

# IYLF 2026

The 2<sup>nd</sup> International Young Leaders Forum

14-18 August 2026 | Auckland, New Zealand

## Conference Handbook

### Hosted by

New Zealand Australia Science and Innovation Alliance (NZASIA)  
Zhengzhou University

### Organised by

Faculty of Engineering and Design, The University of Auckland  
Zhengzhou University New Zealand Research Institute (Preparatory)  
New Zealand SEC Centre  
New Zealand Chinese Scientists Association



<https://iylforum.com/>

# Welcome

On behalf of the Organising Committee, it is our great pleasure to extend a warm welcome to all participants attending the 2<sup>nd</sup> International Young Leaders Forum (IYLF 2026). The conference will be held in Auckland, New Zealand, from August 14th to August 18th, 2026.

Following the success of the inaugural forum, IYLF 2026 continues its mission of bringing together outstanding young researchers, innovators, and future leaders from around the world to explore solutions to global challenges through science, engineering, technology, and innovation. Guided by the theme "Innovation-Driven Pathways Toward a Sustainable Future," the forum provides an international platform for participants to exchange ideas, establish collaborations, and showcase cutting-edge research that contributes to sustainable development.

This year, IYLF 2026 received a total of 140 submissions, with 83 accepted for presentation, including 64 oral presentations across 17 technical sessions and 19 poster presentations. The programme also features 5 plenary lectures and 11 keynote speeches delivered by internationally recognised experts, offering participants valuable insights into emerging research trends and technological innovations.

The technical programme covers three major themes: Sustainable Bioscience and Biotechnology, Sustainable Energy, Environment, and Resource Management, and Digital Technologies and Intelligent Manufacturing. Participants will engage in plenary lectures, keynote presentations, technical sessions, panel discussion, poster presentations, laboratory tour, and networking activities designed to encourage interdisciplinary dialogue and foster international collaboration among the next generation of scientific leaders.

IYLF 2026 has attracted participants from universities, research institutes and industries across numerous countries and

regions. The forum features internationally renowned scholars and industry experts who will share their latest research achievements, technological innovations, and perspectives on emerging global challenges. We are confident that the discussions and collaborations established during the forum will inspire new ideas and create lasting partnerships.

Beyond the technical programme, participants will have the opportunity to explore the vibrant city of Auckland and experience New Zealand's unique natural environment and multicultural society. Known as the "City of Sails," Auckland offers a remarkable combination of world-class research institutions, diverse cultures, stunning coastal scenery, and a strong commitment to sustainability. As one of the world's most liveable cities, it provides an ideal setting for international academic exchange and innovation.

New Zealand is internationally recognised for its leadership in environmental stewardship, renewable energy, and sustainable development. With abundant natural resources, breathtaking landscapes, and a culture that values harmony between people and nature, the country offers an inspiring backdrop for discussions on building a more sustainable future. We hope your visit will be enriched not only by the scientific programme but also by the unique cultural and natural experiences that New Zealand has to offer.

## Highlights of IYLF 2026:

**World-Class Speakers:** Learn from internationally recognised researchers,

innovators, and emerging leaders across multiple disciplines.

**Interdisciplinary Collaboration:** Participate in technical sessions, panel discussions, and workshops that encourage cross-disciplinary research and innovation.

**Networking Opportunities:** Build meaningful connections with researchers, students, and industry professionals from around the world.

**Laboratory Tour:** Visit leading research laboratories at the University of Auckland and explore state-of-the-art facilities in areas including dynamics and control, vibration, acoustics, energy harvesting, wireless power transfer, advanced manufacturing, and biomedical technologies.

**Cultural Experience:** Discover Auckland's multicultural community, spectacular natural landscapes, and New Zealand's unique Māori heritage.

**Why Attend IYLF 2026?**

**Inspiration:** Explore innovative research and visionary ideas that address the world's most pressing sustainability challenges.

**Innovation:** Discover emerging technologies and interdisciplinary solutions shaping the future of science, engineering, healthcare, manufacturing, and environmental sustainability.

**Collaboration:** Establish international partnerships and connect with a global community committed to advancing research, innovation, and sustainable development.

Thank you for being part of IYLF 2026. We sincerely hope that your participation will be academically rewarding, professionally valuable, and personally memorable. We wish you an enjoyable and productive stay in Auckland and look forward to welcoming you to the forum.

On behalf of the Organising Committee

The 2<sup>nd</sup> International Young Leaders Forum (IYLF 2026)



**Wei Gao**  
Honourable Chair  
Professor  
The University of Auckland, New Zealand



**Peng Li**  
Honourable Chair  
Professor, President  
Zhengzhou University, China



**Lihua Tang**  
General Chair  
Associate Professor  
The University of Auckland, New Zealand

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# Conference Committees

## Honorable Chairs

### **Wei Gao**

The University of Auckland

### **Peng Li**

Zhengzhou University

## Organising Committee

### General Chair

#### **Lihua Tang**

The University of Auckland

### General Co-Chair

#### **Shanghai Wei**

The University of Auckland

### Program Chair

#### **Shaohua Wang**

The University of Auckland

### Award Committee Chair

#### **Xun Xu**

The University of Auckland

### Award Committee Co-Chair

#### **Aiguo Hu**

The University of Auckland

### Panel Discussion Chair

#### **Jing Ma**

Auckland University of Technology

### Panel Discussion Co-Chair

#### **Guoliang Lu**

The University of Auckland

### Secretary-General, Secretaries

#### **Guoliang Lu**

The University of Auckland

#### **Cuipeng Xia**

The University of Auckland

#### **Harper Guo**

NZSEC

# Steering Committee

**Aiguo Hu**

The University of Auckland

**Chongxin Shan**

Zhengzhou University

**Mengjie Zhang**

Victoria University of Wellington

**Xiaoqi Chen**

South China University of Technology

**John Zhu**

The University of Queensland

**Shane Xie**

The University of Leeds

**Xun Xu**

The University of Auckland

**Shuangquan Zang**

Zhengzhou University

**Jun Zhang**

The University of Auckland

**Guoliang Lu**

The University of Auckland

**Assad Y. Shamseldin  
(deceased)**

The University of Auckland

**Michael Hodgson**

The University of Auckland

# Main Conference Venue

Faculty of Arts and Education (Building 201)

The University of Auckland

10 Symonds Street, 1010, Auckland CBD, Auckland

Situated in the heart of Auckland's CBD, the Faculty of Arts and Education (Building 201) provides a modern, sustainable, and inspiring venue for the conference. The recently redeveloped building features contemporary lecture theatres, flexible learning spaces, collaborative breakout areas, and a spacious central atrium, creating an excellent environment for

academic presentations and networking. With its award-winning design, convenient city-centre location, and easy access to public transport, accommodation, and campus amenities, Building 201 offers an outstanding setting for delegates to engage in technical sessions, discussions, and professional exchange throughout the conference.

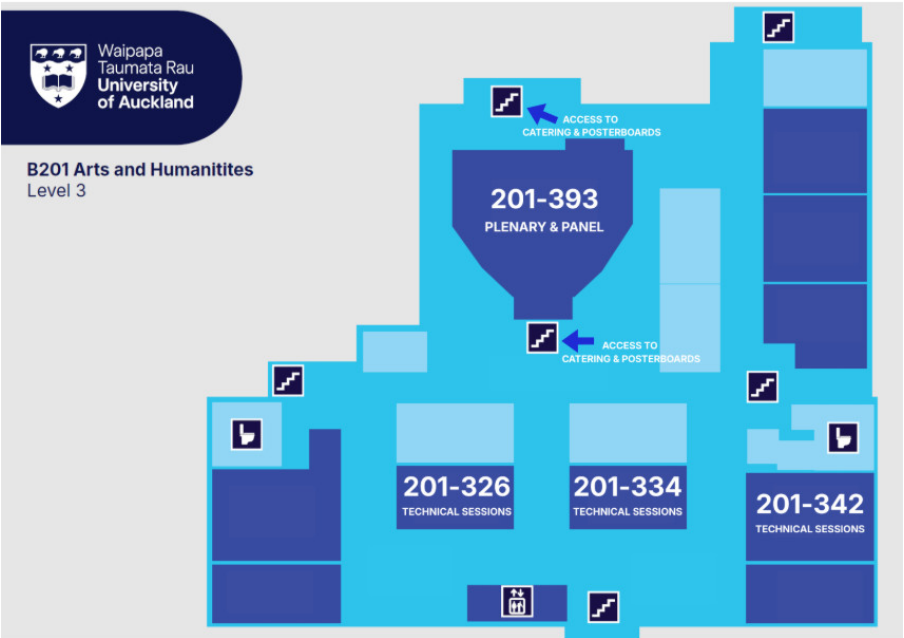
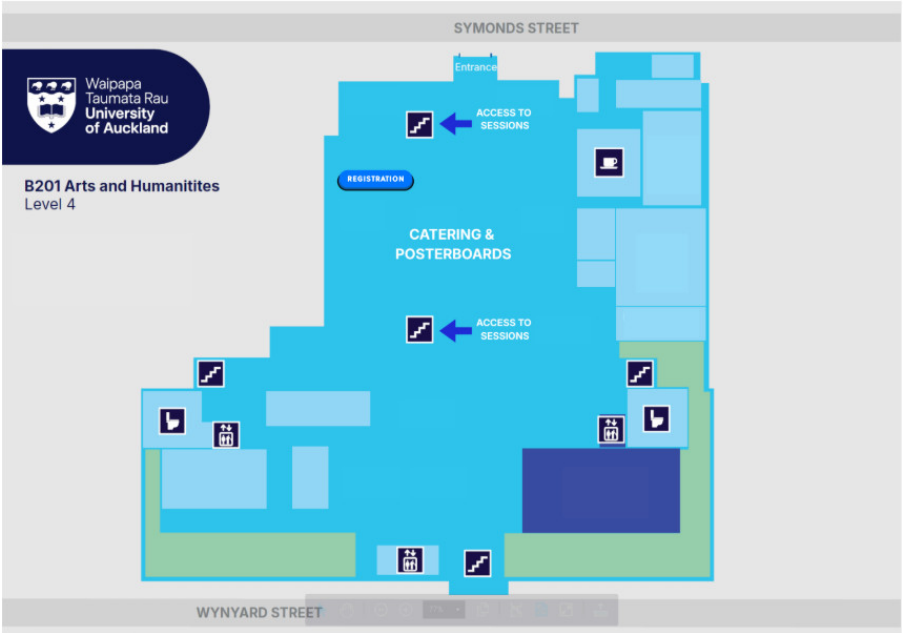


Conference Wifi Network: UoA-Guest-WiFi

Username: [iylf26@uoawifi.com](mailto:iylf26@uoawifi.com)

Access code: PjhVMUWT

# Floor Plan



# Program Overview

| 14-Aug-26 |                                                                                                             |
|-----------|-------------------------------------------------------------------------------------------------------------|
| TIME      | Day 1                                                                                                       |
| 15:30     | <b>Registration</b><br><br><i>Venue: 201 Foyer</i>                                                          |
| 18:00     | <b>Welcome Reception</b><br>* Māori Performance<br>* Light Dinner & Beverage<br><br><i>Venue: 201 Foyer</i> |
| 19:30     |                                                                                                             |

| 15-Aug-26 |                                                                                                                    |                                                                                                              |                                                                                              |
|-----------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| TIME      | Day 2                                                                                                              |                                                                                                              |                                                                                              |
| 8:00      | <b>Registration</b><br><i>Venue: 201 Foyer</i>                                                                     |                                                                                                              |                                                                                              |
| 8:45      | <b>Opening Ceremony</b><br>* Māori Welcome (Mihi)<br>* Opening Remarks<br>* Group Shot<br><br><i>Room: 201-393</i> |                                                                                                              |                                                                                              |
| 9:10      | <b>Plenary Session</b><br><br><i>Room: 201-393</i>                                                                 |                                                                                                              |                                                                                              |
| 9:50      |                                                                                                                    |                                                                                                              |                                                                                              |
| 10:30     | <b>Tea Break &amp; Poster Viewing</b><br><br><i>Venue: 201 Foyer</i>                                               |                                                                                                              |                                                                                              |
| 11:00     | <b>Parallel Session A1</b><br>Materials, Energy & Environmental Sustainability<br><br><i>Room: 201-326</i>         | <b>Parallel Session B1</b><br>AI, Intelligent Systems & Engineering Applications<br><br><i>Room: 201-334</i> | <b>Parallel Session C1</b><br>Biomedical, Health & Life Sciences<br><br><i>Room: 201-342</i> |
| 12:30     | <b>Lunch Break</b><br><br><i>Venue: 201 Foyer</i>                                                                  |                                                                                                              |                                                                                              |

|       |                                                                                                                                 |                                                                                                                                       |                                                                                                                                 |
|-------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 13:30 | <b>Parallel Session A2</b><br>Chemical Exposure, Biotransformation and Molecular Toxicology<br><br><i>Room: 201-326</i>         | <b>Parallel Session B2</b><br>Secure, Robust and Intelligent Biomedical Systems for Clinical Applications<br><br><i>Room: 201-334</i> | <b>Parallel Session C2</b><br>Innovative Medical Devices, Wearable Technologies and Smart Materials<br><br><i>Room: 201-342</i> |
| 15:00 | <b>Tea Break &amp; Poster Viewing</b><br><br><i>Venue: 201 Foyer</i>                                                            |                                                                                                                                       |                                                                                                                                 |
| 15:30 | <b>Panel Discussion</b><br><br><i>Room: 201-393</i>                                                                             |                                                                                                                                       |                                                                                                                                 |
| 16:15 | <b>Parallel Session A3</b><br>Low-Carbon Transition, Policy and Industrial Decarbonization<br><br><i>Room: 201-326</i>          | <b>Parallel Session B3</b><br>Reconstructing Natural and Cultural Histories<br><br><i>Room: 201-334</i>                               | <b>Parallel Session C3</b><br>Ageing, Digital Health and Healthcare Management<br><br><i>Room: 201-342</i>                      |
| 17:00 |                                                                                                                                 |                                                                                                                                       |                                                                                                                                 |
| 18:30 | <b>Conference Banquet &amp; Award Ceremony</b><br>* Dinner<br>* Award Ceremony<br><br><i>Venue: Cordis Hotel Crystal Room 2</i> |                                                                                                                                       |                                                                                                                                 |
| 21:30 |                                                                                                                                 |                                                                                                                                       |                                                                                                                                 |

| 16-Aug-26 |                                                                                                                |                                                                                                                          |                                                                                                                                    |
|-----------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| TIME      | Day 3                                                                                                          |                                                                                                                          |                                                                                                                                    |
| 8:00      | <b>Registration</b><br><b>Venue: 201 Foyer</b>                                                                 |                                                                                                                          |                                                                                                                                    |
| 9:10      | <b>Plenary Session</b><br><b>Room: 201-393</b>                                                                 |                                                                                                                          |                                                                                                                                    |
| 9:50      |                                                                                                                |                                                                                                                          |                                                                                                                                    |
| 10:30     | <b>Tea Break &amp; Poster Viewing</b><br><b>Venue: 201 Foyer</b>                                               |                                                                                                                          |                                                                                                                                    |
| 11:00     | <b>Parallel Session A4</b><br>Sustainable and<br>Advanced Materials<br>Engineering<br><br><b>Room: 201-326</b> | <b>Parallel Session B4</b><br>Intelligent Robotics,<br>Digital Twins and<br>Adaptive Control<br><br><b>Room: 201-334</b> | <b>Parallel Session C4</b><br>Bioengineered<br>Therapeutics and<br>Cellular Models for<br>Human Health<br><br><b>Room: 201-342</b> |
| 12:30     | <b>Lunch Break</b><br><b>Venue: 201 Foyer</b>                                                                  |                                                                                                                          |                                                                                                                                    |

|       |                                                                                                                    |                                                                                                                        |                                                                                                                |
|-------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| 13:30 | <b>Parallel Session A5</b><br>Wireless Power Transfer, Sustainable Energy Technologies<br><br><i>Room: 201-326</i> | <b>Parallel Session B5</b><br>Human-Centred Product Innovation and Data-Driven Engineering<br><br><i>Room: 201-334</i> | <b>Parallel Session C5</b><br>Computational Intelligence, Biosensing and Diagnosis<br><br><i>Room: 201-342</i> |
| 15:00 | <b>Tea Break &amp; Poster Viewing</b><br><br><i>Venue: 201 Foyer</i>                                               |                                                                                                                        |                                                                                                                |
| 15:30 | <b>Parallel Session A6</b><br>Circular Bioenergy and Sustainable Wastewater Treatment<br><br><i>Room: 201-326</i>  | <b>Parallel Session B6</b><br>AI-enabled Monitoring of Climate and Geophysical Hazards<br><br><i>Room: 201-334</i>     |                                                                                                                |
| 16:15 |                                                                                                                    |                                                                                                                        |                                                                                                                |

| 17-Aug-26 |                                                                                                           |
|-----------|-----------------------------------------------------------------------------------------------------------|
| TIME      | Day 4                                                                                                     |
| 10:00     | <b>Academician Lecture</b><br><br><b>Room: 902-402</b><br>(Newmarket Campus – The University of Auckland) |
| 11:00     |                                                                                                           |
| 12:30     | <b>Lunch Break</b><br><br><b>Venue: 902 Foyer</b>                                                         |
| 13:30     |                                                                                                           |
| 14:00     | <b>Lab Tour</b><br><br><b>Assembly Point: 405 Foyer</b>                                                   |
| 16:00     |                                                                                                           |

| 18-Aug-26 |                                                                            |
|-----------|----------------------------------------------------------------------------|
| TIME      | Day 5                                                                      |
| 10:00     | <b>Culture Experiencing Day</b><br><br><b>Assembly Point: Cordis Hotel</b> |
| 17:00     |                                                                            |

# Plenary Talks



**Jamal Deen**

*McMaster University*

## Smart Sensing and AI Towards Ubiquitous Healthcare

The convergence of artificial intelligence (AI) and smart sensor technologies is revolutionizing healthcare by enabling real-time monitoring, personalized health interventions, and ambient assisted living. In this talk, I will present a comprehensive overview of AI-enabled smart systems across the domains of mobility analysis, smart medical homes, wearable telehealth platforms, and lifestyle management tools. I will then discuss a holistic view of a smart medical home ecosystem driven by sensor fusion, edge computing, and AI analytics that form the core of next-generation aging-in-place and daily activity monitoring. Central to this is the concept of a "brain" or an autonomic decision making system that orchestrates data flow, interprets contextual information, and delivers intelligent outputs. A key focus of the talk will be our mobility and walking pattern analyzer, a multi-sensor AI-based system that assesses gait and mobility patterns in real-time, empowering early gait diagnostics and rehabilitation tracking. I will also introduce the smart living diary, a multi-modal interface aggregating activity, nutrition, and sleep data to promote healthy lifestyle. Next, I will highlight the

growing role of wearable telehealth devices and how AI augments their predictive and diagnostic capabilities. Trends in ubiquitous healthcare and sensor performance will be discussed, alongside ethical and interoperability challenges. The presentation will conclude with a forward-looking perspective on the future of AI-enabled healthcare, emphasizing the need for standardized frameworks, inclusive design, robust privacy-preserving mechanisms and future pathways for research and implementation in smart healthcare systems.

**Biography:** *M. Jamal Deen is a Distinguished University Professor at McMaster University in Canada and a Chair Professor at the School of Computer Science and Artificial Intelligence, Zhengzhou University. He has been elected Fellow or Academician of 13 national academies and professional societies, including the Royal Society of Canada, the Chinese Academy of Sciences (Foreign Member), the Canadian Academy of Engineering, the Engineering Institute of Canada, and the IEEE.*

*From 2015 to 2017, he served as President of the Royal Society of Canada. His main research areas include data analytics for human-machine-object systems, nano/optoelectronics, and their applications in health and environmental sciences. To date, he has published more than 900 high-quality papers, authored two textbooks, and holds six patents that have been widely adopted in industry. He has received numerous prestigious awards, including the Order of Canada from the Government of Canada, the Eadie Medal from the Royal Society of Canada, and several IEEE Canada awards such as the Ham Education Medal, the McNaughton Gold Medal, the Fessenden Medal, and the Gottlieb Medal. He has also received the President's Award for Graduate Supervision at McMaster University and the Humboldt Research Award from the Alexander von Humboldt Foundation in Germany.*



**Tava Olsen**

*The University of Melbourne*

## **AI and Innovation in Agriculture**

Agriculture is undergoing a profound transformation driven by rapid advances in artificial intelligence (AI), digital technologies, automation, and data-driven decision-making. As global demand for sustainable food production continues to increase, agricultural systems are facing unprecedented challenges related to productivity, climate change, resource efficiency, and supply chain resilience. In response, AI-enabled technologies are reshaping agricultural supply chains by improving forecasting, optimizing production and logistics, supporting precision farming, and enhancing decision-making across the entire agricultural value chain. At the same time, emerging technologies such as intelligent sensing, autonomous machinery, digital twins, and precision agriculture are creating new opportunities to build smarter, more sustainable, and more resilient agricultural systems. New

Zealand, with its strong agricultural sector and growing digital capabilities, provides valuable examples of how these innovations can be translated into real-world applications. This presentation will explore the evolving role of AI and digital innovation in transforming modern agriculture, with a particular focus on agricultural supply chains. It will highlight emerging technologies, New Zealand case studies, and recent advances in precision agriculture, while discussing future research directions and the opportunities for interdisciplinary collaboration to accelerate AI-driven agricultural innovation and sustainable food systems.

**Biography:** Dr. Tava Olsen received her BSc (Honours) in Mathematics from the University of Auckland, New Zealand, and her Ph.D. in Operations Research from Stanford University, USA. She is currently the Deputy Dean and Professor of Operations and Supply Chain Management at Melbourne Business School. Prior to joining Melbourne Business School, Dr. Olsen held academic positions at the University of Michigan and Washington University's Olin Business School. She later joined the University of Auckland Business School, where she served as the Ports of Auckland Chair of Operations and Supply Chain Management and Director of the Centre for Supply Chain Management. Dr. Olsen's research focuses on stochastic and economic modelling of production, service, agricultural, and health systems. She has published extensively in leading international journals and has made significant contributions to the fields of operations research and supply chain management. She served as Area Editor for Operations Research from 2018 to 2023 and was President of the Manufacturing and Service Operations Management Society (MSOM), demonstrating her leadership and international recognition within the operations management community.



**Aiguo Hu**

*The University of Auckland*

## **Development Trends of Modern Power Supplies in Relation to Wireless Power Transfer Technologies**

The rapid development of power electronics and wireless power transfer (WPT) technologies is transforming the way electrical energy is generated, delivered, and utilized across a wide range of applications. In this talk, I will present an overview of the evolution of modern power electronics and discuss how emerging WPT technologies are enabling safe, efficient, and flexible power delivery without physical electrical connections. I will then introduce key advances in wireless charging systems for consumer electronics, electric vehicles, biomedical devices, industrial automation, and renewable energy applications. A particular focus will be placed on the fundamental principles of high-efficiency power conversion, magnetic coupling, resonant compensation, and intelligent control strategies that enable reliable wireless energy transfer over

diverse power levels, ranging from microwatts ( $\mu\text{W}$ ) to megawatts (MW). I will also discuss recent developments in integrating power electronics with renewable energy systems and future smart grids to improve system efficiency, sustainability, and resilience. Trends in wireless power technologies, together with the remaining technical challenges in efficiency, interoperability, safety, and standardization, will be examined. The presentation will conclude with a forward-looking perspective on the future of wireless power transfer and intelligent power electronics, highlighting their potential to reshape energy delivery for next-generation industrial, transportation, healthcare, and consumer applications.

**Biography:** Professor Aiguo Patrick Hu is a Full Professor in the Department of Electrical, Computer and Software Engineering at the University of Auckland, New Zealand. He received his B.E. and M.E. degrees from Xi'an Jiaotong University, his Ph.D. from the University of Auckland, and completed postdoctoral research at the National University of Singapore. His research focuses on wireless and contactless power transfer, power electronics, and renewable energy systems. He holds more than 50 patents in wireless power transfer technologies, has published over 350 peer-reviewed journal and conference papers, and authored the first monograph on wireless inductive power transfer. Professor Hu received the University of Auckland Vice-Chancellor's Funded Research and Commercialisation Medal in 2017 and serves as Co-Director of the IEEE Future Directions Wireless Power Initiative and the John Boys Interdisciplinary Wireless Power Research Centre. His research has made significant contributions to the advancement and commercialization of wireless power technologies for industrial, transportation, and consumer applications.



**Dan Zhao**

*The University of Canterbury*

## **PINNs-derived Van der Pol Oscillators Simulating and Predicting Bifurcation and Amplitude Death Characteristics of Combustion Instabilities**

Self-sustained thermoacoustic oscillations observed in low-emission combustion-involved gas turbines and aero-engines involve complex thermal-fluid-acoustics interactions and rich nonlinear dynamics. Such pulsating oscillations are known as thermoacoustic instability. When they occur, large-amplitude limit-cycle oscillations (LCOs) of thermodynamic parameters are frequently observed. LCOs could cause overheating, flame flashback, and even engine failures. Thus, it is critical to understand and predict the generation mechanisms, nonlinear dynamics behaviours and then develop corresponding control approaches to prevent or control the onset of such instabilities. For this, we develop and extend the conventional Van der Pol (VDP) oscillators by integrating the PINNs (Physics-informed neural networks) algorithm with a modelled nonlinear Rijke-type thermoacoustic combustor. The theoretical Rijke

tube system (with Galerkin expansion and modified King's Law implemented) and a CFD simulation model are applied to provide 'training/calibration data' for the EVDP (extended VDP)-PINNs model. The optimized EVDP oscillators are confirmed to capture the key nonlinear characteristics by comparing the transient growth behaviours of thermodynamic perturbations and LCOs' amplitudes and frequencies. Further investigations are conducted to obtain Hopf bifurcation and amplitude death (AD) characteristics. A comparison is then made with the coupled EVDP systems. Quite similar Hopf bifurcation features, but differences in regions of AD, are observed. In general, we demonstrate an applicable approach to intelligently 'learn' a nonlinear thermoacoustic system and to create reliable EVDP oscillator systems, which have great potential to contribute to the development and testing of control approaches, such as the coupling described above, thereby potentially replacing costly experimental tests.

**Biography:** Dr. Dan Zhao is the Director of the Master of Engineering program at the University of Canterbury and a Strategic Evaluation Panel member of the Royal Society Te Apārangi. He serves as Chief Editor and Associate Editor for several leading scientific journals, including *Progress in Aerospace Sciences*. Dr. Zhao has been elected Fellow of 12 prestigious professional societies, including the Royal Society Te Apārangi, Engineering New Zealand, the US National Academy of Artificial Intelligence, the European Academy of Sciences and Arts, the European Academy of Sciences, the Royal Aeronautical Society, the Royal Society of Chemistry, and Distinguished Fellow of the International Institute of Acoustics and Vibration. His research expertise includes turbomachinery, aeroacoustics, UAV aerodynamics, propulsion systems, and ammonia/hydrogen combustion science and technology. To date, he has secured more than NZD 18.5 million in competitive research funding.



**Zoran Salcic**

*The University of Auckland*

## Software Defined Systems – An answer to Complex Cyber-Physical Systems Design

Cyber-physical systems (CPS) are becoming a cornerstone of the Internet of Things (IoT), enabling seamless interactions between the physical and digital worlds through billions of interconnected sensing and actuation devices. As these systems continue to grow in scale and complexity, significant challenges arise in designing reliable, safe, and efficient closed-loop applications capable of operating in real time. Conventional development approaches often struggle to fully exploit the enormous computing and communication resources available across distributed IoT infrastructures. Software-defined systems have emerged as a promising paradigm for integrating software-based functionalities into flexible Systems of Things (SoT), providing a

scalable framework for developing next-generation cyber-physical systems. This presentation will explore the principles of software-defined systems and their applications in complex IoT-enabled environments. It will highlight formal computation models, reliable software architectures, and innovative design methodologies that simplify system development while improving the safety, reliability, and performance of real-time and safety-critical cyber-physical systems.

**Biography:** Dr. Zoran Salcic received the B.E., M.E., and Ph.D. degrees in Electrical and Computer Engineering from the University of Sarajevo in 1972, 1974, and 1976, respectively. He is currently Professor and Chair of Computer Systems Engineering at the University of Auckland, New Zealand. Dr. Salcic has published more than 500 peer-reviewed journal and conference papers and several books with IEEE, ACM, Elsevier, and Springer. His research interests include cyber-physical systems, complex digital systems design, hardware/software co-design, design automation, formal models of computation, sensor networks and the Internet of Things (IoT), concurrent and distributed systems, industrial automation, intelligent environments, service robotics, and machine learning. He is a Fellow of the Royal Society of New Zealand, a recipient of the Alexander von Humboldt Research Award (2010), and a Life Senior Member of the IEEE. He has made pioneering contributions to computer engineering education by helping establish one of the world's first computer engineering degree programmes at the University of Sarajevo and New Zealand's first Computer Systems Engineering degree programme at the University of Auckland, and has authored several influential books on digital systems, FPGAs, hardware description languages, and embedded systems.

# Keynote Speakers



**Ziyun Wang**

The University of Auckland

***Rational Catalyst Design for CO<sub>2</sub> Electrochemical Reduction Reaction***

This presentation showcases recent advances in rational catalyst design for electrochemical CO<sub>2</sub> reduction. It highlights how computational modelling and innovative catalyst engineering are improving efficiency, selectivity, and stability for sustainable carbon utilization.



**Xun Xu**

The University of Auckland

***How are Industry 4.0, Industry 5.0 and AI Reshaping Manufacturing?***

The talk discusses how Industry 4.0, Industry 5.0, and artificial intelligence are reshaping the future of manufacturing. It highlights the emerging roles of Generative AI and Agentic AI in building intelligent, human-centric, and sustainable manufacturing systems.



**Stefan K. Bohlander**

The University of Auckland

***The Genomics Revolution***

This presentation examines the rapid advances in genomics and the transformative impact of DNA sequencing technologies on modern medicine. It also highlights how genomic discoveries are improving our understanding of human diseases, advancing precision cancer treatment, and shaping the future of healthcare and medical research.

### Jinjun Chen

Swinburne University of Technology

#### ***Composite DP: Bounded and Unbiased Composite Differential Privacy***

The keynote introduces Composite Differential Privacy (Composite DP), a novel mechanism that eliminates the long-standing bias problem in traditional differential privacy. It demonstrates how bounded and unbiased privacy protection can improve fairness and reliability in real-world data applications.

### David Budgett

The University of Auckland

#### ***Medical Devices, Innovation and Regulation, Keeping Pace Up***

This presentation explores recent advances in implantable medical devices for personalized healthcare, focusing on sensing technologies, data-driven therapies, and the regulatory challenges of implementing patient-specific treatments in clinical practice.

### Peng Cao

The University of Auckland

#### ***Green and Selective Recovery of Critical Metals from Lithium-ion Battery Waste***

This talk presents a sustainable hydrometallurgical approach for recycling critical metals from spent lithium-ion batteries. It highlights an environmentally friendly closed-loop process that efficiently recovers high-purity battery materials for reuse.

### Shane Xie

The University of Leeds

#### ***Advanced Robotics for Effective Stroke Rehabilitation Treatment in Home Environment***

This presentation examines advanced robotic technologies for stroke rehabilitation and neurological care in home environments. It also highlights intelligent rehabilitation exoskeletons, human-robot interaction, and AI-enabled assistive technologies that support personalized treatment and remote healthcare.



**Wei Zhang**

Flinders University

***Biomanufacturing of Marine Bioactives for Human Health and Nutrition toward Circular Blue Bioeconomy***

This presentation examines how marine biomanufacturing can transform bioresources into high-value products for human health and nutrition. It also highlights the importance of interdisciplinary innovation and collaboration in advancing circular blue bioeconomy.



**Xin Dai**

Chongqing University

***Future of Wireless Power Transfer Research and Applications***

This keynote explores the future of wireless power transfer and its transition from laboratory research to real-world deployment. It highlights resilient system design and probabilistic optimization to enable efficient, adaptive, and cable-free energy delivery.



**Gursel Alici**

The University of Wollongong

***Human-Centered Mechatronics: Significance of Mentoring our Early/Mid-Career Staff and Students***

This presentation explores human-centered mechatronics through wearable human-machine interfaces, collaborative robotics, and assistive technologies that enhance human capabilities. It also shares practical insights into mentoring and supporting early- and mid-career researchers to foster future academic leaders.



**Mianxiong Dong**

Muroran Institute of Technology

***Frontiers of Computational Intelligence in Biomedicine***

This talk examines the frontiers of computational intelligence in biomedicine, exploring how artificial intelligence can interpret physiological data for medical diagnosis and healthcare applications. It also highlights recent advances in AI-driven analysis of electrocardiograms, brain activity, and endoscopic imaging, providing new perspectives for next-generation intelligent healthcare systems.

# Panel Discussion

## ***How Emerging Technologies are Transforming the Future of Sustainable Innovation and Intelligent Manufacturing***

The 2nd International Young Leaders Forum will host a special panel discussion on the afternoon of 15 August, bringing together experts across sustainability, low-carbon energy, advanced materials, biomedical innovation, artificial intelligence, robotics, and intelligent manufacturing.

This session will explore how emerging technologies are reshaping global development, from low-carbon energy solutions and next-generation materials to breakthroughs in healthcare, biotechnology, and smart industrial systems. The discussion will highlight how AI, autonomous robotics, digital twins, and data-driven decision-making are enabling more intelligent, efficient, and sustainable approaches across science, engineering, and industry.

Panellists will share insights into current challenges, transformative opportunities, and the interdisciplinary collaborations required to accelerate technological innovation and sustainable progress. By connecting advances in energy, materials, healthcare, and intelligent manufacturing, the session will explore how cross-sector partnerships can address global challenges and create meaningful societal impact.

Designed for young researchers, innovators, and future leaders, this discussion aims to inspire forward-thinking approaches and highlight pathways for impactful innovation in science, technology, and industry.

### ***Moderators***

**Jing (Julia) Ma**

**Auckland University of Technology**



**Guoliang (Leon) Lu**

**The University of Auckland**



# Lab Tour

The lab tour will take participants through a range of research laboratories supporting work in dynamics and control, advanced nanostructured materials fabrication and characterisation, wireless power transfer, and space technologies. Below is a brief introduction to the laboratories that registered participants will visit.

## **Dynamics and Control Lab**

Dynamics and Control Lab supports work in various areas to study the dynamic response of systems and control engineering concerns in the design of automatic systems.

## **Advanced Materials and Energy Lab**

The Advanced Materials Engineering and Energy Laboratory focuses on the fabrication and characterization of advanced nanostructured materials, engineering alloys, and high-performance coatings for applications in advanced engineering, energy technologies, and sustainable environmental solutions. The laboratory's capabilities span the entire materials development process, from sample preparation, materials characterization, and nanomaterial synthesis to alloy development, coating technologies, energy storage device fabrication, and performance evaluation.

## **Wireless Power Transfer Lab**

Wireless Power Transfer Lab conducts medium-to-high powered systems within inductive power transfer (IPT) research. This technology has been utilized in biomedical implants and is also licensed to many international companies.

## **Space Institute Lab**

Space Institute Lab consists of two facilities, i.e. fabrication, Assembly Facility and Cleanroom (FAF) and national Satellite Test Facility (NSTF). FAF is a lab that is reconfigurable for various projects to development of Flight Hardware for in-house activities and external partners. NSTF offers full end-to-end testing capability to support activities from concept development to qualification to acceptance of hardware for space and other applications.

# Session Schedule

## Day 2 – Morning Sessions

| No. | 15/08/2026<br>9:10-10:30 | Plenary Session<br>Room: 201-393<br>Session Chair: Xun Xu                                              |
|-----|--------------------------|--------------------------------------------------------------------------------------------------------|
|     | 9:10-9:50                | <b>Smart Sensing and AI Towards Ubiquitous Healthcare</b><br><i>M. Jamal Deen, McMaster University</i> |
|     | 9:50-10:30               | <b>AI and Innovation in Agriculture</b><br><i>Tava Olsen, The University of Melbourne</i>              |

| No. | 15/08/2026<br>11:00-12:30 | Parallel Session A1: Materials, Energy & Environmental Sustainability<br>Room: 201-326<br>Session Chairs: Wei Gao, Shanghai Wei                                                                                                   |
|-----|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | 11:00-11:30               | <b>Keynote: Rational Catalyst Design for CO<sub>2</sub> Electrochemical Reduction Reaction</b><br><i>Ziyun Wang, The University of Auckland</i>                                                                                   |
| 129 | 11:30-11:45               | Legacy and Emerging PFAS in New Zealand Common Dolphins (Delphinus delphis): Source-Resolved Exposure Regimes Revealed by Nontarget Screening and Positive Matrix Factorization<br><i>Xinrui Shen, The University of Auckland</i> |
| 94  | 11:45-12:00               | Development of High Energy Density Cathode Materials for Sodium Ion Batteries<br><i>B. Moossa, The University of Auckland</i>                                                                                                     |
| 112 | 12:00-12:15               | Development of a Realistic Water-Pressure Loading Device for Concrete Dam Structural Interfaces to Support Smart Dam Safety<br><i>Jingjing Wang, Zhengzhou University</i>                                                         |
| 90  | 12:15-12:30               | Phase-Engineered Cuprous Sulfide Thin Films For Sustainable Low-Temperature Thermoelectric Applications<br><i>Caroline Kennedy, The University of Auckland</i>                                                                    |

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|-----|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| No. | 15/08/2026<br>11:00-12:30 | <b>Parallel Session B1: AI, Intelligent Systems &amp; Engineering Applications</b><br>Room: 201-334<br>Session Chairs: Jing Ma, Xun Xu                   |
|     | 11:00-11:30               | <b>Keynote: How are Industry 4.0, Industry 5.0 and AI Reshaping Manufacturing?</b><br><i>Xun Xu, The University of Auckland</i>                          |
| 60  | 11:30-11:45               | Battery-Free Sensing via Mantis Shrimp-Inspired Electromagnetic Harvesting of Quasi-Static Motions<br><i>Yihao Li, The University of Auckland</i>        |
| 89  | 11:45-12:00               | Goal-Driven Autonomous Execution for Robotic Systems in Smart Manufacturing<br><i>Yinwang Ren, The University of Auckland</i>                            |
| 88  | 12:00-12:15               | HTF-MAE: Label-Efficient Essential Tremor Recognition and Severity Assessment from Digital Handwriting<br><i>Xuexin Wang, Xi'an Jiaotong University</i>  |
| 119 | 12:15-12:30               | AI-Enabled Urban Regeneration in China: Computational Evidence on Policy Functions and Governance Safeguards<br><i>Jianju Wang, Zhengzhou University</i> |

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|-----|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No. | 15/08/2026<br>11:00-12:30 | <b>Parallel Session C1: Biomedical, Health &amp; Life Sciences</b><br>Room: 201-342<br>Session Chairs: Guoliang Lu, Stefan K. Bohlander                                                                                    |
|     | 11:00-11:30               | <b>Keynote: The Genomics Revolution</b><br><i>Stefan K. Bohlander, The University of Auckland</i>                                                                                                                          |
| 27  | 11:30-11:45               | Healthy Lifestyle Attenuate the Association Between Organophosphate Flame Retardants Exposure and Incident Type 2 Diabetes: Integrative Epidemiological and Mechanistic Evidence<br><i>Xueyan Wu, Zhengzhou University</i> |
| 146 | 11:45-12:00               | Innate Immune Checkpoint SIRPα/CD47 Blockade Ameliorates Silica-Induced Pulmonary Fibrosis By Modulating Macrophage Immunity<br><i>Meixiu Duan, Zhengzhou University</i>                                                   |
| 52  | 12:00-12:15               | Genetic Mutation and Dysfunction of AT2 Stem Cells Drive Inflammation-Related Lung Tumorigenesis: Evidence and Mechanism of Autophagy<br><i>Xiaotong Jian, Zhengzhou University</i>                                        |
| 43  | 12:15-12:30               | Mechanistic Study of How D-peptides Reduce Neuroinflammation after Ischemic Stroke<br><i>Hui Zhang, Zhengzhou University</i>                                                                                               |

## Day 2 – Afternoon Sessions

| No. | 15/08/2026<br>13:30-15:00 | <b>Parallel Session A2: Chemical Exposure, Biotransformation and Molecular Toxicology</b><br><b>Room: 201-326</b><br><b>Session Chairs: Xiaomeng Qiao, Zhenrui Pan</b>                                        |
|-----|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 123 | 13:30-13:45               | Mechanistic Determinants of CYP-Mediated 6:2 FTSA Biotransformation<br><i>Mingzhi Zhao, The University of Auckland</i>                                                                                        |
| 96  | 13:45-14:00               | Mechanistic Study of Juglone in Suppressing Lung Cancer Brain Metastasis via the CYP1A1/EREG Signaling Axis<br><i>Kaixuan Deng, Zhengzhou University</i>                                                      |
| 23  | 14:00-14:15               | The Effect of PM2.5 and Its Constituents on Frailty: an Integration of Epidemiological and Network Toxicological Evidence<br><i>Huanxiang Zhang, Zhengzhou University</i>                                     |
| 147 | 14:15-14:30               | Indoor Ozone Reaction Products C8–C10 Aldehydes and Respiratory Inflammatory Diseases in Preschool Children: Preliminary Exploration of Association and Mechanism<br><i>Yunyang Yin, Zhengzhou University</i> |
| 38  | 14:30-14:45               | GATOR1 Complex Controls Cisplatin Sensitivity<br><i>Zhenrui Pan, Zhengzhou University</i>                                                                                                                     |
| 48  | 14:45-15:00               | Alcohol Facilitates Social Dominance Via Activating Dopamine 1 Receptor-expressing Neurons in the Lateral Septum of Male Mice<br><i>Xiaomeng Qiao, Zhengzhou University</i>                                   |

| No. | 15/08/2026<br>13:30-15:00 | <b>Parallel Session B2: Secure, Robust and Intelligent Biomedical Systems for Clinical Applications</b><br><b>Room: 201-334</b><br><b>Session Chairs: Jing Ma, Xun Xu</b>                                                                             |
|-----|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | 13:30-14:00               | <b>Keynote: Composite DP: Bounded and Unbiased Composite Differential Privacy</b><br><b><i>Jinjun Chen, Swinburne University of Technology</i></b>                                                                                                    |
| 122 | 14:00-14:15               | RoboBDsys-II: A Robotic System for Multidimensional Assessment of Trunk Control Ability in Individuals with Spinal Cord Injury<br><i>Xingzhao Guo, Zhengzhou University</i>                                                                           |
| 30  | 14:15-14:30               | Application Evaluation of Machine Learning Based on Multimodal Digital Biomarkers in the Diagnosis of Alzheimer's Disease and Mild Cognitive Impairment: A Systematic Review and Meta-analysis<br><i>Jun Luo, Zhejiang Chinese Medical University</i> |
| 136 | 14:30-14:45               | A Preliminary Empirical Study on the Robustness of U-Net-based Spleen CT Segmentation under Simulated Image Degradation<br><i>Jiaqi Geng, Qingdao University of Science and Technology</i>                                                            |
| 148 | 14:45-15:00               | Development and Validation of a Two-Stage Deep Learning Framework for Automated Bone Age Assessment Based on the Chinese 05 RUS-CHN Standard<br><i>Xinyu Li, Zhengzhou University</i>                                                                 |

|     |                           |                                                                                                                                                                                                 |
|-----|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No. | 15/08/2026<br>13:30-15:00 | <b>Parallel Session C2: Innovative Medical Devices, Wearable Technologies and Smart Materials</b><br><b>Room: 201-342</b><br><b>Session Chairs: Yihao Li, David Budgett</b>                     |
|     | 13:30-14:00               | <b>Keynote: Medical devices, innovation and regulation, keeping the pace up</b><br><b><i>David Budgett, The University of Auckland</i></b>                                                      |
| 19  | 14:00-14:15               | Sustainable Radiative cooling of Eco-friendly Polymer Fabrics<br><i>Xianhu Liu, Zhengzhou University</i>                                                                                        |
| 26  | 14:15-14:30               | Integrated Electrochemical Transistor Enabled by Printable Ionic Thermoelectric Gel<br><i>Hanyu Jia, Zhengzhou University</i>                                                                   |
| 124 | 14:30-14:45               | Construction and Performance of Bio-inspired Structures in Ultra-High Molecular Weight Polyethylene Artificial Joint Materials<br><i>Yue Ren, Zhengzhou University</i>                          |
| 139 | 14:45-15:00               | The Construction of an Intelligent Response Platform based on MOF and Its Application in the Field of Personal Protection<br><i>Shuangying Li, Qingdao University of Science and Technology</i> |

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|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15/08/2026<br>15:30-16:15 | <b>Panel Discussion: How Emerging Technologies are Transforming the Future of Sustainable Innovation and Intelligent Manufacturing</b><br><b>Room: 201-393</b><br><b>Moderators: Jing Ma, Guoliang Lu</b>                                                                                                           |
|                           | This panel discussion highlights how advances in AI, advanced materials, low-carbon energy, biotechnology, digital twins, autonomous robotics, and intelligent manufacturing are fostering sustainable innovation and interdisciplinary collaboration to address global challenges and improve societal well-being. |

| No. | 15/08/2026<br>16:15-17:00 | <b>Parallel Session A3: Low-Carbon Transition, Policy and Industrial Decarbonization</b><br><b>Room: 201-326</b><br><b>Session Chairs: Xinrui Shen, Ziyun Wang</b> |
|-----|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 37  | 16:15-16:30               | Research on the Effect and Mechanism of Digital Government Construction Driving Urban Carbon Emission Reduction<br><i>Jing Ma, Zhengzhou University</i>            |
| 133 | 16:30-16:45               | Prioritizing Low-carbon Technologies in China's Key Sectors under the Net-Zero Emission Goals<br><i>Cong Liu, Qingdao University of Science and Technology</i>     |
| 134 | 16:45-17:00               | Decarbonization Pathways for the Dust-Proof Nets Industry<br><i>Xuan Wang, Qingdao University of Science and Technology</i>                                        |

| No. | 15/08/2026<br>16:15-17:00 | <b>Parallel Session B3: Reconstructing Natural and Cultural Histories</b><br><b>Room: 201-334</b><br><b>Session Chairs: Xiaoling Gao, Buzaina Moossa</b>                                                        |
|-----|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 102 | 16:15-16:30               | Colonial Commodities and the Construction of British Identity in William Hogarth's Paintings<br><i>Xiaoling Gao, Zhengzhou University</i>                                                                       |
| 151 | 16:30-16:45               | Cranial Morphological Analysis of Sapeornis from the Early Cretaceous<br><i>Xiang Yin, Shandong University of Science and Technology</i>                                                                        |
| 154 | 16:45-17:00               | Microfossils from Chert Nodules of the Xiangkuang Formation, Penglai Group, Shandong, and Their Implications for Precambrian Biodiversity<br><i>Jiaying Chen, Shandong University of Science and Technology</i> |

| No. | 15/08/2026<br>16:15-17:00 | <b>Parallel Session C3: Ageing, Digital Health and Healthcare Management</b><br><b>Room: 201-342</b><br><b>Session Chairs: Ting Chu, Guoliang Lu</b>                                                      |
|-----|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 54  | 16:15-16:30               | Influencing Factors and Intervention Advances for Frailty Among Middle-aged and Older Couples From the Digital Health Ecological Perspective: A Scoping Review<br><i>Yanfei Liu, Zhengzhou University</i> |
| 32  | 16:30-16:45               | Hospital Management for Safe and Appropriate Use of Nursing Assistants: A Scoping Review<br><i>Xiaona Bao, Zhejiang Chinese Medical University</i>                                                        |
| 33  | 16:45-17:00               | Experience of Older Adults Using Smart Devices and mHealth Apps in Nursing Homes in Chinese Megacities: A Descriptive Qualitative Study<br><i>Ting Chu, Zhejiang Chinese Medical University</i>           |

## Day 3 – Morning Sessions

|     |                          |                                                                                                                                                                                              |
|-----|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No. | 16/08/2026<br>9:10-10:30 | Plenary Session<br>Room: 201-393<br>Session Chair: Lihua Tang                                                                                                                                |
|     | 9:10-9:50                | Development Trends of Modern Power Supplies in relation to Wireless Power Transfer Technologies<br><i>Aiguo Hu, The University of Auckland</i>                                               |
|     | 9:50-10:30               | PINNs-derived Van der Pol Oscillators Simulating and Predicting Bifurcation and Amplitude Death Characteristics of Combustion Instabilities<br><i>Dan Zhao, The University of Canterbury</i> |

|     |                           |                                                                                                                                              |
|-----|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| No. | 16/08/2026<br>11:00-12:30 | Parallel Session A4: Sustainable and Advanced Materials Engineering<br>Room: 201-326<br>Session Chairs: Peter Murmu, Peng Cao                |
|     | 11:00-11:30               | Keynote: Green and Selective Recovery of Critical Metals from Lithium-ion Battery Waste<br><i>Peng Cao, The University of Auckland</i>       |
| 92  | 11:30-11:45               | Sustainable Thermoelectric Materials for Energy Harvesting<br><i>Peter Murmu, National Isotope Centre, Earth Sciences New Zealand</i>        |
| 64  | 11:45-12:00               | Low-Temperature Electrolysis Recovery of Spent ITO under the Strategy of Molten Salt Electrolysis<br><i>Xiuhao Jia, Zhengzhou University</i> |
| 110 | 12:00-12:15               | Study on the Mesomechanical Properties of Granite<br><i>Xiaomeng Wang, Zhengzhou University</i>                                              |
| 131 | 12:15-12:30               | Carborane Meets Metal Nanocluster: New Opportunities in Nanomaterials<br><i>Zhaoyang Wang, Zhengzhou University</i>                          |

| No. | 16/08/2026<br>11:00-12:30 | <b>Parallel Session B4: Intelligent Robotics, Digital Twins and Adaptive Control</b><br><b>Room: 201-334</b><br><b>Session Chairs: Ryan Liu, Shane Xie</b>                                             |
|-----|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | 11:00-11:30               | <b>Keynote: Robotics and AI for Effective Stroke Rehabilitation Treatment: Challenges and Opportunities</b><br><b><i>Shane Xie, The University of Leeds</i></b>                                        |
| 106 | 11:30-11:45               | Load Distribution Modeling and Digital Twin Platform for Recirculating Ball Screws Considering Non-Load-Bearing Zones and Geometric Errors<br><i>Zhong Yi, Zhengzhou University</i>                    |
| 74  | 11:45-12:00               | UAV-Assisted Joint Trajectory Planning and Dynamic NOMA for Industrial IoT<br><i>Zishuo You, Huazhong University of Science and Technology</i>                                                         |
| 155 | 12:00-12:15               | Reverse Engineering of Low-Reynolds-Number UAV Propellers: A Robust Framework for Geometric Characterization and Aerodynamic Polar Extrapolation/Modeling<br><i>Ryan Liu, University of Canterbury</i> |
| 107 | 12:15-12:30               | Design and Control of a Large-Angle Adaptive Compliant Joint for Peg-in-Hole Assembly in Confined Spaces<br><i>Yuxin Shi, Zhengzhou University</i>                                                     |

| No. | 16/08/2026<br>11:00-12:15 | <b>Parallel Session C4: Bioengineered Therapeutics and Cellular Models for Human Health</b><br><b>Room: 201-342</b><br><b>Session Chairs: Guoliang Lu, Wei Zhang</b>            |
|-----|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | 11:00-11:30               | <b>Keynote: Biomanufacturing of Marine Bioactives for Human Health and Nutrition toward Circular Blue Bioeconomy</b><br><b><i>Wei Zhang, Flinders University</i></b>            |
| 137 | 11:30-11:45               | From MSC-Derived Exosomes to iRGD-Engineered NK Exosomes: A Study on Targeted Therapy for Pulmonary Fibrosis<br><i>Anping Pan, Qingdao University of Science and Technology</i> |
| 138 | 11:45-12:00               | Treatment of Lung Cancer with miR-34a-Loaded Exosomes Derived from Engineered NK-92MI Cells<br><i>Mengting Guo, Qingdao University of Science and Technology</i>                |
| 59  | 12:00-12:15               | Heat Stress-Activated PLD3 Drives Esophageal Squamous Cell Carcinoma Progression via Metabolic Reprogramming<br><i>Hui Liu, Zhengzhou University</i>                            |

## Day 3 – Afternoon Sessions

| No. | 16/08/2026<br>13:30-15:00 | Parallel Session A5: Wireless Power Transfer, Sustainable Energy Technologies<br>Room: 201-326<br>Session Chairs: Kai Tao, Alex Kacprzak                  |
|-----|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | 13:30-14:00               | <b>Keynote: Future of Wireless Power Transfer Research and Applications</b><br><i>Xin Dai, Chongqing University</i>                                       |
| 79  | 14:00-14:15               | Simulation-Led Magnetic Coupler Design for Contactless Quadruped Robot Charging<br><i>Alex Kacprzak, The University of Auckland</i>                       |
| 82  | 14:15-14:30               | Hierarchical Co-Optimization of Network Configuration and Power Control in Wireless Power Transfer Systems<br><i>ShunSheng Hong, Chongqing University</i> |
| 63  | 14:30-14:45               | Micro Vibration Energy Harvesting and Self-powered Sensing<br><i>Kai Tao, Northwestern Polytechnical University</i>                                       |
| 61  | 14:45-15:00               | Recycling of Waste Indium Tin Oxide Target Based on Molten Salt electrochemistry<br><i>Xuena Meng, Zhengzhou University</i>                               |

| No. | 16/08/2026<br>13:30-15:00 | Parallel Session B5: Human-Centred Product Innovation and Data-Driven Engineering<br>Room: 201-334<br>Session Chairs: Yinwang Ren, Gursel Alici                                                                |
|-----|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | 13:30-14:00               | <b>Keynote: Human-Centered Mechatronics: Significance of Mentoring our Early/Mid-Career Staff and Students</b><br><i>Gursel Alici, The University of Wollongong</i>                                            |
| 72  | 14:00-14:15               | Adaptive Generation of Smart Product-Service System Innovation Co-driven by Knowledge Graph and LLM: From a Perspective of Dynamic Market Demand–R&D Supply Matching<br><i>Yaixin Xu, Zhengzhou University</i> |
| 70  | 14:15-14:30               | Dynamic Modeling the Technical Characteristics Based on User Voice via a T3C Model for Data-driven Product Innovation<br><i>Linghan Li, Zhengzhou University</i>                                               |
| 108 | 14:30-14:45               | Rapid Quantitative Assessment of Asphalt Mixture Conditions Using Short-Wave Infrared Hyperspectral Imaging<br><i>Yaowen Xu, Zhengzhou University</i>                                                          |
| 98  | 14:45-15:00               | Photothermal Self-Healing Materials For Thermal Management Devices<br><i>Weijing Yao, Zhengzhou University</i>                                                                                                 |

| No. | 16/08/2026<br>13:30-15:00 | <b>Parallel Session C5: Computational Intelligence, Biosensing and Diagnosis</b><br><b>Room: 201-342</b><br><b>Session Chairs: Qingqing Sun, Mianxiong Dong</b>                             |
|-----|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | 13:30-14:00               | <b>Keynote: Frontiers of Computational Intelligence in Biomedicine</b><br><b><i>Mianxiong Dong, Muroran Institute of Technology</i></b>                                                     |
| 18  | 14:00-14:15               | Bifunctional Photonic Synapse With Short-Term and Long-Term Plasticity for Neuromorphic Image Recognition<br><i>Yanbin Han, Zhengzhou University</i>                                        |
| 25  | 14:15-14:30               | In-situ Signal Amplification of Microneedles in a Transistor for Continuous Detection<br><i>Qingqing Sun, Zhengzhou University</i>                                                          |
| 55  | 14:30-14:45               | Development and Validation of a Machine Learning-based Diagnostic System for 22 Pediatric Respiratory Pathogens: a Large-Scale Multicenter Study<br><i>Yaping Guo, Zhengzhou University</i> |
| 69  | 14:45-15:00               | Predictive Value of Obesity Indices for Carotid Atherosclerosis: An Interpretable Machine Learning Study<br><i>Huifang Zhang, Zhengzhou University</i>                                      |

| No. | 16/08/2026<br>15:30-16:15 | <b>Parallel Session A6: Circular Bioenergy and Sustainable Wastewater Treatment</b><br><b>Room: 201-326</b><br><b>Session Chairs: Caroline Kennedy, Qingqing Sun</b>                       |
|-----|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 135 | 15:30-15:45               | Sustainability Analysis for Biomethane Production Systems: Techno-Economic and Environmental Aspects<br><i>Yumeng Li, Qingdao University of Science and Technology</i>                     |
| 35  | 15:45-16:00               | Research on the Current Carbon Emission Situation and Emission Reduction Strategies of AAO Process Wastewater Treatment Plants<br><i>Meiqi He, Central Plains Environmental Protection</i> |
| 39  | 16:00-16:15               | Selective Sludge Withdrawal Regulates Gasified Sludge Slag Retention and Nutrient Removal Performance in Sequencing Batch Reactors<br><i>Ke Cheng, Zhengzhou University</i>                |

| No. | 16/08/2026<br>15:30-16:15 | <b>Parallel Session B6: AI-enabled Monitoring of Climate and Geophysical Hazards</b><br><b>Room: 201-334</b><br><b>Session Chairs: Yinwang Ren, Alex Kacprzak</b>                         |
|-----|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 44  | 15:30-15:45               | Full coverage and updated raster-based rainfall intensity duration frequency formula for China using remotely sensed CMORPH precipitation data<br><i>Peixi Wang, Zhengzhou University</i> |
| 152 | 15:45-16:00               | Seismic Bandwidth Extension Using an Improved Cycle-Consistent Generative Adversarial Network<br><i>Renzhe Hao, Shandong University of Science and Technology</i>                         |
| 153 | 16:00-16:15               | Digital Monitoring and Assessment of Flood Risk in Cold Region Watersheds for Ecological Restoration<br><i>Aiqi Chen, Shandong University of Science and Technology</i>                   |

## Day 4 – Academician Lecture

|     |                           |                                                                                                                 |
|-----|---------------------------|-----------------------------------------------------------------------------------------------------------------|
| No. | 17/08/2026<br>10:00-11:30 | Academician Lecture<br>Room: 902-402 (New Market Campus, The University of Auckland)<br>Session Chair: Aiguo Hu |
|     | 10:00-11:00               | Trends and Future of Cyber-Physical Systems Software<br><i>Zoran Salcic, The University of Auckland</i>         |

## Day 2 & Day 3 - Poster Sessions

| No. | Poster Sessions<br>Venue: 201 Foyer<br>10:30-11:00 & 15:00-15:30                                                                                                                                                                                                   |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 50  | Reinforcement Learning Assisted Triboelectric Self-Regulating Intelligent Transportation System<br><i>Xiaohui Lu, Changchun University of Technology</i>                                                                                                           |
| 95  | Defect-Engineered TiO <sub>2-x</sub> Nanotube Electrodes for Sustainable Oxygen Electrocatalysis<br><i>Shuo Wan, The University of Auckland</i>                                                                                                                    |
| 117 | Research on the Capture of CO <sub>2</sub> Using Amino-Functionalized Ionic Liquid Combinational Absorbents<br><i>Tao Li, Zhengzhou University</i>                                                                                                                 |
| 120 | Hollow Structure TiO <sub>2</sub> with Rich Oxygen Vacancies Derived by V-Ion-Doping: Synergistic Enhancement on Hydrogen Storage Performance of MgH <sub>2</sub><br><i>Can Li, Henan University</i>                                                               |
| 121 | Carbon Layer-Promoted Carrier Separation of BiVO <sub>4</sub> at the Gas-Solid Interface for Efficient Solar-Driven Water Oxidation<br><i>Jiaxin Chen, Henan University</i>                                                                                        |
| 125 | The stability of $\beta$ -phase upon heating and the phase transition between $\beta$ - and $\alpha$ -phase during strain recovery and creep of stretched PHBHHx: an investigation by in-situ WAXS and polarized FTIR<br><i>Baobao Chang, Zhengzhou University</i> |
| 126 | Crystallization Behavior and Properties of Poly (lactic acid)/Silane-compound Modified Cellulose Composites<br><i>Mengfan Jing, Zhengzhou University</i>                                                                                                           |

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|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 128 | Flexible Thermoelectric Generator with Synergistic High Thermal Conductivity and Breathability for Wearable Applications<br><i>Yalong Wang, Zhengzhou University</i>                                   |
| 150 | 3D Printed Thermoelectric Energy Conversion Materials and Devices<br><i>Jianxu Shi, Xi'an University of Posts and Telecommunications</i>                                                               |
| 76  | A BERT-Based Dimension-Decomposed Method for MBTI Personality Prediction<br><i>Siyan Ding, Monash University</i>                                                                                       |
| 145 | Multi-Dimensional Integration of Gene Expression, Protein Evidence, and Serum Autoantibodies for Diagnostic Modeling in Esophageal Squamous Cell Carcinoma<br><i>Yuanlin Zou, Zhengzhou University</i> |
| 85  | A Reliability-Oriented Multi-objective Optimization Framework for WPT Systems via Stochastic Parameter Characterization for Intelligent Manufacturing<br><i>Yanling Li, Xihua University</i>           |
| 100 | Advancing Humanoid Robotics: A Framework for Integrative Leadership and Decision-Making in AI-Driven Environments<br><i>Jianshe Gao, Zhengzhou University</i>                                          |
| 101 | Mechanistic Modeling of Oxy-Acetylene Ablation and Oxidation in CFRP<br><i>Jianwei Shi, Zhengzhou University</i>                                                                                       |
| 109 | CAE-Aware Progressive Streaming for Web-Based CAD/CAE Simulation in Intelligent Manufacturing<br><i>Saifei Ding, Zhengzhou University</i>                                                              |
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# Abstracts

18.

## **Bifunctional Photonic Synapse With Short-Term and Long-Term Plasticity for Neuromorphic Image Recognition**

Yanbing Han, Zhengzhou University

Ti-doped  $\text{CaSb}_2\text{O}_6$  demonstrates that shallow and deep traps in one persistent luminescent host can natively divide volatile synaptic processing from non-volatile memory. Dual-wavelength excitation enables optical potentiation, inhibition, erasure, and rewriting without electrical readout. The material reproduces PPF, spike-number-dependent potentiation, learning-forgetting-relearning, post-tetanic potentiation, and frequency-dependent plasticity. Translating its measured dynamics into an Opto-Logistic activation function links defect physics directly to neural computation and supports high-accuracy image recognition on an edge device. This work establishes persistent luminescence as a material-level platform for scalable photonic synapses, reconfigurable reservoir computing, and intelligent optical information processing.

19.

## **Sustainable Radiative Cooling of Eco-friendly Polymer Fabrics**

Xianhu Liu, Zhengzhou University

Environmentally friendly radiative cooling materials provide new approaches to zero-energy cooling technology, but maintaining cooling performance under prolonged exposure to complex environments remains challenging. This work uses electrospinning to prepare polylactic acid (PLA) fabrics, followed by annealing to enhance the crystallinity of PLA stereocomposite crystals and improve aging resistance. After 100 days of natural aging, the fabric maintains excellent performance. The environmentally friendly radiative cooling membranes demonstrate strong aging resistance and sustained high-efficiency cooling, showing potential for widespread real-world applications.

23.

## **The Effect of PM<sub>2.5</sub> and Its Constituents on Frailty: An Integration of Epidemiological and Network Toxicological Evidence**

Huanxiang Zhang, Zhengzhou University

This study investigates associations between long-term PM<sub>2.5</sub> exposure and frailty using epidemiological and network toxicology approaches, including 23,937 participants from the Henan Rural Cohort Study. PM<sub>2.5</sub> and multiple constituents were associated with frailty, with  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$  identified as key constituents using Weighted Quantile Sum regression. Network toxicology identified 54 genes connecting PM<sub>2.5</sub> exposure and frailty, enriched in inflammation, immune response, apoptosis, lipid metabolism, PI3K-AKT, and MAPK pathways. Core genes included IL6, TP53, IL1B, TNF, and IL10. The findings suggest that long-term PM<sub>2.5</sub> exposure is associated with prefrailty and frailty risk, partly through inflammatory signaling pathways.

25.

### **In-situ Signal Amplification of Microneedles in a Transistor for Continuous Detection**

Qingqing Sun, Zhengzhou University

This work develops microneedles (MNs) as the extended gate of a thin-film transistor (TFT) for in-situ transdermal histamine detection. Combining the semi-invasive and real-time detection capability of MNs with TFT signal amplification improves biosensor sensitivity. Molecular imprinted polymers provide specific histamine recognition through hydrogen bonding. The MN-TFT demonstrates a detection sensitivity of 18.1  $\mu\text{A}/\text{decade}$  and an approximately  $10^4$ -fold improvement in the limit of detection. Subcutaneous experiments in mice further demonstrate high specificity and continuous monitoring of histamine fluctuations in vivo.

26.

### **Integrated Electrochemical Transistor Enabled by Printable Ionic Thermoelectric Gel**

Hanyu Jia, Zhengzhou University

This work introduces printable thermoelectric ionogels with n-p convertible thermopower for thermoelectric gating of organic electrochemical transistors (OECTs). The Seebeck coefficient can be tuned from  $-3.61$  to  $+9.74$   $\text{mV K}^{-1}$  through [EMIm][Cl] doping. The ionogels simultaneously serve as thermoelectric legs and ionic dielectrics, enabling soft complementary p-n thermoelectric modules. Thermoelectric gating of BBL- and p(g2T-T)-based OECTs achieves high on/off ratios ( $>10^3$ ), robust transconductance under low temperature gradients ( $<30$  K), and mechanical stretchability, providing a route toward energy-autonomous flexible electronics with thermal sensing and adaptive control.

27.

### **Healthy lifestyle attenuate the association between organophosphate flame retardants exposure and incident type 2 diabetes: Integrative epidemiological and mechanistic evidence**

Xueyan Wu, Zhengzhou University

Mixed OPFR exposure, dominated by TPHP, was associated with higher incident T2DM risk in a rural Chinese population, while sustained healthy lifestyles partly attenuated susceptibility. EGFR-related signaling emerged as a plausible mechanistic node linking exposure to impaired glucose homeostasis. These findings support a dual prevention strategy that reduces OPFR contamination while promoting durable healthy behaviors. Future work should incorporate repeated biomonitoring and validate the proposed pathway in primary cells and in vivo systems.

**30.**

### **Application Evaluation of Machine Learning Based on Multimodal Digital Biomarkers in the Diagnosis of Alzheimer's Disease and Mild Cognitive Impairment: A Systematic Review and Meta-analysis**

Jun Luo, Zhejiang Chinese Medical University

This systematic review and meta-analysis evaluates machine-learning techniques based on multimodal digital biomarkers for diagnosing Alzheimer's disease (AD) and mild cognitive impairment (MCI). Twenty-nine studies involving 70,682 participants and 74 diagnostic models were included. Overall accuracy, sensitivity, and specificity were 81.20%, 83.96%, and 79.80%, respectively. Models using language, multimodal biomarkers, and deep learning performed best. For MCI, pooled sensitivity was 0.86, specificity 0.82, and AUROC 0.91. The findings indicate promising diagnostic value, although larger and higher-quality studies are required.

**32.**

### **Hospital Management for Safe and Appropriate Use of Nursing Assistants: A Scoping Review**

Xiaona Bao, Zhejiang Chinese Medical University

This scoping review examines management practices, structural challenges, and digital implications for nursing assistants in no-escort wards. 28 studies were included, producing five themes: entry criteria and role delineation, training and competency development, management structures, collaboration mechanisms, and supervision and quality control. Considerable variation was found across regions and institutions, with limited attention to humanistic care, continuous competency development, systematic performance appraisal, and digital management. The study proposes a digital e-portfolio integrating entry, training, practice, and evaluation to establish a traceable and feedback-enabled management loop.

**33.**

### **Experience of Older Adults Using Smart Devices and mHealth Apps in Nursing Homes in Chinese Megacities: A Descriptive Qualitative Study**

Ting Chu, Zhejiang Chinese Medical University

This study explores older adults' experiences using digital health tools in nursing homes in Chinese megacities. Using descriptive qualitative methodology and the Technology Acceptance Model, semi-structured interviews were conducted with 12 older adults in Hangzhou. Two major themes and eight sub-themes emerged around perceived usefulness and perceived ease of use, including participation, rapid feedback, information accuracy, early warning, technology self-efficacy, privacy, physical barriers, and technical support. Older adults generally recognize the potential value of digital health tools but continue to experience practical challenges in their use.

**35.**

### **Research on the Current Carbon Emission Situation and Emission Reduction Strategies of AAO Process Wastewater Treatment Plants**

Meiqi He, Zhengzhou University

This study evaluates carbon emission pathways in four urban sewage treatment plants in Zhengzhou using the anaerobic/anoxic/aerobic (AAO) process. Electricity consumption was the largest carbon emission source (40.8–43.5%), followed by  $\text{N}_2\text{O}$  (20.6–31.7%) and  $\text{CO}_2$  (19.7–31.4%). Carbon reduction potential was approximately 10% per ton of water for large plants and up to 20% for small plants. A four-step strategy is proposed involving regionalized water collection, increasing influent carbon-to-nitrogen ratio, optimizing operational management, and upgrading energy-saving processes.

**37.**

### **Research on the Effect and Mechanism of Digital Government Construction Driving Urban Carbon Emission Reduction**

Ma Jing, Zhengzhou University

Using China's national “information for the people” pilot as a quasi-natural experiment, this study employs a DID model with 2010–2023 panel data from 283 prefecture-level cities. Digital government construction significantly promotes urban carbon emission reduction, with stronger effects in western cities, non-capital cities, and cities southeast of the Hu Huanyong Line. The effect operates partly through corporate green innovation and increased public environmental awareness. Government digital attention also positively moderates the carbon-reduction effect, providing evidence for promoting urban low-carbon transformation.

**38.**

### **GATOR1 Complex Controls Cisplatin Sensitivity**

Zhenrui Pan, Zhengzhou University

This study investigates the role of the GATOR1 complex in cisplatin resistance. Deletion of GATOR1 members NPRL2, NPRL3, or DEPDC5 promotes cisplatin resistance, whereas their overexpression increases sensitivity. GATOR1 deletion increases ATP7A expression while reducing cisplatin influx transporters CTR2 and LRRC8A, limiting intracellular drug accumulation and cisplatin-DNA adduct formation. These cells also exhibit enhanced DNA damage response and mTORC1 activity. GATOR1 overexpression and/or mTORC1 inhibition restores cisplatin sensitivity, identifying GATOR1 as an important factor in resistance to DNA-damaging anticancer drugs.

**39.**

### **Selective Sludge Withdrawal Regulates Gasified Sludge Slag Retention and Nutrient Removal Performance in SBRs**

Ke Cheng, Zhengzhou University

This study investigates how top and bottom sludge withdrawal regulate the accumulation of fine gasified sludge slag (GSS) and nutrient removal in sequencing batch reactors. During long solids-retention-time operation, top withdrawal promotes selective retention of dense GSS-embedded aggregates, enhancing nitrification, simultaneous nitrification–denitrification, and phosphorus release. Under shortened SRT conditions, bottom withdrawal improves nitrification and SND by removing excessively mineralized sludge and reducing diffusion limitations. The findings demonstrate that sludge withdrawal strategy is an important regulator of mineral particle retention, sludge structure evolution, and biological treatment performance.

**43.**

### **Mechanistic Study of How D-peptides Reduce Neuroinflammation After Ischemic Stroke**

Hui Zhang, Zhengzhou University

This study investigates D-peptides for modulating neuroinflammation after ischemic stroke. Experiments using BV2 microglia and THP-1 monocyte-derived macrophages show that D-peptides markedly attenuate LPS-induced inflammation. D-peptide treatment decreases pro-inflammatory IL-6 and IL-1 $\beta$  while increasing anti-inflammatory IL-10 and TGF- $\beta$ . The effects appear to be partly mediated through inhibition of the NF- $\kappa$ B pathway. These results suggest that D-peptides are promising candidates for treating neuroinflammation after ischemic stroke and potentially other neuroinflammatory diseases.

**44.**

### **Full Coverage and Updated Raster-based Rainfall Intensity Duration Frequency Formula for China Using Remotely Sensed CMORPH Precipitation Data**

Peixi Wang, Zhengzhou University

This study uses 1998–2024 CMORPH remotely sensed precipitation data corrected with ground-station observations to construct an updated, full-coverage raster-based rainfall intensity-duration-frequency (IDF) formula for China. The Pearson Type III distribution and quasi-Newton methods provide optimal performance, with more than 95% of raster cells meeting specification requirements. Validation across 31 provincial capitals achieves  $R > 0.9$ . The resulting nationwide IDF formula provides an updated scientific basis for urban stormwater network design, climate resilience, and sustainable water-environment governance.

48.

## **Tetrodotoxin Reconstructs Basal Ganglia Circuit Balance and Improves Parkinsonian Motor Dysfunction via Voltage-Gated Sodium Channel Modulation**

Xiaomeng Qiao, Zhengzhou University

Degeneration of dopaminergic neurons in the substantia nigra is the core pathology of Parkinson's disease (PD), which triggers excitation-inhibition imbalance in the basal ganglia motor circuit and pathological hyperactivity in nuclei including the subthalamic nucleus. Current clinical therapies still have obvious limitations. This study aimed to explore the efficacy and mechanism of tetrodotoxin (TTX) in improving PD motor dysfunction by regulating voltage-gated sodium (Nav) channels and reconstructing basal ganglia circuit balance. PD mouse models were established and received subthalamic nucleus (STN) targeted TTX or rAAV2/9-CaMKII $\alpha$ -TTX-like sodium channel inhibitory peptide-EGFP-PolyA administration, combined with electrophysiological, behavioral and molecular biological detections. The results showed that TTX significantly suppressed abnormal high-frequency firing of STN neurons, reduced Nav channel current density, downregulated Nav1.6 protein expression and c-Fos positive cell number in the STN, restored functional homeostasis of the basal ganglia circuit, and effectively ameliorated motor dysfunction (decreased rotational behavior, shortened pole-climbing time and increased locomotor activity) in PD mice. This study will provide experimental evidence and a novel strategy for TTX-targeted neuromodulation in PD treatment.

50.

## **Reinforcement Learning Assisted Triboelectric Self-Regulating Intelligent Transportation System**

Xiaohui Lu, Changchun University of Technology

Against the backdrop of global sustainability transition and intelligent transformation, urban traffic congestion has become a bottleneck restricting urban sustainable development. Traditional traffic monitoring systems rely on external power supplies and complex deployment, which are inconsistent with the goals of clean energy utilization and low-carbon development. This study innovatively integrates a multi-functional triboelectric nanogenerator with a bidirectional transmission structure into an intelligent speed bump, realizing self-powered traffic flow sensing by harvesting mechanical energy from passing vehicles—a typical green application of clean energy in the transportation field. We optimized the structural parameters of the nanogenerator to enhance its power generation performance, and combined the SUMO simulation platform with the Deep Q-Network artificial intelligence technology to dynamically optimize traffic signal timing. Real-vehicle and durability tests verified the system's stable operation; the proposed intelligent traffic system reduced the average vehicle waiting time by 97.7% and queue length by 71.4%. This work breaks the external power dependency of intelligent traffic devices, innovates traffic management by fusing clean energy and digital technologies, and provides a feasible technical path for the sustainable and intelligent development of urban transportation.

**52.**

### **Genetic Mutation and Dysfunction of AT2 Stem Cells Drive Inflammation-related Lung Tumorigenesis: Evidence and Mechanism of Autophagy**

Feifei Feng, Zhengzhou University

This study investigates changes in alveolar type 2 (AT2) cells during inflammation-related lung tumorigenesis. A mouse model combining benzo[a]pyrene and lipopolysaccharide exposure was analyzed using single-cell RNA sequencing and whole-exome sequencing. Chronic inflammation promotes lung tumorigenesis and is associated with reduced AT2 cell proportion, altered differentiation trajectories, increased mutations and DNA damage, and decreased differentiation markers. Autophagy-related genes Foxo3 and Ppp2r5 are reduced, suggesting that impaired AT2-cell autophagy may represent an important mechanism connecting chronic inflammation with lung tumorigenesis.

**54.**

### **Influencing Factors and Intervention Advances for Frailty Among Middle-aged and Older Couples From the Digital Health Ecological Perspective: A Scoping Review**

Yanfei Liu, Zhengzhou University

This scoping review maps influencing factors and interventions related to frailty among middle-aged and older couples from a digital health ecological perspective. It examines spousal frailty concordance, dyadic mechanisms, multi-level ecological determinants, and digitally supported assessment and interventions. Determinants are organized across individual, dyadic, socio-environmental, and digital domains. The review aims to clarify current evidence, methodological gaps, and opportunities for developing couple-centered and digitally enabled frailty management strategies within sustainable health ecosystems.

**55.**

### **Development and Validation of a Machine Learning-Based Diagnostic System for 22 Pediatric Respiratory Pathogens: A Large-Scale Multicenter Study**

Yaping Guo, Zhengzhou University

This study develops Pathog-PDx, an interpretable machine-learning system for early diagnosis of pediatric respiratory pathogens. The multicenter study includes 134,500 hospitalized children and integrates 42 clinical and laboratory features from electronic health records. Prospective validation was conducted on an independent cohort of 1,338 children. The system distinguishes 22 pathogen subtypes and achieves a mean AUC of 0.88, including an AUC of 0.95 for influenza virus. The model provides early actionable predictions to support timely and targeted treatment of pediatric respiratory infections.

59.

### **Heat Stress-Activated PLD3 Drives Esophageal Squamous Cell Carcinoma Progression via Metabolic Reprogramming**

Hui Liu, Zhengzhou University

This study identifies phospholipase D3 (PLD3) as a molecular link between chronic heat stress and esophageal squamous cell carcinoma (ESCC). Heat stimulation upregulates PLD3, which promotes proliferation, invasion, and tumor growth through metabolic reprogramming involving the OTUD4/SAFB/PCK2 signaling axis and mitochondrial alterations. A targeted compound screen identifies alpelisib and deferoxamine as potential PLD3 inhibitors capable of suppressing ESCC progression. The findings reveal a PLD3-centered mechanism linking environmental heat exposure with esophageal carcinogenesis and suggest potential therapeutic strategies.

60.

### **Battery-Free Sensing via Mantis Shrimp-Inspired Electromagnetic Harvesting of Quasi-Static Motions**

Yihao Li, The University of Auckland

Inspired by the ultrafast power-amplification mechanism of the mantis shrimp, this work develops an electromagnetic energy harvester that accumulates energy from quasi-static footsteps or vehicle loads and converts it into ultrafast magnet motion. The 3D-printed device produces up to 60 V and 7.74 W instantaneous power, delivering 44.24 mJ per trigger. Field tests demonstrate energy harvesting from both vehicles and human footsteps. The harvested energy powers a radar proximity-alert system or a camera node with BLE transmission and ConvNeXt-based object recognition, enabling sustainable battery-free intelligent surveillance for smart transportation infrastructure.

61.

### **Recycling of Waste Indium Tin Oxide Target Based on Molten Salt Electrochemistry**

Xuena Men, Zhengzhou University

Waste ITO targets contain valuable indium but conventional hydrometallurgical recovery requires large quantities of acids, alkalis, and organic solvents, while pyrometallurgical recovery involves high energy consumption and carbon emissions. This work proposes molten salt electrolysis for spent ITO recovery. The electrochemical mechanism of in-situ deoxidation and the feasibility of using spent ITO as an inert anode are investigated, providing an alternative approach for recovering rare and precious metals and supporting circular resource management.

**63.**

### **Micro Vibration Energy Harvesting and Self-powered Sensing**

Kai Tao, Northwestern Polytechnical University

This work addresses the narrow bandwidth and low output performance of micro-scale energy harvesting technologies. It investigates approaches for expanding operating frequency and improving output efficiency through micro/nano processing. Technologies include multi-mode nonlinear frequency expansion, a helical gear-clutch frequency-up mechanism, and an etch-free micro-charge graphic preparation method. Applications include human-machine interaction interfaces and self-powered wireless health monitoring, providing a technical basis for overcoming limitations of micro- and nano-scale energy harvesting devices.

**64.**

### **Low-Temperature Electrolysis Recovery of Spent ITO Under the Strategy of Molten Salt Electrolysis**

Xiuhao Jiao, Zhengzhou University

This study proposes a low-temperature molten salt electrolysis strategy for recycling spent indium tin oxide. Conventional pyrometallurgical and hydrometallurgical approaches suffer from greenhouse-gas emissions and high reagent consumption, while conventional  $\text{CaCl}_2$  molten salt electro-deoxidation requires an operating temperature of  $850^\circ\text{C}$ . The proposed approach uses constant-voltage electrolysis above 2.2 V to enable simultaneous dissolution and electrochemical deoxidation, selectively producing indium-tin alloy deposits. Energy consumption is reduced to 13.3 kWh, providing a more sustainable pathway toward a circular indium economy.

**69.**

### **Predictive Value of Obesity Indices for Carotid Atherosclerosis: An Interpretable Machine Learning Study**

Huifang Zhang, Zhengzhou University

This study uses interpretable machine learning to evaluate six obesity indices for predicting carotid atherosclerosis. A cohort of 36,376 adults from Henan Province is analyzed using XGBoost, random forest, SVM, and LightGBM, with Boruta for feature selection and SHAP for model interpretation. XGBoost achieves the best performance, while waist-to-height ratio emerges as the most robust obesity predictor. Combined with age, hypertension, and physical activity, it achieves an AUC of 0.8824, demonstrating its potential as an accessible and low-cost screening tool.

70.

### **Dynamic Modeling the Technical Characteristics Based on User Voice via a T3C Model for Data-Driven Product Innovation**

Ke Zhang, Zhengzhou University

This study proposes a dynamic modeling methodology for product technical characteristics based on user voice using a T3C model. User requirements and technical characteristics are automatically extracted from online reviews and official product websites and mapped through data-driven QFD. Their evolution is evaluated through sentiment distributions, opportunity scores, and predicted development trends. A three-dimensional T3C classification model integrating sensitivity, lability, and opportunity score is developed and validated using the Redmi K60 smartphone, supporting forward-looking and targeted product innovation strategies.

72.

### **Adaptive Generation of Smart Product-Service System Innovation Co-driven by Knowledge Graph and LLM: From a Perspective of Dynamic Market Demand–R&D Supply Matching**

Ke Zhang, Zhengzhou University

This study proposes an adaptive approach for generating smart product-service system innovation solutions through knowledge graphs and large language models. Following the logic of “knowledge representation–knowledge matching–solution adaptive generation,” knowledge graphs are constructed from user reviews and product manuals to represent market demand and R&D supply. Demand and supply knowledge graphs are then matched to identify evolutionary patterns. Link prediction and visualization are finally used to automatically derive demand-targeted innovation solutions, providing methodological support for AIGC and data-driven sustainable innovation.

74.

### **UAV-Assisted Joint Trajectory Planning and Dynamic NOMA for Industrial IoT**

Qiang Li, Huazhong University of Science and Technology

This study investigates a multi-UAV, multi-terminal network access system for smart industrial parks. A joint UAV trajectory planning and dynamic non-orthogonal multiple access problem is formulated to maximize average terminal access rate. A graph attention network-parameterized deep Q-network (GAT-PDQN) framework is proposed to dynamically capture network topology and jointly determine access decisions, trajectories, and power allocation. Simulation results show improvements of 14.7% over GNN-PDQN and 32.5% over GAT-PPO in average access rate.

**76.**

### **MBTI Personality Dimension Decomposition and Prediction Method Based on BERT**

Siyan Ding, Monash University

In digital transformation and intelligent manufacturing, collaboration among engineers, operators, and intelligent systems increasingly relies on digital platforms and text-based communication. Understanding personality traits can improve team collaboration, human-machine interaction, and decision-making in smart manufacturing. However, most text-based MBTI prediction approaches treat the task as 16-class classification, resulting in high complexity and severe class imbalance (e.g., INFP accounts for 21.1% of samples, while ESTJ represents only 0.4%). This study proposes a dimension decomposition method that converts the 16-class task into four independent binary classification tasks (E/I, S/N, T/F, and J/P), reducing complexity and improving interpretability. A DistilBERT-based multi-task framework extracts semantic representations, followed by four parallel MLP classification heads. To address class imbalance, weighted cross-entropy loss and differential learning rates are applied. Experiments on the Kaggle MBTI dataset (8,676 samples) show an average dimension accuracy of 82.62% and an 11.5% improvement in overall accuracy over the TF-IDF + logistic regression baseline, demonstrating potential for collaboration analysis in intelligent industrial environments.

**79.**

### **Simulation-Led Magnetic Coupler Design for Contactless Quadruped Robot Charging**

Laurence Li, The University of Auckland

This work investigates a misalignment-tolerant wireless charging dock for quadruped robots to enable more persistent autonomous field operation. Wireless power transfer removes exposed conductive connectors and reduces the need for human intervention, but charging efficiency is sensitive to coil misalignment, air-gap variation, and docking inaccuracies. The proposed design focuses on resonant inductive power transfer, coil topology, compensation design, and charging performance under realistic docking conditions, aiming to improve docking robustness and practical autonomous charging.

**82.**

### **Hierarchical Co-Optimization of Network Configuration and Power Control in Wireless Power Transfer Systems**

Shunsheng Hong, Chongqing University

This study develops a topology self-organizing approach for wireless power transfer networks in which network topology and duty-cycle regulation are jointly optimized. A hierarchical framework first identifies feasible topologies capable of satisfying current power demands and then optimizes operating variables to improve efficiency and coordinate power distribution. DC-side coupling identification allows the system to adapt as network conditions change. Nodes can dynamically switch between transmitting, receiving, and inactive modes, enabling adaptive wireless energy delivery for robotics, automated logistics, and intelligent industrial applications.

85.

### **A Reliability-Oriented Multi-objective Optimization Framework for WPT Systems via Stochastic Parameter Characterization for Intelligent Manufacturing**

Yanling Li, Xihua University

Wireless power transfer (WPT) systems are inherently susceptible to stochastic parameter variations—such as coil misalignment and component tolerances—which often compromise the reliability of deterministic optimization models. Traditional global search strategies typically target peak performance in nominal scenarios, frequently resulting in excessive design redundancy and performance degradation under real-world fluctuations. This paper proposes a novel stochastic-model-driven multi-objective optimization framework specifically designed to enhance system robustness. The methodology first characterizes the statistical distributions of key random variables and derives the probabilistic distribution of output efficiency through surrogate modeling. By employing an improved NSGA-II algorithm, the optimization identifies solutions adapted to high-probability operating conditions while strategically disregarding low-probability extremes. Simulation results from a series-series (SS) compensated prototype demonstrate that the proposed method significantly stabilizes system performance. These findings confirm that integrating probabilistic modeling into WPT design effectively balances efficiency and operational stability, providing a rigorous theoretical foundation for resilient wireless energy transmission. The proposed method is beneficial to enhance the reliability of WPT system in intelligent manufacturing.

88.

### **Label-Efficient Essential Tremor Recognition and Severity Assessment from Digital Handwriting**

Xuexin Wang, Xi'an Jiaotong University

This work proposes a self-supervised representation learning model for essential tremor diagnosis and severity assessment using digital handwriting signals. The model learns transferable time-series representations from unlabeled data through masked reconstruction in both time and frequency domains. Data from four handwriting tasks involving 45 healthy controls and 97 patients with essential tremor are used. The model achieves 92% classification accuracy and a QWK of 0.78 for severity assessment. Even with only 50% of training labels, accuracy remains 87%, demonstrating strong label efficiency and potential for remote screening.

**89.**

### **Goal-Driven Autonomous Execution for Robotic Systems in Smart Manufacturing**

Yinwang Ren, The University of Auckland

This work presents a goal-driven autonomous execution framework that transforms high-level manufacturing task specifications into executable robotic actions without task-specific reprogramming. A unified, device-agnostic action abstraction is combined with agentic AI and generative reasoning to interpret task intent and generate actions. A dual-layer architecture separates task planning from low-level execution. Experiments with a collaborative robot demonstrate autonomous interpretation, action generation and physical execution, as well as generalization across task variants without modifying the underlying control code.

**90.**

### **Phase-Engineered Cuprous Sulfide Thin Films for Sustainable Low-Temperature Thermoelectric Applications**

Caroline Kennedy, The University of Auckland

This study investigates phase-engineered  $\text{Cu}_2\text{S}$  thin films for sustainable low-temperature thermoelectric energy harvesting. Films are fabricated by ion beam sputtering and annealed at 100–400°C to control phase evolution. Mixed monoclinic  $\gamma\text{-Cu}_2\text{S}$  and hexagonal  $\beta\text{-Cu}_2\text{S}$  phases are observed at lower temperatures, while higher-temperature annealing produces cubic  $\alpha\text{-Cu}_2\text{S}$ . Mixed-phase films annealed at 100°C exhibit carrier energy filtering and achieve the highest power factor of 308.5  $\mu\text{W/mK}^2$ . The findings demonstrate the potential of phase engineering for improving sustainable thin-film thermoelectric materials.

**92.**

### **Sustainable Thermoelectric Materials for Energy Harvesting**

Peter Murmu, Earth Sciences New Zealand

This work investigates sustainable copper iodide (CuI) thin films for low- to intermediate-temperature thermoelectric energy harvesting. CuI films fabricated using ion beam sputtering exhibit a zinc-blende crystal structure, a bandgap of approximately 3.00 eV, and optical transmittance above 65%. Annealing at 100°C increases electrical conductivity and the Seebeck coefficient, improving the power factor. Experimental characterization, density functional theory, and Monte Carlo simulations indicate that native defects and associated energy-filtering effects play important roles in enhancing thermoelectric transport.

94.

### **Development of High Energy Density Cathode Materials for Sodium Ion Batteries**

Buzaina Moossa, The University of Auckland

This work explores high-energy-density sodium-ion batteries as cost-effective alternatives to lithium-ion batteries. A microwave-assisted sol-gel route is used to synthesize  $\text{NaFe}_{0.5}\text{Mn}_{0.5}\text{O}_2$  layered oxide, while a symmetric NASICON-type  $\text{Na}_3\text{V}_2(\text{PO}_4)_2\text{F}_3$  electrode integrated with  $\text{Ti}_3\text{C}_2$  MXene is also investigated. Structural characterization confirms successful synthesis. The layered oxide delivers approximately 120 mAh/g at 0.05 C, while the symmetric NASICON material achieves 92.61 mAh/g at 1 C. These approaches provide potential routes toward cost-effective commercialization of high-energy-density sodium-ion batteries.

95.

### **Defect-Engineered $\text{TiO}_2\text{-x}$ Nanotube Electrodes for Sustainable Oxygen Electrocatalysis**

Shuo Wan, The University of Auckland

Efficient and durable electrocatalysts for the oxygen evolution reaction (OER) are critical for sustainable hydrogen production via water electrolysis, a cornerstone of the clean energy transition. Anodized  $\text{TiO}_2$  nanotube arrays (TNAs) offer a promising binder-free electrode platform with ordered porous architecture, yet their widespread adoption is limited by the inherently poor electrical conductivity of stoichiometric  $\text{TiO}_2$ . Here, reductive annealing was employed to introduce oxygen vacancies into  $\text{TiO}_2$ , forming  $\text{TiO}_{2-x}$  with substantially enhanced charge transport and active nucleation sites for catalyst deposition. Ordered TNAs were fabricated via two-step anodization of Ti foil in an ethylene glycol-based electrolyte. NiFeCo multi-metallic species, leveraging the synergistic interplay among earth-abundant Ni, Fe, and Co for enhanced OER activity, were subsequently deposited onto the reduced  $\text{TiO}_{2-x}$  substrates by hydrothermal synthesis. SEM imaging confirmed the formation of well-ordered nanotube structures. STEM-EDS elemental mapping further confirmed that the tubular architecture was preserved after NiFeCo loading, with Fe, Co, and Ni signals homogeneously distributed across the surface without elemental segregation. The integration of a defect-rich  $\text{TiO}_{2-x}$  support and uniform earth-abundant catalyst coating establishes a well-defined model platform for studying defect-catalyst interactions, advancing the rational design of low-cost, sustainable electrocatalysts for green hydrogen production.

**96.**

### **Mechanistic Study of Juglone in Suppressing Brain Metastasis of Lung Cancer via the CYP1A1/EGFR Signaling Axis**

Kaixuan Deng, Zhengzhou University

Juglone significantly suppresses proliferation, migration, and invasion of lung cancer cells, including brain-metastatic cells. Integrated transcriptomic and proteomic analyses identify CYP1A1 and EGFR as important regulatory factors. CYP1A1 overexpression inhibits malignant behaviors and induces cell-cycle arrest, whereas CYP1A1 knockdown partially reverses the inhibitory effects of Juglone. Meanwhile, enhanced EGFR-mediated compensatory survival signaling may reduce Juglone sensitivity in brain-metastatic cells. The findings identify the CYP1A1/EGFR signaling axis as a potential therapeutic target for lung cancer brain metastasis.

**98.**

### **Photothermal Self-Healing Materials for Thermal Management Devices**

Weijing Yao, Zhengzhou University

This work develops transparent photothermal self-healing films by integrating polyurethane self-healing polymers with plasmonic-enhanced MXene and  $W_{18}O_{49}$  hybrids. The films achieve visible-light transmittance above 88% and rapidly reach 102°C within five minutes under 808 nm irradiation. Surface scratches disappear within two minutes through photothermal self-healing, while toughness increases from 75.2 to 116.5 MJ m<sup>-3</sup>. Demonstration as a transparent thermal-management material shows a temperature reduction of approximately 10°C, highlighting potential applications in next-generation energy-saving and thermal-management devices.

100.

## **Advancing Humanoid Robotics: A Framework for Integrative Leadership and Decision-Making in AI-Driven Environments**

Jianshe Gao, Zhengzhou University

The rapid advancement of artificial intelligence has significantly influenced the development of humanoid robots, positioning them as essential entities in modern socio-technological ecosystems. This paper explores the integration of advanced AI methodologies within humanoid robotics, focusing on leadership and decision-making capabilities required for effective interaction in dynamic, real-world environments. By synthesizing recent breakthroughs in machine learning, cognitive robotics, and sensorimotor integration, we propose a framework emphasizing autonomous decision-making and collaborative leadership skills. These advancements enable humanoid robots to evaluate complex situations, interact adaptively with humans, and contribute proactively to interdisciplinary teams. The study also examines societal implications and ethical considerations arising from humanoid robots assuming roles traditionally reserved for human leaders. Through a systematic literature review and case studies of deployed robotic systems, we illustrate the transformational impact of AI-driven humanoid robotics on future talent competency frameworks, interdisciplinary collaboration, and innovation ecosystems. Findings highlight the necessity of embedding robust ethical guidelines and social responsibility principles within robot design to foster trust and acceptance. Ultimately, this research presents an integrated approach aligning technological advancement with societal expectations and stimulates discourse on the future direction of humanoid robotics.

101.

## **Embodied Robot Control Theory: Advancements and Applications in Humanoid Robotics**

Jianwei Shi, Zhengzhou University

The field of embodied robot control theory has emerged as a crucial framework for developing sophisticated humanoid robots capable of navigating complex, real-world environments. This paper explores the theoretical foundations, methodologies, and practical applications of embodied robot control, emphasizing sensorimotor integration, adaptive learning algorithms, and dynamic interaction capabilities. By synthesizing principles from robotics, neuroscience, and artificial intelligence, we present a comprehensive overview of control architectures designed to enable humanoid robots to effectively perceive, interpret, and respond to their environments autonomously. Key topics addressed include proprioceptive feedback mechanisms, real-time sensor integration, and predictive modeling for effective motion control and interaction management. Case studies highlight successful implementations of embodied robot control systems in diverse scenarios, such as healthcare assistance, disaster response, and collaborative manufacturing. These examples demonstrate how advanced control theories enhance robotic autonomy, precision, adaptability, and resilience in complex operational contexts. The research further discusses future directions in embodied robot control, emphasizing the necessity of integrating cutting-edge learning algorithms, including deep reinforcement learning and evolutionary computation, to advance robotic capabilities continuously. By providing a robust theoretical and practical foundation, this study aims to support young researchers and industry leaders in developing innovative humanoid robotics solutions that meet contemporary societal and industrial needs.

**102.**

### **Colonial Commodities and the Construction of British Citizenship in William Hogarth's Paintings**

Xiaoling Guo, Zhengzhou University

This work examines how colonial commodities such as sugar, tobacco, and tea were represented in William Hogarth's paintings as symbols of civilization and elegance while their underlying colonial production networks remained obscured. Through works including *Beer Street* and *Marriage à-la-Mode*, three visual strategies are identified: integrating colonial goods into everyday life, concealing exploitation through composition, and using humor to soften ethical dilemmas. These representations contributed to the construction of emerging British bourgeois identity and provide insight into the relationship between visual culture and colonial economies.

**106.**

### **Load Distribution Modeling and Digital Twin Platform for Recirculating Ball Screws Considering Non-Load-Bearing Zones and Geometric Errors**

Zhong Yi, Zhengzhou University

This study proposes a discontinuous load-distribution model for recirculating ball screws that accounts for non-load-bearing zones introduced by reversers and geometric errors. Based on Hertz contact theory and deformation compatibility, the model captures local load redistribution that conventional continuous models overlook. The effects of reverser number, raceway curvature ratio, reverser size, and geometric errors are investigated. A MATLAB GUI-based digital twin platform is subsequently developed for real-time visualization and prediction of ball load distribution, axial displacement, and contact stress, with verification through MTS testing.

**107.**

### **Design and Control of a Large-Angle Adaptive Compliant Joint for Peg-in-Hole Assembly in Confined Spaces**

Yuxin Shi, Zhengzhou University

This project develops a large-angle adaptive compliant joint for peg-in-hole assembly in confined spaces. The design targets low efficiency and limited success rates associated with misaligned insertion in aerospace and precision machine-tool applications. Three approaches are introduced: a multi-stiffness-domain high-compliance joint mechanism, time-optimal force-position hybrid compliant assembly, and nonlinear dynamic modeling with parameter identification. Together, these approaches aim to enable efficient and reliable misaligned insertion and support intelligent manufacturing of high-end equipment.

**108.**

### **Rapid Quantitative Assessment of Asphalt Mixture Conditions Using Short-Wave Infrared Hyperspectral Imaging**

Yaowen Xu, Zhengzhou University

This study integrates hyperspectral imaging and deep learning for non-destructive moisture-content prediction and visualization in asphalt mixtures. The FNN-MVG-DeepSpectra model is developed using six asphalt-mixture groups with different gradations, binder types, and moisture states. It achieves an  $R^2$  of 0.9042, RMSEP of 0.2172, and MAE of 0.1685 on the prediction set. Applying the model pixel-wise produces moisture-distribution maps capable of revealing increasing moisture levels and abnormal high-moisture regions in damaged specimens, supporting rapid pavement assessment and water-damage diagnosis.

**109.**

### **CAE-Aware Progressive Streaming for Web-Based CAD/CAE Simulation in Intelligent Manufacturing**

Saifei Ding, Zhengzhou University

Modern intelligent manufacturing increasingly relies on cloud-based Computer-Aided Engineering (CAE) simulation to support digital twins, multi-physics analysis, and rapid design validation. However, interactive delivery of large-scale finite element analysis (FEA) results to web clients remains difficult. Full-mesh transmission causes high startup latency, while purely visual approximations often fail to preserve the numerical fidelity required for engineering queries. This paper presents a CAE-aware progressive streaming framework for web-based CAD/CAE simulation. The framework organizes CAE results into three layers: an L0 base layer containing a field-aware proxy mesh, a quantized primary engineering field, and a seed set of high-priority 3D Gaussians; L1 visual enhancement chunks ordered by perceptual importance; and L2 engineering refinement chunks carrying additional scalar fields and hotspot binding records. This design enables early visual rendering while preserving numerically valid field queries in engineering-critical regions. To evaluate CAE-oriented streaming performance, we introduce two metrics: Time to First Query (TTFQ), which measures when a browser client can first return a binding-validated field value, and Hotspot Readiness Rate (C4), which quantifies the accessibility of high-stress regions during streaming. Experiments on three FEA benchmarks, including NAFEMS LE10, a plate with a hole, and a curved cantilever, show that the proposed GS-Mesh interleaved schedule reduces TTFQ by up to 62% compared with random ordering and maintains hotspot readiness above 80% at 50% data delivery. These results demonstrate the potential of CAE-aware streaming for cloud-native intelligent manufacturing simulation.

**110.**

### **Study on the Mesomechanical Properties of Granite**

Xiaomeng Wang, Zhengzhou University

This study uses numerical simulations to investigate how granite mineral grain size affects hydraulic fracture initiation, propagation, and morphology under different stress conditions. Changes in grain size alter internal structural interlocking strength and stress-field distributions, significantly influencing fracture initiation and overall fracturing behavior. The work provides preliminary insight into the scale-dependent mechanism through which rock micro-morphology controls hydraulic fracture propagation and offers theoretical guidance for mechanism studies and engineering parameter optimization.

**112.**

### **Development of a Realistic Water-Pressure Loading Device for Concrete Dam Structural Interfaces to Support Smart Dam Safety**

Jingjing Wang, Zhengzhou University

This work describes the evolution from traditional dams toward digital, simulated, digital-twin, and intelligent dams. Digital dams digitize engineering and monitoring information, while simulated dams use models to evaluate normal and hazardous conditions. Digital twins synchronize physical dams with virtual counterparts using real-time data. Intelligent dams integrate digital platforms, predictive models, control systems, and automated mechanisms into a closed-loop framework of perception, analysis, decision-making, and control, enabling risk identification, warnings, decision support, and autonomous regulation.

**113.**

### **Why Does Public Service Value Articulation Fail? Verifiability Bias and Human–AI Collaborative Calibration in Grassroots Performance Evaluation**

Mengyao Li, Zhengzhou University

Digital transformation has made grassroots performance evaluation increasingly dependent on verifiable information, including data records, procedural traces, case-closure systems, and rankings. While these tools enhance accountability, they may obscure core public service values. Drawing on China's grassroots practices, this paper develops the concept of verifiability bias. Values such as responsiveness, effectiveness, accessibility, trust, and administrative responsibility are relational and context-dependent, making them difficult to quantify or compare. Evaluation systems therefore privilege measurable performance signals, encouraging grassroots actors to produce auditable and risk-avoiding traces. To address this bias, the paper proposes a human–AI calibration mechanism. AI can integrate multi-source information, analyze texts, identify repeated claims, and detect anomalies, while value judgment remains grounded in citizen feedback, grassroots experience, and organizational responsibility. Intelligent performance governance should ultimately support the recognition and realization of public value.

114.

## **Performance Evaluation and Grassroots Cadres' Taking Charge in the Digital Era: A Typological Analysis**

Rui Zhao, Zhengzhou University

Performance evaluation serves as a critical steering instrument in grassroots governance, yet its influence on cadre behavior exhibits pronounced differentiated effects. To explain this variation, this paper moves beyond the linear critique of "inevitable indicator failure." By integrating insights from incomplete contract theory, attribution theory, and attention allocation theory, it distills two core conditions—task measurability and attribution clarity—and constructs an integrated analytical framework. The framework categorizes the operational contexts of performance evaluation into four configurations: "responsibility-clear," "credit-ambiguous," "process-compliant," and "vaguely trapped." It further reveals the differentiated activation logics of mechanisms such as goal displacement, attention shift, and risk aversion under each configuration. On this basis, the paper examines the moderating effect of digital technology embedding on the framework.

116.

## **Full-Process Flood Prevention Digital Twin and Intelligent Early Warning Decision Support System**

Lihuan Wang, Zhengzhou University

This project addresses the challenges of urban flooding disasters under the context of increasing extreme weather events by developing a "Full-process Digital Twin and Intelligent Early Warning Decision Support System for Flood Prevention." The system begins with multi-source data perception, integrating real-time data from weather radars, rainfall stations, water level gauges, and pipeline monitoring networks. It employs the HiPIMS hydrodynamic model to achieve high-precision and high-efficiency inundation simulations, which are further visualized in three dimensions through digital twin technology. On this basis, the system innovatively introduces a retrieval-augmented generation (RAG) architecture combining agent technology with large language models, enabling deep integration of dynamic twin data with static knowledge bases (e.g., emergency plans, historical cases, and waterlogging-prone locations). This facilitates intelligent decision-making through natural language interaction, automatically generating resource dispatch instructions and emergency measure recommendations. The system provides personalized responses tailored to different users: delivering global situational maps and resource allocation plans to decision-makers, and personalized evacuation routes to citizens, achieving "early warning to individuals and precision at specific locations." Compared with conventional flood prevention software, purely visual twin platforms, and general-purpose large language models, this project demonstrates significant advantages in professional accuracy, AI-driven decision-making capabilities, and customized services. Leveraging the multi-billion-dollar market opportunities presented by China's 15th Five-Year Plan, the "AI+" initiative, and smart city development, the project aims to provide full-stack disaster prevention and mitigation solutions for urban construction, offering substantial social benefits and broad application prospects.

**117.**

### **Research on the Capture of CO<sub>2</sub> Using Amino-Functionalized Ionic Liquid Combinational Absorbents**

Tao Li, Zhengzhou University

Against the background of global climate change and energy transition, carbon dioxide emission reduction has become a key technology for achieving the “dual carbon” goals and promoting green development. Carbon capture, utilization, and storage technology, as an important pathway linking emission reduction in high-carbon industries with the construction of clean energy systems, not only contributes to reducing carbon dioxide emissions from industrial production but also provides a viable solution for the green transformation of traditional industries. Related studies indicate that the development of efficient, low-energy, stable, and recyclable CO<sub>2</sub> absorption systems is critical to improving the economic feasibility and practical applicability of carbon capture. In this study, a [TEPAH][Ser]-n-propanol-H<sub>2</sub>O phase-change absorption system was constructed. The saturated CO<sub>2</sub> absorption capacity reached 2.418 mol/mol, with a CO<sub>2</sub>-rich phase volume ratio of 38%. After formulation, the viscosity of the system decreased from 677.3 mPa·s to 4.38 mPa·s, while the regeneration efficiency reached 93%. After five absorption cycles, the regeneration efficiency remained above 90%. This study provides a new approach for the design of CO<sub>2</sub> capture materials and the application of industrial carbon reduction technologies.

**119.**

### **AI-Enabled Urban Regeneration in China: Computational Evidence on Policy Functions and Governance Safeguards**

Jianju Wang, Zhengzhou University

This study investigates artificial intelligence as an emerging governance infrastructure for urban regeneration in China. A computational policy-text framework combines an AI-related dictionary, keyword statistics, LDA topic modeling, topic-evolution analysis, co-word networks, and manual validation. The analysis identifies AI functions including urban diagnostics, risk sensing, infrastructure monitoring, service matching, platform coordination, and adaptive maintenance. It further examines their relationship with data integration, algorithmic accountability, inclusiveness, and human-centered public value, arguing that effective AI-enabled urban regeneration requires institutional safeguards alongside technological capability.

120.

### **Hollow Structure TiO<sub>2</sub> with Rich Oxygen Vacancies Derived by V-Ion-Doping: Synergistic Enhancement on Hydrogen Storage Performance of MgH<sub>2</sub>**

Can Li, Henan University

The large-scale application of magnesium hydride (MgH<sub>2</sub>) is limited by its need for high temperature to absorb and release hydrogen, as well as its poor cycling stability. To address these issues, this study synthesizes V-doped TiO<sub>2</sub> with a thin-walled, hollow tube structure and oxygen vacancies (OV), applying it to improve the hydrogen storage performance of MgH<sub>2</sub>. The experimental results demonstrate that MgH<sub>2</sub>-10 wt.% Ti<sub>0.8</sub>V<sub>0.2</sub>O<sub>2-δ</sub> exhibits the best hydrogen storage performance. Specifically, its initial hydrogen desorption temperature and dehydrogenation activation energy (*E<sub>a</sub>*) decrease to 163 °C and 69.08 ± 4.25 kJ/mol, respectively. After 30 cycles, its hydrogen absorption and desorption remain close to the theoretical values of 97.51% and 98.83%, respectively. It releases 6.35 wt.% of hydrogen (H<sub>2</sub>) within 5 min at 280 °C and still absorbs 3.65 wt.% of H<sub>2</sub> within 60 min even at room temperature. DFT calculations show that doping MgH<sub>2</sub> with Ti<sub>0.8</sub>V<sub>0.2</sub>O<sub>2-δ</sub> reduces the H dissociation barrier from 4.41 eV to 2.43 eV, thereby indicating that Ti<sub>0.8</sub>V<sub>0.2</sub>O<sub>2-δ</sub> substantially diminishes the ionic bond strength of the Mg-H bond. The excellent hydrogen storage performance of MgH<sub>2</sub>-10 wt.% Ti<sub>0.8</sub>V<sub>0.2</sub>O<sub>2-δ</sub> is mainly due to the stable loading of thin-walled and hollow tube Ti<sub>0.8</sub>V<sub>0.2</sub>O<sub>2-δ</sub> on the MgH<sub>2</sub> surface, which provides active sites for hydrogen absorption/desorption and prevents agglomeration during cycling of MgH<sub>2</sub>. The OV facilitate electron transport and weaken the Mg-H bond, accelerating electron migration. This work synthesizes a novel structure of titanium-based catalysts and enhances the hydrogen storage performance of MgH<sub>2</sub>.

121.

### **Carbon Layer-Promoted Carrier Separation of BiVO<sub>4</sub> at the Gas-Solid Interface for Efficient Solar-Driven Water Oxidation**

Jiaxin Chen, Henan University

Water oxidation constitutes the rate-determining step in overall photocatalytic water splitting. To address this bottleneck, the introduction of a carbon layer can significantly boost the separation efficiency of charge carriers, while the concomitant incorporation of a thermal field accelerates their migration kinetics. In this study, a bismuth vanadate (BiVO<sub>4</sub>)/carbon composite photocatalyst was fabricated and immobilized onto a carbonized foam skeleton support, thereby successfully constructing a gas-solid interface for highly efficient, solar-driven photothermal catalytic water oxidation. Under AM 1.5G simulated solar irradiation, the polydopamine (PDA)-modified semiconductor exhibited superior photocatalytic oxygen evolution performance. Concurrently, electrochemical measurements substantiated that the introduction of PDA significantly accelerated charge separation and transfer dynamics. This is chiefly attributed to the PDA-derived carbon layer, which not only establishes an efficient transport pathway for the rapid separation of photogenerated charges, but also functions as a photothermal receptor to induce thermal localization effects at the reaction sites, thereby accelerating the reaction kinetics. Overall, this work demonstrates a versatile strategy for semiconductor synthesis to substantially optimize catalytic efficiency, thereby paving a new avenue for efficient solar-driven water splitting and oxygen evolution.

**122.**

### **RoboBDsys-II: A Robotic System for Multidimensional Assessment of Trunk Control Ability in Individuals with Spinal Cord Injury**

Xingzhao Guo, Zhengzhou University

This study presents RoboBDsys-II, a robotic brace for multidimensional assessment of trunk control in individuals with spinal cord injury. The system provides active protection and external disturbances while simultaneously collecting kinematic, kinetic, and center-of-pressure data. Tests with ten individuals evaluate muscle strength, range of motion, and resistance ability. Most ROM and resistance metrics demonstrate good reliability, and several measures correlate with clinical assessment scores. The system therefore provides a reliable and multidimensional approach for trunk-function evaluation and personalized rehabilitation.

**123.**

### **Mechanistic Determinants of CYP-Mediated 6:2 FTSA Biotransformation**

Mingzhi Zhao, The University of Auckland

This work investigates the early oxidative biotransformation of 6:2 fluorotelomer sulfonic acid, a PFAS alternative, by cytochrome P450 enzymes. Molecular docking, molecular dynamics, density functional theory, kinetic analysis, and binding-energy evaluation are integrated to examine substrate binding, catalytic accessibility, spin-state-dependent reactivity, and intermediate retention. The study clarifies the progression from initial binding through hydrogen abstraction and rearrangement and identifies factors controlling preferred transformation routes. These molecular insights support PFAS transformation-product prediction, environmental risk assessment, and the design of more degradable PFAS alternatives.

**124.**

### **Construction and Performance of Bio-Inspired Structures in Ultra-High Molecular Weight Polyethylene Artificial Joint Materials**

Yue Ren, Zhengzhou University

This study develops three bio-inspired strategies to regulate polyphenol transport and release in ultra-high molecular weight polyethylene artificial-joint materials for sustained antibacterial performance. A sedimentary-rock-inspired cross-bedded structure extends diffusion pathways and suppresses burst release; a hydrogen-bonded polyethylene oxide–polyphenol network enables controlled infiltration and swelling–erosion behavior; and a mechanically interlocked polyphenol–hyaluronic acid interface anchors Pluronic F127 micelles. These structures enhance sustained polyphenol release, lubrication, wear resistance, and resistance to bacterial and protein adhesion, offering potential for next-generation infection-resistant joint implants.

125.

### **The Stability of $\beta$ -Phase upon Heating and the Phase Transition between $\beta$ - and $\alpha$ -Phase during Strain Recovery and Creep of Stretched PHBHHx: An Investigation by In-situ WAXS and Polarized FTIR**

Baobao Chang, Zhengzhou University

While the  $\beta$ -phase of poly(3-hydroxybutyrate-co-3-hydroxyhexanoate) (PHBHHx) is promising for enhancing the elasticity and toughness of the material, its stability and the phase transition between  $\beta$ - and  $\alpha$ -phase remain under hot debate. In this work, the stability of  $\beta$ -phase in solid-state stretched PHBHHx upon heating, as well as the phase transition between  $\beta$ - and  $\alpha$ -phase during strain recovery and creep were studied via in-situ WAXS and polarized FTIR. The absence of  $\beta$ -phase characteristic in perpendicular FTIR spectra revealed that  $\beta$ -phase is primarily highly oriented along the stretching direction. Upon heating, the contents of both  $\beta$ - and  $\alpha$ -phases begin to decrease as the temperature reaches the  $\alpha$ -relaxation temperature of the stretched PHBHHx. This disappearance proceeds in a stepwise manner involving conformational adjustments of the chain backbone and ester groups, alongside weakened interchain interactions. Furthermore, a phase transition between  $\beta$ - and  $\alpha$ -phase was observed during strain recovery and creep, governed by a similar stepwise process accompanied by conformational and interchain interaction changes. Critically, the  $\beta$ -phase content varies linearly with strain recovery or creep displacement, providing substantial evidence that the phase transition is consistent with a viscoplastic flow-controlled process in the stretched PHBHHx.

126.

### **Crystallization Behavior and Properties of Poly(lactic acid)/Silane-compound Modified Cellulose Composites**

Mengfan Jing, Zhengzhou University

Against the background of carbon neutrality, developing bio-based and biodegradable materials to replace petroleum-based polymers has become a research hotspot. Poly(lactic acid) (PLA) offers renewability, biodegradability, and ease of processing. However, its weak crystallization ability often results in poor thermal deformation resistance. Cellulose, the most abundant renewable and biodegradable resource, can improve PLA performance while maintaining sustainability. Effective cellulose defibrillation and surface modification are key to high-performance PLA/cellulose composites. To address these challenges, pulp fibers (PF) and microcrystalline cellulose (MCC) were ball milled and simultaneously modified with (3-aminopropyl)triethoxysilane and tetraethoxysilane. This mechanochemical method promoted cellulose defibrillation, altered surface chemistry, and increased surface roughness by introducing  $\text{SiO}_2$  particles. Compared with controls, silane-compound modified PF most significantly enhanced the non-isothermal crystallization ability of PLA. In-situ infrared spectroscopy showed that modified PF and MCC altered PLA's nucleation mechanism and provided heterogeneous nucleation sites. Controlling filler content and cooling rate during molding effectively improved composite mechanical properties and thermal deformation resistance. This work provides new ideas and theoretical guidance for preparing high-performance green composites.

**128.**

### **Flexible Thermoelectric Generator with Synergistic High Thermal Conductivity and Breathability for Wearable Applications**

Yalong Wang, Zhengzhou University

Thermoelectric conversion technology, capable of directly transforming low-grade thermal energy into electricity, holds significant promise for waste heat recovery and micro/nano energy applications. In particular, flexible thermoelectric devices have garnered considerable attention as self-powered solutions for wearable electronics. However, conventional flexible devices are often constrained by the trade-off between low thermal conductivity and poor breathability of their substrates, which severely compromises long-term wearing comfort and stability. To address this, this study proposes a design strategy based on a Janus-type fabric substrate. By doping boron nitride (BN), a high-thermal-conductivity polydimethylsiloxane (PDMS)/BN composite was prepared. Using a patterned filling technique, this composite was integrated into the fabric skeleton to construct a flexible substrate that combines high thermal conductivity with breathability. Furthermore, a double-sided differential spraying technique was employed to construct hydrophilic and hydrophobic layers on opposite sides of the substrate, enabling the directional transport and rapid evaporation of sweat from the skin side to the ambient environment. The thermoelectric device based on this PDMS/BN-Janus fabric not only maintains high thermal conductivity to ensure output performance but also significantly enhances breathability and moisture-thermal management capabilities, which provides a novel approach to reconciling the dilemma between high thermal conductivity and high breathability in flexible thermoelectric devices.

**129.**

### **Legacy and Emerging PFAS in New Zealand Common Dolphins (*Delphinus delphis*): Source-Resolved Exposure Regimes Revealed by Nontarget Screening and Positive Matrix Factorization**

Xinrui Shen, The University of Auckland

This study investigates PFAS exposure in stranded New Zealand common dolphins as sentinels of marine contamination. Target analysis, high-resolution nontarget screening, and source apportionment are combined to characterize both known PFAS and previously unmonitored fluorinated features. The work examines how long-range transport, historical use, and emerging replacement chemicals contribute to PFAS burdens in a Southern Hemisphere marine environment. It demonstrates how wildlife monitoring can help reveal legacy contamination, emerging PFAS chemistries, and contaminant transport in remote coastal ecosystems.

130.

### **An Upper-Limb Rehabilitation Robot with Progressive Assist-as-Needed Training Based on Probabilistic Movement Primitives and Anomaly Detection**

Aoyu Duan, Zhengzhou University

Upper-limb motor impairment after stroke or neurological injury creates demand for safe, personalized, and progressive rehabilitation systems. This study presents an upper-limb rehabilitation robot for passive and active-assistive training based on a planar parallel mechanism. Probabilistic movement primitives learn representative patterns from healthy human motion data to construct individualized reference trajectories. During training, the robot monitors patient states, including position, velocity, joint angle, interaction force, and muscular effort. An anomaly detection module identifies abnormal motion patterns and potentially unsafe human-robot interactions. Based on motion performance and abnormality level, the controller adaptively adjusts assistance force and training difficulty. When patients perform well, the system reduces assistance and increases task difficulty, encouraging active participation and progressive recovery. The proposed framework provides a feasible solution for intelligent, safe, and personalized upper-limb robotic rehabilitation.

131.

### **Carborane Meets Metal Nanocluster: New Opportunities in Nanomaterials**

Zhao-Yang Wang, Zhengzhou University

This work investigates carborane as a ligand-backbone scaffold for atomically precise metal nanoclusters. Carboranyl ligands provide distinctive spherical topology and three-dimensional aromatic electronic characteristics that improve nanocluster structural stability and tailor chemical reactivity. The work presents one-pot self-reduction routes for superatomic, heterometal-doped, and isostructural nanoclusters, together with carborane-mediated structural regulation and hierarchical assembly. Potential applications include boron neutron capture therapy, electrocatalytic CO<sub>2</sub> reduction, and nitrate reduction, while atomically precise structures enable detailed investigation of structure–property relationships.

133.

### **Prioritizing Low-Carbon Technologies in China's Key Sectors Under the Net-Zero Emission Goals**

Cong Liu, Qingdao University of Science and Technology

This study develops an integrated framework combining Carbon Emission Pinch Analysis, Cost-Benefit Analysis, Marginal Abatement Cost Curves, and Stepwise Multi-Scenario Analysis to evaluate 84 low-carbon technologies across five major sectors. Thirty viable technologies are identified, providing a cumulative greenhouse-gas reduction potential of 90.84 Gt CO<sub>2</sub>-e. The power and construction sectors emerge as the principal decarbonization drivers. The framework enables systematic technology screening and multi-sector scenario assessment to support China's net-zero transition and can potentially be applied to other countries and regions.

**134.**

### **Decarbonization Pathways for the Dust-Proof Nets Industry**

Xuan Wang, Qingdao University of Science and Technology

This study integrates Material Flow Analysis and Life Cycle Assessment to evaluate resource consumption and environmental impacts across the life cycle of China's plastic dust-proof net industry. Four scenarios are considered to develop a decarbonization roadmap toward 2060. Under business as usual, emissions could reach 6.14 Mt CO<sub>2</sub>e by 2060. Increasing recycling rates is identified as particularly important for reducing energy consumption, greenhouse-gas emissions, and plastic pollution. The optimal scenario reduces GHG emissions by 47.3% and plastic pollution by 28.2% relative to the baseline, although economic costs increase by 14.0%.

**135.**

### **Comparative Assessment of Biomethane Production Modes from High-Concentration Organic Wastewater**

Yumeng Li, Qingdao University of Science and Technology

This study evaluates the conversion of high-concentration organic wastewater into biomethane from both environmental and economic perspectives. Four typical biomethane production modes are compared by considering feedstock sources, process configurations, downstream utilization pathways, biogas yield, economic feasibility, and environmental performance. The industrial-park centralized mode achieves the best overall performance, with the lowest unit biogas production cost of 2.16 CNY/m<sup>3</sup>. The results further highlight the combined importance of economies of scale and feedstock composition, providing quantitative guidance for biomethane process selection and sustainable waste-to-energy deployment.

**136.**

### **A Preliminary Empirical Study on the Robustness of U-Net-based Spleen CT Segmentation under Simulated Image Degradation**

Jiaqi Geng, Qingdao University of Science and Technology

This study investigates the robustness of U-Net-based spleen CT segmentation when medical images are affected by common quality degradation. Gaussian noise, impulse noise, blurring, and contrast reduction are introduced into CT images, while Gaussian and median filtering are evaluated as lightweight preprocessing strategies. Segmentation performance is assessed using overlap-based and boundary-aware metrics together with qualitative visualization. Rather than proposing a new architecture, the work demonstrates that conventional signal-processing methods can improve robustness under certain degradation conditions, although excessive filtering may blur anatomical boundaries and reduce segmentation accuracy.

137.

### **From MSC-Derived Exosomes to iRGD-Engineered NK Exosomes: A Study on Targeted Therapy for Pulmonary Fibrosis**

Anping Pan, Qingdao University of Science and Technology

This work develops iRGD peptide-modified engineered natural killer cell-derived exosomes for targeted treatment of idiopathic pulmonary fibrosis. Activated myofibroblasts highly express integrins  $\alpha v\beta 3$  and  $\alpha v\beta 5$ , providing potential targeting sites. By exploiting the affinity between iRGD and integrin  $\alpha v\beta 3$ , the engineered exosomes actively target activated myofibroblasts. The intrinsic cytotoxic molecules carried by NK-derived exosomes, including granzyme B, perforin, and IFN- $\gamma$ , are then used to eliminate pathological myofibroblasts. The approach provides a cell-free therapeutic strategy combining “targeted navigation and precise elimination” for pulmonary fibrosis.

138.

### **Treatment of Lung Cancer with miR-34a-Loaded Exosomes Derived from Engineered NK-92MI Cells**

Mengting Guo, Qingdao University of Science and Technology

This study develops engineered NK-92MI cell-derived exosomes enriched with the tumor-suppressive miRNA miR-34a for lung cancer treatment. The resulting NK-Exo-miR-34a retains the intrinsic cytotoxic activity and tumor-homing properties of NK-derived exosomes while efficiently delivering functional miR-34a into cancer cells. This downregulates oncogenic targets including Bcl-2 and CDK6, inducing apoptosis and G1-phase arrest. In a mouse xenograft model, treatment suppresses tumor growth, reduces metastatic burden, and prolongs survival, demonstrating a potential cell-free precision therapeutic platform combining NK-exosome cytotoxicity with miRNA-based gene regulation.

139.

### **The Construction of an Intelligent Response Platform Based on MOF and Its Application in the Field of Personal Protection**

Shuangying Li, Qingdao University of Science and Technology

This study develops a pH/ROS dual-responsive MOF-based hydrogel dressing for intelligent wound management. MIL-88B-NH<sub>2</sub> acts as a pH-responsive antibacterial module, with acidic wound conditions promoting Fe active-site exposure and enhancing Fenton-like antibacterial activity. A phenylboronic acid–gallic acid module provides ROS-responsive antioxidant behavior by releasing gallic acid under excessive oxidative stress. The hydrogel combines flexibility and tissue adhesion with an antibacterial rate above 80%, while also supporting H<sub>2</sub>O<sub>2</sub> clearance and inflammatory microenvironment regulation. The dual-responsive design enables synergistic antibacterial and antioxidant functions for wound repair.

**145.**

### **Multi-dimensional Integration of Gene Expression, Protein Evidence, and Serum Autoantibodies for Diagnostic Modeling in Esophageal Squamous Cell Carcinoma**

Yuanlin Zou, Zhengzhou University

Esophageal squamous cell carcinoma (ESCC) accounts for most esophageal cancer cases. This study implemented a multi-dimensional integrative approach to identify tumor-associated autoantibodies (TAABs) and develop a diagnostic model for the early detection of ESCC. The study comprised four phases: discovery, verification, modeling, and evaluation. Transcriptomic screening of public datasets and protein-level evidence from literature were integrated to identify candidate tumor-associated antigens (TAAs), followed by serological evaluation using enzyme-linked immunosorbent assay (ELISA) in 940 samples. Eight machine learning algorithms were assessed to develop the optimal diagnostic model. In the discovery phase, transcriptomic analysis identified 26 differentially expressed genes in ESCC, of which ten genes encoding proteins with literature supported evidence were selected as candidate TAAs for serological testing. Seven TAABs were significantly elevated in ESCC cases compared with normal controls in the verification phase. In the modeling phase, six TAABs (anti-CEP55, anti-CKS1B, anti-ECT2, anti-KIF2C, anti-SURV, and anti-TPX2) remained elevated in ESCC cases compared with both benign esophageal disease and normal controls. The support vector machine (SVM) model demonstrated the best diagnostic performance, achieving AUCs of 0.826 in the training set and 0.741 in the internal test set. In the evaluation phase, the SVM model was validated in an independent temporal test set with an AUC of 0.779. This multi-dimensional approach linking transcriptomic evidence, protein-level validation, and immunodiagnostic markers facilitated the development of a diagnostic model, which may hold promise for early detection of ESCC.

**146.**

### **Innate Immune Checkpoint SIRP $\alpha$ /CD47 Blockade Ameliorates Silica-Induced Pulmonary Fibrosis by Modulating Macrophage Immunity**

Meixiu Duan, Zhengzhou University

This study investigates the role of the innate immune checkpoint SIRP $\alpha$ /CD47 in silicosis. A mouse model shows progressive upregulation of SIRP $\alpha$  and CD47 in lung tissue. Blocking this pathway with RRx-001 reduces lung injury and collagen deposition while improving pulmonary function. Mechanistically, SIRP $\alpha$ /CD47 blockade influences T-cell activation, macrophage polarization, inflammatory and profibrotic factors, and reverses silica-induced suppression of macrophage phagocytosis. Elevated soluble SIRP $\alpha$  and CD47 are also observed in patients with silicosis, suggesting that this immune-checkpoint pathway may represent a therapeutic target for silicosis.

147.

### **Indoor Ozone Reaction Products C8–C10 Aldehydes and Respiratory Inflammatory Diseases in Preschool Children: Preliminary Exploration of Association & Mechanism**

Yunyang Yin, Zhengzhou University

This study investigates associations between indoor ozone-reaction products—octanal, nonanal, and decanal—and respiratory diseases in preschool children. A cross-sectional study includes 2,786 children aged 2–6 from 36 kindergartens in Zhengzhou, complemented by cell experiments, network toxicology, and molecular docking. Nonanal exposure is significantly associated with bronchitis symptoms and is the principal contributor among three aldehydes. Cell experiments demonstrate dose-dependent increases in IL-8 and IL-1 $\beta$ , while HSP90AA1 is identified as a potential molecular target, providing epidemiological and mechanistic evidence linking indoor nonanal exposure to childhood bronchitis.

148.

### **Development and Validation of a Two-Stage Deep Learning Framework for Automated Bone Age Assessment Based on the Chinese 05 RUS-CHN Standard**

Xinyu Li, Zhengzhou University

This study develops a two-stage deep learning framework for automated pediatric bone-age assessment. YOLOv5 first detects 13 RUS bones from left-hand radiographs, followed by ResNet50 classifiers for skeletal maturity grading. The predicted grades are combined with the Chinese 05 RUS-CHN scoring system to estimate bone age. External validation demonstrates excellent bone detection, including 99.94% precision and 99.95% recall. The integrated system achieves an overall mean absolute error of 0.5 years, with 89.23% of predictions falling within  $\pm 1$  year of the reference age, supporting its potential as a clinical decision-support tool.

150.

### **3D Printed Thermoelectric Energy Conversion Materials and Devices**

Jianxu Shi, Xi'an University of Posts and Telecommunications

3D printing enables the fabrication of complex thermoelectric materials, holding significant potential in thermoelectric material and device structure design, adaptation to complex curved heat sources, and improvement of conversion efficiency. This paper reviews the current research status of 3D printing in the thermoelectric field, introducing the group's use of selective laser sintering to prepare porous thermoelectric materials. This structure helps reduce thermal conductivity, achieving a thermoelectric figure of merit of 1.29 for p-type bismuth telluride. Furthermore, the group synthesized  $\text{Sb}_{2.5}\text{Te}_3$  and  $\text{Bi}_{0.5}\text{Sb}_{1.5}\text{Te}_3$  thermoelectric materials in situ using selective laser melting. The antimony telluride synthesized at a bulk energy density of 3 J/mm<sup>3</sup> achieved a ZT of 0.4, while  $\text{Bi}_{0.5}\text{Sb}_{1.5}\text{Te}_3$  achieved a synthesis rate of 254 g/h and a maximum ZT of 1.1. Finally, the paper summarizes and looks forward to the future development of 3D printing in the thermoelectric field.

**151.**

### **Cranial Morphological Analysis of Sapeornis from the Early Cretaceous**

Xiang Yin, Shandong University of Science and Technology

This study reports a new Sapeornis specimen, SDUST-V1049, from the Yixian Formation in western Liaoning, China. Morphological analysis of the preserved postcranial elements identifies diagnostic features of Sapeornithidae. X-ray computed tomography and three-dimensional reconstruction further reveal cranial structures embedded within the surrounding matrix that cannot be directly observed externally. These newly accessible anatomical features expand current knowledge of Sapeornis cranial morphology and contribute to revision of the diagnostic characters of this important basal bird lineage.

**152.**

### **Artificial Intelligence-Based Seismic Bandwidth Extension Using an Improved Cycle-Consistent Generative Adversarial Network**

Renzhe Hao, Shandong University of Science and Technology

This study develops an improved CycleGAN for seismic bandwidth extension and resolution enhancement. DenseNet blocks are incorporated into the generator to strengthen multilevel feature reuse, while perceptual loss preserves local waveform characteristics and reduces artificial artifacts. Evaluation using synthetic datasets and the Netherlands F3 field dataset shows thinner and more continuous reflection events and improved visibility of weak structural details. Spectral analysis reveals increased energy between 20 and 40 Hz while preserving major phase relationships and large-scale structures, demonstrating the potential of deep learning to recover useful information from existing seismic records.

**153.**

### **Digital Monitoring and Assessment of Flood Risk in Cold Region Watersheds for Ecological Restoration**

Aiqi Jiang, Shandong University of Science and Technology

This study develops a digital monitoring and flood-risk assessment framework for the Yalu River Basin in Northeast China. ArcGIS and MATLAB are coupled with multi-source data fusion to characterize the watershed surface, while a Flood Risk Index model quantitatively evaluates hydrological risk. Results reveal strong spatial differentiation, with high-risk areas concentrated along the main river channel. Runoff depth, with a weight of 0.55, is identified as the dominant risk factor. The framework supports delineation of priority risk-control zones and targeted ecological restoration, providing quantitative guidance for flood-control engineering and regional environmental resilience.

**154.**

**Microfossils from Chert Nodules of the Xiangkuang Formation, Penglai Group, Shandong, and Their Implications for Precambrian Biodiversity**

Jiaying Chen, Shandong University of Science and Technology

This study investigates Precambrian microfossils preserved in chert nodules from the Xiangkuang Formation of the Penglai Group. Petrographic thin-section analysis reveals abundant filamentous microfossils, numerous sphaeroidal forms, and a smaller number of vase-shaped microfossils. Their morphological diversity and preservation provide new evidence about Proterozoic microbial communities in the southeastern North China Craton. Comparison with well-dated Precambrian assemblages elsewhere also provides biological evidence for regional paleogeographic and evolutionary interpretation, expanding the known paleobiodiversity of the Penglai Group.

**155.**

**Reverse Engineering of Low-Reynolds-Number UAV Propellers: A Robust Framework for Geometric Characterization and Aerodynamic Polar Extrapolation/Modeling**

Xiran Liu, University of Canterbury

This study develops a reverse-engineering framework for low-Reynolds-number UAV propellers integrating 3D laser scanning, point-cloud processing, mesh generation, and geometric extraction. For an APC 10x5 E propeller, the reconstructed mesh achieves an average deviation of only 0.0042 mm, while comparisons with manufacturer and experimental data confirm accurate recovery of chord and pitch-angle distributions. The framework also generates full-angle aerodynamic polar data for blade-element momentum theory modeling using XFOIL and extrapolation methods. The modified AERODAS approach shows better agreement with available wind-tunnel data in important drag and post-stall lift regimes, supporting practical aerodynamic modeling of UAV propellers.

## Notes:

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