioration in the past decades. Microbial Source Tracking (MST) markers are accurate and specific tools for characterising and quantifying faecal contaminations. This study used both bacterial (Bacteroidales) and viral (crAssphage) MST markers to quantify host-specific faecal contamination in ten major inflow rivers of Taihu Lake, and the results were correlated with water quality and land-use patterns.

015

Learning-to-Rank algorithm assists drug development in clinical trials

Tianjun WANG (PhD)

SUPERVISORS Xin Liu, Jia Meng (XJTLU)
Francesco Falciani (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Drug development is a demanding and high-risk process, and ninety per cent of candidates would fail. Thus, this research aims to practice deep learning-based high-throughput screening to know possible reasons for a molecule passing the trial. A full clinical trial, from preclinical to approval, is similar to climbing a ladder. Therefore, conventional classification algorithms are improper, setting rigid boundaries between each class. Inspired by information retrieval research, the model here regards trial phases as ranks for drugs and is trained to sort the samples. Based on the ranking result, it is possible to find the features of approved drugs.

016

Study on the grafting polyelectrolyte on cross-linked polyethylene surface and its biotribological behaviors

Weipeng ZHANG (PhD)

SUPERVISORS Yong Luo

UNIVERSITY/INSTITUTES China University of Mining and Technology /
School of Chemical Engineering Technology

Three monomers [2-(methacryloyloxy)ethyl] dimethyl-(3-sulfopropyl) ammonium hydroxide (MEDSAH), methacryloyloxyethyl trimethyl ammonium chloride (MTAC) and sodium styrenesulfonate (NaSS) with good hydrophilicity were grafted onto the Cross-linked polyethylene (CLPE) surface by UV irradiation, and the grafting quantity, hydrophilicity and the biotribology properties of the modified CLPEs were characterized by different instruments. Results confirmed that CLPE surfaces grafted by PMEDSAH, PMTAC and PNaSS displayed excellent hydrophilicity, and which could improve the tribological properties and revealed the lubrication mechanism of polyelectrolytes under different lubrication.

017

Antibody conjugated cytokine for nonalcoholic steatohepatitis treatment

Xujia WANG (PhD)

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Christopher Goldring (UoL)
Hui Feng (Shanghai Junshi Biosciences Co., Ltd.)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Nonalcoholic fatty liver disease (NAFLD) or nonalcoholic steatohepatitis (NASH) is a prevalent metabolic disease, which has no effective treatment today. According to mechanism and data of clinical trials, we suppose a lowering low density lipoprotein antibody may have synergetic effect with lowering glucose and triglycerides cytokine for better NASH treatment and we will validate this hypothesis. During this process, we also use proteomics or genomics to identify potential prognostic biomarkers for disease monitoring and diagnosis.

018

Role of glutamic-oxaloacetic transaminase 2 (GOT2) succinylation on mitochondrial metabolism in prostate cancer cells

Yifan JIANG (PhD)

SUPERVISORS Mu Wang (XJTLU)
Sonia Rocha (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Prostate cancer (PCa) affects men worldwide, and current therapies urgently need improvement. Dietary intervention in the form of ω-3 polyunsaturated fatty acids (ω-3 PUFAs) has shown promise in inhibiting PCa progression. However, its underlying mechanism remains elusive.

To better understand how ω-3 PUFAs influence PCa cell proliferation, we have conducted a multi-omics study to unveil changes in the global protein expression, post-translational modification (PTM), and metabolite levels. A recent succinylomics analysis identified several interesting proteins that are succinylated after the ω-3 PUFAs treatment. One of the key indications of this study is that GOT2 and MDH2 are succinylated upon ω-3 PUFAs treatment (unpublished data). GOT2 and MDH2 are involved in the malate-aspartate shuttle, which is a crucial system in cancer cell proliferation in different metabolic aspects, from maintaining a redox-oxidative balance to synthesizing essential biological precursors. In addition, according to our recent interactome study, succinylation of GOT2 is highly possible in an enzymatic reaction catalyzed by desuccinylase HDAC1 and succinyltransferase CPT1A.

019

Evolutionary dynamics of the elevational diversity gradient in the world's richest temperate alpine biota

Yixi WANG (PhD)

SUPERVISORS Xiaoting Xu

UNIVERSITY/INSTITUTES Sichuan University / School of Life Science

In plants, the majority of species diversity occur in mid-low elevation regions, but the alpine plants always concentrate in high-elevation areas. To examine the elevational diversity gradient and evolutionary dynamics of alpine plants, we (1) assembled a comprehensive elevational data set including alpine species mainly occurring in the Qinghai Tibet Plateau (QTP), Himalaya, and Hengduan Mountains, and simulated distribution patterns for alpine biota along elevational gradients, then, we (2) applied a dynamic phylogenetic model to test for elevation-dependent rates of speciation and extinction, and to account for the transition of species between different elevational states over evolutionary time.

020

Multi-task adaptive pooling enabled synergetic learning of low-resolution epitranscriptomes across tissues and modifications

Yiyou SONG (PhD)

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

ACADEMY/SCHOOL School of Science

Post-transcriptional RNA modifications are found to play important roles in epitranscriptome regulation on all types of RNAs. To date, many computational approaches have been developed for predicting RNA modification sites. Most of them are computed on the high-resolution data. In this study, mainly focusing on low-resolution data, we proposed AdaptRM, a multi-tasking computational method for an integrated learning of low-resolution epitranscriptomes. We compared it to two originally proposed methods: a Transformer-based method and a ConvMixer-based method, and two state-of-the-art methods: WeakRM (low-resolution) and TS-m6A-DL (high-resolution). Despite its simplicity, AdaptRM outperformed these four competing methods on both single-task and multi-task predictions in three different case studies

021

The role of dimethylguanidino valeric acid related metabolic pathway on carbohydrate and lipid metabolism

Yueyuan HAN (PhD)

SUPERVISORS Mu Wang, Ken Cheng (XJTLU)
Luning Liu (UoL)

ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Untargeted metabolomic and epidemiological studies have found that dimethylguanidino valeric acid (DMGV) is an independent biomarker of metabolic disease and closely related to lifestyle. However, the role of DMGV in carbohydrate and lipid metabolism and insulin resistance remains unknown. In this study, we aim to first establish an LC-MS/MS-based targeted method to absolutely quantify the DMGV-related metabolites and then verify the potential of DMGV as a biomarker of diabetes in a Chinese metabolic disease cohort. The mechanism of DMGV in carbohydrate and lipid metabolism and insulin resistance will be further investigated by conducted in vitro and in vivo experiments.

022

Hypoglycemia effect of eletroacupuncture at ST25 through neural regulation of the pancreatic intrinsic nervous system

Yun LIU (PhD)

SUPERVISORS Bin Xu

UNIVERSITY/INSTITUTES Nanjing University of Chinese Medicine /
Key Laboratory of Acupuncture and Medicine
Research of Ministry of Education

Electroacupuncture (EA) may be a potential strategy for managing blood glucose levels and improving β-cell function in T2DM. However, the role of pancreatic intrinsic nervous system (PINS) in the improvement of T2DM by EA remains to be elucidated. The purpose of this study was to investigate whether EA at ST25 can improve insulin resistance and pancreatic β-cell function in a rat model of diabetes induced by high-fat diet streptozotocin (HFD/STZ). This study innovatively proposed the role of TRPV1-CGRP-β cell pathway in the regulation of glucose metabolism by EA, and to verify the activation status of EA and PINS in vivo.

023

DirectRMDB: a database of post-transcriptional RNA modifications unveiled from direct RNA sequencing technology

Yuxin ZHANG (PhD)

SUPERVISORS Jia Meng (XJTLU)
Dan Rigden (UoL)
Guifang Jia (PKU: Peking University)

ACADEMY/SCHOOL School of Science

With advanced technologies to map RNA modifications, our understanding of them has been revolutionized, and they are seen to be far more widespread and important than previously thought. Current next-generation sequencing (NGS)-based modification profiling methods are blind to RNA modifications and thus require selective chemical treatment or antibody immunoprecipitation methods for particular modification types. They also face the problem of short read length, isoform ambiguities, biases and artifacts. Direct RNA sequencing (DRS) technologies enable the direct interrogation of modification present in individual transcripts and promise to address the limitations of NGS-based methods. Here, we present the first comprehensive RNA modification profiles derived from direct RNA sequencing samples.

024

Functional characterization of a potential drug target in Mycobacteria

Ziwen XIE (PhD)

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Mal Horsburgh (UoL)
Boris Tefsen (UU: Utrecht University),
David Ruiz-Carrillo (EMBL: European Molecular Biology Laboratory)

ACADEMY/SCHOOL School of Science

Mycobacterium tuberculosis is one of the most successful human pathogens and multi-drug resistance makes current treatments increasingly difficult. Its essential Rv0647c gene codes for a protein identified in cell wall fractions making it a potential drug target. The goal of this study is to characterize the function of MSMEG_1353, a homologue of Rv0647c in Mycolicibacterium smegmatis, a commonly used model organism. Using the CRISPR interference method, a mutant strain with downregulated MSMEG_1353 was created. An upregulated mutant strain was also constructed and both strains were characterized microbiologically and compared with the wild type. Current results indicate a role of MSMEG_1353 in colony formation, cell growth and antibiotic resistance.

025

Trying unfamiliar styles: using Augmented Reality to improve pruchase likelihood

Anqi HU (PhD)

SUPERVISORS Russa Yuan, Martin Liu, Ruolan Chen

UNIVERSITY/INSTITUTES University of Nottingham Ningbo China /
Nottingham University Business School China

Issues related to physical apprehension hinder consumers' online shopping (i.e, clothes, cosmetics), especially for unfamiliar styles. Augmented Reality (AR) assists customers' decision-making by reducing product fit uncertainty and increasing perceived playfulness. This study carried out a lab experiment (N=240) 2 AR (present vs. absent) * 2 familiarity (high vs. low) to investigate whether AR can increase consumers' purchase intention. The finding suggests that the usage of AR can reduce individuals' perceived product fit uncertainty and perceived playfulness, particularly for unfamiliar styles, further promoting consumers' online purchase likelihood. We discuss implications for theory and practice.

026

Momentum via machine learning

Ao YANG (PhD)

SUPERVISORS Qing Ye, Jia Zhai (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

This study explores the driving factors of momentum anomalies in the stock market. We focus on the stock returns and turnovers, and discover whether and how they contribute to the momentum under normal and momentum crash periods by using machine learning models (ML). First, we find the effect of turnover in identifying the momentum and reversal of the return. Second, we find the abnormal contribution of return features to the momentum during the momentum crash period. In addition, constructing the portfolio based on these factors can outperform the alternative momentum strategies measured by Sharpe ratios and cumulative returns. Finally, our results are robust to the use of different ML models.

027

Complexity in a platform-based servitization: A complex adaptability theory perspective

Fangxu YAN (PhD)

SUPERVISORS Lujie Chen, Robert Willison (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

This paper aims to investigate the impacts of a platform-based servitization process on system complexity and how the degree of complexity further affects system adaptability. We adopt complex adaptive system (CAS) theory as a theoretical lens to address these two issues by conducting a multiple case study. Three leading enterprises with digital platform-based servitization are chosen as our case companies. This research proposes a conceptual framework through case analysis and identifies the relationships among servitization, internal complexity, supply chain resilience (SCR), and vulnerability (SCV). Specifically, our study illustrates how service modularity, platform development and digitalization affect the system complexity. More importantly, we demonstrate a mechanism of improving system adaptability through pursing the balance between SCR and SCV.

028

Asymmetric impacts of macroeconomic and oil price shocks on Chinese renewable energy stock market

Guimin YAO (PhD)

SUPERVISORS Syed Abbas, Hao Lan (XJTLU)
Jozef Konings (UoL)

ACADEMY/SCHOOL International Business School Suzhou

We investigate asymmetric impact of macroeconomic and oil price shocks on the stock returns of renewable energy industry in the Chinese financial markets. The shocks are identified based on the New Keynesian model augmented with the world oil market. Macroeconomic shocks include aggregate-supply associated with inflation dynamics, aggregate-demand, monetary policy and oil price respectively. Then, based on a Markov-switching model, a short and low volatility regime is distinguished from a long and high volatility regime in financial markets, where returns can be largely explained by inflation and oil price shocks. In high volatility regime, the stock returns are mainly driven by financial market return.

029

Forecasting the SMES' Credit Risk Using Adjacent Enterprises Data — A Relational Graph Attention Network Method

Jiaxing WANG (PhD)

SUPERVISORS Xiaobo Xu (XJTLU)
Daniel Xing (UoL)
Guoquan Liu (External)

ACADEMY/SCHOOL International Business School Suzhou

Forecasting the credit risk of small and medium-sized enterprises (SMEs) has been a popular and challenging research area for decades. Most forecasting models on SMEs' credit risk focus only on the variables of the target enterprise itself. We utilize the data from adjacent enterprises to improve the predictive capability of financial service providers (FSPs) when facing data deficiency problems of target SMEs. This information is used by building a network where two enterprises are linked if they have mutual ownership relations, managerial teams, and business interaction. A relational graph attention network algorithm is proposed to compute the complex topological information in the network mentioned above. The empirical experiment results from China SMEs show the proposed model's predictive capability and economic benefit.

030

Does time compression always a good thing? From the temporal view to exploring the effectiveness when adopting retrenchment or strategy actions on firm turnaround performance

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ACADEMY/SCHOOL International Business School Suzhou

This study extends the understanding of the retrenchment and strategy-turnaround relationship in declining firms by adopting a temporal view and arguing the different effects of actions on turnaround performance. Drawing on the time compression (dis)economies, we hypothesize the direct effects of the speed of retrenchment (strategy) on turnaround performance. We also examine the two-moderation effect of regularity of action and path of actions on the relationship between action speed and turnaround performance. We use data on a sample of declining firms collected from the CSMAR database and a matched-pair sample of 859 surviving and non-surviving firms between 2011 and 2019.

031

Supply chain learning and performance: A meta-analysis

Mengqi JIANG (PhD)

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Adopting a meta-analysis approach, this study sampled 54 empirical studies on the supply chain learning (SCL) – performance relationship to confirm the positive effects of SCL on both firm- and supply chain-level performance. Building on the knowledge-based view, we found that the observed SCL – performance relationship is affected by several moderator variables, including learning source, learning type, knowledge type, performance measurement and industry type. This study is the first meta-analysis on the SCL – performance relationship, differentiates learning from customers and suppliers and examines a more comprehensive list of performance measurements, which significantly contributes to the SCL literature.

032

Financial inclusion and firm performance: evidence from Chinese micro, small, and medium-sized enterprises (MSMEs)

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Using a nationwide survey of Chinese MSMEs, we find that the use of bank finance leads to better performance for medium-sized enterprises, not for small and micro enterprises; access to Internet loans mostly shows a negative impact for firms of different sizes; informal finance positively affects firm performance for micro-enterprises only. Moreover, while focusing on different dimensions of financial inclusion, we find loans with larger amounts and higher interest rates are associated to better firm performance. Besides, MSMEs in western China and technology-intensive industries benefit more from financial inclusion. Our findings have implications for policy interventions targeted to promote financial inclusion and growth for micro, small, and medium enterprises.

033

What determines the risk spillovers in China's green finance markets? Economic fundamentals or market cognitions

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SUPERVISORS Lingyun He

UNIVERSITY/INSTITUTES China University of Mining and Technology / School of economics and management

In this study, we attempt to revisit how dependent the China's green finance market spillovers are on the economic fundamentals and market cognition hypothesis. In this regard, we first construct dynamic time-varying connectedness based on the TVP-VAR method and finds that the overall spillover varies over time and demonstrates drastic fluctuations during financial and economic events. Then, the quantile regressions are employed to verify that economic fundaments and market cognition effects are all significant determinants of the spillovers. Furthermore, the economic fundamentals and market cognition effects differ in the extreme upper and lower market conditions.

034

Systematic review and meta-regression analysis on tourism Eco-efficiency measurement

Rui TAN (PhD)

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Since the environmental impact caused by tourism activities drew much attention, many studies have started measuring tourism eco-efficiency using the DEA model. This paper aims to supplement and expand the previous literature review and provide empirical evidence on the study level influencing factors of tourism eco-efficiency measurement. We use the meta-regression method to analyse how variable selection and model type influence the tourism eco-efficiency measurement using DEA model. Our data are published references related to tourism eco-efficiency using DEA with high quality from well-known databases. We found that both model type and variable selection can influence the tourism eco-efficiency measurement.

035

Dynamic rebalancing strategies and optimisation of the dockless bike-sharing system

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The bike rebalancing problem is one of the main challenges in the bike-sharing system operation. We propose a framework to solve the dynamic bike rebalancing problem in the dockless bike-sharing system. A data-driven method is developed to optimise the number of clusters with corresponding centroids, and a metaheuristic algorithm is proposed to solve this optimisation problem. The framework and the model are tested using real data from Louisville, USA. The numerical experiments indicate that the proposed model increases average daily profit by at least 77%, outperforming clustering the data with random initial centroids.

036

Path to realize low-end disruptive innovation for entrant platform firm

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This study sheds light upon on an entrant platform's evolution path to achieve low-end disruption. We propose two levers: (1) disruptive innovation is a dynamic process in which platform-based business model fits and co-evolves with dynamic capabilities. (2) sensing capability, innovation capability and digital capability are key capabilities to clarify and realize platform ecosystem's value proposition, value creation and value capture. In addition, the digital capability is further refined into digital infrastructure, digital platform capability, digital network capability and digital management ability. This paper will provide a practical reference for entrants in the context of China.

037

Employee status and voice under authoritarian leadership: An attachment perspective

Tingxi WANG (PhD)

SUPERVISORS Yue Xu, Jie Li (XJTLU)
Yves Guillaume (UoL)

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Attachment style is essential in guiding individuals' social interactions, especially in adversities. Based on social defence theory, we develop a moderated-mediation model to explore how employees' attachment style guides employees' reactions to threatening authoritarian leadership. Through a time-lagged design with 258 employees and their 142 direct leaders, we find that insecure attachment exhibits a positive role in alleviating authoritarian leaders' negative indirect infuence on employee voice via employees' perceived status. However, secure attachment strengthens authoritarian leaders' negative infuence on employee status perception and voice behaviour. These fndings expand the perspective of leadership drawn upon attachment theory and provide practical implications for management.

038

Analysis of corporate greenwashing governance considering product circulation: from the perspective of commercial bribery

Wei WANG (PhD)

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

This paper constructs an evolutionary game model between enterprise, media, government and consumer from the perspective of commercial bribery to analyze the mechanisms of interaction between the complex behaviors of different decision makers. This paper aims to focus on the circulation process of greenwashing products, starting with the production of greenwashing products by enterprises and ending with the consumption of greenwashing products by consumers, to clarify the chain of interests induced by commercial bribery that leads to the stakeholders' collusion in greenwashing, and to provide a reference for decision-making in the management of corporate greenwashing by stakeholders.

039

The integration and application of strategic leadership in pandemic environment — the case of wonder management consulting

Xiaoxuan QI (Master)

SUPERVISORS Peng Liu (XJTLU)

ACADEMY/SCHOOL International Business School Suzhou

Strategic leadership has been fully researched and developed over the past two decades or so, yet the overall research tends to be fragmented. In today's epidemic environment, companies need a clear concept of strategic leadership to help them overcome the turmoil and impact of the epidemic and to make macro-strategic plans for future change and growth. In addition to this, strategic leadership can also help companies to rebuild the confidence and gain the trust of their employees. The purpose of this paper is to reorganize the existing strategic leadership concepts and to analyze representative case studies in order to develop a strategic leadership model that can be applied in an epidemic environment.

040

Exploring integrated reporting in China: A mission approach

Xinyu ZHAO (PhD)

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Purpose: Drawing on a mission approach, this study investigates the application of Integrated Reporting (IR) and explores its role in shaping organisations' internal processes in a Chinese nuclear power company, China General Nuclear Power Corporation (CGN).
Design/methodology/approach: This study employs the case study method and collects data by conducting semi-structured interviews with CGN's managers and analysing its reports and other documentation.
Findings: The findings reveal that CGN's IR is motivated by its mission, and IR contributes to the mission's implementation in the company.

041

Acceptance of autonomous vehicles: a systematic review and future research agenda

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Abstract

This paper systematically reviews the existing literature on individuals' acceptance of autonomous vehicles (AVs). By searching three databases (i.e., Scopus, Web of Science, and EBSCO) and following a rigorous selection process, 200 articles finally entered the review. We then conducted a quantitative content analysis to extract research focuses from current literature yielded 24 themes and 65 features which were categorised into four clusters: environment, technology, user, and behaviour. After critically synthesising review findings under these four clusters, we propose an Environment-Technology-User-Behaviour (ETUB) framework for analysing AV acceptance. Finally, we discuss the future research agenda to advance AV acceptance research.

042

Measuring abnormal book-tax differences: A new model

Yang LOU (PhD)

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This paper proposes a new measure to quantify abnormal book-tax differences(ABTD) based on specific differences between the U.S. tax law and the U.S. GAAP. This paper validates this new measure by matching identified tax-shelter firms with non-tax-shelter firms using propensity score match and comparing ABTD between these two groups. The results show that tax-shelter firms have larger ABTD than matched firms. This paper further tests whether ABTD can capture tax management (TM) and earnings management (EM). Panel linear regression results show that tax and earnings management have a statistically positive association with ABTD. This paper contributes to current tax research by providing a comprehensive model to quantify ABTD and identifying specific sources of book-tax difference (BTD). This measure offers U.S. tax authority and SEC an alternative way to detect firms' non-conforming tax aggressiveness practices.

043

Monetary policy as market stabilizer in the COVID-19 pandemic

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We categorize expansionary monetary policies based on interest rate, monetary easing, and liquidity decisions. We examine to what extent they stabilize the Chinese stock market over three periods: pre, during and post the pandemic. We find that the stock market reacted positively to liquidity policy announcements by a more significant margin during and post the pandemic at market aggregate and industry levels relative to the remaining two policy announcements. The economic consequence is large and persistent. At the firm level, the positive responses were more pronounced from small & medium businesses and non-state-owned enterprises to liquidity policy announcements during the crisis relative to other enterprises, using firm characteristics proxies for monetary policy transmission channels.

044

MFN or FTAs? trade policy with social welfare

Yuanzhe LI (PhD)

SUPERVISORS Hao Lan, Haifeng Fu, Eddy Fang (XJTLU)
Jozef Konings (UoL)

ACADEMY/SCHOOL International Business School Suzhou

This chapter investigates the choices of trade policy in terms of different types of countries between capital-intensive and labour-intensive goods. A developed country assumes a large market size and a particular focus on consumer welfare, while a developing country refers to a small market size and a focus on producer surplus. We also assume developed (developing) countries with small (large) costs of capital-intensive goods while large (small) costs of labour-intensive goods. Our model combines a four-country model and a weighted welfare function. When the costs are similar, developed countries choose MFN, while developing countries tend to choose FTAs. When the cost gap is sufficiently large, developed countries prefer FTAs, while developing countries prefer MFN. It has important trade policy implications.

045

CEO awards, internal coalition and stock price crash risk: evidence from China

Yudian FANG (PhD)

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This research is about how awards affect human decision-makings, and accordingly influence firm performance. This paper believes that awarded CEOs who receive psychological entitlement have strong incentives to hide bad news from the public. Meanwhile, this paper argues that CEOs cannot hide news by themselves, there must be a certain internal coalition between CEOs and directors. Therefore, this paper have two research questions: (1) Awards have positive relationship with stock price crash risk. (2) Internal coalition is a moderation effect between the main relationship.

046

How self-discrepancy explains the link between psychological contract breach and employee innovative work behaviour?

Yue ZHOU (PhD)

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Psychological contract breach (PCB) and its consequences have mainly been studied from a social exchange perspective or an affective events perspective. In this study, we use a self-discrepancy perspective to capture the experience of sensed self-discrepancies following PCB and its implications on employees' reactions. Drawing from self-discrepancy theory, we propose that PCB elicits the perception of self-discrepancy, which, in turn, decreases employee innovative work behaviour (IWB). We also suggest that higher levels of independent self-construal help mitigate the positive relationship of PCB with the perception of self-discrepancy, and thus decreased IWB. We use multi-studies to examine the proposed relationships.

047

On the dynamics of closed-loop supply chains under different remanufacturing strategies

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Carl Philip T. Hedenstierna (UoL)
Guoquan Liu (External)

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Understanding the closed-loop supply chain (CLSC) is essential to accelerate the transition to a circular economy. We investigate the CLSC system with two remanufacturing strategies, in-house and outsourcing, and applied the proportional order-up-to (POUT) policy. POUT has the ability to cope with the bullwhip effect; therefore, it is often used to improve the performance of supply chain systems. From Z-transform and discrete time approach, we compare the dynamics of the in-house and outsourcing remanufacturing systems. We find that the in-house remanufacturing system outperforms the outsourcing remanufacturing system, with less bullwhip effect and inventory variance.

048

The research on soft information in banking lending behavior: evidence from US banks

Yujia ZHONG (PhD)

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ACADEMY/SCHOOL International Business School Suzhou

The research that bank lending behavior reflects the credit relationship between banks and enterprises has attracted much attention. Among them, taking advantage of the soft information of enterprises to enhance the bank's credit risk measurement has become an effective solution. Based on information asymmetry, we investigate a special measurement to examine the role of soft information in banking lending behavior. Particularly, we try to seek the factors which can explain the variation of soft information in loan pricing from the relationships between banks and firms, by using panel data of 411,638 loans from 1981Q1 to 2018Q4. In terms of bank-firm pair, this study provides a new perspective to verify the significance of soft information in banking lending behavior and applies it to credit risk measurement.

049

A novel model for product defect detection based on the joint training aspect term extraction

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ACADEMY/SCHOOL International Business School Suzhou

Product defect detection (PDD) has always been an essential supporting application in industry big data. Detailed defect information is expected to be extracted for a more comprehensive understanding of the defects, and therefore, aspect-based PDD methods from social media have been widely concerned. However, previous studies omitted the impact of the aspect term extraction (ATE) module on the subsequent PDD task, and thus suffer from low performance (accuracy and PMI index). To close research gaps, we propose a BERT-based joint training model to simultaneously extract the aspect terms and their corresponding defects with high performance. A case study in the automotive industry is introduced to validate the effectiveness of the proposed model.

050

How to help emerging markets attract green-tech foreign direct investment through corporate environmental information disclosure

Zhuoran LIU (PhD)

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Corporate environmental information disclosure (CEID) refers to a series of behaviors that companies publicly disclosing information on environment-related objectives, management, investments and technology, which plays a significant role in the development of the firm’s green innovation technology.Currently, mainstream research into environmental disclosure mainly covers the following two aspects: the measurement of CEID and the impact of CEID on the firm’s financial performance and environmental performance. However, we know little about whether and how local firms’ CEID could attract green-tech FDI. Adopting the asymmetric information perspective and the AMC (awareness, motivation and capability) model. This study theorises three features of CEID from local firms to explain whether and how CEID helps emerging markets to attract green- tech FDI from advanced economies.

051

Investigation metallocene in graphene-contacted single molecular junction

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Richard Nichols (UoL)
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ACADEMY/SCHOOL School of Science

Monomolecular electronics, which studies the charge transport properties of various monomolecular systems, has vastly increased in popularity over the last decade. Previous studies have been mainly focused on metal-molecule-metal junctions and electron transfer at room temperature. Less concrete data in the literature regarding non-symmetric molecule-electrode contacts in other media. This project aims to investigate the conductance of metallocenes and derivatives junctions formed by hybrid 2D graphene/Au contacts at room temperature ionic liquid medium. Single molecular conductance measurements were obtained using a scanning tunneling microscope (STM), in particular the current distance I(s) and break junction (BJ) technique. The conductance of metallocene junctions increases with the length between metal center and Cp rings, and the introduction of graphene electrode shows a higher conductance than the conventional gold counterpart. This work opens perspective for graphene-based molecular devices in molecular electronics and electrochemical electron transfer at the single molecular level.

052

Catalytic hydroconversion of two lignin-related model compounds over Ni/CeO_2

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School of Chemical Engineering & Technology

Ni/CeO_2 was prepared by in-situ carbon templating and reduction with H_2. Oxydibenzene and benzyloxybenzene were used as lignin-related model compounds (LRMCs). Over Ni/CeO_2, oxydibenzene was completely converted into cyclohexane at 160 °C for 2 h and complete conversion of benzyloxybenzene to cyclohexane and methylcyclohexane was achieved at 120 °C for 1.5 h. H···H transfer to the benzene rings (BRs) in the LRMCs and phenol from benzyloxybenzene hydrocracking results in the BR hydrogenation, while H+ transfer to the oxygen atom in benzyloxybenzene, hydrogenated oxydibenzene, and benzyloxybenzene-derived cyclohexanol leads to the >CH-O- bond cleavage and subsequent dehydration of the resulting protonated cyclohexanol.

053

Controllable synthesis and electromagnetic wave loss mechanisms of hollow silicon carbide

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ACADEMY/SCHOOL School of Science

Increasing research has been done to design and develop high-performance electromagnetic wave-absorbing materials for electromagnetic protection and radar detection. Silicon carbide is a dielectric absorber and can be applied in harsh working environments due to its high-temperature oxidation resistance and good chemical inertness. Hollow spherical silicon carbide was fabricated with silica templates through the sacrificial templating method in a high-temperature tube furnace. The basic properties were characterized using SEM, XRD, TEM, BET, TEM and TGA. VNA analyzed the absorption performance of the products at the frequency of 2-18 GHz. The effective absorption bandwidth was 3.67 GHz covering from 12.85 GHz to 16.52 GHz at a sample thickness of 1.9mm. The unique hollow spherical structure of silicon carbide significantly promoted the multi-reflection and scattering of electromagnetic waves, leading to the enhanced absorption performance.

054

Four-coordinate organoboron for thermally activated delayed fluorescence materials: design, synthesis and characterization

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ACADEMY/SCHOOL XJTLU Wisdom Lake Academy of Pharmacy

Four-coordinate organoboron compounds with a π-conjugated N, O, C-chelate backbone are promising materials for their applications in the areas, such as, organic light-emitting diodes (OLEDs), organic field-effect transistors (OFETs), as well as sensory and imaging materials, etc owing to their strong luminescence and novel thermally activated delayed fluorescence (TADF). This project focuses on their design, synthesis and photoluminescence and electrochemiluminescence property study. In the last few months, a series of novel TADF materials with were designed, synthesized and structurally characterized successfully. Their photoluminescence and electrochemiluminescence will be studied for structure-performance optimization to develop new compounds with improved properties.

055

Experimental and chemical kinetic effect of expanded Aluminum on 6.5% Ethylene-Air explosion

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To explore chemical kinetic effect of expanded aluminum (EA) on ethylene explosion, the 6.5% ethylene-air explosion were undergone by filling different densities EA. The overpressure results show that EA can first promote and then inhibit explosion, and the flame propagation speed gradually decrease but is much higher than the blank group with densities increase. After the explosion, 25kg/m^3 EA characterization results show that the material surface is smoother, and the aluminum phase decreases alumina phase increases. The simulation results show that ·H, ·O, and ·OH are the key to promoting Ethylene consumption pathway. It indicates that low filling density EA mainly causes combustion to forming turbulence, accelerates chain reaction, and promote explosion. With densities increasing, the honeycomb hole is smaller than the maximum safe gap and the destruction of free radicals increases and is far greater than the generation rate, the explosion is suppressed. It provides a reference and guidance for the future application of EA and the study of controllable detonation.

056

A dual-thermosensitive hydrogel catalyst capable of single/tandem/non catalytic switchable ability

Lei PU (PhD)

SUPERVISORS Songjun Li

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Herein, an Ag NPs loaded bi-layered molecularly imprinted thermosensitive hydrogel catalyst is prepared for controlling the alternating of single and tandem reactions. This catalyst shows two main phase transition temperatures (i.e., 37°C and 46°C) by combining positive and negative response temperature sensitive hydrogels layers, enabling crossing range responsive ability of "open" or "close" the channel of the substrates. Since the thermosensitive characteristics of the opposite hydrogels coupled together lead to the order of swelling-contraction behavior, this catalyst achieved the single/tandem/non catalytic reaction in sequence efficiently. Thus, this study reveals a promising strategy for developing smart hydrogels catalyst in self-controlling tandem catalytic systems.

057

Computer-aided design and fabrication of covalent organic framework-based sensors for detecting trace organic carbonates during an electrolyte leakage from lithium-ion batteries

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ACADEMY/SCHOOL School of Science

Lithium-ion batteries (LIBs) have been widely utilised in many industries as they provide high energy density and power capacity. However, such high power capacity poses serious safety concerns during possible LIB failures, which are mostly linked to the leakage of highly flammable organic carbonates (OCs) in electrolytes. Early detection of electrolyte leakage will offer invaluable time to intervene in the leakage. This project aims to design a novel covalent organic framework-based gas sensor using the electrical transduction principle to selectively and sensitively detect trace OCs leakage. Molecular simulation and density functional theory will be followed to explain the adsorption behaviour.

058

Preparation and thermoelectric transport of sphalerite structural compounds

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Using electrons or holes as the working medium of thermoelectric conversion provides a possibility for the application of solid thermoelectric conversion technology. This topic selects cu2snse4 as the research object to explore sphalerite structural compounds with high thermal and electrical properties. By designing doped elements and optimizing the band structure, the thermoelectric transport mechanism is regulated and the thermoelectric performance is greatly improved.

059

Nanomaterial composite synthesis of OCN/TiNTA to achieve and investigate visible light activity in photo and electro catalysis

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ACADEMY/SCHOOL School of Science

Semiconductor TiO2, especially TiO2 nanotubes, are widely studied in the field of photoelectric catalysis. Due to the limitation of the band gap (3.2 eV), TiNTAs have been considered to improve its photoelectric chemical (PEC) performance under visible light through modification with oxygenated carbon nitride (OCN), a black photocatalytic material developed by g-C3N4 and shows good photoelectric activity under visible light. The synthesized OCN/TiNTA samples by different methods are compared and their PEC performance are shown and the enhanced photocurrents after modification with OCN and protonated OCN can be clearly seen. SECM mapping has been used to show the difference of active position in the dark and under the varying-wavelength LED irradiation.

060

Tuning physiochemical properties of Somatostatin analog Lanreotide through crystallisation and co-crystallisation

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Lanreotide, an important synthetic Somatostatin analog used for the treatment of acromegaly and carcinoid syndrome, is dosed by injection. The poor oral bioavailability and low solid-state stability constrain the development of an oral route. Crystallisation and co-crystallisation studies were carried out on amorphous Lanreotide to discover crystalline salts/co-crystals to improve its physiochemical properties. Two crystals with pamoic acid and p-acetamidobenzoic acid were isolated successfully. Single crystal analysis of pamoate provided in-depth structural information and shed light on the design of stable crystalline forms for pharmaceutical development, while Lanreotide-p-acetamido-benzoic acid co-crystals proved to significantly improve the solid-state stability of Lanreotide.

061

Investigating charge transport of Self-Assembled Monolayers (SAMs) based large-area junctions

Yijia WANG (PhD)

SUPERVISORS Li Yang (XJTLU)
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ACADEMY/SCHOOL School of Science

In the past decade, single-molecule junctions has been the model system of molecular electronics to study the charge transfer at the molecular level. However, in practical electronic application, rather than a single molecule, molecules are normally formed through thin layers of materials, allowing electrical charge to cross by a tunnelling process. This project proposes to form noncovalent self-assembled monolayers (SAMs) large-area junctions through a eutectic alloy of gallium and indium (EGaIn) as a tip and two-dimensional materials as the bottom electrode. Asymmetric elements such as asymmetric anchor groups and asymmetric electrodes were introduced in SAMs junctions. The results showed clear characteristics of resistive random-access memory (RRAMs), which can act as both a diode and a resistor in a molecular junction. The charge transport mechanism is currently under investigation.

062

Effect of porosity and α-Al(Fe/Mn)Si phase on ductility of high-pressure die-casting Al7Si0.2Mg Alloy

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High pressure die-casting (HPDC) was used to develop two sizes of Al7Si0.2Mg thin-plates. Castings with varying degrees of porosities and uneven microstructures were obtained and their effect on ductility were investigated. The results showed elongation dropped sharply when specimens contained large porosities. However, for samples with small porosities, α-Al(Fe/Mn)Si phase cracked prior to the cracking of eutectic phase. The number density of α-Al(Fe/Mn)Si phase played an important role in the fluctuation of elongation, specimens with higher number density of α-Al (Fe/Mn)Si particles exhibited deteriorated elongations. In addition, increasing in the number density of α-Al(Fe/Mn)Si phase was attributed to higher cooling rates.

063

The application of N-heterocyclic carbenes/photocatalyst dual catalysis system in organic synthesis

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N-heterocyclic carbene (NHC) is one of the most popular organocatalyst in organic synthesis, where the polarity of the functional group, mostly aldehydes, could be reversed via the Breslow intermediate. Benefiting from the different electronic and steric properties of various classes of NHCs, many new organic synthesis pathways have been developed so far. The visible-light-induced photocatalytic strategy has become a powerful tool for redox reactions in synthetic organic chemistry due to its ability to cause single-electron transfer process under mild conditions. Recently, the inspiration of light activated NHC catalysis has built novel pathways to form carbon-carbon bond in advanced of photochemical activation.
This project aims to further explore the potential application of NHC/PC dual catalysis system on the α,β-unsaturated aldehydes, especially cinnamaldehdyde derivatives to produce organic molecules of interesting structures. The progress has been made in the syntheses of catalysts and initial investigations on the new chemical transformations.

064

Social inequalities and spatial disparity: the representation of urban villages in post-2000s Chinese science fiction

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Cities have been re-imagined in many post-2000 science fiction works. The urban village embodies the problems brought about by rapid urbanization. Migrant workers have witnessed the development of urban development since the reform and opening up. They have no place to live after the cities have taken shape, so they have to coexist with the cities in urban villages. This paper takes two contemporary Chinese science fiction works, Wang Weilian's Wild Future and Chen Qiufan's Flower of Shazui, as examples to rethink the relationship between the literary representation of urban development in science fiction and spatial writing. This paper attempts to answer the question of what kind of insights are generated from the combination of realistic experience and imagination in these works. How are social inequalities embodied through spatial differences?

065

In two minds: parental citizenship strategies for Sino-British children in China and beyond

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ACADEMY/SCHOOL School of Humanities and Social Sciences

In recent decades, the rise of international migrants establishing lives in China has resulted in a corresponding growth in the number of Chinese-foreign marriages. Against the backdrop of China's non-recognition of dual nationality, mixed-nationality parents face a delicate task in the selection of nationality for their offspring. This decision has immediate repercussions for the lives of such children in China impacting everything from conditions of residence to their access to public services. This research examines Sino-British families in China, the United Kingdom and third countries, in order to understand the agentic citizenship practices of parents on behalf of their children.

066

Study on tourists' environmental behavior based on multi-sample latent class model: a case of Suzhou

Mei ZHU (PhD)

SUPERVISORS Degen Wang

UNIVERSITY/INSTITUTES Soochow University / School of Architecture

Based on multi-sample latent class model, this paper divides the latent classes of tourists' environmental behavior, and comparatively analyzes their similarities and differences according to different demographic characteristics. The results show that: (1) Tourists can be divided into three types, i.e. mature, budding and unsympathetic types, and mature tourists are the least in all the three types. (2) Gender, education level and income have slight impact on tourists' environmental behavior, while age has strong impact on tourists' environmental behavior. Finally, it suggests that tourists' environmental behavior can be improved from three aspects, namely, tourists themselves, tourism enterprises, and the state.

067

Rural women's participation in village governance

Ruoyu CAO (PhD)

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Susan Pickard (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

The Chinese government has released policies to improve women's political status at the grassroots level since 1949. The officially launched quota policy in the Organic Law of the Villagers (2010) is seen as the most direct promotion of rural women's political participation. This paper provides an overview of research on this topic. Rural women's attitudes towards politics are questioned and their political performances are evaluated negatively. Traditional culture and customs, the institutional factor, economic status and educational level are the most discussed factors that influence rural women's political participation.

068

From megacities to metropolitan areas: What is the missing middle?

Siyang LI (PhD)

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ACADEMY/SCHOOL School of Humanities and Social Sciences

The Chinese state government has been encouraging the development of metropolitan areas centred on megacities since 2019. However, the state has also tightened up urban annexation, with megacities having to abandon annexation in favour of integration with smaller neighbouring cities in their quest for growth. While there have been studies on how large cities coordinate regionally, little work has drawn from the lens of neighbouring cities and towns being integrated. This study argues that peripheral towns might become the 'missing middle' for development. They may face additional governance and livelihood challenges in terms of regional integration thus worth more attention.

069

Power and harmony: face as a mean of social control in chinese social media

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ACADEMY/SCHOOL School of Humanities and Social Sciences

As the recent scholarship convincingly demonstrated, for centuries face (lian, mianzi) was one of the main factors determining communication, social encounters and social control in China. Despite progressing modernisation of Chinese society, face seems not to lose its contemporary significance. The arrival of social media that has long become a dominant communication method, Chinese' self-representation process and re-mediated social relation (guanxi) that facework roots in were not left intact. This research is then a try to investigate how Chinese social media has adapted face culture towards generating "controlled netizens" by integrating factorial survey with a qualitative analysis on interview data.

070

Rescuing nature from nation's developmentalism: Reading Han Song's Red Ocean from an ecocritical perspective

Yue ZHOU (PhD)

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Peng Ding (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

As one of the "big three" science fiction writers, Han Song's works are featured with eeriness. In the Red Ocean (2014), humans de-evolved into aquatic mammals. The floating corpses, the boiling ocean, and cannibalism repetitively occur to signify the human destruction of nature and the regression of human civilization. The presentation focuses on an ecocritical interpretation. It is found that the writer deconstructs the linear, progressive, and teleological notion of history to critique what the developmentalist ethos of post-Mao China has been blindfolded, development is not necessarily associated with growth or progress when it comes at the cost of nature.

071

Why Chinese younger generations embrace China Chic?

Yunpeng XIANG (PhD)

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Pooya Sareh (UoL)
Cheng-hung Lo (External)

ACADEMY/SCHOOL School of Humanities and Social Sciences

China Chic, the trend of the Chinese culture, combines with fancy designs and elements from the Chinese traditional cultures. It starts from the fashion industry and then spreads to other industries, including cosmetic, food, film, television and music industries, etc. Now it becomes the mainstream attracting the public, especially, the younger generations. They have warmly embraced the China Chic in the recent years as followers and participants. This research aims to figure out the factors affecting Chinese younger generations' attitude to China Chic, by hybrid method with both in-depth interviews and questionnaire surveys.

072

China-CEE relations: objectives, strategies and outcomes

Zhaosheng SHI (PhD)

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Obert Hodzi (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

In recent years, the quickly deepening relationship between China and Central and Eastern European countries (CEECs) was reflected in establishing the so-called 16+1 platform in 2012. Since the launch of 16+1, the platform and China's presence in the CEE region have raised many questions about its implications and end goals. This project aims to understand China's foreign policy toward CEECs by addressing the primary question, 'how and how effectively does China pursue its influence in CEECs?'. Specifically, it intends to examine the strategies, the policy objectives, the outcomes and the effectiveness of China's engagement in the CEE region.

073

Discussion on the improvement of prevention and control response mechanism of rural organizations in epidemic transmission

Zhaoting ZHANG (PhD)

SUPERVISORS Feng Wang

UNIVERSITY/INSTITUTES China University of Mining and Technology / School of Public Administration

The outbreak and spread of public health outbreaks have had a great impact on rural society. It is necessary to further improve the prevention and control response mechanism of rural grass-roots administrative organizations and village-level organizations in the transmission of major public epidemics. It is necessary to improve the institutional setting, improve the process, complete the system personnel, and establish a relatively perfect prevention and control response mechanism through continuous improvement to ensure the health safety of villagers

074

Cultural promotion of grassroots: Case studies of burgeoning Chinese We Media on overseas platforms and the influences

Zhaoyu BING (PhD)

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ACADEMY/SCHOOL School of Humanities and Social Sciences

Multiple Chinese We Media, producing the content of traditional Chinese culture, have 'gone abroad' on overseas platforms. Some have attracted millions of followers. Previous research only emphasises the interaction between We Media and marketing, and scholars rarely highlight such grass-root We Media from China. To address the reasons for their popularity and the influences on grass-root cultural promotion behind this phenomenon, I will employ interviews with the producers and viewers, then conduct questionnaires and data analysis for the viewers with English and non-English background. This study will examine these Chinese We Media's cultural impacts and the feedback from multicultural viewers.

075

Psychological, sociocultural, and academic domains of intercultural adjustment and adaptation: A case study of international students at an EMI university in China

Ziyun ZHANG (PhD)

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ACADEMY/SCHOOL School of Humanities and Social Sciences

Academic adaptation is a prominent achievement for international students seeking successful cross-border education. Whether there is an association between academic adaptation and other domains of adaptation remains unclear yet. This study reports on a longitudinal, mixed methods investigation of the impact of psychological and sociocultural adjustment on the academic adaptation of a multinational sample of international students at an English medium of instruction university in China, while the moderating impact of perceived social support on their academic adaptation is also examined. Hypotheses propose that psychological and sociological adjustment are positively associated with academic adaptation, and social support moderated the effect on academic adaptation. This study would contribute a more comprehensive understanding of international students' intercultural experiences in China.

076

Higher sensitivity and reproducibility of wavelet-based amplitude of resting-state fMRI

Feifei LUO (PhD)

SUPERVISORS Ming Zhang

UNIVERSITY/INSTITUTES Xi'an Jiaotong University /
School of Life Sciences and Technology

The study compared the sensitivity and reproducibility of FFT-ALFF with those of Wavelet-ALFF based on five mother wavelets in the conventional frequency band (0.0117 – 0.0781 Hz) and other sub-bands. The results indicated that the Wavelet-ALFF of all five mother wavelets was generally more sensitive and reproducible than FFT-ALFF in all frequency bands. Specifically, in the higher frequency band (0.1992 – 0.25 Hz), the mean sensitivity of db2-ALFF results was 1.54 times that of FFT-ALFF, and the reproducibility of db2-ALFF results was 2.95 times that of FFT-ALFF. The findings suggest that wavelet-ALFF can replace FFT-ALFF, especially in the higher frequency band.

077

Semantic-enhanced 3D reconstruction of building information models

Hong HUANG (PhD)

SUPERVISORS Cheng Zhang, Yong Yue, Fangyu Guo (XJTLU)
Thanh-Toan Do (UoL)

ACADEMY/SCHOOL Design School

Three-dimensional (3D) reconstruction has become a common method to obtain the actual geometry of the built environment. This technique generates a massive 3D point cloud with rich spatial information in an effective way. With the rapid development in deep learning, algorithms can be developed to identify objects by deep learning. By integrating deep learning technology into 3D reconstruction, semantic-enhanced reconstruction will act as an interpreter that translates the data from the construction site into a well-structured, understandable information model.

078

"Softening" effect and influence mechanism of abandoned mine water on the boundary coal pillar

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School of Resources and Geosciences

The mine boundary coal pillar will soften under the immersion of high permeability and strong corrosive mine water, and its physical and mechanical strength and water resistance ability will decrease. In this research, through on-site sampling and independent research and development of a high-pressure mine water rock (coal) coupling action test device, the pressure immersion simulation test of coal samples under different immersion conditions was carried out, and the "softening" rule, influencing factors and mechanism of coal and rock samples under different experimental conditions were studied.

079

Characterisation of sustainable high-performance fibre reinforced pervious concrete

Jie LI (PhD)

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Luigi Di Sarno (UoL)

ACADEMY/SCHOOL Design School

This project aims to characterize the performance of sustainable high-performance fiber-reinforced pervious concrete designed for the sustainable development of a sponge city. Due to the different compaction methods, it is challenging to fully achieve the properties of pervious concrete in field construction compared to the lab. In response to this phenomenon, this project prefers to make the properties under control, which means producing finished products, like pervious pavement bricks, pervious pavement panels, etc. According to market research, more ceramic pavement bricks are on sale, which consume much energy due to sintered process. This project aims to produce pervious concrete pavement bricks without sintering while achieving high strength. The appropriate type, shape, and number of fibers, as well as the suitable cementitious matrix, will be identified to achieve an optimal balance between strength and permeability, which ensures its application under light traffic. Extensive literature review, experimental investigation, theoretical analyses, and numerical simulation will be conducted to investigate the short-term and long-term performance of the proposed pervious material. The sustainability of the proposed material will be examined based on the constitution and manufacturing process. The implementation of sustainable fiber-reinforced pervious concrete will lead to positive economic and environmental impact through the realization of low-impact development and utilization of waste and recycled materials

080

From industry 4.0 to construction 4.0: barriers to the digital transformation of engineering and construction sectors

Kaiyang WANG (PhD)

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Dirk Schaefer (UoL)

ACADEMY/SCHOOL Design School

The construction industry plays a crucial role in any country's economy, which is widely recognized as a strategically important sector and a fundamental driver of national development and progress. However, the construction industry faces issues such as poor project management and execution, inadequate design processes, industry fragmentation, and lack of innovation. In order to mitigate the issues, digital technologies are being explored for process and business enhancement in the construction sector, also known as digital transformation (DT). Accordingly, this study aims to raise construction practitioners'and firms'understanding of the critical barriers to DT and their internal relationships.

081

On the effect of solute atoms on twin boundary migration in magnesium alloys

Lang LIU (PhD)

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Yuyuan Zhao (UoL)
Qing Liu (External)

ACADEMY/SCHOOL Design School

Twins are the controlling defects in the yielding of magnesium. In this project, 6 alloying elements were chosen to study the effects of solute segregation on twin evolution. MD simulations were performed to test the impeding force of segregation against twins. From the results, Y had the weakest impeding force while Nd and Al were the strongest. Furthermore, twins mostly unpinned at BP facets. The results indicated that common elements can be equally significant in hardening magnesium as rare earth elements, and that the mobility of BP facets was critical in determining the yield point of magnesium alloys.

082

Hydration and material properties of blended cement with ground desert sand

Mengdi LIU (PhD)

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Luigi Di Sarno (UoL)

ACADEMY/SCHOOL Design School

The future of green cement depends largely on finding new SCMs to address the sustainability issue. Desert sand would seem to be a viable source for SCM, given its abundance around the world. This study investigates desert sand powder as an SCM in cement through physical experiments, thermodynamic modeling, and life-cycle analysis. The results revealed that desert sand powder demonstrated physical and chemical roles in cement hydration and phase assemblage. The carbon emissions of blended cement were far lower than pure cement, indicating the excellent feasibility of desert sand powder as a new SCM.

083

DEM simulations of triaxial behaviour of granular materials

Minyi ZHU (PhD)

SUPERVISORS Guobin Gong, Jun Xia, Charles Kwet Shin Loo (XJTLU)
Xue Zhang (UoL)

ACADEMY/SCHOOL Design School

The discontinuous and inhomogeneous nature of granular materials leads to complex mechanical behaviors which can be difficult to investigate with classical numerical models. An alternative to these continuous numerical methods is to use the discrete-based method (DEM) which represent the material as an assemblage of independent elements, such as particles and grains, interacting with each other. This project investigates the macroscopic and microscopic behaviour of granular materials under different loading conditions (drained/undrained; axisymmetric/true triaxial; loading/unloading, etc) using DEM.

084

Mechanical properties of concrete incorporating recycled tyre rubber materials

Ran ZANG (PhD)

SUPERVISORS Bowen Xu, Jun Xia, Lei Fan (XJTLU)
Luigi Di Sarno (UoL)

ACADEMY/SCHOOL Design School

Recycling of solid wastes, such as tyre rubber, to produce concrete composites with both environmental-friendly and structural performance merits, has attracted research interests in recent years. This project focuses on the study of the comprehensive properties of concrete composites incorporating recycled tyre rubber materials, especially the constitutive model under multiaxial stress. The experimental results, combined with numerical and analytical analyses, will provide detailed insights in the optimal mix design of rubberised concrete as well as the design guidance for practical applications.

085

A framework for assessing the building spatial design from fire evacuation perspective

Rong FU (PhD)

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Hyungjoon Seo (UoL)

ACADEMY/SCHOOL Design School

Globally, building fire accident is one of the disasters that threaten the safety of human life in modern society. In order to reduce casualties and property damage, some research has focused on using fire simulation, mathematical methods, and virtual reality technologies to increase safety awareness, improve building spatial design, and enhance evacuation performance in emergency situations. However, rarely existing studies integrated human physiological data with emergency sign system design to improve building spatial design. Therefore, this study proposes a framework to evaluate existing building spatial design from the fire evacuation perspective and provide suggestions to the designer.

086

Determinants of digital technology adoption in renovation waste management based on the theory of planned behaviour

Shiwang YU (PhD)

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Luigi Di Sarno (UoL)

ACADEMY/SCHOOL Design School

China's rapid urbanisation has contributed to the rapid growth of urban residential renovation projects, which generated a large amount of renovation waste. Renovation contractors (RCs) are faced with many challenges in renovation waste management (RWM). The adoption of digital technology (DT) will help RCs to manage renovation waste efficiently. However, few studies have focused on the determinants affecting the DT adoption in the RWM by RCs. To this end, a study was conducted to investigate the determinants that influence the DT adoption in RWM by RCs, using the theory of planned behaviour. The findings will help policy makers to develop more rational policies to promote the digitalisation of RWM.

087

Investigation of the compressive behaviours of waste-containing FRP-confined concrete columns

Temitope DADA (PhD)

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Luigi Di Sarno (UoL)

ACADEMY/SCHOOL Design School

Statistics have shown that construction sites worldwide contribute significantly to global carbon emissions. Attempts to utilise the wastes in concrete revealed that they reduce concrete performance. Fibre-reinforced polymers have been suggested as a possible solution to enhance the performance of waste-containing concrete, but gaps exist in using FRPs in concrete columns containing wastes. A literature review was conducted to assess the research area's state-of-the-art. Furthermore, investigations were carried out on the compressive behaviour of waste-containing FRP-confined concrete columns by simulating published experimental studies using ABAQUS. Convergence of result existed, and the ductile behaviour of the columns was also enhanced.

088

Photocatalytic-magnetic g-C3N4 quinary nanocomposite for efficient removal of aqueous organic pollutants

Tianqi LIU (PhD)

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Beata Layla Mehdi (UoL)

ACADEMY/SCHOOL Design School

In recent years, due to rapid industrialization and increasing human population, aqueous environmental pollution has been getting more serious than ever. Thus, there is an urgent need to develop an environmentally-friendly and efficient technology to address global water pollution. Recently, the work on graphitic carbon nitride (g-C3N4) has been gaining unprecedented attention due to its huge potential to harness the renewable solar light for efficient environmental remediation. For the first time, this research will elucidate the synthesis of a sustainable photocatalytic-magnetic quinary nanocomposite, namely magnetite coupled with silver bromide, silver chloride, silver iodide and g-C3N4 (g-C3N4/Fe3O4/AgBr/AgCl/AgI) through novel synthesis protocols. This nanocomposite will be thoroughly characterized using advanced materials characterization, and be employed to efficiently degrade various aqueous recalcitrant and toxic organic contaminants under visible-light irradiation.

089

Study on travertine permeable concrete as a sustainable method for urban flooding and pollution management system

Tianzhen LI (PhD)

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Ming Li (UoL)

ACADEMY/SCHOOL Design School

Rapid urbanization and the consequent increase in impervious surfaces have become one of the major contributors to urban flooding, which has negatively altered the urban water cycle. This paper aims to introduce travertine to produce new travertine pervious concretes (TPC) to achieve the sustainable target. Different Portland cement mixtures were tested to estimate the effect of water/cement ratio, aggregate/cement ratio, coarse aggregate size, fine aggregate per-centage, and Supplementary Cementitious Materials (SCMs), along with the relationships be-tween compressive strength, porosity, and permeability. Besides, the function of adsorption of heavy metal ions in TPC is also conducted to assess its environmental benefits.

090

Multi-source remote sensing image fusion

Yuan FANG (PhD)

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Luigi Di Sarno (UoL)

ACADEMY/SCHOOL Design School

Pansharpening refers to the fusion of a panchromatic (PAN) image with a high spatial resolution and a multispectral (MS) image with a low spatial resolution, aiming to obtain a high spatial resolution MS (HRMS) image. I proposed a band-separated local attention (BSLA) method for image pansharpening to avoid mixing spectral information from different channels. At three scales (i.e., the original scale, downsampled by two, and downsampled by four), the attention module injects the selected PAN features into the corresponding spectral bands according to the similarity obtained by matrix calculation to extract useful spatial details more efficiently.

091

Semantic segmentation of terrestrial laser scanning point clouds using locally enhanced image-based geometric representations

Yuanzhi CAI (PhD)

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Kristian Krabbenhoft (UoL)

ACADEMY/SCHOOL Design School

Point cloud data acquired using terrestrial laser scanning often need to be semantically segmented to support many applications. To this end, various point-based, voxel-based and image-based methods have been developed. The former two types of methods often require extensive computational effort. In contrast, image-based methods are favourable from the perspective of computational efficiency. However, existing image-based methods are highly dependent on RGB. To overcome such issues, this research proposes a novel image enhancement method to reveal the local geometric characteristics in images derived by the projection of the point cloud coordinates.

092

Investigation of reinforcement corrosion in concrete by microwave non-destructive test

Zitong GAO (PhD)

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Hyungjoon Seo (UoL)

ACADEMY/SCHOOL Design School

Corrosion of steel bars is one of the unavoidable problems in the use of buildings. In reality, it is nearly impossible to do the destructive testing of existing buildings. Non-destructive testing(NDT) is a kind of analysis technique used to evaluate the materials' properties without damaging them. The Microwave NDT method to determine reinforcement corrosion demonstrates the advantages over other testing methods as the method is purely non-destructive, has rapid measurements, and low energy consumption. The ultimate objective of the thesis is to use the material's unique dielectric properties to detect the corrosion of the bars in concrete and evaluate the location and percentage.

093

Spectral clustering based mutant reduction for mutation testing

Changqing WEI (PhD)

SUPERVISORS Xiangjuan Yao

UNIVERSITY/INSTITUTES China University of Mining and Technology / School of Mathematics

Mutation testing is significantly hindered by its high cost, majorly caused by the large number of mutants generated by the technique. In this paper, we make use of an intelligent technique, namely spectral clustering, to improve the efficacy of mutant reduction. First of all, we give a family of definitions and the method to calculate the distance between mutants according to the weak mutation testing criteria. Then we propose a mutant reduction method based on spectral clustering. The experimental studies show that the new approach can significantly reduce the number of mutants without jeopardizing the performance of mutation testing.

094

Point cloud self-supervised learning

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Anh Nguyen (UoL)
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ACADEMY/SCHOOL School of Advanced Technology

With the decreasing cost of 3D sensors and the onset of the autonomous driving research boom, the use of deep artificial neural networks (DNNs) to train 3D point cloud data is one of the hot research areas of the moment. Thanks to large-scale finely annotated point cloud data, DNNs have achieved impressive results. However, as the research progresses, the models become more and more dependent on data and labels. The annotation of point clouds with labels is time-consuming and completely manual. Therefore, getting rid of the point cloud label-hunger has become a difficult challenge. Self-supervised learning (SSL), an unsupervised training paradigm that mines supervised information directly from the data itself without label annotation, is considered a key technique for moving away from label dependency because of its clever pre-training task design. Originating from natural language processing, self-supervision has been refined and extended to the image and point cloud domains. My research filed is to explore the way to design a innovative pre-train model to train the feature extractor without labels.

095

Decentralised multi-agent cooperation via adaptive partner modelling

Chenhang XU (PhD)

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Dominik Wojtczak (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Multi-agent cooperation can benefit from reinforcement learning (RL) in a small number of interactions with other agents in the environment, a property known as opponent sample efficiency. This research thus investigates how to build the opponent model (OM) and how to use the learned OM to improve opponent sample efficiency. We present a novel multi-agent model based RL algorithm: adaptive partner modelling (APM), utilizing the decentralized learning with decentralized execution framework (DTDE)

096

Application of deep reinforcement learning in portfolio management

Fengchen GU (PhD)

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Angel Garcia-Fernandez (UoL)

ACADEMY/SCHOOL School of AI and Advanced Computing

Portfolio management is an investment strategy to redistribute the fund into different assets, which aims to maximize the return and minimize the risk. There has been much research on the application of machine learning techniques to portfolio management. In this paper, we propose a novel investment strategy framework based on the Depthwise convolution, Squeeze and Excitation module, Residual Block, and Gate Recurrent Unit, called DSRG Network. Results show that our proposed strategy outperforms at least 40% better than other strategies used for comparison experiments.

097

A comparative analysis of fuzzy logic and deep reinforcement learning's applications on PID tuning for autonomous ships

Ip CHENG (Master)

SUPERVISORS Xiaohu Zhu (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

PID controller is one of the most common control algorithms in the world. However, the lack of a general solution for searching optimal PID gains (PID tuning) remains to be its limitation. This study is a comparative analysis between two branches of Artificial Intelligence's (Fuzzy Logic and DRL) applications in PID tuning, and analyze their performance in error reduction, specifically for autonomous ship navigation. The DRL algorithms chosen for this study should theoretically have better performance than Fuzzy PIDs in error reduction and consistency. The study will contribute to future studies in AI, PID and autonomous navigation.

098

ExploreVR: Explorative learning in virtual environment

Jiachen LIANG (Master)

SUPERVISORS Yue Li (XJTLU)

ACADEMY/SCHOOL School of Advanced Technology

The virtual reality (VR) technology has received increasing attention from scholars as a learning support tool. This project aims to use VR technology to facilitate the learning experience of the module DES001 (Explore Design), at Xi'an Jiaotong-Liverpool University. We build two virtual classrooms based on 3D and 2D respectively for the module DES001, to increase students' engagement with learning activities and improve course content delivery with a technology-enhanced approach. We devote to validate the impact of the virtual classrooms on student learning and to demonstrate advanced technology topics to more audiences in the future work.

099

Real-time detection of simulator sickness in virtual reality games based on players' psychophysiological data during gameplay

Jialin WANG (PhD)

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Navjot Kukreja (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Virtual Reality (VR) technology has been proliferating in the last decade, especially in the last few years. However, Simulator Sickness (SS) still represents a significant problem for its wider adoption. Currently, the most common way to detect SS is using the Simulator Sickness Questionnaire (SSQ). SSQ is a subjective measurement and is inadequate for real-time applications such as VR games. This research aims to investigate how to use machine learning techniques to detect SS based on in-game characters' and users' physiological data during gameplay in VR games. To achieve this, we designed an experiment to collect such data with three types of games. We trained a Long Short-Term Memory neural network with the dataset eye-tracking and character movement data to detect SS in real-time. Our results indicate that, in VR games, our model is an accurate and efficient way to detect SS in real-time.

100

Evaluate machine translation quality without reference translations

Jingshi ZHOU (PhD)

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ACADEMY/SCHOOL School of Advanced Technology

Translation quality evaluation is the key to machine translation. The current evaluation methods include human evaluation and automatic evaluation. Human evaluation typically depends on translation experts, involving assessing adequacy and fluency. And the conventional automated assessment is based on reference translations, depending on the error type indicator systems. Both existing evaluations are based on expert reviews. Still, the reader, who is also the end-user of the translation, is not involved in the evaluation process. This study aims to incorporate end-user assessment into machine translation quality assessment. The expected outcome of the research is a User-Oriented Assessment.

101

Text semantic mining study on patent novelty detection

Jingxuan LIU (PhD)

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ACADEMY/SCHOOL School of AI and Advanced Computing

The current patent novelty search analysis method is mainly based on the patent text's content and structure design, which can only solve the problem of basic equivalence and comprehensive coverage of patent content or structure.
This project proposes a model for computing document-level similarity. The core idea is to map queries and documents into a common dimensional semantic space and calculate the sum of the matrices between query and document semantic vectors. Then perform cosine similarity to obtain the similarity values between articles, and finally rank the similarity of related documents to achieve the purpose of patent document retrieval.

102

Active learning for domain adaptive sementic segmentation

Junkun PENG (PhD)

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ACADEMY/SCHOOL School of Advanced Technology

In ADA semantic segmentation, entropy uncertainty-based metrics for sample selection for annotation are frequently used. However, during the initial stages of network training, the estimation quality of entropy is poor, which leads to a large number of inaccurate estimates. To address this issue, we propose a new uncertainty measurement to assist entropy, with the aim of enhancing the ability to select uncertain samples in the prior rounds.

103

Weakly-supervised learning on large-scale 3D point cloud segmentation

Junwei WU (PhD)

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Jeremy Smith (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Annotation of large-scale 3D data is notoriously cumbersome and costly. As an alternative, weakly-supervised learning alleviates such as need by reducing the annotation by several order of magnitudes. We propose COARSE3D, a novel architecture-agnostic contrastive learning strategy for 3D segmentation. Since contrastive learning requires rich and diverse examples of keys and anchors, we leverage a prototype memory bank capturing class-wise global dataset information efficiently into a small number of prototypes as key. An entropy-driven sampling method allows us to select good pixels from predictions as anchors. Extensive experiments demonstrates our proposed methods outperform baselines with 0.001% annotations

104

Efficient interaction techniques for large-scale astronomical data exploration in immersive environment

Lixiang ZHAO (PhD)

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ACADEMY/SCHOOL School of Advanced Technology

The immersive environment proposes new prospects for scientific data exploration and information exchange in a shared space via Head-Mounted Displays. The use of immersive environments has applicable potential in the field of astronomy, helping scientists explore the unknown and verify research predictions. To understand such a massive spatial data, researchers are required to observe the 3D space, zoom in and out of the data, select and explore the area of interest. We aim to develop the efficient interaction techniques to support users to select, navigate and collaborate in the immersive space.

105

The cause of causal emergence: redistribution of uncertainty and critical condition

Liye JIA (PhD)

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ACADEMY/SCHOOL School of Advanced Technology

The granularity is significant in building effective models for complex systems to study them. Scientists have found that the coarse(macro) is sometimes more “causal” and effectual than the detailed(micro) for modeling complex systems, which is called Causal Emergence(CE). Coarse-graining the model to macro can quantitatively measure the emergence. However, relevant works have ignored other conditions except for granularity. This project aims to show that uncertainty is the obstacle to Causal Emergence. With Effective Information(EI), one of the causation metrics, we have defined a set of equations to quantify the CE thresholds, displayed by figures derived from the General EI Calculator.

106

Gabor feature-based video emotion recognition

Misbah AYOUB (PhD)

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The FACS (Facial Action Coding System) is one of the effective approaches to describe facial expressions, such as eye blinking, eyebrow movement, and lip movement, which can be used for emotion recognition. This project aims to investigate and propose novel methods for video emotion recognition based on FACS, with lower computational complexity and good explainability. Three methods are proposed:1) novel LAR (Lacrimal aspect ratio) based method for eye blinking; 2) novel LDA (lacrimal distance analysis) based methods for eyebrow movement; and 3) Gabor feature extraction and modified mouth aspect ratio based methods for lip movement.

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Solution of large-scale many-objective optimization problems based on dimension reduction and solving knowledge guided evolutionary algorithm

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

There are lots of many-objective optimization problems (MaOPs) in real-world applications, which often have many decision variables. Although many methods have been proposed to solve MaOPs, with the increasing number of decision variables or objective functions, the performance of these algorithms deteriorates appreciably. In view of this, the paper proposes a method to solve large-scale MaOPs (LSMaOPs) based on dimension reduction and a solving knowledge guided evolutionary algorithm.

108

Continual graph learning: A survey

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ACADEMY/SCHOOL School of Advanced Technology

Graphs are widely used to represent relational data and usually evolve continually in real life. Current learning models are mostly designed for static graphs. Models designed for dynamic graphs tend to suffer from high space complexity and time complexity. Continual graph learning (CGL) is an emerging area aiming to enable a model to learn incrementally on graph-structured data with lower training cost. This poster mainly summarizes the current research of continual graph learning (problem statement, methods and future direction).

109

Group-based object alignment in virtual reality environments

Rongkai SHI (PhD)

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ACADEMY/SCHOOL School of Advanced Technology

Group-based object alignment is an essential manipulation task. In conventional 2D interfaces, such tasks are generally achieved via a menu-based interface. Virtual reality (VR) head-mounted displays (HMDs) open more design options for group-based object alignment interaction techniques. However, object alignment techniques in immersive environments are underexplored. In this paper, we present and evaluate four interaction techniques for 3 degrees-of-freedom translational alignments: AlignPanel, AlignWidget, AlignPin, and AlignGesture. Our results indicate different benefits and drawbacks of these techniques for group-based alignment in immersive systems. Based on the findings, we distill a set of design recommendations for these techniques in various scenarios.

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Multi-modal traffic target detection and scene understanding based on natural language and multi-sensor

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With the rapid development of deep learning, smart city and intelligent traffic system achieve high-quality progress. Multiple sensors, such as cameras and radar, could make traffic systems clever by perceiving data of different modalities. However, natural language, as a significant modality in our daily, always neglected in intelligent traffic systems. If traffic supervisors can adopt natural language to interact with multiple traffic sensors, it can make intelligent transportation systems cleverer and more user-friendly, greatly facilitating routine tasks such as traffic supervision and suspect vehicle tracking, which could dramatically assist cooperative vehicle infrastructure system (CVIS).

111

WaterScenes: A multi-task radar-camera fusion dataset for autonomous driving on water surfaces

Shanliang YAO (PhD)

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ACADEMY/SCHOOL School of Advanced Technology

Unmanned Surface Vehicles (USVs) play an essential role in executing hazardous and time-consuming missions on water surfaces, such as water quality monitoring, riverbed mapping, surface cleaning and underwater detection. This work presents WaterScenes, the first multi-task radar-camera fusion dataset for autonomous driving on water surfaces. A monocular camera and a 4D radar are used as our perception sensors, which provide all-weather solutions for object information like color, shape, texture, range, velocity, azimuth and elevation. Focusing on pier and buoy as static objects as well as boat, ship and vessel as dynamic objects, we label the camera images and radar points in pixel-level and point-level, respectively. In addition to basic perception tasks, including object detection, instance segmentation and object tracking, we also provide annotations for free-space segmentation and waterline detection. With the multi-task and multi-modal data, this work aims at introducing a dataset contributing not only to algorithms on images or points but also to fusion methods of radar and camera.

112

A comparative study of desktop, tablet, and virtual reality for 3D object interaction

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Virtual Reality Head-Mounted Display (VR HMD) is an emerging interface that allows immersive 3D experience. However, there is limited research showing how 3D object interaction in VR HMD differs from the most commonly used Personal Computers (PCs) and tablet devices. Therefore, we have conducted a user study to investigate how users perform and perceive workload on different 3D object interaction tasks such as selection, manipulation, and stable control using different devices (e.g., PC, Tablet and VR). The research lays the foundation for future work in developing cross-device experiences. Our findings will be applicable to various fields such as design, education, and games.

113

Verifiable data trading using hybrid blockchain and digital twins

Sida HUANG (PhD)

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The big data era has emerged, and many data trading schemes have appeared worldwide. Traditional data trading schemes, however, have poor trustworthiness due to their vulnerability to self-caching, impermissible tampering, and single point of attack. Although blockchain has decentralized, tamperresistant, and traceable features, the user cannot derive the device of generation from the data, so it is possible the data is fake and forged. Digital twin (DT) has the ability to demonstrate realtime visualization information of the device of data generation, and users can observe the device's usage, including the device's real-time status and the external environmental conditions. This paper proposes a verifiable hybrid blockchain-based data trading platform integrating DT. We used a public blockchain for data trading and a private blockchain as advertising and traceable evidence, storing details of DT and data from different periods.We also designed smart contracts and set up a penalty mechanism in the form of a security deposit. Finally, the experiments evaluate the feasibility of the model and its performance on the blockchain.

114

Hands-free text entry for multi-type characters in virtual reality

Tingjie WAN (PhD)

SUPERVISORS Haining Liang (XJTLU)
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ACADEMY/SCHOOL School of Advanced Technology

Uppercase and lowercase letters, symbols, and numbers are essential in text entry activities but there has been very limited exploration of multi-character text entry for virtual reality head-mounted displays. Typically, multi-type character entry requires four kinds of keyboards between which users need to switch. Our work explored the usability and efficiency of four locations of the switch keys, the two hands-free selection mechanisms (eye blinks and dwell) for text input, and crossing-based switching for switching between keyboards. Our results show that use blink or dwell to select characters and use crossing for mode-switching is effective especially in left layout.

115

Human-machine decision making and interaction: from the perspective of "information—design—choice"

Wei LIU (PhD)

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The perspective of "information-design-choice" is constructed according to Simon, and typical cases are selected to analyze the interactions between people and AI. AI shows its advantages in "information-design-choice", which makes the decision-making show the changes of "from experience to data", "from man to machine" and "from thinking to query".
AI and human have formed three interactive forms of“suggestion”“assistance”and“agency”. However, it leads to neglect of value, reduction of transparency, and infringement of subjectivity. We should adhere to value, clarify the attributes of decision makers, pay attention to the transparency of algorithms to form a good relationship.

116

Sound-guided framing in cinematic virtual reality

Wenbai XUE (PhD)

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ACADEMY/SCHOOL School of Advanced Technology

Since the audience can freely choose the visual field, watching a virtual reality film may lead to an erroneous judgement of the narrative plot, especially when the plot is outside the field of vision. Some studies have shown that using spatialized offscreen sound cues can solve this problem. Nevertheless, the truth is, whether sounds are spatialized or not, they still may have a certain degree of attraction to the viewers. We evaluated the effect of different categories of offscreen sound on the audience's attention and frame guiding. We conjecture that the difference in timbre may be a potential reason for the difference in guidance between different categories of offscreen sound cues. Our test is conducted in a virtual scene with low complexity, reducing the possible confounding effects of various visual elements. The results show that different categories of offscreen sound cues can impact the guidance of the free framing work of viewers and have significant differences. However, it is only related to the horizontal plane. The viewer is insensitive to the sound stimuli of the vertical direction. Guiding effects between different categories of sounds can vary due to specific properties of the sound timbre.

117

Transfer learning with unsupervised domain adaptation method for bearing fault diagnosis

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ACADEMY/SCHOOL School of Advanced Technology

Although bearing fault diagnosis methods based on deep learning are very popular in recent years and a lot of brilliant results have been achieved, they assume that the distribution of training samples is same with test samples. However, the working condition of bearing is variable due to complex working demand, and labeling fault tags for all data is time-consuming and laborious. In order to address the problem of lacking labeled data in cross domain scenario, a novel domain adaptation transfer learning based fault diagnosis method based on deep domain adversarial network is proposed. In this method, a deep convolutional neural network (CNN) is used to extract features from raw vibration signals. Then a discriminator and a classifier are applied to minimize the distribution of cross-domain features. Experiments are carried out on three benchmark datasets, and the results show that the accuracy of proposed methods is higher than other existing unsupervised transfer learning methods.

118

An inception network with bottleneck attention module for deep reinforcement learning framework in financial portfolio management

Xiaotian REN (PhD)

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ACADEMY/SCHOOL School of AI and Advanced Computing

Reinforcement learning algorithms have widespread applications in portfolio management problem, image recognition processing and many other domains. In this paper, we introduce a novel network architecture embedded in deep reinforcement learning framework based on the Inception network and Bottleneck Attention module. Our back-test results demonstrate that our algorithm can achieve 213.2%, 98.7 % and 153.9% returns in three different 50-day time frames, which are at least 10% higher than all other comparative strategies, and risk-adjusted profits also prevail them in the most time periods.

119

Analysis and research on the key problems and techniques of chromosome image segmentation and classification based on convolutional neural network

Xinyu FAN (PhD)

SUPERVISORS Lin Zhang

UNIVERSITY/INSTITUTES China University of Mining and Technology / School of Information and control Engineering

Karyotyping is the cytogenetic tool to classify and arrange chromosomes into a image, which can be investigated by cytogeneticists to detect chromosome abnormalities. As the manual karyotyping is work escalated and tedious assignment, automated karyotyping frameworks are favoured for chromosome examination. However, perfect implementation of completely automated framework is a difficult task because of noisy and low contrast input images, clumped or overspread metaphases, touching or overlapped and nonrigidity of chromosomes. The study is to propose a solution based on convolutional neural network for the difficulties and problems existing in the two main stages of chromosome karyotype analysis: segmentation and classification.

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Successive over relaxation recurrent confidence inference network based on linear extrapolation

Yihao XUE (PhD)

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ACADEMY/SCHOOL School of Advanced Technology

It is very important to be able to deduce an unknown conclusion from one or several known premises when solving a logical inference. The existing inference methods or models have certain logical inference abilities. However, because of the diversity of the forms of problems and the complexity of the derivation process, the scope of applying these methods is limited; this means the inference results are not ideal. Therefore, this paper proposes a novel neural network model to solve the logic inference problem found in calculus. By using the successive over relaxation (SOR) method and the principle of recurrent confidence, the recurrent confidence inference network (RCI-Net) is built to solve the inference problem. The network simulates the solving process of the inference problem. Based on the known premise of this problem, it is calculated step by step so that the result of the calculation becomes gradually closer to the answer. At the same time, to make RCI-Net have stronger logical inference ability, this study uses the half mean squared error (HMSE) to construct the loss function of the model, improving the training efficiency of the model and preventing training collapse caused by the loss value exceeding the system's value range. This paper takes Sudoku reasoning problem as an example to carry out experiments. The results show that when the number of prompts of the reasoning problem is 17, the accuracy of the test set model can reach 99.67%, which is 3.07% higher than the existing models. It proves that the algorithm has better effect than the existing methods in solving logical reasoning problems.

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Path-keeping algorithm for USVs based on artificial potential field

Yijie CHU (PhD)

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ACADEMY/SCHOOL School of Advanced Technology

Due to obstacle avoidance and other factors such as wind, water waves, and dynamics of USVs, USVs usually deviate from the original planned path during autonomous navigation. I proposed a novel path-keeping algorithm based on the artificial potential field method (PK-APF) for USVs. To minimize the deviation between the actual path and the original planned path, the vertical distance and the virtual foot points of the current position of USVs to the original path are calculated. When the vertical distance is larger than a threshold, I regard the vertical foot point as a virtual goal point to guide the USVs to navigate the original path in real-time to achieve high-precision path-keeping.

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Easy-to-use multi-camera AR navigation system for needle insertion guidance

Yizhi WEI (PhD)

SUPERVISORS Steven Zhiying Zhou

UNIVERSITY/INSTITUTES NUS (Suzhou) Research Institute / Electronic and Computer Engineering

In this work, we propose an easy-to-use mobile AR needle guidance system based on a multi-camera tablet design. The multi-camera vision system enables a "marker-free" operating experience and requires no additional preoperative calibration steps beyond the first-time setup. We also introduce a multi-camera co-registration system for the surgical operating room. The optimal needle access path is transferred from the scanner to the AR device in an end-to-end fashion and used to guide the surgeon through a novel navigation approach. In AR-based navigation, combined with the tracking of surgical instruments, the surgeon is guided step-by-step to adjust the needle placement for optimal results. We have conducted several phantom studies and clinical experiments. The experiments show that our proposed AR guidance system achieves the clinically required insertion accuracy of less than 5 mm and facilitates needle-based treatments by improving needle placement accuracy, shortening completion time, and reducing radiation exposure.

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A study on radar target detection and classification methodologies

Yu DU (PhD)

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ACADEMY/SCHOOL School of Advanced Technology

For intelligent transportation systems and autonomous driving applications, all-weather sensing ability in traffic participants detection and classification is essential. While radar is known as an all-weather sensor, considering the significant improvement on radar point clouds density, radar is able to act as the major sensor to fullfill the above-mentioned applications. However, reliable classification and detection of objects by radar sensor in real-time have proved to be quite challenging. In this project, major classical and the state of the art approaches are throughout studied, and several potential deep neural network theories have been applied in actual scenario with some fruitful visualized outcomes.

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Radar-based cardiac feature monitoring

Yuanyuan ZHANG (PhD)

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Yi Huang (UoL)
Yutao Yue (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

This project will mainly focus on investigating the advanced algorithms for extracting cardiac features from the received radar signal because contactless cardiac monitoring has vast potential to replace contact-based monitoring in various future scenarios such as in-cabin monitoring.

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Dynamic pricing from sparse data on E-commerce based on deep reinforcement learning

Yuchen LIU (PhD)

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ACADEMY/SCHOOL School of Advanced Technology

This poster presents a framework for addressing dynamic pricing problems on electronic commerce sites based on Deep Reinforcement Learning(DRL). The previous work has mainly focused on the algorithms chosen to improve performance in density data. However, many models do not robustly affect sparse data structure,e.g. low-traffic products, causing the cold-start problem. Through numerical results, this framework provides a novel thought from the reward function's design and combines the clustering of similar products with a pre-trained transfer learning neural network work model to solve this problem. According to this optimization, the performance of sparse predictive data would be improved significantly.

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EEG error-related potentials elicited by user-initiated errors at different levels of game difficulty

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ACADEMY/SCHOOL School of Advanced Technology

Error-related potentials (ErrPs) are electrical brain signals elicited by the perception of errors. This study investigated the influence of task difficulty on ErrPs to explore the modulation mechanism of ErrPs and reference factors for ErrPs' decoding algorithm in the brain-computer interface. The time-domain analysis showed that the highest peak of hard-level ErrPs had a longer latency than easy-level ErrPs, which provided preliminary evidence that the error processing takes more time for a task with higher difficulty levels; the time-frequency analysis showed the difference in the power of α and β bands, which implies the differences in cognitive processes.

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Towards better text-Image consistency in text-to-image generation

Zhaorui TAN (PhD)

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Generating text-consistent high-quality images from texts is essential for visual-language understanding. Albeit its significance, designing better text-image consistency metrics surprisingly remains under-explored in the community. Therefore, we develop a novel CLIP-based metric termed as Semantic Similarity Distance (SSD), which is both theoretically founded from a distributional viewpoint and empirically verified on benchmark datasets. Benefiting from SSD, we further design the Parallel Deep Fusion Generative Adversarial Networks (PDF-GAN), which fuse semantic information at different granularities and capture accurate semantics. Equipped with two novel plug-and-play components: Hard-Negative Sentence Constructor and Semantic Projection, PDF-GAN mitigates inconsistent semantics and bridges the text-image semantic gap.

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Blockchain-based cross-domain access control

Zhi LIN (PhD)

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In large systems, such as the Internet of Things or Internet of Everything, data access across different management domains is frequent. However, most existing access control schemes are domain-specific and based on the trust of management/centralized nodes in specific domains. Thus, they are not suitable for cross-domain scenarios where it is challenging to establish trust across various domains. This research overcomes the challenge of trust through the blockchain technique. It proposes a blockchain-based cross-domain access control framework where a shared ledger of access control policies is maintained by all domains, and thereby the dependence of trusted centralized node is removed.

129

Underwater topography: A review of bathymetric methods and an analysis of the accuracy of underwater maps

Zhuoxiao LI (PhD)

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ACADEMY/SCHOOL School of Advanced Technology

With the development of geographic information system (GIS) technology, a highly accurate model of the terrain for its three dimensional visualization can be generated using measurements from the terrain elevation. Building a high-precision underwater terrain model in the underwater environment is the key to navigation planning, marine resource planning, lake resource planning, port construction, and underwater archaeological projects. However, the existing modeling methods apply to different types underwater terrains. It has not been effectively carried out a comparative analysis of these methods' reliability. The purpose of this paper is to summarize and review the current underwater modeling methods, including the underwater digital elevation data (DEM) acquisition, DEM data interpolation. For different bathymetry and measurement ranges, the performance of single-beam echo sounder (SBES), multi-beam echo sounder (MBES), satellite altimetry (SA), satellite-Derived Bathymetry (SDB), and light detection and ranging (LiDAR) methods are summarized. According to different underwater landforms, the performance of various interpolation algorithms is outlined, and four interpolation algorithms are compared. The applicability, reliability, and accuracy of the modelling methods in different underwater environments are summarized. Finally, the recommendation is made for the three-dimensional visualization of the underwater terrain environment in different regions.

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Evaluating the perceived sense of agency on avatar-mediated game control

Zixuan GUO (PhD)

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Most video games now have avatars in place to explore and act in the game's virtual world. In addition to its locomotion, the avatar often interacts with other manipulable objects to accomplish a game task. We adapt Sense of Agency (SoA) to evaluate the players' perception of avatar-mediated game controls, and start by developing a semantic-based perceptual model of SoA. We then run an experiment in a test game scene, which includes an avatar waiving a tool with varied centers of gravity. We systematically vary the combinations of the tools and animations to see how the SoA is influenced.

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The application of Stackelberg's leadership model for IoT data trading

Ziyang JI (PhD)

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The new era of the internet (aka Web3) has attracted significant attention from both industry and academia since 2021. In Web3, users will be in complete control of their data and thus can profit from the data. Meanwhile, IoT devices owned by Web3 users are anticipated to generate a large volume of data. Through data trading, the data owner can gain a profit, and the value of data will be better exploited. This research studies the problem of trading models for IoT data trading. It applies Stackelberg's leadership model in an IoT data trading scenario to promote optimal profit.

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Teaching under dual-challenge in a foreign land: understanding foreign teachers' professional identity and confidence development via the transformative learning lens

Biying WEN (PhD)

SUPERVISORS Qian Wang, Juming Shen (XJTLU)
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ACADEMY/SCHOOL Academy of Future Education

This study takes the transformative learning lens to gain insights into foreign teachers' identity and professional confidence at a Sino-British university. The biographical narrative interpretive method was used for data collection and analysis. Foreign teachers encountered dual-dimensional challenges during the pandemic: one related to cultural differences and the other caused by delivering teaching online. Foreign teachers' perceptions of their professional identities anchored their behavioral rationales and helped them overcome workplace challenges. This study developed a framework to explain the relationship between teacher identity and professional confidence, which offers theoretical and practical contributions to teacher identity and professional development.

133

Research on undergraduate talent training path of emergency management in colleges and universities based on post competency

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SUPERVISORS Aibin Li

UNIVERSITY/INSTITUTES China University of Mining and Technology / School of public policy and management

Through literature analysis and case analysis, this study systematically combs the talent training of five colleges and universities that currently offer undergraduate majors in emergency management in China. Based on the competency of emergency management posts, It is proposed to formulate talent training objectives that meet the development needs of emergency management, build a curriculum system combining knowledge and practice, and adopt information-based and flexible teaching methods, so as to improve the quality of undergraduate talent training of emergency management in Colleges and universities and promote the high-quality development of emergency management talent team in China.

134

The impact of maternal parenting style on sibling relationship: A transnational study on two-child families of China and the United Kingdom

Huichao BI (PhD)

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This study, through a survey of two-child families in China and the UK, aimed to explore the differences, similarities, and associations between sibling relationships and maternal parenting styles from a transnational point of view. A total number of 107 mothers (UK: N = 55; China: N = 52) with two children were administered through a battery of online questionnaires respectively. Results showed no significant differences in the quality of sibling relationships between the two countries. Conflict and competitive behaviours among siblings greatly outnumbered warmth-related ones for both countries. In terms of maternal parenting style, permissive and authoritarian parenting styles were more dominant in both China and the UK compared with the authoritative style. However, British mothers tend to be more authoritarian than their Chinese counterparts towards both older and younger children. Although significant transnational correlations were found on the associations between maternal parenting style and the quality of sibling relationships, the authoritative parenting style was found to be more conducive to reduce the conflict behaviours between siblings in the UK, while the authoritarian parenting style turned out to be more effective among Chinese mothers. The above findings deepen our understanding of the association of parenting styles with sibling relationships. Implications on parenting practice to improve the quality of sibling relationships are also offered.

135

The role of middle managers in network organizations: A case study in the higher education context

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ACADEMY/SCHOOL Academy of Future Education

Although the hierarchical structure has supported the university's operation for centuries, the social revolution caused by the emerging knowledge economy and disruptive information technologies challenges its effectiveness. Hence, the considerable challenge is how the university can respond to the educational needs of the emerging information society and change its structure to support interdisciplinary education. The construction of network organizations is considered as a response from 21st-century organizations to society's needs and the changing environment. Hence, to investigate the cooperation patterns by analysing middle managers' role in the network organization under the university context, an in-depth case study of organizational structure change was conducted with one Sino-Foreign Cooperative University.

136

The effect of organizational learning on ESG performance: from the HeXie management perspective

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With the concept of ESG (environmental, social, and governance) gradually becoming mainstream, ESG has been widely examined, practiced and popularized in the practical field, and it has aroused the interest of scholars from all over the world. This paper is trying to provide an overall perspective of the relationship between organisational learning and ESG. At present, there are few literature reviews on ESG research. Therefore, this paper pioneers a comprehensive assessment of the relationship between organisational learning and ESG. Combing the qualitative and quantitative research methods in the light of HXMT (HeXie Management Theory), this study also highlights the importance of the effect of organisational learning on ESG, which lies in the overlooked and hidden in the extant studies.

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The role of teachers in university transformation from teaching centred to learning centred: An institutional work perspective

Lin YI (PhD)

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Under the dramatically changing society facilitated by internet and artificial intelligence, global higher education encounters significant challenge regarding paradigm transformation from teaching centred to learning centred. China's higher education reform is considerably a unique case as there is a strong tradition for teacher centred for thousands of years in China. As teachers are key actors in the transformation, it is crucial to understand how Chinese university teachers could break the conventions of Teaching-Centred Paradigm, and approach to Learning-Centred education which suits the present and future trend of the world. Through the lens of institutional work theory, this project adopts a practice-based perspective to investigate how university teachers negotiate and collaborate with multiple actors during this dynamic transforming process, so as to facilitate the paradigm shift. This study contributes to identifying a new form of institutional work, and bridging institutional work to higher education field within Chinese context. The study also aims to provide practical instructions on facilitating Chinese higher education paradigm transformation.

138

The impact of social support on anxiety and depression under the context of COVID-19 pandemic: A scoping review and meta-analysis

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COVID-19 has brought tremendous challenges to people's daily life. As a result, the subsequent changes in the structure of social support has triggered a high risk of mental health. In spite of the increasing number of empirical studies, there is a clear lack of in-depth and holistic review to sum up what has been found about the impact of social support on anxiety and depression. Adopting a scoping review and meta-analytic approach, this study aimed to examine how social support affected depression and anxiety during COVID-19 pandemic from 2020 to 2022.A literature search was conducted systematically in 6 databases of PubMed, Web of Science, PsycINFO, Taylor and Francis, Elsevier Science Direct, and ERIC for the empirical studies on the association of social support with either anxiety or depression published from February 2020 to June 2022. Of 6662 identified studies, 60 studies (53 cross-sectional studies and 7 longitudinal studies or daily-to-daily) were included in the final analysis with a total number of 64693 participants. Random-effects meta-analyses were employed to estimate the pooled prevalence.

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An experimental study on tracking identity of moving shapes: do stimulus complexity and familiarity affects tracking accuracy of male and female students?

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The current study explored effects of stimulus complexity and familiarity on tracking accuracy between male and female postgraduate students in Malaysia. Since online courses are not restricted by location, the convenience of recording classes has become a steady trend especially during the COVID-19 period. However, some are also skeptical about the efficacy of online teaching and learning through the digital environment and believe that the stimulus generated on these foundations will result in undesirable consequences (Dhawan, 2020). As student attention determines their tracking accuracy, external factors like stimulus complexity and familiarity tend to be an obstacle for students to be attentive. In this quantitative experimental study named "Simon Effect", 24 postgraduate students (12 males and 12 females) in a Malaysian public research university were used as samples to test whether or not gender plays a role in tracking accuracy. Results show that gender does not influence tracking accuracy of the postgraduate students. At the same time, the stimulus complexity and familiarity do influence tracking accuracy of the postgraduate students. The implication of the study lies in promoting the teaching and learning sessions not only for a postgraduate student but for all the students in different educational levels during the COVID-19 period and maximizing the educational outcomes.

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Using digital educational escape room for online faculty professional development: an experiential view

Wan MENG (Master)

SUPERVISORS Loretta Teng (XJTLU)

ACADEMY/SCHOOL Academy of Future Education

Digital educational escape rooms (DEERs) have drawn the attention of educators as a new type of learning activity. However, little research has focused on the effectiveness of DEERs in online faculty professional development (OFPD). This study aims to explore faculty participants' experiential learning experiences with a DEER in an OFPD module at a university through Kolb's Experiential Learning Cycle, and the impact of such learning experiences on their educational practices in using education technologies to promote active learning. An explanatory sequential mixed-method research design will be carried out. This study can provide recommendations for future OFPD module design.

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Motivational strategies in EFL classrooms in China: how do teachers impact junior school students' motivation?

Xiao HAN (PhD)

SUPERVISORS Lihua Wang

UNIVERSITY/INSTITUTES Zhejiang University / School of Education

This article studies the relationship between EFL learners' language-learning motivation and their English teacher's motivational strategies in class, grounded in China. Also, related elements are considered to analyze the students' perceptions of MS. To address these questions, mixed methods including quantitative research and qualitative research are adopted. 43 students and an English teacher in a public junior school in China were participated in this investigation.Three instruments were applied as triangulation data, namely, questionnaire, focus group discussions and classroom observation. After correlation analysis and content analysis, a positive relationship is showed between participants' motivation and the English teacher's MS. In addition, gender, academic achievements, attitudes toward English, learning anxiety and social factors influence participants' opinions of MS. The findings in this study highlight the important role of SL or FL instructors' behaviour in class and have some pedagogical implications for classing teaching and practices.

142

Blended-learning affects students' engagement in higher education — a systematic review (2001-2021)

Xuan LI (PhD)

SUPERVISORS Peng Liu, Youmin Xi (XJTLU)
Wiebe Van Der Hoek (UoL)

ACADEMY/SCHOOL Academy of Future Education

Creating a smart learning space where space-time and teaching are deeply integrated, offline and online are combined with reality, and promoting scenario-based, experiential and immersive teaching is the current focus of the transformation and development of higher education. This paper uses PRISMA search to collate the current situation, characteristics and future development trend of the development of integrated education from 2001 to 2021. This is used to analyse the factors that may affect student engagement in different types of learning mode and the differences in the impact of technological tools and teaching methods under blended learning on student engagement.

143

How organizations adopt a structural hybrid unit to engage with alternative institutional logics: A case study of higher education institution

Ye JIANG (PhD)

SUPERVISORS Xiaojun Zhang, Youmin Xi (XJTLU)
Peter Kahn (UoL)

ACADEMY/SCHOOL Academy of Future Education

The ways through which how structural hybrids are created and sustained over time remain scarce. This study conducts an in-depth case study of an International Innovation Hub from 2016–2022 at a higher education institution to see how this hub constructs and manages a structurally distinct unit characterized by alternative multiple logics different from the logic that dominants the remaining organization. The empirical analysis reveals that the construction and management of the structural unit depend on three dynamic tactics over time: (a) constructing structural flexibility, (b) buffering time as resources, and (c) construing innovative image. Further, pluralistic leaders with dual roles to ensure and reassert boundaries between distinct logics. These findings contribute to the heterogeneity and dynamism of organizational responses to a novel type of institutional complexity, and advance the literature by adding time per se as a buffering strategy to manage the structural hybrid unit.

144

Deep culture and Chinese culture teaching from the perspective of deep learning

Yipu WANG (PhD)

SUPERVISORS Hong Bo, Stuart Perrin

UNIVERSITY/INSTITUTES Capital Normal University / School of Arts

Currently, the teaching of Chinese culture is either through Chinese cultural classes, or superficially built into Chinese language classes. My research argues that a deep learning (Shaules, 2007) approach to Chinese cultural teaching better engages students learning and understanding.
By analyzing the connotation and characteristics of deep culture, my research constructs a Chinese (deep) culture teaching mode from the perspective of deep learning. As the pronunciation, form and meaning of Chinese is closely integrated to Chinese culture, my research suggests that a deep learning-based approach to teaching better enables the development of international Chinese language education.

145

Towards exploring and measuring entrepreneurial fear of failure among college students

Yuan GAO (PhD)

SUPERVISORS Jiajun Liu, Bing Chen (XJTLU)
Kirsty Morrin (UoL)

ACADEMY/SCHOOL Academy of Future Education

Entrepreneurial fear of failure (EFoF) is acknowledged as a crucial inhibitor for college student entrepreneurship. However, existing studies failed to systematically deconstruct college students' EFoF to help them correctly confront and overcome the mindset. Following an exploratory sequential design, this study first captures the constituent factors of college students' entrepreneurial fear of failure through interviews and thematic analysis. Based on the inductive results, the research develops a scale to measure college students' entrepreneurial fear of failure. Findings clearly provide a theoretical understanding of the mindset among college students. The assessment kit also gives some practical enlightenment to practitioners in entrepreneurship.

146

The Impact of Home literacy environment on the Reading ability of Chinese migrant children

Yuchen SONG (PhD)

SUPERVISORS Rong Yan, Enggee Lim (XJTLU)
Leonardo De Pascalis (UoL)

ACADEMY/SCHOOL Academy of Future Education

In recent years, an increasing number of studies have been conducted on the relationship between the Home Literacy Environment (HLE) and the reading ability of children in the western world. However, there has been very little research with special attention on Chinese Migrant Children (CMC), whose household structure and family environment would provide a very unique context to further investigate the complicated interactions among different HLE variables and how they are associated with the reading ability of the vulnerable group of children. In addition, the majority of previous studies focus on the relationship between HLE and cognitive aspects of reading ability, very few have examined the impact of HLE on meta-cognitive awareness/competence, e.g. meta comprehension monitoring and control, and how it impacts reading ability, which is another equally significant issue that should not be neglected. In response to the above limitations, the objective of this study is to explore the impact of HLE on the reading ability of CMC from both cognitive and metacognitive aspects of reading ability.

147

Study of postdoctoral job satisfaction from the perspective of JD-R model--based on data from 2020 Nature's Global Postdoctoral Survey

Yue ZHANG (PhD)

SUPERVISORS Xinxing Duan

UNIVERSITY/INSTITUTES China University of Mining and Technology / School of Public Policy and Management

Based on the data from the 2020 Nature Global Postdoctoral Survey, under the theoretical framework of the Job Requirements-Resources model (JD-R), we explore the influence of job characteristics elements on postdoctoral job satisfaction, and found that the attrition path of job requirements negatively influence postdoctoral job satisfaction and the job resources positively influence postdoctoral job satisfaction. The buffer hypothesis and the correspondence hypothesis that job requirements and job resources interact with each other and jointly affect postdoctoral job satisfaction are partially supported. In the buffer hypothesis, only two types of job resources, organizational resources and humanistic feedback, can reduce the negative effect of job requirements on postdoctoral burnout; in the counter hypothesis, only life requirements can enhance the positive effect of job resources on postdoctoral job engagement, so that postdocs feel the highest level of job satisfaction under the combination of high requirements-high resources. The above findings generally support the applicability of the job requirement-resource model in the postdoctoral group and confirm the positive effects of improving university management and optimizing the ratio of job resources to job requirements on postdoctoral job satisfaction.

148

Learning design and role of instructors in development of real-life problem-solving abilities in higher education: problem posing, task sequence, and scaffolding

Zhulin HAN (PhD)

SUPERVISORS Xiaojun Zhang, Youmin Xi (XJTLU)
Maria Limniou (UoL)

ACADEMY/SCHOOL Academy of Future Education

Problem-solving abilities, especially the capability to solve complex real-life problems, are linked to students' career success. The current study explores how various learning activities could allow students to develop their problem-solving ability in a real-life context. Four different combinations of problem-based learning activities were presented to 211 Chinese students. The findings show that the free problem posing process and metacognitive scaffolding has significantly positive influence to students' "wicked" problem-solving performance. This study is leading teachers to reconsider their problem-based scenarios, identifying the optimal learning approach that should be followed by students to assist them to develop their solving skills in real-life "wicked" problems.

149

Channel estimation for millimeter wave cell-free massive MIMO networks

Bowen ZHONG (PhD)

SUPERVISORS Enggee Lim (XJTLU)
Yi Huang, Valerio Selis (UoL)

ACADEMY/SCHOOL School of Advanced Technology

With the increasing Quality of Service (QoS) requirements of future wireless communication networks, a new network architecture, called the cell-free (CF) massive multiple-input multiple-output (MIMO) system, is considered as one of the most promising enablers for future 6G networks. Benefiting from its macro diversity and joint processing, it could provide higher spectral efficiency and energy efficiency compared with the conventional cellular massive MIMO network. However, the accuracy and efficiency of the channel estimation process is vital for its performance and still need to be improved. This project concentrates on the research of channel estimation scheme for CF massive MIMO systems.

150

An integrated approach for fatigue life prediction of adhesive bonded joints

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Yuyuan Zhao (UoL)
Weijian Han, Li Huang (External)

ACADEMY/SCHOOL School of Advanced Technology

Fracture of joints in automobile is a typical failure caused by cyclic loadings. The life prediction of joints through experiments are time and cost consuming. The numerical evaluation of joints including the fatigue and fracture propagation is highly demanded in industry.
In this paper, an integrated approach using the J-integral based on FEA and experimental data is proposed. Different machine learning algorithms are adopted to investigate the life prediction of joints.
The proposed method is validated on test dataset and part level physical tests with complex loading states for an unbiased evaluation. It demonstrates that for life prediction of adhesive joints the integrated solutions can constitute an improvement over conventional solutions.

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Stress-field driven conformal lattice design using circle packing algorithm

Fuyuan LIU (PhD)

SUPERVISORS Min Chen, Konstantinos Papadikis (XJTLU)
Yuyuan Zhao (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Aided by additive manufacturing (AM), lattice material has become a potential candidate for a high stiffness-to-weight ratio design. This research proposed an integrative structure optimization strategy to design, evaluate and manufacture high-stiffness structures with strut-based lattices. The method can generate conformal functional gradient lattice structures within arbitrary 2.5D spaces using a sphere packing algorithm driven by the stress field. Lattice size changes along with the stress intensity. All sphere centers are connected into strut-based lattices based on multiple linking means, including the Voronoi and Delaunay triangular patterns. By three points bending experiments, the proposed method significantly improves structure stiffness in contrast with a uniform material infilling of body-center cubic(BCC) lattice and Topology Optimization (TOPO).

152

An interleaved three port DC-DC-AC converter based on DAB topology

Guangyu WANG (PhD)

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Yong Yang (External)

ACADEMY/SCHOOL School of Advanced Technology

A new three port converter (TPC) is proposed that interfaces two DC voltage sources of different magnitude and an output AC port in single stage. The proposed converter is primarily based on dual active bridge topology where, the secondary bridge is composed of four quadrant bidirectional switches which allows it to be directly connected to an AC port. The primary bridge can also be used as an interleaved bidirectional boost converter by connecting two inductors across the transformer primary, which forms an additional input DC port.

153

Demand-oriented design and control strategy of power converter for electric vehicle

Haochen SHI (PhD)

SUPERVISORS Chun Gan

UNIVERSITY/INSTITUTES Huazhong University of Science and Technology / School of Electrical and Electronic Engineering

With the rapid development of transportation electrification, the electrical drive technique is adapted on multiple electrical vehicles such as passenger, commercial and engineering vehicles. However, the different application leads to various performance index and optimization objectives. Therefore, this paper proposes a demand-Oriented hardware and control strategy optimization, which can ensure the optimized performance of the target application. By modelling t the loss, weight, volume, reliability, cost. R&D cycle of the electrical drive system, six dimensions evaluation framework is established. On this basis, the multiple objective optimization design method and customized high performance control schemes is proposed.

154

An auto-encoder based visual odometry for dynamic outdoor environment

Haocheng ZHAO (PhD)

SUPERVISORS Limin Yu (XJTLU)
Junqing Zhang (UoL)
Yutao Yue (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

As the most basic and important part of traditional visual SLAM application, visual odometer has made good achievements in static environment modeling, but still faces great challenges in dynamic environment. Trees swaying, people walking, and vehicles waiting for traffic lights are increasing the error value. Auto-encoder, with its powerful feature extraction ability, can classify image features efficiently and help the detection of dynamic object. This project utilize the auto-encoder network to detect the different features between continuous frames, and then applies the results to the training of visual odometry network. The results show that the pre-trained network and odometry network can achieve great results in the KITTI dataset.

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Cross-frame deep energy loss for weakly supervised video salient object detection

Jian WANG (PhD)

SUPERVISORS Enggee Lim, Jimin Xiao (XJTLU)
Angel Garcia Fernandez (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Video salient object detection (VSOD) aims to segment the most distinguishable object or region from the complex external environment in a short video. Current existing methods acquire excellent performance in this task, however, they ignore the direct connection of optical flow and only leverage static shallow features(color, spatial information), which limits its final performance since such static shallow features may fail to describe pair-wise pixel relationship in complicated cases. In this paper, we propose a metod to propagate the labels from limited scribble annotations to other pixels by calculating energy cross frames using optical flow as bridge, which utilizes both shallow and deep features. What's more, to guarantee the features correctly represent the relationships of pixels, we use a frame regularized loss to help it. To erase the noise introduced by optical flow, we use cnsistency between current frame and generated frame. Extensive experiments show that our approach achieves new state-of-the-art performances, outperforming previous approach by a significant margin with more than 6\% increase in F.

156

Active planning for self-sufficient and cohesive virtual microgrid

Lechuan PIAO (PhD)

SUPERVISORS Fei Xue, Shaofeng Lu (XJTLU)
Lin Jiang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

In this research, the notion of cohesive and self-sufficient grid is proposed. Based on cohesive and self-sufficient Virtual Microgrid, Active Distribution Network is optimally planned, and an optimal configuration of distributed generations and energy storage systems are generated. To cope with stochastic uncertainty from forecast error in wind speed and load, flexibility reserves and uncertainty are quantified and integrated in an innovative index which is defined as cohesion. After testing the optimal configuration in the PG&E 69 bus system, it is found that with a more cohesive VM partition, the self-sufficiency of VMs is also increased.

157

Large-signal stability analysis of boundary control for dual active bridge DC/DC converters under constant power load

Peichao XU (PhD)

SUPERVISORS Huiqing Wen, Jieming Ma (XJTLU)
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ACADEMY/SCHOOL School of Advanced Technology

Different from the resistive load, constant power load (CPL) may make the dual-active-bridge isolated bidirectional dc-dc converter (DAB) unstable. Thus, in addition to less overshoot and shorter setting time, the controller applied in DAB converters should maintain the system stable. This paper proposes an advanced boundary control strategy for a DAB converter under CPL. The analysis provides insight into the dynamics of the DAB converter with CPL under four switching states. It creates a standard theoretical analysis process in the common converter topologies. On this basis, the sufficient condition with respect to the large signal stability of the closed-loop system is specified. Experimental results show that the boundary control strategy has excellent dynamic and static performance compared to the traditional phase-shift control (single-phase shift). In addition, the boundary control strategy can reduce transient start-up time by 50% and speed up output voltage reference change transients time by over 30% compared to the traditional phase-shift control.

158

Optimal power allocation for integrated visible light positioning and communication system with a single LED-lamp

Ruixin Yang (PhD)

SUPERVISORS Shiyin Li

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

We investigate an integrated visible light positioning and communication (VLPC) system with a single LED-lamp. First, Because the VLC channel model is a function of the receiver's location, we propose a scheme to estimates the channel state information (CSI) with the positioning information Second, we derive the Cramer-Rao lower bound (CRLB) of the positioning error and an achievable rate with on-off keying modulation. Third, a robust power allocation scheme is proposed to minimize the CRLB, while satisfying the rate outage probability constraint, which can be tackled by the worst-case Conditional Value-at-Risk (CVaR) and the block coordinate descent (BCD) methods.

159

Towards the fast and generic quasi-dynamic energy flow calculation of the integrated electric and heating networks

Shuai YAO (PhD)

SUPERVISORS Wei Gu

UNIVERSITY/INSTITUTES Southeast University / School of Electrical Engineering

Energy flow analysis is a fundamental tool to determine the network states of the integrated energy systems. This paper develops a code package (named as MATHN) for generalized energy flow analysis of the quality-regulated heating network. Based on it, a generic solution framework that leverages MATPOWER and MATHN to realize decomposed energy flow calculation of the power grid and heating network is further proposed. Case studies on 3 different scales of test systems demonstrate the generality, efficiency and accuracy of the developed code package and solution framework. The MATHN is also made open-sourced for non-commercial use.

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Energy-efficient message bundling with delay and synchronization constraints in wireless sensor networks

Sihao LI (PhD)

SUPERVISORS Kyeongsoo Kim (XJTLU)
Jeremy Smith (UoL)

ACADEMY/SCHOOL School of Advanced Technology

In a wireless sensor network, reducing the energy consumption of battery-powered sensor nodes is key to extending their operating duration before battery replacement is required. Message bundling can save on energy consumption by reducing the number of message transmissions. However, bundling messages could increase the end-to-end delays, message transmission intervals, and packet error rate. To address these issues, we proposed a message bundling scheme, which also considers the effects of packet retransmissions and thereby strikes the optimal balance between the number of bundled messages and the number of retransmissions given a link quality.

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Automatic paper-based microfluidic platform

Sixuan DUAN (PhD)

SUPERVISORS Pengfei Song, Kaizhu Huang, Yujia Zhai (XJTLU)
Kai Hoettges (UoL)

ACADEMY/SCHOOL School of Advanced Technology

This paper reports a deep learning-assisted paper-based microfluidic (μPAD) platform for early screening of Alzheimer's disease (AD). It features a highly integrated on-chip rotary microvalve that enables fully automated colorimetric enzyme-linked immunosorbent assays (c-ELISA). At the same time, the image of the analytical results is captured by smartphone and can be accurately classified/predicted using deep learning algorithms. Finally, we also performed validation experiments on the platform using AD clinical patient samples. The results show that our platform can further improve the performance of μPAD and is expected to facilitate the diffusion of early screening for AD in low-resource settings.

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Scheduling optimisation and coordination with target tracking algorithm under heterogeneous network in Automated Guided Vehicles (AGVs)

Tongpo ZHANG (PhD)

SUPERVISORS Limin Yu, Enggee Lim, Fei Ma (XJTLU)
Xu Zhu (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The problems this project wants to solve are a visual tracking algorithm application in a AGV system, AGVs' scheduling optimization and coordination and a network selection algorithm applied in a AGV system under heterogeneous network environment. AGVs' scheduling optimization and coordination will be realized by simulations. A visual interface will be created. Essential rules to improve AGVs' scheduling and coordination will be considered. Data collected from the designed visual tracking Algorithm's application, the designed network selection algorithm's application and the heterogenous network environment will also be contained.

163

Enhancement-mode GaN p-channel transistors with n-cap layer

Weisheng WANG (PhD)

SUPERVISORS Wen Liu, Huiqing Wen, Sang Lam (XJTLU)
Joseph Yan (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The enhancement mode (E-mode) GaN-based p-channel heterostructure field-effect transistor (p-HFET) is one of the key components for monolithic integration of GaN-based high electron mobility transistors (HEMTs). The p-HFET with n-cap and optimized ohmic contact is a solution for avoiding the harmful effect of inductive coupled plasma etch at the gate region, which will significantly reduce the on-current. This poster demonstrates the optimized ohmic contact results and the fabrication process of the p-HFET.

164

Micropattern embossing: a facile process for microchannel fabrication on nanocellulose-paper-based microfluidics

Wenwen YUAN (PhD)

SUPERVISORS Pengfei Song, Enggee Lim (XJTLU)
Ivona Mitrovic (UoL)

ACADEMY/SCHOOL School of Advanced Technology

This paper reports a facile process for fabricating microchannels on nanocellulose-paper (nanopaper), which is one of the most promising substrate materials for paper microfluidic devices, thanks to its ultrasmooth surface, optical transparency, and tunable chemical properties. Unlike the existing methods that use customized 3D printing or manual cutting and sticking, our approach leveraged the simple operations of hot embossing with the convenient plastic micro-molds, for the first time, patterning microchannel on nanopaper downing to 200 ④m (4 times improvement compared to existing methods) in a rapid manner (< 45 minutes).

165

Deformation behavior of a bi-layered bronze/steel sheet: synergetic effects of microstructure and residual stress

Xingrui JIANG (PhD)

SUPERVISORS Min Chen (XJTLU)
Yuyuan Zhao (UoL)
Guohua Fan (JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

Bi-layered Cu-Pb-Sn bronze/steel sheets serving as raw material for load-bearing shells require urgent upgrading of mechanical properties for service safety. This study investigated the mechanical properties and deformation behaviors of a bi-layered Cu-Pb-Sn bronze/steel sheet prepared by solid-liquid continuous casting (SLC). The samples were identified by two types of bronze microstructures: homogeneous and segregated Pb phase distributions, denoted as HP and SP, respectively. These samples were tested for their tensile properties and residual stress. We found that the yield strength and fracture elongation of SP are higher than those of HP, contrary to the general understanding that Pb phase segregation will degrade the mechanical properties of Cu-Pb-Sn alloys. Characterization of the fractures and residual stress results suggest that the increase in SP yield strength is attributed to the higher required shear stress for yielding induced by the residual stress state. The higher fracture elongation originates from the formation of multiple cracks that accommodate the bi-layered structure's deformation incompatibility.

166

Weight-guided loss for long-tailed object detection and instance segmentation

Xinqiao ZHAO (PhD)

SUPERVISORS Jimin Xiao (XJTLU)
Waleed Al Nuaimy (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The long-tailed characteristic leads to a significant performance drop for various models on long-tailed distribution datasets. Existing works mainly focus on mitigating the data shortage in tail classes at dataset level by data re-sampling, loss re-weighting or knowledge transfer from head to tail. While in this paper, we focus on another perspective which is also related to the performance drop: the gap between total dataset class number and training batch size. To address this issue, we propose a Weight-Guided (WG) loss which utilizes the classifier weights as auxiliary tail samples. It can be easily deployed to different models. By simply adding WG loss to Mask R-CNN with ResNet-50 backbone, we improve the performance by (i) 0.5 box AP and 0.4 mask AP on COCO dataset, (ii) 0.4 box and mask AP (1.8 mask AP for rare classes) on LVIS v1.0 dataset. Codes will be released.

167

Transient DC bias suppression with rapid power reversing for EPS whole voltage range in dual active bridge DC-DC converter

Xu HAN (PhD)

SUPERVISORS Huiqing Wen, Wen Liu (XJTLU)
Jiafeng Zhou (UoL)
Yong Yang (External)

ACADEMY/SCHOOL School of Advanced Technology

Dual active bridge (DAB) bidirectional DC-DC converter has been widely applied in vehicle-grid applications for the features of bidirectional power flow, galvanic isolation, soft switching, high power density, better efficiency and so on. Due to the presence of DC bias in a dual active bridge (DAB) DC-DC converter when the load changes, particularly when the power is reversed, the asymmetric current waveform of the inductor current generates high current stress, which can cause damage to the high-frequency transformer (HFT) and switch tubes. Conventional control schemes rely on the single-phase-shift (SPS) modulation method to reduce dc variation while ignoring limitations SPS control strategy, such as excessive backflow and a limited zero-voltage-switch range. A novel extend-phase-shift (EPS) dc bias suppression strategy based on piecewise linear transient phase-shift optimization is presented when power is fast reversed. This work illustrates all kinds of EPS reversal power situations and experimental results indicate dc deviation generated during transient power reverse stage can be well eliminated with all switches ZVS in all load condition without any add snubbers.

168

Study of drain-current collapse in AlGaN/GaN MIS-HEMTs with different gate lengths

Ye LIANG (PhD)

SUPERVISORS Wen Liu, Huiqing Wen, Yinchao Zhao (XJTLU)
Joseph Yan (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Currently, the current collapse phenomenon in normally-on GaN MIS-HEMTs with different gate lengths has not been thoroughly investigated. In this work, three DUTs of the same size with different gate lengths of 3/6/8 μm were chosen to study current collapse during off-/on-state stress. It is found that current collapse is suppressed under on-state stress due to the formation of de-trapping paths. Current collapse is severe at high-drain off-state stress due to activated traps in the AlGaN barrier layer. Moreover, the current collapse is more severe with decreasing gate lengths, which means more interface traps are exposed to the access region.

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Benchmarking robustness of radar micro-doppler classification under corruptions

Yi ZHOU (PhD)

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Xu Zhu (UoL)
Yutao Yue(JITRI: Jiangsu Industrial Technology Research Institute)

ACADEMY/SCHOOL School of Advanced Technology

Neural networks are popular for classifying radar micro-Doppler spectrograms, but the robustness of these models is not well tested. In this work, we design a set of high-fidelity corruptions applied to three public radar datasets. We unify the signal processing pipeline for a fair comparison. Both CNN-like spatial models and sequential models are considered. Corruptions are applied to frequency dimension and time dimension to test their performance. The results show that CNN-based and CNN-LSTM-based architectures are sensitive to temporal corruptions and pattern corruptions, respectively. We further test transfer learning and data augmentation techniques to improve robustness.

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Alignment multi-modal feature using representation codebook in panoptic narrative grounding task

Yiming LIN (PhD)

SUPERVISORS Xiaobo Jin (XJTLU)
Yi Huang (UoL)
Kaizhu Huang (DKU: Duke Kunshan University)

ACADEMY/SCHOOL School of Advanced Technology

Panoptic Narrative Grounding is an emerging task in Visual grounding literature. Given an image-caption pair, the goal is to produce a panoptic segmentation that grounds the visual objects that occurred in the caption as noun phrases. The core challenge for the PNG task is to align signals from different modalities. As images and text often lie in different regions of the feature space, directly aligning them at the instance level can be challenging. Inspired by recent work in multi-modal self-supervised learning, we introduce an additional alignment loss based on cluster representation to align the Intermediate image-text feature. Specifically, we encode image and text features into a joint visual-linguistic coding space spanned by a clustering-centered lexicon (codebook). We contrast positive and negative samples via their cluster assignments while simultaneously optimizing the cluster centers. We evaluated our approach on the Panoptic Narrative Grounding dataset; The main poster presented the detailed experiment, results, and visualizations.

171

K-means clustering oriented autonomous structure from motion in 3D reconstruction

Yuchen WANG (PhD)

SUPERVISORS Xinheng Wang (XJTLU)
Junqing Zhang (UoL)

ACADEMY/SCHOOL School of Advanced Technology

Structure from motion has long been an important approach to 3D reconstruction. Conventionally, empirical human efforts completely oriented image captures in structure from motion. In the emerging era of smart manufacturing, structure from motion must transform into an autonomous manner to enhance manufacturing adaptiveness and flexibility. This research project aims to innovatively automate structure from motion via a K-means clustering oriented framework. In a single view, K-means clustering will automate camera placements by finding area with the most unknown information. In spatial space, K-means clustering will determine the next will to reconstruct with the most vacuum space.

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Multi-output gaussian process based indoor localization data augmentation

Zhe TANG (PhD)

SUPERVISORS Kyeongsoo Kim (XJTLU)
Jeremy Smith (UoL)

ACADEMY/SCHOOL School of Advanced Technology

The main work in the first year revolved around the indoor localization database. Existing public indoor localization databases suffered from problems such as uneven spatial distribution of samples, temporary emergence of access points (APs) not considered and limited measurement coverage. To address these issues, we proposed a data augmentation algorithm based on a Multi-Output Gaussian Process (MOGP). We further generated data augmentation by building, by neighbour-floor, and by floor three branches based on differences in building structure. The augmented data can significantly improve the spatial distribution density of reference points and improve the location estimates accuracy.In particular, for the first time, data augmentation ratios were proposed to control indoor localization data augmentation within a reasonable range.

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Fault diagnosis of sun gear based on angle-domain windowed synchronous average

Zhile Wang (PhD)

SUPERVISORS Jianhua Yang

ACADEMY/SCHOOL China University of Mining and Technology /
School of Mechatronic Engineering

Planetary gearboxes are widely used in electric motors. In the wind turbine, its main function is to transmit the power generated by the wind wheel under the action of wind to the generator and make it get the corresponding speed. Due to non-stationary, modulation, and complex transmission paths, the observed fault vibration of sun gear is more difficult to analyze. Consequently, the windowed synchronous average in angle domain has been studied for sun gear tooth root crack faults diagnosis. Tests were conducted to verify the validity of the proposed method.

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The research of high-quality Ag-Based ohmic contacts on p-Gan/AlGaN/GaN/Si platform

Zhiwei SUN (PhD)

SUPERVISORS Wen Liu, Yinchao Zhao, Sang Lam (XJTLU)
Harm Van Zalinge (UoL)

ACADEMY/SCHOOL School of Advanced Technology

In this work, we have researched high-quality Ag-based ohmic contacts on p-gan/AlGaN/Gan/Si platform. After ohmic optimization, a low contact resistance and good surface topography are achieved. In addition, the carrier transport mechanism of Ni/Ag is also investigated.

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What leads to a drastic emotional change in Chinese EFL teachers in their classroom episodes?

Aihui WU (PhD)

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ACADEMY/SCHOOL School of Humanities and Social Sciences

Emotion is relational and it needs to be examined in contexts. The present study investigated the causes for a drastic change in emotional state of Chinese EFL teachers in classroom episodes. A total of 596 participants filled out the online questionnaires consisting of open and closed questions. Feedback on the episodes eliciting emotional changes was coded in three categories as the primary causes: (1) Teacher-Self, (2) Teacher-Self-Others, and (3) Others. The category 'Others' was most conducive to emotional changes in Chinese EFL teachers. Statistical analyses revealed that the elicited emotional change was also associated with teachers' occupational status and institutional status.

Keywords: contexts; episodes; change in emotional state; occupational status; institutional status

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How are pandemic-related issues framed in "fake news" ? A content analysis of Covid-19-related misinformation in China

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This paper investigates how pandemic-related issues are framed in "fake news". Specifically, it will provide a typology of Covid-19-related misinformation, investigate the generic and issue-specific frames used in its content and explore the connection between the types of Covid misinformation and news frames. Data of the study include the Covid-19 related misinformation archived in major fact-checking platforms in China. The results of the study contribute to a better understanding of how frames typically found in traditional news reporting apply in the context of fake news and whether the existing framework of news framing can be reinforced or extended.

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A corpus-based study of the translation of Chinese classic quotations in political discourse

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The purpose of this study is to explore the professional translators' cognitive processing of the quotations from Chinese Classics in political discourse so as to arouse sentimentality among the target readers. The research question is: How are quotations from Chinese Classics in Chinese political texts processed and translated? By applying theory of coercive inheritance and a corpus-based analysis, the current study reveals that while inheritance of the meaning remains is predominant in this field of translation, coercion is frequently found at semantic, syntactic and contextual levels.

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Exploring the cultural differences in the localisation process of translating role- playing games in the Chinese context

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The research explores how localisation is used in translating role-play game (RPG) under the Chinese context. Aiming at practically addressing all aspects of localisation, the research features RPG as
examples and case studies across a range of syntax, pragmatics and texts, by answering a set of questions in practices for players. Translating RPG is essential for professional translators and researchers on translation studies in video game localisation. As for the reason and the impact of this trend on translation practice and translation research, it is worth exploring in depth.The central question this research asks is how cultural factors influence the localisation process of translating RPG in China.

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Historiography, and Ann Radcliffe's 'The Romance of the Forest'

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Ann Radcliffe's third novel, The Romance of the Forest, offers an opportunity to rethink historiography. It brings together two escape plots, which intersect at a ruined abbey. This site is an unnerving composition of histories and ideas. Some critics have considered the ways time is managed in the narrative, but their focus is on linearity. This paper draws on the work of Eelco Runia on 'presence' to consider the ways Radcliffe constructed a gothic environment of 'discontinuous' and layered temporalities.

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Digital game-based learning's effectiveness on EFL learners' receptive and productive vocabulary knowledge

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ACADEMY/SCHOOL School of Humanities and Social Sciences

Although digital game-based vocabulary learning (DGBVL) has received increasing attention in the past two decades, the impacts of DGBVL on the depth of word knowledge are still not well understood, especially in regards to productive vocabulary learning and DGBVL's long-term efficacy. This study leverages a quasi-experimental research design to investigate DGBVL's long-term effects on receptive vocabulary (RV) and productive vocabulary (PV). Forty-eight Chinese English-as-a-foreign-language (EFL) university students, assigned to the experimental and control groups, were instructed by a DGBVL approach and PowerPoint (PPT) lecturing, respectively, over the course of 18 weeks. Specifically, a mixed 2×2 repeated measures experimental design was conducted by adopting instruction type (DGBVL and PPT lecturing) and testing time (pretest and posttest) as the independent variables, with RV and PV proficiency as the respective dependent variables. The results suggest that instruction type and teaching time have significant effects on participants' RV and PV learning achievements. However, teaching time's effect size outweighs instruction type. The findings are highly encouraging for the use of DGBVL in the EFL classroom, as it may serve as an effective and long-lasting pedagogical tool within this context.

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Japanese brands and consumer culture positioning strategies in China: Investigating 756 advertisements from 6 leading Japanese cosmetics companies on Sina Weibo

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Consumer culture is deemed as a promising framework for the understanding of international advertising. However, little is known with respect to what specific cultural symbols and how advertising executional elements are used to implement consumer culture positioning (CCP) strategies. This study examines six leading Japanese cosmetic brands' CCP strategies in their cross-cultural advertisements in China. 756 video-format ads were collected from these brands' official accounts on Sina Weibo and in an ensuing content analysis I examined how Chinese, Japanese, and non-East Asian cultural symbols/elements were used to communicate CCP strategies. The results document such strategies in cross-cultural advertising practices, offering insight into what modalities of ad communication can be effectively employed in the framework of CCP for cosmetics
advertising in China.

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Learners' processing of oral corrective feedback in the EFL classrooms: things beyond the final language product

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Nektaria Kourtali (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

This study investigates how Chinese secondary EFL learners process the teacher's oral correction in the classroom. By adopting the classroom observation, stimulated recall interview and the individualized post-test, this multiple-case research captures students' follow-up behaviours and thinking from multiple avenues. Sampling from seven students, the initial findings show that students' process the classroom correction is intertwined with both their internal cognitive mind and the external artefacts, which involves both their verbal, para-lingual and non-verbal reactions. Considering the data collection is still going on, this presentation will demonstrate some initial findings from two participant cases derived from the entire project.

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Comparing metaphors behind social media posts containing ‘COVID-19’ during its early stage in China and UK: Using Weibo and Twitter as examples

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ACADEMY/SCHOOL School of Humanities and Social Sciences

During COVID-19 pandemic, lockdown and social distance policies stimulated internet users to express themselves on social media, where metaphors were widely used and significantly influenced their understanding of, and responses to, COVID-19. How people conceptualize and react to COVID-19 can be represented by their online discourse diachronically. However, no diachronic study compares COVID-19 related metaphors on social media between China vs UK. This study will compare the use of metaphors to ‘COVID-19’ behind institutional social media posts and their comments on Sina Weibo vs those on Twitter. Metaphor identification procedure, critical metaphor analysis and semantic network analysis will be used.

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Where is the missing humour? Translating chinese humor into english subtitle: a semiotic perspective

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ACADEMY/SCHOOL School of Humanities and Social Sciences

Commercial films constantly incorporate plentiful humour elements to amuse audience and enrich overall emotional reactions. Nevertheless, humour is frequently discounted when translated into target languages. This study will use SFL-based Multimodal Social Semiotics (Kress &Van Leeuwen, 1996) and the General Theory of Verbal Humor (Raskin & Attardo, 1991) to explore humour translation and verify how to improve the effectiveness of humour transferring. To this end, a case study of the Chinese high box-office film, Hi, Billionaire (《西虹市首富》) is presented and analyzed from a semiotic perspective.

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Cultural imagination of the other: Chinese women in Hollywood cinema

Yao CHENG (PhD)

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Sarah Thomas (UoL)

ACADEMY/SCHOOL School of Humanities and Social Sciences

By applying textual analysis, this paper examines Anna May Wong’s star image as it developed between the 1920s-1940s and offers alternative reads on the identity of Wong from an intersectional perspective involving gender, race, ethnicity, and class. This research argues that influenced by the racism in Hollywood and American society in general, Wong experienced a cultural and identity split. Being a star, a Chinese American, and a woman allowed her to act out the specific ideas toward Chinese in American society and made her a symbol of Chinese and Chinese culture, which was quite different from her own understanding. However, her contradictory experience in Hollywood made her a unique star not only in Hollywood but global film industry.

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Being Chinese online – discursive (re)production of Internet-mediated Chinese national identity

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School of Social and Political Science

My research assesses how Chinese national identity is discursively (re)generated by various socio-political actors (especially ordinary users) on China’s Internet. I adopt an ethnographic methodology. ‘Fieldsites’: Sina Weibo; bilibili. Methods: virtual ethnographic observations; online in-depth interviews; critical discourse analysis. Initial findings: I found multifarious national(ist) discourses on both ‘fieldsites’; users have agency in interpreting and deploying concrete national (ist) discourses despite the leading role played by the government and two platforms in deciding on the basic framework of national expressions; national(ist) discourses’(re)production process on both sites depends upon both their technical affordances and some established socio-political mechanisms in offline China.

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Systematic literature review on cinematic virtual reality

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Cheng-Hung Lo (External)

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The research and studies into Cinematic narrative for VR have widely been discussed in production techniques and human factor perspectives, focusing on human performance in a virtual environment based on CGI or panoramic video. However, such human performance-oriented cinematic virtual reality studies may not fully explain the transmission difference or emotional aspects of immersive experiences, especially when those aspects are deemed as the critical and fundamental factors in visual storytelling such as VR film and 360-degree video production or other narrated experiences. This paper presents a literature review on current cinematic Virtual Reality studies on audience experience analysis.

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Effect of canopy geometry and branch density and flexibility on PM1 dry deposition velocity under different wind conditions

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James Cooper (UoL)

ACADEMY/SCHOOL School of Science

PM1 has more adverse effect on human health than larger particles. Plants can significantly remove atmospheric particles through interception and impaction, especially under strong wind conditions. However, relatively less is known on the effect of canopy geometry and branch density on PM1 dry deposition under windy conditions as they also vary with changing wind speeds. Plants with different canopy structures and branch flexibility were deployed individually in a mini wind tunnel and dry deposition velocities for wind conditions were measured. Our results show that various canopy structure and density results in different correlation with increased wind speed.

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Develop spatial disturbance model to explain vegetation dynamic in Qinghai-Tibetan Plateau

Dan LI (PhD)

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Kate Parr (UoL)

ACADEMY/SCHOOL School of Science

The PhD project aim to analyze the regime shift of the grassland degradation on the Qinghai-Tibet Plateau, clarify the feedback mechanism in different stages of the degradation, and identify the space-temporary threshold of the formation of the black soil.

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Greenhouse gases emission and leaf litter-derived dissolved organic matter across the soil-water interfaces

Hao LIU (PhD)

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Roy Goodacre (UoL)

ACADEMY/SCHOOL School of Science

The soil-water interfaces are hotspots of biogeochemical cycling due to the associated sharp environmental gradients. Much evidences showed that the the speciation and concentration of redox-sensitive elements vary significantly as well as the structures of active microbial community over a depth of several centimeters across the soil-water interfaces. However, whether similar variation occurs for organic matters remains unknown. In this work, we would like to study how the location of leaf litter influences the greenhouse gas emission across the soil-water interfaces as well as the varying water. To achieve this, we made some efforts in developing an automated methodology and attempt to couple it with the Integrated Porewater Injection sampler.

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A possible mechanism for selenium hyperaccumulation: Selenium-induced recruitment of specific rhizobiome and endophytes in Cardamine hupingshanensis

Huawei ZANG (PhD)

SUPERVISORS Renbin Zhu

UNIVERSITY/INSTITUTES University of Science and Technology of China / School of Earth and Space Sciences

The roles of rhizobiome or endophytes in Se hyperaccumulation in C. hupingshanensis have yet to be explored. In this study, an in-situ-like pot experiment was carried out to investigate the roles of rhizobacteria and endophyte on Se transportation and transformation from soil to plant. Our results showed that, some low-abundance bacteria likely contributed to the increased level of bioavailable Se in the rhizosphere; Plant endophytes may be recruited from rhizobiome, and then played important roles in the transformation of inorganic Se into SeCys2 in plant tissues, especially during the flowering stage.x

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The adaptive management of the Tibetan pastoral social-ecological system facing the challenge of grassland degradation

Huxuan DAI (PhD)

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Mark Riley (UoL)

ACADEMY/SCHOOL School of Science

Grassland degradation on the Qinghai-Tibetan Plateau (QTP) has got increasing ecological concern and restoration investment. From the social¬ – ecological system perspective, the engagement of the local community underlines the success of top-down implemented ecosystem restoration programs. However, in practice, novel scientific restoration approaches can hardly be adopted by the locals, especially when they contradict the local cultural context. This research explores the social learning process during QTP grassland restoration with varied levels of community engagement. We used questionnaire survey and in-depth interviews to reveal the action barriers related to local worldview, value and knowledge system, and institutions. The results will facilitate the development of community-inclusive ecological restoration policies for the QTP region.

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Does eradicating plateau zokor increase grassland productivity for livestock?

Jiahuan NIU (PhD)

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Kate Parr (UoL)

ACADEMY/SCHOOL School of Science

I studied if there is competition for food between a small burrowing rodent, plateau zokor, and yak, the main livestock on the Qinghai-Tibetan Plateau. Both rely on vegetation for food, however they differ in diet, yak prefers tall grasses whereas zokors mainly forage belowground for forbs. Thus, because foraging is either above-or belowground and yaks and zokors consume different plant species, competition for food is much less than is widely assumed. Zokors may also induce a vegetation shift towards grasses, which increases forage for livestock. However, zokors do cause soil disturbance that lowers the total vegetation cover.

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Elimination and recovery of Hg2+, Pb2+, Cu2+, and Cd2+ metal ions from contaminated water with PAN-S functionalized melamine sponge

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Mercury, lead, and cadmium are among the most toxic and carcinogenic heavy metal ions (HMIs), posing serious threats to the sustainability of aquatic ecosystems and public health. There is an urgent need to remove these ions from drinking water by a cheap but green process. Traditional methods have insufficient removal efficiency and reusability. Structurally robust, large surface-area adsorbents functionalized with high-selectivity affinity groups to HMIs are attractive filter materials. In purpose of the further utilization of adsorption technique in metal ions remove and recovery from wastewater, this study developed a new type adsorbent of polyacrylonitrile-sulfur (PAN-S), a sulfur contained polymer and explored its metal ions adsorption properties, suitable adsorption schema, and metal recovery method.

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Experimental study of both the CO2 geo-sequestrated characteristics and methane production-enhanced mechanism on bituminous coal

Jinghua LI (PhD)

SUPERVISORS Guichen Li

UNIVERSITY/INSTITUTES China University of Mining and Technology / School of Mines

The CO2 geology-sequestrated characteristics and CH4 production-enhanced mechanism in CO2 Injected for Enhanced Coalbed Methane Recovery (CO2-ECBM) technique were studied. The two basic physical-chemical effects of CO2 over coal that stripping effect and displaced effect were characterized by a novel experiment. The results shows:
1) The efficiency of CO2 adsorbed-sequestration is in exponential decaying, and CO2 injected actuates the stratum instability potentially.
2) There is a three-stage relationship between two basic effects, and the displaced behaviour contains displaced-adsorption and pressure-gradient.
3) Soak at the right time can improve the CH4 produced capacity and relieve the instability tendency to some degree.

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Prediction and zoning of the impact of underground coal mining on groundwater resources

Liangning Li (PhD)

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UNIVERSITY/INSTITUTES China University of Mining and Technology / School of Resources and Geosciences

With the depletion of coal resources in eastern China, the focus of coal mining has shifted to the arid and semiarid regions of northwest China, where five major coal bases have been established, including the Ningdong base inNingxia Province. These coal bases account for twothirds of the country's coal reserves and only 3.9% of the country's water resources, which are in short supply. However, the exploitation of underground coal resources changes the strata and may result in the loss of groundwater resources. Therefore, it is necessary to predict the effects of coal mining on groundwater resources before mining coal resources in these areas to provide a basis for the sustainable development of groundwater and coal natural resources in northwest China.

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The verification of land cover datasets with the Geo-Tagged natural scene images

Liu CUI (PhD)

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Land cover is important for global change studies, and its accuracy and reliability are usually verified by field sampling, which costs a lot. In this study, a framework was developed to improve the efficiency of land cover map verification by using the NSIC-Inception model to recognize images and directly evaluate the accuracy of land cover maps using a pre-sampling method based on image location. The differences in verification between LUCAS and Flickr images were discussed regarding the image's quantity, the spatial distribution, the representativeness, and so on. The uncertainties of verification arising from differences in the spatial resolution of the different datasets were explored by CCI LC and GCL-FCS. The application of the method has great potential to support and improve the efficiency of land cover verification.

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Boundary layer flow characteristics under different simulated atmospheric stability conditions

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James Cooper (UoL)

ACADEMY/SCHOOL School of Science

The study was conducted at the Trent Environmental Wind Tunnel Laboratory and analyzed the effect of thermal stability quantified by the gradient Richardson number on streamwise and vertical velocity and turbulence profiles, Reynolds stress, the constant stress theory, and analyzed the Law of the Wall and corresponding parameters under varying thermal stratifications. A strong linear relationship between the gradient Richardson number and the v. Kármán parameter, the apparent roughness length, and the slopes of streamwise velocity profiles was found as well as a strong dependence of the vertical turbulence and velocity profile, the Reynolds stress, and the related shear velocity.

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Spatial-temporal distribution, fate and health impact assessment of organic plastic additives in the atmosphere

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Haifei Zhang (UoL)

ACADEMY/SCHOOL School of Science

With the more and more widespread use of plastic products, the environmental concentration of plastic additives, environmental fate, environmental impact, and public health impact is more and more concerning. There is growing evidence that plastic additives can cause many health problems for humans and the environment. This study aims to further explore the spatial-temporal distribution of organic plastic additives in atmospheric particulate matter and to explore the heterogeneity reactions that occur on the surface of atmospheric particulate matter to simulate the environmental fate of organic plastic additives. Furthermore, toxicology simulations of ecological and public health risks are also carried out.

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Temporospatial methylated (Thio)arsenic dynamics at oxic-anoxic soil-water interfaces

Sha ZHANG (PhD)

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ACADEMY/SCHOOL School of Science

Arsenic (de)methylation and (de)thiolation in paddy system is meditated by the thermodynamics and kinetics of multiple processes. Here, high-throughput microdialysis profilers coupled with IC-ICP-MS was used to capture temporospatial evolution of speciation of arsenic, phosphorus and sulfur, and dissolved iron and manganese to match pH-EH profile and RNA transcriptions and microbial communities at soil-water interface (60 mm) in resolution of about 2.0 mm. Dissolved (thio)methylated arsenic species rapidly increased in the rapid sulfate-reducing zone where a hotspot (111.9 nM on Day 12) of monomethylarsonous acid (MMA) rather than dimethylarsinous acid (DMA) was observed. Transcription abundance-depth profiles of arrA, arsM, and drsB were overlapped at the MMA hotspot supporting the mechanism coupling of sulfate-reduction and arsenic methylation. MMA hotspot was enhanced to 161.7 nM in 48 hours, after which dimethyldithioarseinic acid (DMDTA) (on Day 14) and monomethylmonothioarsonic acid (MMMTA) (on Day 90) profiles were observed with a similar trend to that of DMA and MMA, respectively. Long-term incubation for 90 days enhanced the soil sulfidogenesis, arsenic thiolation and demethylation. Thiolation would facilitate preserving MMA and DMA under anaerobic condition. These results suggested instant concentration profiles was likely the legacy of previous microbial activities and mediated by latter biogeochemical feedbacks.

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Structure design of functional nano carbon-based catalyst for electrocatalytic CO2 reduction

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Electrocatalytic CO2 reduction reaction (CO2RR) has been considered as a new way for achieving carbon neutrality. Recently, we designed an inner single atom Ni hollow nano-reactor (I-Ni SA/NHCRs) with the Ni-C3N1 moiety, which showed a maximum FECO (CO Faradaic efficiency) of 94.47% at -0.80 V vs. RHE in H-cell. Based on experimental results and COMSOL Multiphysics finite element simulations, mechanistic studies reveal that the unique structure of the catalyst can facilitate the CO2RR reaction kinetics, thus the activity can be boosted. Meanwhile, a home-made Zinc-CO2 battery with I-Ni SA/NHCRs as cathode showed the peak power density of 2.54 mW cm-2.

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Biodiversity and yield trade-offs for organic farming

Shanxing GONG (PhD)

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ACADEMY/SCHOOL School of Science

Organic farming supports higher biodiversity than conventional farming, but at the cost of lower yields. We developed a compatibility index (Cc-o) and the substitution (Sc-o) index, and conducted a meta-analysis quantifying the trade-off between biodiversity gain and yield loss comparing conventional and organic farming. Values of two indexes varies across taxa. Then we conducted a 2-year field experiment to test multifunctionality between conventional farming and organic farming in different duration. We also applied compatibility index on the results. Arthropods showed 0 value of Cc-o, but soil eukaryotes showed negative. Duration of organic farming did not have effect on biodiversity.

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A multidimensional framework to quantify the effects of urbanization on avian breeding fitness

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ACADEMY/SCHOOL School of Science

Urbanization has transformed our environments and caused environmental changes. Land-use change, urban heat island, noise pollution and artificial light at night are pervasive environmental factors that can filter species by influencing their persistence, breeding fitness and reproduction in urban areas, and ultimately population dynamics and eco-evolution. However, few studies have explored the combined effects among these factors, and their interactive impacts on trophic levels. Here, we conducted a systematic review and synthesized the existing knowledge of the individual and combined effects of these environmental factors on species breeding fitness and food resources. We provided a multidimensional framework for future research.

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Elemental speciation on Se via IC-ICP-MS and applications

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ACADEMY/SCHOOL School of Science

Selenium is of great importance for human and health and essential for plants' growth. In China, selenium-enriched soil always accopanied by the exceeded content of Cd. To understand the interaction between Se and Cd in soil-crop system, the method to do the speciation of Se is needed. While the up-to-date Se speciation method are capable to determine samples with total selenium higher than 1 mg/kg, limiting the exploration of the distribution of Se speciation in natural Se-rich crops/plants. Therefore, a newly-developed method using IC (ion chromatography) paired with ICP-MS (inductively coupled plasma mass spectrometer) is established with low detction limit and sensitivity. Five selenium species including selenite, selenate, selenomethionine, selenocysteine and selenomethylcystine were separated using PRP-X100 as separation column and diammonium citrate as mobile phase.

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Enhanced anaerobic reduction of nitrobenzene at high salinity by betaine acting as osmoprotectant and regulator of metabolism

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School of Envitonmental and Biological Engineering

Anaerobic technology is extensively applied in the treatment of industrial organic wastewater, but high salinity always triggers microbial cell dehydration, causing the failure of the anaerobic process. In this work, betaine, one kind of compatible solutes which could balance the osmotic pressure of anaerobic biomass, was exogenously added for enhancing the anaerobic reduction of nitrobenzene (NB) at high salinity. The long-term assessment demonstrated that exogenous addition betaine played an important role in maintaining the stability of the anaerobic system, which would be a potential strategy to achieve a high-efficiency anaerobic process under high salinity conditions.

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Selenium combined with chitin reduced phosphorus leaching in soil with pomelo by driving soil phosphorus cycle via microbial community

Yanni TANG (PhD)

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College of Resources and Environment

Metagenomics was used to explore the effects of selenium and chitin inputs on genes and microorganisms related to the soil phosphorous cycle. Phenotypic approaches were used to explore phosphorus accumulation in plants and the leaching of soil phosphorus from leaching column experiments. The results showed that compared with the control, the combination of selenium and chitin could significantly promote phosphorus accumulation in leaves by 33.3% and reduce the leaching of phosphorus from soil by 29.11%. Addition of selenium and chitin also changed the composition of microbial community, thus affecting the relative abundance of genes and microorganisms involved with phosphorus cycle.

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Humidity-insensitive NO2 sensors based on SnO2/rGO heterojunction

Yingyi WANG (PhD)

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Yaochun Shen (UoL)

ACADEMY/SCHOOL School of Science

This study reported a novel humidity-insensitive nitrogen dioxide (NO2) gas sensor based on tin dioxide (SnO2)/reduced graphene oxide (rGO) heterojunction through the sol-gel method. The sensor demonstrated ppb-level NO2 detection in p-type sensing behaviors (13.6% response to 750 ppb). The limit of detection (LOD) of sensors was as low as 6.7 ppb under 0% RH. Moreover, benefited from the formed superhydrophobic structure of the SnO2/rGO composites (contact angle: 149.0°), the humidity showed a negligible influence on the dynamic response (Sg) of the sensor to different concentration of NO2 when increasing the relative humidity (RH) from 0 to 70% at 116℃. The response of the sensor to 83% RH was 0.11%. In addition, the response ratio (Sg/SRH) between 750 ppb NO2 and 83% RH was 649.0, indicating the negligible impaction of high-level ambient humidity on the sensor. The as-fabricated humidity-insensitive gas sensor can promise NO2 detection in real-world applications such as safety alarm, chemical engineering, and so on. ct.

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Testing the sentinel method: Live prey produce better estimates of predation intensity than plasticine models

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ACADEMY/SCHOOL School of Science

The sentinel method has been widely adopted to quantify predation intensity by establishing patches of prey (commonly worm-shaped insect prey resembling a caterpillar) and recording the rate of disappearance or traces of predation after a certain period of exposure. However, many studies use plasticine caterpillar models, which might substantially underestimate predation intensity. Here, we designed an experiment across a natural-to-urban gradient in Suzhou (East China) combining live prey and plasticine models to show that live prey should preferably be used to obtain accurate estimates of predation intensity.

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Iron redox chemistry across soil-water interface.

Yujia CAI (PhD)

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John Boyle (UoL)

ACADEMY/SCHOOL School of Science

Soil-water interfaces (SWI) are biogeochemical hotspots characterized by millimeter-scale redox gradients, indicating that parallel changes are also present in microbial community structure and activity. However, soil-based analyses of microbial community structure typically examine bulk samples and seldom consider variation at a scale relevant to changes in environmental conditions. Here we presented a study that aimed to describe millimeter-scale variance in both microbial community structure and physicochemical properties in a lab flooded soil. At this fine-scale resolution, the stratification of biogeochemical properties (e.g. redox potential, nitrate) was consistent with the structure of the active microbial community with clear shifts in the relative abundance of transcriptionally active populations associated with changing redox conditions. Our results demonstrate that spatial scale should be carefully considered when investigating ecological mechanisms that influence soil microbial community structures.

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Collembolans maintain a core microbiome responding to diverse types of soil

Zhelun LIU (PhD)

SUPERVISORS Yongguan Zhu

UNIVERSITY/INSTITUTES University of Chinese Academy of Sciences /
Research Center for Eco-Environment Sciences

This study was to investigate how gut microbiome in collembolans performed meeting diverse types of soil. A core microbiome was identified in collembolan guts. Notably, soil-borne phytopathogenic fungi such as Fusarium were probably located and arrested by collembolans from soil. Gut microbial communities differed significantly from their surrounding soil communities. Deterministic process dominated in community assembly of gut microbiome. Furthermore, gut microbiome shaped different network patterns from soil microbiome. In conclusion, the unique gut habitat shaped distinct microbial composition and community from soil, and attributed to a core microbiome in collembolan.

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Autism is a serious game, daily family care scenarios at play

Donglin WANG (PhD)

SUPERVISORS Gianni Corino

UNIVERSITY/INSTITUTES University of Plymouth / CODEX

Children with autism and their families face multiple challenges, including social integration and inadequate assistance. Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder involving social communication deficits, social interaction obstacles, and repetitive behaviour stereotyped. The research aims to help parents and caregivers of children diagnosed with autism spectrum disorder (ASD) by introducing Serious Games. Embodied intervention therapy methods to customise gameplay mechanics to remit intense emotional experiences that meltdown conditions induce.

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Movement modulation in virtual reality: impact on sense of agency and user performance

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ACADEMY/SCHOOL Design School

Virtual movement modulation, which refers to the visual alteration of remapped movement, shows potential to be applied in motion-related virtual reality programs. Sense of agency (SoA), which measures the user's feeling of control in their action, has not been fully investigated for modulated movement. This study investigated the effect of modulated movement at five different levels on users' SoA and user performance by analyzing subjective responses and objective motion data. The results show that enhancement mode at S = 1.5 can boost the highest subjective SoA. User performances in several aspects are also significantly influenced by the modulated movements.

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Mental workload evaluation of virtual object manipulation on WebVR: An EEG study

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Virtual object manipulation as a key feature has been studied in virtual reality (VR) environments. Previous studies highlighted user experience on three basic types of virtual object manipulation, translation, rotation, and scaling. However, prior literature mainly studied task performance in manipulation modes with different degrees of freedom (DoF), and few studies assessed user experience by evaluating the psychological response, such as mental workload on these three basic manipulation types in virtual environments. This paper compared manipulation modes with 1DoF and 3DoF to assess users' mental workload as a critical indicator of user experience by electroencephalogram (EEG) measurement and questionnaires in manipulation tasks on the webpage with VR effects (also known as WebVR). By applying signal processing and statistical methods to analyze EEG data from ten subjects, the results demonstrated that the participants generally perceive less mental workload by 1DoF manipulation modes than 3DoF on WebVR. Besides, this study also found some different results between objective and subjective data.

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Chinese traditional grass beating printing features and sustainable design

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UNIVERSITY/INSTITUTES University of Plymouth /
School of Art, Design and Architecture

in view of the Chinese traditional folk dyeing process lamented the grass in the printing process, the textual research of field investigation and literature research method, and combined with a large number of data, handed down from ancient times from the aspects of technology, art and culture connotation, to pound a grass printing production process, process characteristics and generalizes the creation thought and test analysis. The paper points out the core craft of "beating" in traditional malus malus printing and its unique features in pre-media materials and usage, and analyzes the formation of these craft characteristics under the influence of traditional folk ideas of "suitable for time", "suitable for place" and "suitable for material". Through the interpretation of the craft characteristics and creation ideas of grass flower printing, we hope to inherit and develop the craft better, show the charm of Chinese traditional culture, and provide reference for the development of modern clothing design.

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EEG fading data classification based on improved manifold learning with adaptive neighborhood selection

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In electroencephalogram (EEG) signal analysis, data fading problem exists in signal collection by brain-computer interface (BCI) device, which is raised by BCI device deficiency, dynamic network limitation and subject issue. This problem results in cluster center movement and fuzzy class boundary with negative effects in EEG classification results. A novel fading data classification method based on manifold learning and adaptive neighborhood selection is proposed to mitigate this adverse effect of data fading. The method is carried out on BCI Competition 2008 data set 2a of motor imagery experiments. The experimental results indicate that the proposed method effectively improves the classification accuracy of fading data.

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The role of international student education in promoting China's soft power — The case of African students

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ACADEMY/SCHOOL School of Humanities and Social Sciences

To serve the national strategy to promote China's soft power and to educate more voluntary followers in Africa who know, befriend and support Beijing, the Chinese government and universities have invested generous resources in recruiting and educating African students. However, African students' perception of China is volatile and Covid-19 pandemic serves as a catalyst to accelerate a decline, which is a deviation of Beijing's expectation to garner its interests on the continent through pro-Chinese African talents. Quality of Chinese higher education, discriminative experiences and stringent Covid-19 restrictions are considered as the main factors compromising China's soft power among African students.

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From Rhodesia to Zimbabwe: The transition and its peacebuilding prospects

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The Rhodesia-to-Zimbabwe transition was a colonial to post-colonial experience that witnessed systematic transitional processes and post-conflict negotiations since the late 1970s. The international and regional actors' role in Zimbabwe's attainment of independence generated some forms of peacebuilding initiatives. This paper demonstrates how the peace programs created structural connections between international and regional actors, the top leadership, the middle, and the grassroots, contributing to the success of meaningful peace initiatives from 1979 to 1980. Using Zimbabwe as a case study, this chapter analyses how implementing peace initiatives has made the colonial-to-post-colonial transition successful despite the challenges faced.

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The EU's digital public diplomacy towards china during the COVID-19 pandemic

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Based on the genealogy of the EU's digital public diplomacy (DPD), this study attempts to provide an overall evaluation and analysis of the EU's DPD towards China during COVID-19. With the focus on EU rather than member stats, a triangulation approach that consists of strategy document analysis, large data sets and computational analysis, and contextual reading is adopted, to map the topics, examine the narratives, and determine the production of DPD. The data will be collected from both the official Weibo and Twitter accounts of the EU's delegation to China from 2020 to 2022 supported by EU official documents.

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Uncertainty quantification of convolutional neural networks using monte carlo dropout

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ACADEMY/SCHOOL School of Mathematics and Physics

This research aims to use Monte Carlo (MC) dropout, a computationally efficient approach, to investigate the reliability of several Convolutional Neural Network (CNN) models while keeping their high accuracy. A high-dimensional regression problem is considered from the domain of subsurface fluid flow modeling using 376250 generated samples. The results demonstrate the effectiveness of MC dropout in terms of reliability with a Standard Deviation (SD) of 0.012-0.174, and of accuracy with a coefficient of determination (R2) of 0.7881-0.9584 and Mean Squared Error (MSE) of 0.0113-0.0508, respectively.

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Missing value imputation of m6A RNA methylene using Auto-Encoder

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Methylation at the N6 position in adenosine(\ce{m^{6}}A) affects the RNA binding proteins that regulate cell process including translation and degradation. A common problem for quantification of \ce{m^{6}} A like other genomic data is missing data.
We proposed machine learning method of auto-encoder to model the latent pattern of data and imputing missing values. We compare it with other missing data imputation method, such as PCA and KNN. We have uploaded the code to github and achieves competitive performance.

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Financial risk forecasting with multimodal deep belief networks

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Predicting stock market movements has always been a popular study. The current mainstream methods not only rely on stock price information but also pay attention to the impact of financial news, and some researchers even use image information to make predictions. With the development of multimodal learning, it becomes feasible to apply multimodal learning when predicting the stock market. This paper proposes a three-modal fusion learning prediction model to predict the stock market. In addition, our model could also cope with the lack of some modal information and improve the prediction performance. We use the Nasdaq 100 constituent stock dataset for experiments and result validation. Compared with the latest research progress, our proposed model has better performance.

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China bond risk premium with machine learning

Jiahui XI (PhD)

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My research show that machine learning methods, in particular, PCR and Elastic Net provide strong statistical evidence in favor of bond excess returns predictability. At the same time, they have a better forecast performance than non-linear techiniques including Gradient boosted trees and random forests. We also showed that macroeconomic variables contain additional predictive power both in linear and non-linear contexts. Among macro variables, tax and monetary policy have the largest positive effect on model performances.

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Smith-Wilson method for term structure of bond yields in China

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This paper focuses on the term structure of Chinese govenment bond yields in the Smith-Wilson model and further extends this model within the context of the economic scenarios generation for bond yields from the perspective of risk management. First, we develop the Kalman filter to estimate the dynamic ultimate forward rates in the Smith-Wilson method which replace the traditional EIOPA's determination procedures. The estimation process of ξUFRξ (and also alpha) presents a manner of determining the long-term forward rates in Chinese bond market in the Smith-Wilson model. Moreover, we employ the Smith-Wilson model, combined with the principal component analysis (PCA) and vector autoregressive model (VAR) to develop a new methodology for the economic scenario generation of bond yield with the specificed market views. The empirical results show that the Smith-Wilson model conducts impressive performance in bond pricing and modelling term structure of bond yields, and further presents promising applications in risk managment of bond yields in China.

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Stepwise feature fusion: local guides global

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Pre-screening is a common and effective cancer prevention strategy. The use of deep learning models to assist lesion screening is an efficient and low-cost paradigm. Some lesion segmentation tasks, such as polyps, which are morphologically diverse, have blurred boundaries and are sensitive to measurement. The segmentation model must maintain strong generalization while pursuing high dense prediction accuracy. Following this principle, I experimented with and optimized existing related models and novel model structures. Finally, I proposed a novel model, SSFormer, which achieves state-of-the-art and competitive performance in dense prediction accuracy and generalization across multiple polyps and lesion segmentation benchmarks.

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Influence of planets on debris disks in star clusters I: the 50 AU Jupiter

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Observations of planetary debris disks suggest a strong correlation between the orbits of planets and the orbits of nearby planetary debris particles (PDPs). To determine the effect of planetary companions on the dynamics of PDPs, we perform N-body numerical simulations of star clusters using NBODY6++GPU and study the effect of planet' presence on massless PDPs using REBOUND. We find the presence of the planet affects PDPs far beyond its Hill radius, while such influence is restricted in 400 AU. The planetary system itself cannot retain particles beyond 700 au. Our results help to understand the formation of debris disk and planetary systems.

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Extreme analysis of typhoons disaster in China with insurance management

Kaihao HU (PhD)

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is an increasing number of catastrophic typhoons worldwide due to climate change. It may cause significant damage to human beings in many aspects including property and health aspects, especially in China’s coastal areas. This paper aims at developing a catastrophic insurance based on the risk modelling of severity of huge typhoons in China during the last 20 years. The main methodology is to model the threshold excess of losses due to single Typhoon by generalized extreme value distribution in Extreme Value Theory (EVT). The pricing of the typhoon insurance is given according to the three zones with different level of typhoon influence. Constructive suggestions and policies are proposed concerning the Typhoon risk warning and preventions.

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Cardiovascular health monitoring and biometrics via deep-learning-assisted triboelectric pulse sensor

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Intelligent healthcare based on artificial intelligence (AI) and wearable bioelectronic is increasingly being used in people's daily lives, showing advantages in disease diagnosis, but the resulting issues of continuous pulse wave monitoring and privacy protection of biometric data remain a great challenge and highly desired. Here, a deep-learning-assisted wearable triboelectric pulse sensor has been developed for long-term and continuous high-fidelity pulse monitoring, cardiovascular condition assessment, biometric and fatigue driving detection applications. The accuracy of identity recognition of 5 people and normal/fatigue driving reaches 94% and 98%, respectively.

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Portfolio optimization with mean-CVaR-skewness based on normal inverse gaussian distribution

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In most financial investing behaviours, risk measures and discovering the optimal weights of assets in a constant portfolio is a challenging and demanding problem. In our paper, we propose and study an optimisation model with minimum conditional value at risk (CVaR) and maximum skewness with the constant expected return of investors. Indeed, added skewness into the portfolio optimisation means more profits when investing. According to Markowitz's(1952) theory, his model is reasonably appropriate only in cases where the statistical distributions are normal Gaussian. We have restructured this theory in establishing a variation distribution called Normal Inverse Gaussian distribution (NIG). To solve the above multi-objective optimal subject, we suggested a straightforward solution. Therefore, the mean—CVaR-skewness optimisation model can be consistently explained. To illustrate the method, we selected 15 top stocks from the US market using our model. We show that this model could make some signs of progress to research on making investment decisions.

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A novel deep reinforcement learning strategy in financial portfolio management

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Reinforcement learning algorithms are used in various fields widely, such as cryptocurrency market forecasting, image recognition, and natural language processing. In this research, we use the Reinforcement learning algorithm to solve the portfolio management problem. In the Reinforcement learning algorithm, we adopt the squeeze-and-excitation in the neural network to realize the Ensemble of Identical Independent Evaluators proposed by Jiang et al. "The Squeeze-and-Excitation" block works by adaptively recalibrating channel-wise feature responses, which improves the ability of the network in extracting information from the financial environment. To further improve the performance of the network, we adopt the soft thresholding function as nonlinear transformation layers to effectively eliminate the noise-related features.

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Mathematical theory and design of photothermally driven soft robots

Shaobo HE (PhD)

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Photothermal materials can deform in response to heat and light, thus the mechanical responses can be originated from either the thermal expansion due to temperature rise under light or photochemical reactions that trigger macroscopic deformations directly. Because of its capability to change shape under photo-thermal stimuli, the potential to develop into photothermally driven soft robots is appealing and smart remote control of such photothermally driven robots also has promising engineering applications. The project is aimed to study the photo-thermal-mechanical response of such material and a mathematical theory describing such behavior will be developed and implemented in computer simulations.

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Bilateral-ViT for robust fovea localization

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The fovea is an important anatomical landmark of the retina. Detecting the location of the fovea is essential for the analysis of many retinal diseases. However, robust fovea localization remains a challenging problem, as the fovea region often appears fuzzy, and retina diseases may further obscure its appearance. This paper proposes a novel Vision Transformer (ViT) approach that integrates information both inside and outside the fovea region to achieve robust fovea localization. Our proposed network, named Bilateral-Vision-Transformer (Bilateral-ViT), consists of two network branches: a transformer-based main network branch for integrating global context across the entire fundus image and a vessel branch for explicitly incorporating the structure of blood vessels. The encoded features from both network branches are subsequently merged with a customized Multi-scale Feature Fusion (MFF) module. Our comprehensive experiments demonstrate that the proposed approach is significantly more robust for diseased images and establishes the new state of the arts using the Messidor and PALM datasets.

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Multimodal analysis of medical data and graphs for computer-aided diagnosis of various cancer

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multimodal analysis of medical data and graphs for computer-aided diagnosis of various cancer, Use high dimension data analysis and deep learning to construct a multimodal model to predict or diagnose type or sub-type of certain cancer.

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Algebra topology based graph neural networks

Size HOU (PhD)

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Deep learning has affected all aspects of human beings in today's era. Under the transformation of multi-layer complex linear mapping and nonlinear mapping, neural networks can fit arbitrary functions. The purpose of pattern classification is to analyze the high-dimensional structure in point clouds. Now data science involves high-dimensional space or larger sample size, so we need to organize this process into a set of algorithms that can be understood by computers. Hence, we introduced the method of algebraic topology - homology into graph neural networks. The experiments has shown our methods achieved the state of the arts performance in classification and regression tasks.

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An empirical study on risk assessment scenario in terms of extremal precipitations in China

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Climate change and the consequently mutation in frequency or severity of extreme weather events are likely to be responsible for the increasingly significant economic damages in China nowadays. The precipitation related economic damages were tested to significantly increase from 1980 to 2020 by quantile regression and the Mann-Kendall mutation test. An essential aspect of assessing such risks was considering the reciprocal effect of climatic hazards and socio-economic indicators (i.e., exposure and vulnerability). A multi-sectors damage function specified by the variables and covariates including precipitation extremes, temperature variations, GDP per capita, inflations and drainage conditions was used, which resulted in a projection of increase for intensity (10.23%~20.13%) and fluctuation for frequency (-1.56 to 0.17) of future five-year weather related losses.

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The Dbar-dressing Method for a (2+1)-dimensional equation

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The (2+1)-dimensional Jimbo-Miwa equation is analyzed by means of the Dbar-dressing method. By means of the characteristic function and Green's function of the Lax representation, the problem has been transformed into a new Dbar problem. A solution is constructed based on solving the Dbar problem with the help of Cauchy-Green formula and choosing the proper spectral transformation. Furthermore, we can obtain the solution formally of the Jimbo-Miwa equation when the time evolution of the spectral data is determined.

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Run-and-tumble particles in one dimension with a fertile site

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Run-and-tumble particles move along a straight line: they run with constant speed and switch direction (tumble) randomly. After going through the fertile site (a source of nutrients), an RTP produces new particles until it switches direction. We model the process of creation of new particles by a fertility function (multiplied by a fertility rate), which depends on the distance traveled since going through the origin. The equations of motion can be solved in the Laplace domain. We work out the large-time growth rate of the total number of particles in terms of the fertility function and fertility rate.

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XGBoost prediction of infection of leukemia patients with fever of unknown origin

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For leukaemia patients with fever of unknown origin, fast discovering the source of the fever is a formidable challenge, as this population has the potential to lead to fever in many different situations. In this research, we applied XGBoost algorithm to predict the pathogenic infections from a big data repository of leukemia patients with fever of unknown origin (FUO) and compared the performance with other machine learning algorithms. Our results illustrate that XGBoost method obtains the best performance with an area under receiving-operating-characteristics curve (AUC) of 0.8376
and F1-score of 0.7034.

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Distillation helps exploration: A goal-aware reinforcement learning framework for portfolio optimization

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As a vanguard fin-tech research subject, recent years have witnessed excellent strides in portfolio optimization via reinforcement learning (RL). Due to the noisy and imperfect financial data, however, the current flat RL has been confronted with difficulties in either producing lucrative portfolios consistently or exploring the market efficiently. To address the aforementioned challenges, we propose a novel RL framework with goal-aware exploration and multilevel supervision (GEMs). In our paradigm, the low-level policy is in charge of exploration while being steered by goals learned and generated by the high-level policy. Meanwhile, these two target policies are both supervised by an optimal policy that specifies the instruction that the target policies aspire to achieve. The optimal policy is trained with perfect market information. The substantial experiments on the U.S. market and the Chinese market revealed that the proposed method is efficient and outperforms a variety of strong baselines with tenable trading actions.

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Machine learning in implied volatility

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This study investigates the predictive effect of machine learning on the implied volatility. Based on the attributes of options, XGboost and DNN models are selected with moneyness, time-to-maturity and temporal features as inputs. In addition, we propose a new model employing LSTM to deal with temporal features and select lags of different lengths to verify the effect of temporal variations on the results. We choose ETF50 and SP500 to comprehensively compare the empirical results of these models in Chinese and American markets. The experiment demonstrates that machine learning can provide support for implied volatility prediction and broaden the research scope.

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Nonparametirc Bayesian modelling on infinite mixture student t copula

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This article proposes the model of infinite mixture t copula by using the nonparametric Bayesian approach, the corresponding Markov chain monte carlo (MCMC) sampler is established for the model. In comparison with the normal mixture model, this model would be more appropriate if the dependence structure of the data exhibit tail dependence, which is very often the case in the area of financial risk management. The proposed algorithm are verified by theoretical simulation and real data analysis. Parameter estimation results in the simulation experiments show that it has advantages over the standard maximum likelihood estimation (MLE) method embedded in the copula library of R software. The real data analysis of Shanghai Shenzhen stock market in the last four years further confirm the validity of the approach and the importance of applying t copula when heavy tail exits.

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Current-driven magnetic skyrmions for encoding/storing information:manipulation and dynamics in nanoscale structures

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Magnetic skyrmions are topological protected spin structure. They are promising to be an information carrier for future low-power memory and computing systems owing to the nano-scale size and relatively low driving current compared to traditional devices. To develop applications such as racetrack memory at room temperature, the interaction of current driven motion, pinning and thermal fluctuations must be investigated. We established the relation between the pinning energy and thermal fluctuations and showed that the skyrmion Hall angle is dependent on the driving current in the presence of the pinning effect at various finite temperatures.

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Factor models and Investment: A relative-valuation perspective

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This project aims to develop a relatively complete procedure to conduct investment by utilizing the information extract from the relative perspective. The first objective of this project is to study the cross-sectional variation of the firm relative value by Hu, Sy and Wu's Statistical Factor Model. This model decompose the firm relative value into fair value and misvalue, and we conduct some extended research based on the misvalue. The second objective is to propose a relative measure for valuation factor and develop the framework of relative based portfolio construction within multiple-objectives programming. The final objective is to use multiple backtesting approaches to test the investment strategies. All in all, these three objectives basically cover the main procedure of investment (asset pricing, portfolio management and backtesting).

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More interpretable graph similarity computation via maximum common subgraph inference

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Graph similarity measurement, which computes the distance/similarity between two graphs, arises in various graph-related tasks. Recent learning-based methods lack interpretability, as they directly transform interaction information between two graphs into one hidden vector and then map it to similarity. To cope with this problem, this study proposes a more interpretable end-to-end paradigm for graph similarity learning, named Similarity Computation via Maximum Common Subgraph Inference (INFMCS). Our critical insight into INFMCS is the strong correlation between similarity score and Maximum Common Subgraph (MCS). We implicitly infer MCS to obtain the normalized MCS size, with the supervision information being only the similarity score during training. To capture more global information, we also stack some vanilla transformer encoder layers with graph convolution layers and propose a novel permutation-invariant node Positional Encoding. The entire model is quite simple yet effective. Comprehensive experiments demonstrate that INFMCS consistently outperforms state-of-the-art baselines for graph-graph classification and regression tasks. Ablation experiments verify the effectiveness of the proposed computation paradigm and other components. Also, visualization and statistics of results reveal the interpretability of INFMCS.

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The relationship between heavy metals in soil and self-reported body pains in Chinese adults: a cohort study

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This study investigated the relationship between the concentration of heavy metals in soil and self-reported body pains across mainland China. The cohort was constructed by mapping city-level geochemical data extracted from 1203 papers published between 2008 and 2018 in China and health data derived from a follow-up study started in 2011 with the lasted wave in 2018. Totally 13474 individuals in 128 cities in China were included in this study. By using logistic regression analysis, soil cadmium was found positively associated while mercury and zinc were found negatively associated with multiple sites of body pain.

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Effects of creative crowdsourcing on sexual health behaviours among college students in Eastern China

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In China, surveys show a high number of young adults engaging in condomless sex leading to increasing rates of sexually transmitted infections (STIs). We conducted a Randomized Controlled Trial evaluating a crowdsourced health promotion intervention's effects on sexual behaviours among college students in Eastern China. A generalized estimating equations (GEE) analysis was conducted for sexual activity (odds ratio (OR): 1.06), condomless sex (OR:1.71), and self-perceived risk of contracting STIs (OR:1.09). The results were not statistically significant and suggest that participation in creative crowdsourcing health promotion campaigns may have minimal effects on promoting sexual behaviour change among college students.

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The construction of patient credibility among people with chronic fatigue in China

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Chronic fatigue syndrome (CFS) is a poorly understood medical condition whose diagnosis relies largely on patient-reported symptoms. Therefore, determining patients' credibility as reporters of symptoms is a task of utmost importance for the diagnosis process. This research examines the credibility work that patients with CFS symptoms perform in interaction with healthcare practitioners and others in daily life. The data-collection consists of qualitative in-depth interviews with people suffering from persistent fatigue and doctors who have experienced diagnosing people with CFS symptoms.

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A systematic review of breast milk iodine concentration as a biomarker of maternal and infant iodine status

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There are inconsistent relationships between breast milk iodine concentration (BMIC) and urinary iodine concentration (UIC). Thus, this systematic review aimed to investigate the relationship, so as to explore whether BMIC could be used as a biomarker of maternal and infant iodine status. Three electronic databases were searched until year 2021. Overall, 51 studies were included. In most studies, the categorisation of iodine status assessed by median UIC was consistent with the categorisation of iodine status assessed by median BMIC cut-off of ⩾100 μg/L. Therefore, our review suggested that BMIC may be a promising biomarker.

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Adaptive reuse from industrial heritage to urban public cultural space: Ningbo Fishing Wheel Factory as a case study

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As an important part of cultural heritage, industrial heritage is regarded as a national and local cultural resource, and the potential of industrial heritage reuse for local industries and urban development is increasingly perceived. The preservation and reuse of industrial heritage have become an important tool for many cities to build public space and construct urban cultural spirit. This study introduces the theory of Neo-Tribalism and explores the highlights and pain points, possibilities, and possibilities of adaptive regeneration of industrial heritage with the help of materials obtained from the Ningbo Fishing Wheel Factory regeneration project through field research.

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Analysis of urban space vitality based on Weibo check-in data — A case study of Suzhou

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With the development of the information technology, there are all kinds of data in our urban lives. Among them, social media data represented by Weibo check-in data provides the possibility for planners to explore the dynamic relationship between social activities and the urban environment. This study uses Suzhou's Weibo check-in data as a carrier to explore the application of emerging big data in interpreting spatial structure and vitality. This study also explores the understanding of the interaction between urban residents' social activities and urban space. The results show that the land use and organization of urban space determine the degree and duration of urban residents' activities. This research provides new ideas for understanding the relationship between urban structure and social activities, and provides reference for future related research and planning practices.

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Study on the outdoor wind environment of traditional villages in Huizhou

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This paper studies the outdoor wind environment of traditional villages in Huizhou, focusing on the following four key issues: first, what is the current situation of the outdoor wind environment of traditional villages in Huizhou; second, how to evaluate the outdoor wind environment of traditional villages in Huizhou; third, what methods are used to study the outdoor wind environment of traditional villages; fourth, the outdoor wind environment of traditional villages in Huizhou How to improve the environment.

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When film festivals arrive small cities: the changing geography of Chinese film festivals and its impacts on urban transformation in China's inland region

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China's film festivals are returning to where they were born – inland cities, although active areas of the film industry remain in the coastal regions. The rise of film festivals has offered a medium for inland cities to employ in urban transformation, and many provide different forms of support to the events. By focusing on film festivals' geographical changes and revealing the arrangements for mutual employment between film festivals and inland cities, I argue that the transformation of inland cities led by film festivals is not achieved with the goal of place marketing but instead by helping the host city gain the transformation priority through the synergy of the festivals and urban spaces.

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Design research on university campus environment to promote students' mental health

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This research aims to analyze ways in which the university campus design can affect students' mental health and provide design guidelines that can promote students' emotional health, cognitive health and social well-being, so as to benefit students' mental health. Previous research focuses on interpreting and verifying the relationship between human mental health and natural environments. However, there are few studies on the impact of university campuses as one of the urban environments on students' mental health and the corresponding design guidelines.
Based on the literature review and case studies, the environmental factors considered important to students will be identified, and the corresponding design principles will be proposed according to the findings of best practices. To verify the effectiveness of the design principles, a VR based survey will be conducted. Findings from the survey will be used to guide the revision of the design principles. Finally, a series of university campus design guidelines that can promote students' mental health will be proposed.

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Research on the mechanism of underground space promoting urban high-quality development under the background of urban renewal

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Based on the background of urban renewal, and on the basis of clarifying the role of urban underground space development in improving urban functions, improving urban quality, and promoting sustainable development of urban space, we should clarify the types and processes of underground space development in urban renewal, summarize the technical methods of underground space development based on urban renewal, and propose a long-term mechanism for underground space to promote high-quality urban development in the context of urban renewal, It provides scientific guidance for guiding the development of underground space based on urban renewal and promoting the sustainable development of urban space.

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Intra-provincial disparities in China, a case study of Sichuan

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During the past decades, many provinces introduced place-based development strategy such as "Strong provincial capital". The research aims to investigate the evolution of intra-provincial disparities in selected case and explain the reasons behind such dynamics. Specifically, how agglomeration economies, local preferential policies and decentralization jointly shape the regional inequality.

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Megaproject planning and stakeholders' relationship management: Chinese PPP governance under the self-correcting mechanism of the institutional settings — A case study in Jiangsu, China

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Chinese people often say that if you want to be rich, build roads first. Over the past 30 years, China has become the world's largest infrastructure market, thanks to its economic reform and booming urbanization efforts. A huge amount of infrastructure has been built. However, behind the scenes there are increasing concerns about China's infrastructure governance. One key issue is the relationships within public private partnerships (PPP). This thesis is attempting to investigate the dynamics of stakeholder relationships in PPP, as well as the channels via which they influence PPP governance over time in Jiangsu Province, China.

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Getting public transport networked: How to improve the implementation of this "wicked" problem

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Networking Public Transport (also known as "one road- one line bus transportation system" in China), is understood to be an effective way to produce a public transport system that can act as an alternative to the car. Networked public transport system has been implemented in many cities but feedback from the public are not as expected, showing that implementation leading to public acceptance is complex. Thus, implementation of networked systems will be explored to determine ways to deal with this complexity. One element of the research explores whether habit formation based on the self-determination theory can help deal with this complexity.

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Explore influences of small-scale public open space of resettlement neighbourhood environment on elderly residents' health-related behaviours in China — A health niche model approach

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This research aims to explore the interrelationship between small-scale open space within resettlement neighbourhoods and health-related behaviours of the landless elderly in China. Extensive previous researches have shown the complex relationship between neighbourhood environment, behaviours, and health outcomes, but the role of small open space within the resettlement neighbourhood has been largely overlooked. Many researchers considers that most landless farmers, especially the elderly, have a strong sense of place attachment to their farmland and homestead. After losing farmland and relocating to the resettlement neighbourhood in the city,many elderly farmers may experience adaptation issues in terms of unhealthy lifestyle, stress and broken social ties. Those 'soft edge' space between buildings and roads is indeed the most intimate space for the elderly, as an extension from home place to public space, particularly for displaced farmers who used to live in the countryside. Based on the combination of qualitative and quantitative methods, the objective evaluation of small-scale public space of resettlement neighbourhood, observational behaviours, and self-report perceived environment will be collected and analysed. It is expected to be found from this research that the interrelationship among SNPoS (small-scale neighbourhood public open space), PE (Perception of environment), HRB(health-related behaviours) within the resettlement neighbourhood and enriching the concept of health niche model at meso-macro level.

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Urban spatial elements and children's wellbeing

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A good city should be child-centered, allowing children to be deeply involved in urban life activities. From the environmental psychology perspective, urban design elements could potentially influence children's behaviour. Previous studies concerned the interrelationship between the built environment and children's well-being but have not addressed children's behavior. Understanding the influencing mechanism of urban design on children's behaviour is vital to children's well-being and designing child-friendly cities. This study set out to evaluate "how children perceive the space" and "what behaviour children will have in the different built environment," determining how different affordances in open space influence children's well-being conditions.

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The evolution of urbanization and planning practice: A comparative study between England and China

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This paper aims to provide a vision for urbanization in China and shed insight into planning practice in 2021-2035. Taking England as a comparator, where urbanization has largely been completed, this paper compares urbanization evolution to draw valuable lessons on planning policies and practices. It is expected that findings would inform further evolution of China's planning practice, including planning transformation into a policy-based plan; balancing local concerns and strategic objectives; achieving long-term interests and integrative development; enhancing public participation; strengthening the legal force. Some discussions may inform the Territorial and Spatial Planning in China and benefit New-type Urbanization.

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Renovating the existing residential communities to improve the elderly's well-being and thereby support 'Healthy ageing-in-place' : A case study of Suzhou, China

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Nowadays the main strategy recommended by the Chinese government to cope with ageing issues is to promote ageing-in-place. However, most older adults are currently living in the old residential communities built before 2000. It is therefore important to renovate these residential communities towards ageing-friendly standards. This research aims to shed light on this, focusing on the impact of the built environment on the well-being of the elderly in particular. First, based on literature review and case studies of the best practice worldwide, a holistic theoretical framework of healthy ageing is summarized, covering issues relating to older adults' behaviour and their well-being. Then based on the principles of environmental behaviour, this theoretical framework is further developed to show the interrelationship between the built environment features and the older adults' behaviour (and their well-being). Second, a case study has been conducted in Wujiang District, Suzhou, to verify the theoretical framework. Structured observation and GPS are used to record and map the older residents' behaviour and movement, and the results are compared against the items as addressed in the theoretical framework. Finally, a follow-up interview is conducted to explore the difference between the theoretical framework and the findings from the fieldwork and to collect the older residents' opinions on the existing built environment and their preference for healthy activities. Based on an in-depth critical analysis, the theoretical framework is further modified to facilitate the renovation of the existing residential communities to support healthy ageing-in-place. It is found from this research that, compared with the current community renovation plans that often overlook the psychological and social needs of the elderly, the updated theoretical framework can better guide the renovation of residential communities towards ageing-friendly standards.

Keywords
Healthy ageing-in-place, Older adults, Ageing-friendly, Existing communities, Renovation

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Accessibility, congestion, and air pollution in location choice: an empirical study in Suzhou, China

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In economic geography, accessibility is an essential factor for effectively boosting the economy. Empirical studies show that businesses and companies are tend to agglomerate in areas that benefit from accessibility to maximize productivity and increase economic advantages in the densest areas of cities. However, some studies have shown a trade-off between benefits brought by accessibility and negative effects caused by air pollution and congestion. The benefit of accessibility can be reduced through negative external costs generated by air pollution and congestion. The influence of this trade-off could be varied depending on locations, and/or submarkets.
Regarding Suzhou as the study area, this research aims to investigate the effects of accessibility, air pollution and congestion on the housing price from spatial dimension at both city level and district level. The study intends to contribute to understanding of the spatial implication of urban transportation infrastructure provision and policy in China, and more generally to new urban transportation policy discussion at both national and global level.

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For a better quality of life in China: planning incentivisation in housing development

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Planning incentivisation has emerged as a more proactive mechanism to shape desired forms of development while minimizing their negative public impacts through leveraging developers' resources and motivations. However, effective implementation requires complex negotiations and interactions with different stakeholders and could be dampened by the enhanced role of property developers. This research will examine how planning incentivisations can be used in housing development to improve the quality of life with a detailed analysis and visualization of findings through comparative case studies incorporating cognitive mapping and institutional approach. It will reveal the mechanisms for designing viable developments, selecting instruments and motivations to change, and interacting between parties concerned that can reshape relations between public and private individuals under China's "new-type urbanization."

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Spatial-temporal analysis of the effects of urban form on air quality in Chinese cities at the prefecture level and above

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Over the last two decades, air pollution has posed a tremendous socioeconomic challenge to the development of Chinese cities with rapid urbanisation. Many cross-sectional studies suggest that urban form can sustainably reduce urban air quality deterioration. Difficulties arise, however, when an attempt is made to build a dynamic relationship between urban form metrics and air quality. This research aims to provide a deeper insight into the relationship between changes in urban form and air quality by investigating the time-lag effect and its association with different urban form pattern groups. The study will be conducted through a spatial panel model based on the panel data of 296 cities in China during 2000 - 2020.

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Shrinkage characteristics and planning strategy of Sanhui Town in Chongqing from the perspective of smart shrinkage

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Under the influence of global economic transformation, China's economy has turned into a medium-low growth pattern, and the spatial distribution of population has also undergone structural changes, and more and more cities are facing the challenge of contraction. At present, most of the shrinkage phenomena in China occur in villages and towns, especially in small towns with exhausted resources. In this paper, Sanhui Town, Hechuan District, Chongqing, a typical resource-based small town, is selected as the research object. Firstly, the development process and influencing factors of Sanhui Town are sorted out, and the problems of population contraction, economic development and land use in Sanhui Town are summarized. Then, the theoretical concept and planning strategy of "smart contraction" are put forward. The research results not only seek solutions to the practical problems of shrinking resource-based small towns but also provide a way of thinking for the development of other towns in the future.

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Take-out food consumption and overweight, obesity and subjective wellbeing of adult urban residents in China

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The high prevalence of online-ordered take-out food has dramatically changed Chinese urban residents' dietary behaviours in recent years. Meanwhile, the increase in overweight and obesity has become a major public health concern in China. However, few studies investigated the relationship between take-out consumption and overweight and obesity nor the impacts of take-out consumption on an individual's subjective well-being. This study will fill the research gaps by integrating the social-ecological model and theory of planned behaviour and applying a cross-sectional research design to collect residents' diet behaviours, BMI status, and subjective well-being, as well as their neighbourhood food environment.

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Examing the spatial impact of 15-minute life circle on housing prices in Suzhou

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The crisis of Covid-19 limits people's mobility and places greater demands on service capacity around the community. "15-minute life circle", a "people-oriented" concept to guarantee the convenience and quanlity of life, has become an important concept to tackle the accessibility issues during the pandemic in China. Using POI data from Baidu Map and housing price data, this study will evaluate how the 15-min life circle spatially affects housing prices in main urban areas of Suzhou.

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Spatial network analysis of land use carbon emissions in the Yangtze River Delta Region

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We constructed a spatial correlation network of land-use carbon emissions by using a modified gravity model to analyze the characteristics of the spatial correlations and spillover effects of land-use carbon emissions. Results reveal that: the spatial differences in land-use carbon emissions gradually increased, whereas those in land-use carbon emission intensity gradually narrowed from 1995 to 2018; Shanghai and Wuxi had large land-use carbon radiation ranges and together with Suzhou, Hangzhou, Changzhou, and Nanjing, exhibited above-average betweenness centrality from 1995 to 2018 and strong bridging capabilities across the entire network; the land-use carbon emissions had obvious spatial correlations and spillover effects.