

# The 2024 IEEE Smart World Congress

*The 21<sup>st</sup> IEEE International Conference on Ubiquitous Intelligence and Computing (UIC 2024)*

*The 21<sup>st</sup> IEEE International Conference on Autonomous and Trusted Computing (ATC 2024)*

*The 2024 IEEE International Conference on Digital Twin (DigitalTwin 2024)*

*The 2024 IEEE International Conference on Metaverse (Metaverse 2024)*

*The 10<sup>th</sup> IEEE International Conference on Privacy Computing and Data Security (PCDS 2024)*

*The 24<sup>th</sup> IEEE International Conference on Scalable Computing and Communications (ScalCom 2024)*

*UIC/ATC/DigitalTwin/Metaverse/PCDS/ScalCom-2024*

**December 02 - 07, 2024, Denarau Island, Fiji**

<https://www.ieee-smart-world.org/2024/>



Organized by



**The University of Fiji**  
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## Registration Desk

The registration desk will be open at the **Sheraton Fiji Golf & Beach Resort** to assist you at the following time:

- Monday, December 02, 2024, 14:00 – 17:00
- Tuesday, December 03, 2024, 08:00 – 17:00
- Wednesday, December 04, 2024, 08:00 – 17:00
- Thursday, December 05, 2024, 08:00 – 16:00

## Name Badges and Meal Tickets

All delegates, sponsors and speakers of the IEEE UIC/ATC/DigitalTwin/Metaverse/PCDS/ScalCom-2024 will be provided with a name badge, to be collected upon registration. This badge must be worn at all times as it is your official pass to all technical sessions of the conferences and morning and afternoon coffee breaks.

There are different meal tickets for the welcome reception on December 03, the three lunches on December 03 - 05, and the banquet on December 04, respectively.

# Presentation Guidelines

## Conference Date

The conference is to be held from December 02 - 07, 2024. The time for conference program is based on UTC+12, Fiji Standard Time.

## Language

The presentation language of the IEEE UIC/ATC/DigitalTwin/Metaverse/PCDS/ScalCom-2024 is English.

## For Session Chairs

Session Chairs are requested to join the room at least 10 minutes before their sessions.

## For Authors

For authors of **Regular Research Papers/Research Papers/Workshop Papers/Special Session Papers/WiP Papers**, you are strongly encouraged to join the room during your presentation and Q&A. Please confirm your attendance with the Session Chair at least 10 minutes before the session.

## Timing

Please refer to this advanced program to confirm the exact time of your session and the specific order of your paper within the session.

For authors of Regular Research Papers, Workshop Papers, Special Session Papers, and WIP Papers, it is recommended that presentations for IEEE UIC/ATC/DigitalTwin/Metaverse/PCDS/ScalCom-2024 follow a format of **15 minutes for the presentation and 5 minutes for questions**. However, the exact presentation time for each paper will be determined by the Session Chairs, depending on the number of presentations in each session. The Session Chairs will ensure that the allocated time is not exceeded.

## Proceedings

If you are interested in reading papers during the presentations, here are the proceedings:

**Website:** <https://conferences.computer.org/swcpub24>

**username:** swcpub24

The password will be sent to all fully registered participants.

## Conference Venue

In addition to the three physical rooms, the following Tencent room links are available for online conference presentations. You can join any Tencent room of your interest via the provided links.

The corresponding Tencent/Zoom rooms will be active simultaneously with the onsite presentations.

Congress Keynotes/Panels/Forum:

**Tencent:** URL: <https://meeting.tencent.com/dm/dHbu2u547Mxq>

**ID: 933-1515-0490, Password: 873948**

**Zoom:** URL: <https://us04web.zoom.us/j/3216951642?pwd=l25iXdfaoapzReOsMe4w4JQkWezLQc.1&omn=73188687874>

**ID: 321 695 1642, Password: eBa7Tg**

Closing Ceremony:

**Zoom:** URL: <https://us06web.zoom.us/j/87060255816?pwd=1jMHG7w8hNCYkg5c7aecem1BIw6gMS.1>

**ID: 870 6025 5816, Password: 015211**

### Location: Sheraton Fiji Golf & Beach Resort

Onsite Presentation	Online Presentation
Room 1: Sigatoka/Frangipani/ Tencent (ID: 675-7237-2037, Password: 980213) Zoom (ID: 811 4788 3342, Password: 946007)	Room 1 (Tencent): ID: 675-7237-2037, Password: 980213
Room 2: Navua/Orchid/ Tencent (ID: 604-4634-8221, Password: 362787) Zoom (ID: 822 0374 1460, Password: 456418)	Room 2 (Tencent): ID: 604-4634-8221, Password: 362787
Room 3: Dreketi/Gardenia/ Tencent (ID: 629-6528-9410, Password: 473898) Zoom (ID: 899 5520 6874, Password: 2NP8bd)	Room 3 (Tencent): ID: 629-6528-9410, Password: 473898
	Room 4 (Tencent): ID: 303-7104-5623, Password: 782934
	Room 5 (Tencent): ID: 584-6523-4061, Password: 298378
	Room 6 (Tencent): ID: 803-7949-2382, Password: 789356
	Room 7 (Zoom): ID: 817 9170 0883, Password: 484431
	Room 8 (Zoom): ID: 869 3925 1492, Password: 320110

## Welcome Message from the Congress General and Program Chairs

Welcome to the 2024 IEEE Smart World Congress which includes the 21st IEEE International Conference on Ubiquitous Intelligence and Computing (UIC 2024), the 21st IEEE International Conference on Autonomous and Trusted Computing (ATC 2024), the 2024 IEEE International Conference on Digital Twin (DigitalTwin 2024), the 2024 IEEE International Conference on Metaverse (Metaverse 2024), the 10th IEEE International Conference on Privacy Computing and Data Security (PCDS 2024), the 24th IEEE International Conference on Scalable Computing and Communications (ScalCom 2024).

As we gather in Denarau Island, Fiji, we find ourselves at the forefront of a new era in technological innovation. The theme of the congress, "Smart Things Everywhere," reflects our commitment to exploring how smart technologies can transform daily experiences. Since its inception, the Smart World Congress envisions a future where everyday objects are enhanced with the capabilities of sensation, communication, computation, and intelligence. By connecting numerous "smart things" with varying levels of intelligence, we aspire to achieve an intelligence that can address complex challenges and create new opportunities.

Here, we would like to sincerely thank all organizing committee members, program committee members, and reviewers for their hard work and valuable contributions. Without your help, these conferences would not have been possible. We greatly appreciate the sponsorship from IEEE, IEEE Computational Intelligence Society, IEEE Computer Society, IEEE Technical Committee on Scalable Computing (TCSC), IEEE Hyper Intelligence Technical Committee (HI-TC), and Task Force on Cyber-Physical-Social Systems of IEEE Smart World Technical Committee (CPSS). We are very grateful to the keynote speakers for their authoritative speeches. We thank all authors and conference participants for using this forum to communicate their excellent work.

The conferences are planned to be held in December 02 - December 07, 2024, Denarau Island, Fiji.

We hope you find the congress both enlightening and enjoyable, and that you take the opportunity to experience the vibrant culture of Fiji.



Runhe Huang  
Professor, Hosei University, Japan  
Deputy Director, Hosei University Library  
Congress Program Chair



Huazhong Liu  
Professor, Hainan University, China  
Vice-Dean, School of Computer and Technology  
Deputy Director, International Joint Lab, MoE, China  
Congress Program Chair

# The 2024 IEEE Smart World Congress Program

## IEEE UIC/ATC/DigitalTwin/Metaverse/PCDS/ScalCom-2024

### Monday December 02, 2024 (Fiji Standard Time FJT, UTC+12)

14:00 - 17:00	Registration
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### Tuesday, December 03, 2024 (Fiji Standard Time FJT, UTC+12)

08:10 - 09:00	<b>Opening Ceremony (Orchid Ballroom)</b>					
09:00 - 10:20	<b>Keynote 1:</b> Computational Psychophysiology and Mental Health (Orchid Ballroom) <b>Bin Hu</b> , Beijing Institute of Technology, China <b>Chaired by:</b> Jianhua Ma, Hosei University, Japan  <b>Keynote 2:</b> 3D Computer Vision with Applications to Autonomous Vehicles (Orchid Ballroom) <b>Henry Leung</b> , University of Calgary, Canada <b>Chaired by:</b> Hui Yu, University of Glasgow, UK					
10:20 - 10:40	<b>Coffee Break</b>					
10:40 - 11:40	<b>Panel 1:</b> Riding the Wave: Towards Smarter Digital Twins (Orchid Ballroom) <b>Chaired by:</b> Liming Chen, Dalian University of Technology, China					
11:40 - 12:40	<b>Panel 2:</b> Metaverse Unleashed: AI on Cyber Worlds (Orchid Ballroom) <b>Chaired by:</b> Oscar Fuhua Lin, Athabasca University, Canada					
12:40 - 13:40	<b>Lunch Break</b>					
Room	Room 1 (Sigatoka)	Room 2 (Navua)	Room 3 (Dreketi)	Room 4 (Tencent)	Room 5 (Tencent)	Room 6 (Tencent)
13:40 - 15:40	UIC-1	/	SWC-1	UIC-10	ScalCom-1	PCDS-2
15:40 - 16:00	<b>Coffee Break</b>					
16:00 - 18:00	UIC-2	ATC-1/ DigitalTwin-1	SWC-2	UIC-11	ScalCom-2	PCDS-3
18:00 - 21:30	<b>Cocktail Reception (Sandy Point)</b>					

## Wednesday, December 04, 2024 (Fiji Standard Time FJT, UTC+12)

08:30 - 09:10	<p><b>Keynote 3:</b> Safe, Collaboration-friendly, User-acceptable Perception and Localization for Autonomous Systems (Orchid Ballroom)  <b>Michael Milford</b>, Queensland University of Technology, Australia  <b>Chaired by:</b> Runhe Huang, Hosei University, Japan</p>					
09:10 - 10:20	<p><b>Forum:</b> Smart Women, Smart World (Orchid Ballroom)  <b>Chaired by:</b> Runhe Huang, Hosei University, Japan</p>					
10:20 - 10:40	<b>Coffee Break</b>					
10:40 - 12:40	<p><b>Keynote 4:</b> Facial Sensing for Social Signal Analysis and Applications (Orchid Ballroom)  <b>Hui Yu</b>, University of Glasgow, UK  <b>Chaired by:</b> Huazhong Liu, Hainan University, China</p> <p><b>Keynote 5:</b> Rethinking Privacy Protection in Federated Learning in the Face of Model Inversion Attacks (Orchid Ballroom)  <b>Wenjing Lou</b>, Virginia Polytechnic Institute and State University, USA  <b>Chaired by:</b> Laurence T. Yang, St. Francis Xavier University, Canada</p> <p><b>Keynote 6:</b> Development of Sustainable Urban Digital Twin (Orchid Ballroom)  <b>Yoshihide Sekimoto</b>, The University of Tokyo, Japan  <b>Chaired by:</b> Liming Chen, Dalian University of Technology, China</p>					
12:40 - 13:40	<b>Lunch Break</b>					
Room	Room 1 (Sigatoka)	Room 2 (Navua)	Room 3 (Dreketi)	Room 4 (Tencent)	Room 5 (Tencent)	Room 6 (Tencent)
13:40 - 15:40	UIC-3	DigitalTwin-2	PCDS-1	UIC-12	ScalCom-3	ATC-2
15:40 - 16:00	<b>Coffee Break</b>					
16:00 - 18:00	Metaverse-1	DigitalTwin-3	SWC-3/ ScalCom-5	UIC-13	Metaverse-2/ DigitalTwin-5	ATC-3
18:30 - 22:00	<b>Gala Dinner and Award Ceremony</b> (Golden Ballroom)					



## Thursday, December 05, 2024 (Fiji Standard Time FJT, UTC+12)

Room	Room 1 (Frangipani)	Room 2 (Orchid)	Room 3 (Gardenia)	Room 4 (Tencent)	Room 5 (Tencent)	Room 6 (Tencent)	Room 7 (Zoom)	Room 8 (Zoom)
08:30 - 10:30	UIC-4	UIC-6	UIC-8	/	/	/	ATC-4/ ScalCom-4	UIC-22/ Metaverse-3
10:30 - 10:50	<b>Coffee Break</b>							
10:50 - 12:40	UIC-5	UIC-7	UIC-9	ATC-5	UIC-23	SWC-4	/	/
12:40 - 13:40	<b>Lunch Break</b>							
Room	Room 1 (Tencent)	Room 2 (Tencent)	Room 3 (Tencent)	Room 4 (Tencent)	Room 5 (Tencent)	Room 6 (Tencent)	/	/
13:40 - 15:40	UIC-14	UIC-16	UIC-18	UIC-20	UIC-24	SWC-5	/	/
15:40 - 16:00	<b>Session Break</b>							
16:00 - 18:00	UIC-15	UIC-17	UIC-19	UIC-21	UIC-25	UIC-26	/	/

## Friday, December 06, 2024 (Fiji Standard Time FJT, UTC+12)

Room	Room 1 (Tencent)	Room 2 (Tencent)	Room 3 (Tencent)	Room 4 (Tencent)	Room 7 (Zoom)	Room 8 (Zoom)
08:30 - 10:30	/	/	/	/	UIC-27	DigitalTwin-4
12:40 - 13:40	<b>Lunch Break</b>					
13:40 - 15:40	UIC-28	UIC-31	UIC-34	UIC-37	/	/
15:40 - 16:00	<b>Session Break</b>					
16:00 - 18:00	UIC-29	UIC-32	UIC-35	UIC-38	/	/
18:00 - 18:20	<b>Session Break</b>					
18:20 - 20:20	UIC-30	UIC-33	UIC-36	/	/	/

## Saturday December 07, 2024 (Fiji Standard Time FJT, UTC+12)

9:00 - 11:20	Potential Research Collaborations with Local Universities
11:30 - 12:00	Closing Ceremony (Online)

## Congress Keynotes

**Keynote 1: Bin Hu**, Beijing Institute of Technology, China

Computational Psychophysiology and Mental Health

**Keynote 2: Henry Leung**, University of Calgary, Canada

3D Computer Vision with Applications to Autonomous Vehicles

**Keynote 3: Michael Milford**, Queensland University of Technology, Australia

Safe, Collaboration-friendly, User-acceptable Perception and Localization for Autonomous Systems

**Keynote 4: Hui Yu**, University of Glasgow, UK

Facial Sensing for Social Signal Analysis and Applications

**Keynote 5: Wenjing Lou**, Virginia Polytechnic Institute and State University, USA

Rethinking Privacy Protection in Federated Learning in the Face of Model Inversion Attacks

**Keynote 6: Yoshihide Sekimoto**, The University of Tokyo, Japan

Development of Sustainable Urban Digital Twin

# The 2024 IEEE Smart World Congress

## Keynote 1: Computational Psychophysiology and Mental Health

*Bin Hu, Beijing Institute of Technology, China*

### About the Keynote Speaker



Professor Hu is a (Full) Professor and the Dean of the School of Medical Technology at Beijing Institute of Technology, China. He is a National Distinguished Expert, Chief Scientist of 973 as well as National Advanced Worker in 2020. He is a Fellow of IEEE/IET/AAIA and IET Fellow Assessor & Fellowship Advisor. He serves as the Editor-in-Chief for the IEEE Transactions on Computational Social Systems and an Associate Editor for IEEE Transactions on Affective Computing. He is one of Clarivate Highly Cited Researchers and World's Top 2% Scientists. He is a Member of the Steering Council of the ACM China Council and the Vice-Chair of the China

Committee of the International Society for Social Neuroscience. He is also the TC Co-Chair of computational psychophysiology in the IEEE Systems, Man, and Cybernetics Society (SMC). He is a Member of the Steering Committee of Computer Science at the Chinese Ministry of Education, Science and Technology Commission at the Chinese Ministry of Education.

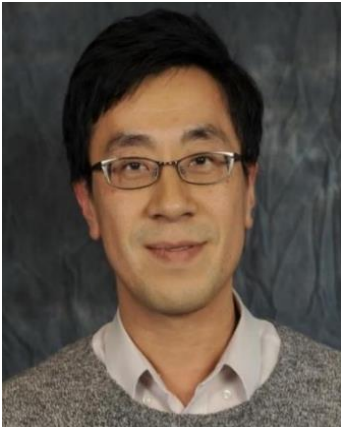
**Summary:** In recent years, mental health issues have become increasingly prominent all the world. According to the report from the World Health Organization, approximately 970 million people suffer from mental disorders, accounting for 13% of the global population. Currently, the diagnosis of mental illnesses primarily relies on physician interviews and Brief Psychiatric Rating Scale (BPRS), lacking objective and quantifiable diagnostic indicators. Besides, the common treatment of mental disorders is pharmacotherapy, which is often associated with significant side effects. The rapid advancement of cutting-edge artificial intelligence and big data technologies offers new opportunities for the diagnosis and treatment of mental disorders. These technologies are shifting the approach to data driven screening and treatment, offering more precise, personalized, and effective solutions. This report will introduce the opportunities and challenges in the field of medical electronics and computational methodologies for the diagnosis and treatment of mental disorders.

# The 2024 IEEE Smart World Congress

## Keynote 2: 3D Computer Vision with Applications to Autonomous Vehicles

*Henry Leung, University of Calgary, Canada*

### About the Keynote Speaker



Professor Leung is a Schulich Industry Research Chair Professor of the Department of Electrical and Software Engineering at the University of Calgary, Canada. His current research interests include data analysis, information fusion, machine learning, signal and image processing, robotics, and internet of things. He has published over 350 journal papers and 250 refereed conference papers. Dr. Leung has been the associate editor of various journals such as the IEEE Circuits and Systems Magazine, International Journal on Information Fusion, IEEE Trans. Aerospace and Electronic Systems, IEEE Signal Processing Letters, IEEE Trans. Circuits and Systems, Scientific

Reports He has also served as guest editors for the special issue “Intelligent Transportation Systems” for the International Journal on Information Fusion and “Cognitive Sensor Networks” for the IEEE Sensor Journal. He is the editor of the Springer book series on “Information Fusion and Data Science”. He is a Fellow of IEEE, SPIE, Engineering Institute of Canada (EIC) and Canadian Academy of Engineering (CAE).

**Summary:** In this talk we present our works on 3D computer vision based on RGBD sensing. A visual SLAM system on static and dynamic platforms is described that uses motion prior to obtain accurate motion estimation in metric scale to make dynamic features usable for SLAM on dynamic platforms. When depth info is not available, deep learning is used to perform depth prediction, and the predicted depth can be used for RGBD SLAM. In this talk, we will also discuss 3D object detection and tracking that can be used for obstacles avoidance, including approaches to enhance object detection in different environments. The proposed RGBD image processing techniques for SLAM, depth prediction, object detection and object tracking are applied to autonomous driving and the performance are evaluated using publicly available datasets and experimental datasets we collected for practical driving scenarios in real environments including highways, residential, semi-urban and urban roads.

# The 2024 IEEE Smart World Congress

## Keynote 3: Safe, Collaboration-friendly, User-acceptable Perception and Localization for Autonomous Systems

*Michael Milford, Queensland University of Technology, Australia*

### About the Keynote Speaker



Professor Milford conducts interdisciplinary research at the boundary between robotics, neuroscience, computer vision and machine learning, and is a multi-award winning educational entrepreneur. His research models the neural mechanisms in the brain underlying tasks like navigation and perception to develop new technologies in challenging application domains such as all-weather, anytime positioning for autonomous vehicles. From 2022 - 2027 he is leading a large research team combining bio-inspired and computer science-based approaches to provide a ubiquitous alternative to GPS that does not rely on satellites. He is also one of Australia's most in demand experts in technologies including self-driving cars, robotics and artificial intelligence, and is a passionate science communicator. He currently holds the position of Director of the QUT Centre for Robotics, Australian Research Council Laureate Fellow, Professor at the Queensland University of Technology, and is a Microsoft Research Faculty Fellow and Fellow of the Australian Academy of Technology and Engineering.

**Summary:** Recently, for robots, autonomous vehicles and general technology platforms to ever be deployed ubiquitously in the world around us, they must meet certain requirements. Firstly, they must be performant - and this has been the focus of the vast majority of research attention, focusing on levels of performance as well as their generality and robustness. Secondly, most robot deployments will be in some manner collaborative or supervised - midway between the human-only traditional model and the speculative fully autonomous approach. Collaboration requires key capabilities from autonomous systems, most notably introspective capability, so that they can work and interact seamlessly with people. Thirdly, they must operate in a manner that is acceptable by end-users: a great example of this being complying with legal and social expectations around privacy in the case of perception systems. Finally, they must be safe and fit-for-purpose, and at least some of the metrics and the manner in which we measure this performance for research should ideally be directly predictive of these properties. In this talk I'll highlight challenges and limitations in all of these areas, and, using both applied industry and fundamental research projects as examples, showcase work we've done to address these challenges.

# The 2024 IEEE Smart World Congress

## Keynote 4: Facial Sensing for Social Signal Analysis and Applications

*Hui Yu, University of Glasgow, UK*

### About the Keynote Speaker



Professor Yu is a Professor with the University of Glasgow, UK. He leads the Visual Computing and Social Robot Group at the university. His research interests lie in visual and cognitive computing as well as machine learning with applications to social signal analysis, social robot, human-machine interaction, intelligent vehicle, and video analysis. Professor Yu's research work has led to several awards and successful collaboration with worldwide institutions and industries. He is the Associate Vice President of IEEE Systems, Man, and Cybernetics Society and a Scientific Advisor for a high-tech company in the UK. Prof. Yu is the PI on grants from a diverse range of funding sources including the EPSRC, EU FP7, RAEng, Royal Society, Innovate UK and Industry. He has been awarded Industrial Fellowship by the Royal Academy of Engineering. He serves as an Associate Editor for IEEE Transactions on Human-Machine Systems, IEEE Transactions on Computational Social Systems, IEEE Transactions on Intelligent Vehicles and IEEE/CAA, Journal of Automatica Sinica.

**Summary:** Human face is one of the key means for social communication and social signal conveying. It represents one of the principal features of natural interaction. Computational and psychophysical research has identified a wide range of social signals conveyed by the face. However, it still faces challenges to fully uncover and understand social signals from human faces. It is thus essential to develop computational models allowing us to perceive these social signals from images and video streams for various applications such as affective computing, social robotics, social interaction, social cognition, and cognitive neuroimaging. In addition, multimodal information including visual and biometric signals can record the facial muscle activity or brain activity closely related to facial movements and the internal emotional states. These multiple sensing channels would help provide an insight into the emotion and social signals of facial expressions. This talk will discuss both computational and psychophysical methods for understanding facial expression and the causative mechanism of emotion combining knowledge of visual computing with multiple disciplines, such as cognitive computing and machine learning.

# The 2024 IEEE Smart World Congress

## Keynote 5: Rethinking Privacy Protection in Federated Learning in the Face of Model Inversion Attacks

*Wenjing Lou, Virginia Polytechnic Institute and State University, USA*

### About the Keynote Speaker



Professor Lou is the W. C. English Endowed Professor of Computer Science at Virginia Tech and a Fellow of the IEEE and ACM. Her research interests cover many topics in the cybersecurity field, with her current research interest focusing on security and privacy problems in wireless networks, blockchain, trustworthy machine learning, and Internet of Things (IoT) systems. Prof. Lou is a highly cited researcher by the Web of Science Group. She received the Virginia Tech Alumni Award for Research Excellence in 2018, the highest university-level faculty research award. She received the INFOCOM Test-of-Time paper award in 2020. She is the TPC chair for IEEE INFOCOM 2019 and ACM WiSec 2020. She was the Steering Committee Chair for

IEEE CNS conference from 2013 to 2020. She is currently the vice chair of IEEE INFOCOM and a steering committee member of IEEE CNS. She served as a program director at the US National Science Foundation (NSF) from 2014 to 2017.

**Summary:** While AI is revolutionizing various industries, it raises considerable privacy concerns due to its reliance on the collection and analysis of extensive amounts of personal data. Federated learning, a distributed learning paradigm allowing institutions to collaboratively train models without moving data across institutional boundaries, is thus highly advantageous due to its ability to maintain data locality and address legal and ethical barriers to data sharing. However, recent research has shown that federated learning is susceptible to privacy attacks, such as data reconstruction and membership inference, where sensitive information can be inferred from model updates. This talk will provide an overview of privacy attacks in federated learning, focusing on the underlying causes and examining the latest attack methodologies. I will introduce a STOA model inversion attack called scale-MIA. This attack efficiently reconstructs clients' training samples from aggregated model updates in federated learning and undermines the effectiveness of secure aggregation protocols. I will also discuss the impact of such attacks and explore emerging solutions to enhance privacy in federated learning systems.

# The 2024 IEEE Smart World Congress

## Keynote 6: Development of Sustainable Urban Digital Twin

*Yoshihide Sekimoto, The University of Tokyo, Japan*

### About the Keynote Speaker



Professor Sekimoto directs the Human-Centered Urban Informatics Laboratory, established in April 2013, which is part of the Institute of Industrial Science (IIS) at the University of Tokyo. He is currently the Director and Professor of the Center for Spatial Information Science (CSIS) at the University of Tokyo. He received his Ph.D. in civil engineering from The University of Tokyo in 2002. He had previously worked at the National Institute for Land, Infrastructure and Management from 2002-2007 and the Center for Spatial Information Science at the University of Tokyo from 2007-2013. Lab HP: <http://sekilab.iis.u-tokyo.ac.jp/>

**Summary:** Recently, the term "smart city" has gained widespread popularity as a concept that represents futuristic cities utilizing cutting-edge information technology. Examples of such cities include autonomous driving cities with zero accidents or cashless cities equipped with numerous surveillance cameras. However, it is important to acknowledge that the majority of cities worldwide are not large or extraordinary, and their focus should be on sustainability for the benefit of their citizens. In this regard, fostering collaboration between citizens and local governments, utilizing self-controlled data that is not exclusively governed by a single stakeholder, such as a large corporation, becomes crucial. To address this need, the introduction of the "People Flow Project" and the "Geospatial Information Center" is proposed as research initiatives based on data governance. Furthermore, the "My City X" project is aimed at providing citizens with collaborative urban planning tools, including the "My City Forecast" for predicting city developments, and the "My City Report" for monitoring civil infrastructure. These tools will leverage a city dashboard, various types of open data, and machine learning techniques to facilitate effective urban management.



## Congress Panels

### Panel 1: Riding the Wave: Towards Smarter Digital Twins

**Panelist 1: Bin Hu**, Beijing Institute of Technology, China

Emotion Understanding Technologies in Digital Twins

**Panelist 2: Everton Cavalcante**, Federal University of Rio Grande do Norte, Brazil

How Far Are We: From the Current Wave to Autonomic and Cooperative Digital Twins

**Panelist 3: Lu Liu**, University of Exeter, UK

Self-learning Digital Twins for Health and Net Zero

**Panelist 4: Zheng Yan**, Xidian University, China

Digital Twin Positioning

### Panel 2: Metaverse Unleashed: AI on Cyber Worlds

**Panelist 1: Georg Borges**, Saarland University, Germany

National Laws in Metaverse and Cyberworld

**Panelist 2: Zhong Chen**, Peking University, China

Practitioners View of AIGC in Yidao Smart Sport Metaverse

**Panelist 3: Hui Yu**, University of Glasgow, UK

AI Enabled Avatar Generation

**Panelist 4: Xiaokang Wang**, Hainan University, China

When Tensor Computing Meets Metaverse

# The 2024 IEEE Smart World Congress

## Panel 1: Riding the Wave: Towards Smarter Digital Twins

In the increasingly connected world with the growing capabilities of sensing, mobility, networking and computational power, the seamless integration and collaboration of people, machines, and organizations in both physical and digital realms have become a prominent and pressing topic. At the heart of this dynamic transformation and transition, digital twin plays a crucial role in representing and manipulating physical entities in virtual world. These technologies continue to rapidly evolve as industries increasingly recognize their potential. Digital twin serves as a bridge, linking the physical and digital worlds, offering a potent toolset for comprehending, managing, and enhancing intricate systems and processes, involving people, machinery, and organizations. Meanwhile, the Intelligent Internet of Things (IIoT) stands as a transformative force across a multitude of industries and applications. It injects intelligence into interconnected everyday objects and systems, revolutionizing operations with increased efficiency, automation, and innovation. This revolution has led to notable improvements in resource management, cost-effectiveness, and elevated user experiences. The fusion of digital twin and IIoT technologies generates robust solutions that enable real-time monitoring, analysis, and control of physical assets and systems. This fusion holds particular significance in dynamic and complex environments like manufacturing, healthcare, transportation, agriculture, and the development of smart cities. This panel discussion serves as a dynamic platform for the exchange of ideas, knowledge dissemination, critical analysis, and collaboration within the academic community. It plays a pivotal role in advancing scholarship, nurturing intellectual growth, and addressing critical societal challenges. It is expected that the interactions and debates will ignite intellectual stimulation, inspire innovation and encourage interdisciplinary thinking, ultimately advancing the research frontier.

### About the Panel Chair



**Professor Liming Chen**

*Dalian University of Technology, China*

**Liming Chen** is Chair Professor in the School of Computer Science and Technology at Dalian University of Technology, China. He is a Fellow of IET, has served as the chief scientist of European Horizon 2020 Excellence Research MSCA project and the Research Director for the School of Computing, Ulster University, UK. His current research interests include data analytics, artificial intelligence, pervasive computing, user-centred smart cyber-physical systems and their applications in smart healthcare and IoT cybersecurity. Dr Chen has over 300 publications in internationally recognised journals, book series and conferences. He was the General Chair for IEEE Digital Twin 2024/2023, IEEE WoWMoM2022, IEEE Smart World Congress 2019, IEEE UIC2017, IEEE HealthCom2017, and an associate or guest editor for IEEE THMS and Computer,

Elsevier PMC and IJDSN and Springer PUC and AIHC. His research has been funded by external grants from the UK research councils, European Research Programmes such as FP7, AAL and Horizon 2020, and industrial collaborators like SAP, British Telecommunication and PwC. Dr Chen has delivered over 40 keynotes, invited talks and seminars in various forums, conferences, industry and academic events. He has served as an expert for research funding assessment for UKRI, EU Horizon2020, Canada, Chile, Netherlands and Denmark.

## About the Panelist Speaker



### **Professor Bin Hu**

*Beijing Institute of Technology, China*

**Topic: Emotion Understanding Technologies in Digital Twins**

**Bin Hu** is a (Full) Professor and the Dean of the School of Medical Technology at Beijing Institute of Technology, China. He is a National Distinguished Expert, Chief Scientist of 973 as well as National Advanced Worker in 2020. He is a Fellow of IEEE/IET/AAIA and IET Fellow Assessor & Fellowship Advisor. He serves as the Editor-in-Chief for the IEEE Transactions on Computational Social Systems and an Associate Editor for IEEE Transactions on Affective Computing. He is one of Clarivate Highly Cited Researchers and World's Top 2% Scientists. He is a Member of the Steering Council of the ACM China Council and the Vice-Chair of the China Committee of the International Society for Social Neuroscience. He is also the TC Co-Chair of computational psychophysiology in the IEEE Systems, Man, and Cybernetics Society (SMC). He is a Member of the Steering Committee of Computer Science at the Chinese Ministry of Education, Science and Technology Commission at the Chinese Ministry of Education.

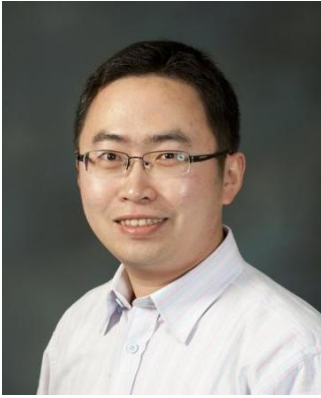


### **Dr Everton Cavalcante**

*Federal University of Rio Grande do Norte, Brazil*

**Topic: How Far Are We: From the Current Wave to Autonomic and Cooperative Digital Twins**

**Everton Cavalcante** is an Assistant Professor in Computer Science and Software Engineering at Federal University of Rio Grande do Norte, Natal, Northeastern Brazil. He received PhD diplomas in Computer Science from Federal University of Rio Grande do Norte, Brazil, and in Information and Communication Technologies and Sciences from Université Bretagne Sud, France. He was also a visiting researcher at Durham University, United Kingdom (2023-2024) and Télécom SudParis, France (2018). His current research interests are focused on digital twins, systems-of-systems, Internet of Things, middleware, software architectures, and smart city applications.



**Professor Lu Liu**

*University of Exeter, UK*

**Topic: Self-learning Digital Twins for Health and Net Zero**

**Lu Liu** is a Professor of Artificial Intelligence and Director of Research and Impact in the Department of Computer Science at the University of Exeter, with expertise in AI, Digital Twins, Sustainable Systems and the Internet of Things. Professor Liu has over 300 publications in reputable journals and leading conferences and has secured over 30 grants as PI/Co-I which are supported by UKRI/EPSRC, EU, Innovate UK, Royal Society, British Council and leading industries worth over £20 million.



**Professor *Zheng Yan***

*Xidian University, China*

**Topic: Digital Twin Positioning**

**Zheng Yan** is Distinguished Professor at Xidian University, an IEEE Fellow, IET Fellow, AAIA Fellow, and AIIA Fellow. She is a Stanford World top 2% scientist, and a highly cited researcher by Elsevier in China. Her research interests are in trust management, information and network security, privacy protection, and data analysis. She has published more than 400 papers in prestigious journals and conferences worldwide, including IEEE SP, IEEE TIFS, IEEE TDSC, INFOCOM, and ICSE, with over 270 as first or corresponding author. She has authored two English books, used for teaching for nearly a decade. She holds 110+ international and domestic patents, including 50 PCT patents, with more than 150 patents adopted by industry, most of them are solely invented by her. Some of these patents have entered international standards or are widely used. Her U.S. patents are tracked by over 60 Fortune Global 500 companies. She has received numerous awards, including the Nokia Distinguished Inventor Award, three EU awards, N<sup>2</sup>Women Star in Computer Networking and Communications, IEEE TCSC Award for Excellence in Scalable Computing, IEEE TEMS Distinguished Leadership Award, 18 times of IEEE Outstanding Leadership and Service Awards, AALTO ELEC Impact Award, IEEE ComSoc Big Data Technical Committee Best Journal Paper, IEEE TrustCom Outstanding Paper, Shaanxi Natural Science Award, and Outstanding Doctoral Dissertation Supervisor by the Electronic Association of China. She founded the first IEEE Blockchain International Conference and serves as a Steering Committee Co-chair. She serves as an Executive Editor-in-Chief of Information Sciences and Area Editor/Associate Editor/Editor Board Member for over 60 journals, including ACM Computing Surveys, Information Fusion, IEEE IoT Journal, IEEE Network Magazine, etc. She has served as a General Chair or Program Committee Chair for over 40 international conferences and has delivered over 30 keynotes and invited talks at international conferences and renowned enterprises.

# The 2024 IEEE Smart World Congress

## Panel 2: Metaverse Unleashed: AI on Cyber Worlds

Welcome to "Metaverse Unleashed: AI on Cyber Worlds", a thought-provoking panel exploring the transformative intersection of artificial intelligence and the metaverse. As leading tech giants like Meta, Google, Nvidia, and Microsoft make unprecedented investments in metaverse development, this digital frontier is reshaping how humans interact with technology and one another. The global metaverse market is projected to soar to \$936.6 billion by 2030, underscoring its immense potential and far-reaching influence. AI lies at the heart of this evolution, driving innovations such as dynamic **world**-building, hyper-realistic avatars, personalized interactions, adaptive learning environments, and seamless virtual collaboration. Beyond the technical marvels, our panel will examine the profound societal impacts of AI in cyber worlds, exploring ethical considerations, security challenges, and ways to ensure accessibility for diverse users. Furthermore, we'll discuss AI's role in fostering creativity, cultural exchange, and inclusive digital ecosystems. Join us as we navigate the future of immersive digital interaction and boundless innovation!

### About the Panel Chair



**Professor Oscar Fuhua Lin**

*Athabasca University, Canada*

**Oscar Fuhua Lin** is a Full Professor of School of Computing and Information Systems and Graduate Program Director of Faculty of Science and Technology, of Athabasca University, Canada. Dr Lin's research interests include AI in education, adaptive learning, intelligent systems, online learning, virtual reality, modelling and simulation, and multi-agent systems. He has more than 160 publications. He serves as an Associate Editor or editorial board member for several international journals, e.g., *Computers and Education: X-Reality*; *Online Learning*. He served as a General Chair of IEEE International Conference on Cyber Science and Technology Congress both 2020 and 2021, Program Chair of International Conference on Intelligent Tutoring Systems 2024. He serves as a co-General Chair of IEEE SWC 2025.

## About the Panelist Speaker



**Professor Georg Borges**

*Saarland University, Germany*

**Topic: National Laws in Metaverse and Cyberworld**

**Georg Borges** is a Professor of Civil Law, Legal Informatics, German and International Business Law and Legal Theory and the managing director of the Institute for Legal Informatics at Saarland University, Germany. From 2004 to 2014, he was Professor of Law at Ruhr-University Bochum. Beside this, he was also a Judge at the State Court of Appeals, Hamm Circuit. Since February 2023, he is also a distinguished visiting professor at the University of Johannesburg, Faculty of Law. Since September 2024, he is also a visiting professor at Keio University, Tokyo. As an expert on IT Law and on law and informatics, Prof. Borges authored several books and numerous articles in the field. Prof. Borges is involved in numerous projects in the field of IT and legal informatics. Currently, a focus of his interest is on the legal framework of AI.



**Professor Zhong Chen**

*Peking University, China.*

**Topic: Practitioners View of AIGC in Yidao Smart Sport Metaverse**

**Zhong Chen**, Ph.D., is Professor and the Director of Metaverse Technology Institute in School of Computer Sciences at Peking University. Dr. Chen graduated and earned his Ph.D degree from Computer Science and Technology Department at Peking University in 1989, and then joined the faculty of computer science in Peking University. He became full professor in 1995. He was a visiting professor of UCLA from 2001 to 2002. He has been assumed the founding dean position of the School of Software and Microelectronics in Peking University from 2002 to 2010, chairman of CS department from 2011-2015.



**Professor Hui Yu**

*University of Glasgow, UK*

**Topic: AI Enabled Avatar Generation**

**Hui Yu** is a Professor with the University of Glasgow. He leads the Visual Computing and Social Robot Group at the university. His research interests lie in visual and cognitive computing and machine learning with applications to 4D facial expression reconstruction and tracking for social signal analysis, human-machine interaction, as well as intelligent vehicle, and video analysis. Professor Yu's research work has led to several awards and successful collaboration with worldwide institutions and industries. He is the Associate Vice President of the IEEE Systems, Man, and Cybernetics Society and a Scientific Advisor for high-tech companies in the UK.



**Professor Xiaokang Wang**

*Hainan University, China*

**Topic: When Tensor Computing Meets Metaverse**

**Xiaokang Wang** is a Professor with School of Computer Science and Technology, Hainan University, China. His research interests include Cyber-Physical-Social Systems, Parallel and Distributed Computing, Industrial Internet-of-Things, and Tensor Decomposition. He is the vice chair of CIS and SMC chapters of IEEE Canadian Atlantic Section, and the chair of IEEE CIS Task Force on Cyber-Physical-Social Systems. He serves or served as Program Chair of many IEEE International Conferences such as the 2025 IEEE International Conference on Ubiquitous Intelligence and Computing (UIC 2025). He serves as an associate editor/ editorial board member or guest editors for international journals.

# The 2024 IEEE Smart World Congress

## Women in the Smart World Forum

Title: Smart Women, Smart World

### Forum Chairs

Prof. Runhe Huang, Hosei University, Japan

Prof. Zhi Jin, Peking University, China

### Executive Chairs

Dr. Fang Liu, Beihang University, China

Dr. Weihong Gao, University of Portsmouth, UK

Dr. Khawla Alhasan, Arab Open University, Kuwait

## About the Forum Presenters (Moderator)



**Professor Runhe Huang**

*Hosei University, Japan*

**Topic: Supporting Vulnerable Groups with Advanced AI and IoT solutions**

Professor Huang received her B.Sc. in Electronics Technology from the National University of Defense Technology, China, in 1982, and her Ph.D. in Computer Science and Mathematics from the University of the West of England, UK, in 1993. She is a full professor in Faculty of Computer and Information Sciences at Hosei University, Japan since 2003. She served as the head of the Department of Computer Science from 2008 to 2010 and currently holds the position of Deputy Director at Hosei University Library.



## About the Forum Presenters



**Professor Ying Zhang**

*Northwestern Polytechnical University, China*

**Topic: AI in the LLM Era: From Independent to Collaborative**

Professor Zhang is the professor with the School of Computer Science of Northwestern Polytechnical University, Xi'an, China and is recognized as a National Youth Talent. She received her PhD in Computer Science from National University of Singapore. She worked as the unit head of Cybersecurity cluster of Institute for Inforcomm Research (I2R) from 2017-2018 and a senior research fellow at National University of Singapore from 2019-2021. She is from Northwestern Polytechnical University, China.



**Professor Binbin Zhou**

*Hangzhou City University, China*

**Topic: Digitalization and Artificial Intelligence Practice in Smart City**

Professor Zhou is an Associate Professor at Hangzhou City University. Her main research areas include multimodal fusion, artificial intelligence, and brain-inspired computing. She has presided projects supported by the National Natural Science Foundation of China and Zhejiang Provincial Natural Science Foundation and participated in several National Natural Science Foundation and National Key R&D Program projects. She is from Hangzhou City University, China.



**Dr. Ismini Psychoula**

*Office of Communications, UK*

**Topic: Responsible AI and Its Impact on Women and Girls**

Dr. Psychoula is a Senior Technical Advisor at Ofcom where she works on multidisciplinary projects that integrate Machine Learning, Privacy Enhancing Technologies, and Responsible AI in the context of online safety. Prior to her

current role, she worked as a Research Scientist in industry, leading Privacy-Preserving Machine Learning and Explainable AI projects. Her expertise is in artificial intelligence, privacy, and data governance.



**Yasmine Rifai**

*Microsoft, Kuwait*

**Topic: Shaping the Future: The National AI Strategy Framework**

Yasmine Rifai is an AI-centric digital transformation leader and Microsoft's Technology Lead for the Public Sector, with over 13 years of experience in technology and nearly a decade in the public sector. She excels in orchestrating digital business transformations and securing high-value deals through strategic negotiation and a customer-focused approach.



**Dr. Khawla Alhasan**

*Arab Open University, Kuwait*

**Topic: Smart Tech, Smarter Skills: Soft Skills Driving Success in AI Era**

Dr. Alhasan is a General Program Coordinator in the deanship of Computer Studies at the Arab Open University. Her research interests are Artificial Intelligence, Smart Cities, Digital Transformation and Adaptive eLearning. She led regional projects such as AI implementation in Education, and Micro credentials. She was awarded IEEE Outstanding Service, “Registration Chair”, at the 2019 IEEE Smart World Congress.

# The ATC 2024 Presentation Program

## ATC-1

### Session Chair: Feisheng Yang, Northwestern Polytechnical University

Modeling and Analyzing Approach for Safety-Critical Cyberattacks Effects on Connected Autonomous Vehicles

*Weifeng Gong; Shichun Yang; Haoran Guang; Bowen Zheng; Yi Shi; Yaoguang Cao*

An Intrusion Detection Method for Automotive Ethernet Networks Based on Time Series Prediction and Rule Setting

*Haoran Guang; Yongling He; Weifeng Gong; Bin Ma; Bowen Zheng; Yi Shi; Yaoguang Cao; Shichun Yang*

Refined Reciprocally Convex Inequality for Less Conservative Stability Analysis of Systems with Interval Delay

*Feisheng Yang; Xiao Feng; Ruisen Ding*

## ATC-2

### Session Chair: Lin Li, Northwestern Polytechnical University

Urban Area Detection Based on Cross-Domain Lightweight Parallel Fusion Network for Orbita “Zhuhai-1” Hyperspectral Satellite

*Jianing Wang; Wan Zhang; Yichen Liu; Zheng Hua; Yuqiong Yao; Shengjia Hao; Zhicao Zhao; Lin Li*

TSCN-ELF: Feature Fusion of Two-Stream Convolutional Neural Networks for Action Recognition

*Zhenghong Gao; Yangyang Li; Guanlong Liu; Qian Chen; Yanqiao Chen; Ronghua Shang; Licheng Jiao*

Vessel Trajectory Prediction Based on Context-Assisted Information

*Jianing Wang; Lianmeng Jiao; Quan Pan*

Object Detection in Complex Background Based in Heterogeneous Information Fusion

*Jiexuan Xiong; Xinyi Wu; Jiexiang Liu*

Maritime Target Intent Recognition Based on Transformer

*Runqing Yang*

Heterogeneous Gaussian and Student's t Fusion for Distributed Target Tracking

*Haowen Qin; Tiancheng Li; Hongfei Li; Guchong Li*

Low-Light Optical Flow Estimation by Enhancing Reflection Component with Global Attention

*Zhaolin Xiao; Ke Gui; Kunyu Wang; Haiyan Jin; Haonan Su; Fengyuan Zuo*

## ATC-3

### Session Chair: Yang Lyu, Northwestern Polytechnical University

Unsupervised Ship Detection in SAR Images Based on Fusion of Statistical and Structural Features

*Hanrui Shi; Shuqian Zhou; Tao Yang; Zuowei Zhang*

Advancing Haul Truck Safety: A Deep Neural Network-Based Driver Assistance System for Blind Spot Detection

*Qaiser Anwar; Muhammad Hanif; Daisuke Shimotoku; Hill H Kobayashi*

Trajectory and Communication Resources Planning for Dual-UAV Data Collection

*Yongjiang Xue; Lidong He*

Structure Tensor Based Multi-Exposure Images Fusion in Gradient Domain

*Feifei Zhang; Jianhui Xu; Ruqi Zhou; Yilin Wu; Xiongyong Zhu; Guoming Chen*

Performance Evaluation Metric for Rectangle Extended Object Tracking Based on Minkowski Distance

*Jiaqi Shi; Ziyi Liu; Chaogun Yang*

Task Offloading Scheme Based on PTSS-DQN Algorithm for Latency Optimization in Multi-User and Multitasking Environments

*Panyang Zhou; Xiaofei Xing; Xiao Wang; Tian Wang; Yuheng Zhang; Guojun Wang*

SAR and Optical Satellite Image Matching Incorporating Category-Supervised Semantic Features

*Jia Zhou; Chunhui Zhao; Yang Lyu*

#### ATC-4

**Session Chair: Yang Li, Northwestern Polytechnical University**

UAV-Based Intelligent Information Systems on Winter Road Safety for Autonomous Vehicles

*Siva Ariram; Veikko Pekkala; Timo Mäenpää; Antti Tikanmäki; Juha Rönning*

Dive Into the Long-Term Effects Autonomous Vehicles Have on Transportation

*Prithvi Krishnan*

Property Optimized GNN: Improving Data Association Performance Using Cost Function Optimization for Sensor Fusion in High Density Environments

*Connor Ricotta; Samuel Khzym; Arthur Faron; Ali Emadi*

Effective Human Intervention in AI and Beyond: A High-Level Framework

*Sarah Sterz*

#### ATC-5

**Session Chair: Guchong Li, Northwestern Polytechnical University**

Task Allocation for Heterogeneous UAV Swarms Under Communication Constraints

*Qiming Du; Lidong He*

An Adaptive Weight Mechanism for Recognizing Unknown Samples in Remote Sensing Scene Images

*Xinran Ji*

*Safety-Violation Scenarios Search for ADS via Multi-Objective Genetic Algorithm*

*Haoxin Zong; Zhonglin Hou; Hong Liu*

SSL-DDS: Integrating SSL Encryption Into DDS Communication Framework for UAV Security

*Yuan Gao; Yang Li; Quan Pan; Shihao Wu*

Enhanced Small Target Detection via Multi-Modal Fusion and Attention Mechanisms: A YOLOv5 Approach

*Xiaoxiao Ma; Junxiong Tong*

RSBO Based LSTM Network for Pulsed Eddy Current Steel Wall-Thinning Inspection

*Zhenyue Lin; Huade Zeng; Ruo Chen Huang; Wancheng Dang; Zihan Xia; Wuliang Yin*

Identification of Starch Types by Using Terahertz Time-Domain Spectroscopy Combined with SG-KNN

*Heng Wang; Tao Wei; Yuying Liang; Chunyan Guo; Wenhui Zhou*

Research Progress and Challenges in Grain Storage Temperature Detection

*Bo Feng; Xuejing Lu; Yuying Jiang; Heng Wang; Chunyan Guo; Hao Chen*

# The DigitalTwin 2024 Presentation Program

## DigitalTwin-1

**Session Chair: Everton Cavalcante, Federal University of Rio Grande do Norte**

A Digital Twin for Pest Population Monitoring

*Sandeep Dhakal; Hazel Parry*

Neuro-Humanoid-Twin: Empowering Neurodiversity in Teams and at the Workplace Through Digital Twins and Digital Human Models

*Mareike V. Keil; Oliver Bleisinger*

Experiments on Compression and Restoration of Point Clouds Using Voxels

*Ryo Komiya; Ryuichi Imai; Kenji Nakamura; Yoshinori Tsukada; Yoshimasa Umehara*

## DigitalTwin-2

**Session Chair: Jaime B. Fernandez, Dublin City University**

Smart DCU Digital Twin: Towards Autism-Friendly Universities

*Jaime B. Fernandez; Iryna Osadcha; Andrius Jurelionis; Kieran Mahon; Noel E. O'Connor; Muhammad Intizar Ali*

Building a Digital Twin Framework for EEG Neurofeedback in Cricket Batting Motor Imagery Using Simulated Data

*Devanka Pathak; Ronald Herrema; Naomi Heffer; Hongji Yang*

Consideration of Road Feature Extraction Using Low-Cost LiDAR Mounted in a Vehicle

*Jin Yamamoto; Ryuichi Imai; Kenji Nakamura; Yoshinori Tsukada; Yoshimasa Umehara*

Basic Study on Improving the Efficiency of Pantograph Slider Inspection Operations Using SfM

*Kota Shoji; Ryuichi Imai; Kenji Nakamura; Yoshinori Tsukada; Yoshimasa Umehara; Yasuhito Niina*

Treasure Maps and Special Effects: The Digital Twin Offering to Threat Actors

*Andrew G Peck; Tim Watson; Iain Phillips*

Sound of Reason: Using AI to Build a Digital Twin After the Kanon of Pythagoras in School Settings

*Zach Anthis; Alexandros Basiakoulis; Kyriakos Efstathiou; Marianna Efstathiou*

## DigitalTwin-3

**Session Chair: Zumin Wang, Dalian University; Ismini Psychoula, Office of Communications**

A Digital Twin System for Predictive Maintenance of Complex Equipment

*Zidi Jia; Jiabao Dong; Shixiang Li; Haiteng Wang; Yuqing Wang; Jing Zhang; Lei Ren*

A Digital Twin Framework for Robot Grasp and Motion Generation

*Jiabao Dong; Zidi Jia; Yuqing Wang; Lei Ren*

A Supply Chain Digital Twins Framework with Generative Knowledge Graph

*Jing Zhang; Yuqing Wang; Zidi Jia; Lei Ren*

Enhancing AEB Systems with Digital Twin Evaluation in Urban Environments

*Yifan Wang; Silvia Thal; Jannes Iatropoulos; Roman Henze*

Layered Implementation of Power Grid Connected Renewable Energy Digital Twin

*Young Sun Kim; Jooseung Lee; Soon Woo Lee; Sang Woo Son; Hui-Myoung Oh; Byeong Yoon Lee*

Design of a Parkinson's Rehabilitation Management System Based on Multimodal Learning and Digital Twin Technology

*Jing Qin; Yuecheng Cai; Zumin Wang; Jianqiang Jin; Xiaofei Huang; Lisha Pei*

Leveraging Middleware to Support Digital Twin System Development

*Lucas Silva Pereira; Andre Almeida; Flávia Coimbra Delicato; Everton Cavalcante; Thais Batista; Rebeca Motta; Marco Vieira*

#### DigitalTwin-4

##### Session Chair: Sahraoui Dhelim, Dublin City University

Overcoming the Data Availability Paradox with Managed Digital Twin Instances

*Christopher I Ugboamah; Sandra Kumi; Richard K Lomotey; Ralph Deters*

A Survey on Digital Twin: From Industrial Applications to Cybersecurity

*Hiren Patel; Asma Jodeiri Akbarfam; Hoda Maleki*

Digital Twins for IC Packages and Electronics-Enabled Systems

*Adwait Inamdar; Przemyslaw Gromala; Christopher Bailey; Luu Nguyen; Benson Chan; Jong Ryu; Farnood Rezaie; Abram Detofsky; Willem D. van Driel; GuoQi Zhang*

Integrating Digital Twin Instance Into Blockchain-Based Access Control Governed by Smart Contracts

*Yongchang He; Sandra Kumi; Richard Lomotey; Ralph Deters*

A Maturity Model for Digital Twin Integration of Mobile Robotics

*Jacob Hart; Gideon Zimmerman; John Hale*

Evaluate the Winter Wheat GVMI and NDMI Correlations with the Rainfall

*Yunan Li; Sahraoui Dhelim; Tahar M Kechadi; Liming Luke Chen*

Digital Twin: Graph Formulations for Managing Complexity and Uncertainty

*Luwen Huang; Michael Kapteyn; Karen E Willcox*

#### DigitalTwin-5

##### Session Chair: Geng Sun, Jilin University

An Intelligent IoT Service Support Platform Based on Cyber-Physical Space Convergence

*Pengfei Hu; Tianhui Li; Chunming He; Yiming Zhu*

Edge-Enabled Data-Centric Dynamic Node Trust Evaluation

*Meng Feng; Pengfei Hu; Yu Zhao; Xiaoliang Wang*

# The Metaverse 2024 Presentation Program

## Metaverse-1

**Session Chair: Tao Zhang, Beijing Jiaotong University**

Research on Rapid Metaverse Generation Technology of Industrial Tools for Intelligent Manufacturing Training Based on Industrial Metaverse

*Jingyu Zhu; Tan Li; Jin Guo; Xianghui Meng; Gang Wu; Wenjun Zhang; Congying Wu; Yue Wang; Nanjiang Chen; Weining Song; Qi Wang; Yalan Xing*

Research on AR Target Recognition Algorithm for Mobile Based on YOLOv8

*Jin Guo; Tan Li; Xianghui Meng; Jingyu Zhu*

Ambient IoT in 3GPP Release 19: A Survey

*Miao Qu; Yuelin Zhao; Xiaoyong Tang; Rongling Jian; Wenwen Huang; Tao Zhang; Jie Zeng*

AI and Personal Data in the Metaverse: A Risk Assessment

*Stanley Simoes; Jesus Martinez del Rincon; Gavin McWilliams*

Harnessing Convolutional Neural Networks for Sentiment Analysis of Tweets on the Metaverse

*Said A. Salloum, Sr.; Fuhua Lin; Azza Mohamed Basiouni; Raghad Alfaisal; Khaled F. Shaalan*

Modeling of All Mutant and Wild Protein Structures Using Metaverse ESM: Surface Area Analysis and Implications

*Said A. Salloum, Sr.; Azza Mohamed Basiouni; Fuhua Lin; Raghad Alfaisal; Khaled F. Shaalan*

A Blockchain-Based Real-Time Forensic Evidence Collection System for a Secure Metaverse

*Yunji Park; Doowon Jeong*

## Metaverse-2

**Session Chair: Geng Sun, Jilin University**

A Scalable and Timely Data Auditing Scheme for Metaverse

*Chen Chen; Tong Wu; Chao Ren; Changai Sun*

Efficient Data Storage: Leveraging Blockchain and IPFS Techniques for Cost Minimization

*Shihfan Chou; Cheyu Qiu*

A Dynamic Clustering Method for Maximizing Energy Efficiency in C-V2X Metaverse

*Mingyang Ma; Xin Feng; Jing Zhang; Haohua Liu; Jiacheng Wang; Geng Sun*

Deep Reinforcement Learning-Based Stackelberg Game for Energy Trading in Power Grid Metaverses

*Yanxun Gu; Lieliang Liu; Xiaoming Lin; Daquan Li; Min Liu; Jia Zhao*

An Optimization Method for Accelerating TCP Convergence in Metaverse Scenarios

*Zhao Qing; Mu Wang*

## Metaverse-3

**Session Chair: Zhaohui Yang, Zhejiang University**

Hyperdimensional Computing Empowered Federated Foundation Model Over Wireless Networks for Metaverse

*Yahao Ding; Wen Shang; Minrui Xu; Zhaohui Yang; Ye Hu; Dusit Niyato; Mohammad Shikh-Bahaei*

Simulating a Multi-Agent UAV System Coordinated by State Machines Using Godot

*Leo N Howard; Fuhua Lin; Henry Leung*

Generative AI-Aided Reinforcement Learning for Computation Offloading and Privacy Protection in VR-Based Multi-Access Edge Computing

*Feiran You; Hongyang Du; Jiawen Kang; Wei Ni; Dusit Niyato; Abbas Jamalipour*

# The PCDS 2024 Presentation Program

## PCDS-1

### Session Chair: Zhe Sun, Guangzhou University

A Study on Classification of Tor Encrypted Traffic Based on Mamba

*Silin Zhao; Qingfeng Tan; Xiang Yu; Runnan Tan*

Distributed Data Synthesis Under Local Differential Privacy

*Xiaoguang Li; Haonan Yan; Qingwen Li; Hui Li; Fenghua Li*

FID: Detecting Adversarial Attacks with Feature Invariants and Applying to License Plate Recognition

*Peng Tang; Xiaoyu Zhu; Weidong Qiu; Yangde Wang; Haochen Zhang; Jie Guo; Zheng Huang*

I Can See Your Secrets, A Way to Recognize User Pin Codes by Surveillance Camera

*Zhenyang Guo; Jin Cao; Xiaoyong Zan; Jiawei Yang; Ang Li; Ben Niu; Zhe Sun; Lihua Yin; Hui Li*

A Data Grading Privacy Preservation Method for Intelligent Connected Vehicle

*Yi Shi; Shichun Yang; Haoran Guang; Bowen Zheng; Weifeng Gong; Yaoguang Cao*

Locally Private Estimator for Degree Distribution with Laplacian Mechanism

*Jiayu Li; Yuke Hu; Xiaoguang Li; Shiqi Zhou; Yuxiang Wang; Fenghua Li; Ben Niu*

## PCDS-2

### Session Chair: Peng Tang, Shanghai Jiaotong University

A Synthetic Data-Enhanced Differential Privacy Reinforcement Learning Policy Optimization Method

*Yutong Liang; Leshu Yuan; Lihua Yin; Zhe Sun; Weifeng Luo; Chao Li; Yuanyuan He; Jin Cao*

Personalized Differential Privacy Federated Learning Model for Internet of Vehicles

*Long Zhang; Jinxin Zuo; Yueming Lu; Shihong Zou*

A Priced Oblivious Transfer Scheme with Time Constraints for Mobile Edge Computing

*Huijie Yang; Tao Zhang; Tianqi Zhou; Jianfei Sun; Jian Shen*

Verifiable, Access-Controllable, and Privacy-Preserving Multidimensional Data Aggregation Based on Blockchain in Smart Grids

*Shan Jiang; Chen Wang; Jian Shen; Haowen Tan; Wei Huang*

Elevating Vision Transformer Performance: The KAN-ViT Model for Image Recognition

*Lvzhou Ye; Zhen Guo*

Time Series Data Prediction Using CNN-BiLSTM Based Attention-KAN Model

*He Zhong; Zhen Guo*

## PCDS-3

### Session Chair: Xiaoguang Li, Xidian University

LC-SID: Developing a Local LLM-Based Chain-Of-Thought Framework for Enhanced Sensitive Information Detection

*Aohai Zhang; Zhe Sun; Lihua Yin; Shangzhe Li; Yutong Liang; Chao Li; Jing Du; Yanwei Sun*

LRBEAL: Learning Representation of Behaviors Extracted From Audit Logs

*Jiaxu Xing; Yongxin Cai; Ximing Chen; Chengliang Gao; Yanhao Chen; Jing Qiu*

Efficient and Verifiable Federated Learning Based on Blockchain

*Wei Huang; Wei Liu; Yinghui Zhang; Yida Wang*

Verifiable and Byzantine-Robust Private Information Retrieval Over Distributed Database



*Xindi Ma; Yu He; Junying Zhang; Ning Xi; Di Lu; Pengbin Feng; Yulong Shen; Jianfeng Ma*

DASM: Dual Attention Subgraph Matching Model Incorporating Local Behavior-Aware Features for Threat Hunting  
*Fei Tang; Yongxin Cai; Ximing Chen; Chengliang Gao; Rongrong Chen; Jing Qiu*

# The ScalCom 2024 Presentation Program

## ScalCom-1

**Session Chair: Gang Liu, University of Electronic Science and Technology of China**

Efficient Bayesian Convolutional Neural Networks via Optimized Weight Sampling and Pruning  
*Ruotong Niu; Gang Wu; Caidie Zhu; Shengyi Ji; Xiaolong Hu; Chubo Liu*

Graph Contrastive Learning via Cluster-Refined Negative Sampling for Semi-Supervised Text Classification  
*Wei Ai; Jianbin Li; Ze Wang; Jiayi Du; Tao Meng; Keqin Li*

MCSFF: Multi-Modal Consistency and Specificity Fusion Framework for Entity Alignment  
*Wei Ai; Wen Deng; Hongyi Chen; Jiayi Du; Tao Meng*

Scalable and Efficient Support Vector Regression Model in Power Systems  
*Bao Wen; Kunyu Song; Haojie Ding; Weiping Liao; Jiahui Zhu; Xiaojing Gao; Xuxian Wang; Ziming Quan*

LLM-Enhanced Survival Model for Electric Device Lifespan Estimation  
*Bao Wen; Wentian Fang; Aihui Wen; Jining Li*

## ScalCom-2

**Session Chair: Peng Wang, Hunan First Normal University**

Research on Dynamic HoneyNet Technology Based on Machine Learning  
*Jiasheng Wang; Ping Chen; Yutong Yang; Zhihong Sun; Qing Ye*

Survey on Blockchain-Based Internet of Things Security Technologies  
*Qingrui Meng; Zhihong Sun; Zheng Lv*

A Survey of Machine Learning-Based TLS 1.3 Encrypted Traffic Analysis  
*Jiuxing Zhou; Zhihong Sun; Zhihong Zhang; Tao He; Wei Fu*

deepV: PPO-Driven Task Latency Minimization in Volunteer-Supported Edge Computing  
*Xiaojie Zhang; Saptarshi Debroy; Jiaqi Tong*

A Load Balancing Mechanism Based on Non-Cooperative Game in Traffic Environment  
*Jia Xie; Sifan Long; Xin Chen; Qinglin Li; Mengquan Li*

Multi-Hop Link Quality Prediction for DRL Based Task Offloading in RSU-Assisted IoV  
*Wei Zhao; Qixue Zuo; Tangjie Weng; Xinwei Xu; Xun Shao; Zhi Liu*

## ScalCom-3

**Session Chair: Ronghui Cao, Changsha University of Science and Technology**

NESpMV: NEON-Enhanced SpMV Algorithm for NUMA Architectures  
*Guoqing Xiao; Zhijie Li; Yuedan Chen; Yimiao Zeng; Wangdong Yang*

Enhancing Collaborative Filtering via Structural Denoised and Scalable Graph  
*Jinting Nie; Yan Wang*

PointSaT: Structure-Aware Transformer for Point Cloud Classification  
*Zhihong Liu; Huicong Xue; Ping Luo; Yongjie Liu*

Real-Time Determination and Correction of Multi-Source Multi-Modal Heterogeneous Data Quality  
*Jiahao Liu*

Distributed Inverted List Indexes Technology Based on Virtual Data Space  
*Jian Dai; Junyan Li; Hanming Zhang; Zhaohua Chen; Zhihong Liu*

Meta-Path-Based Multiple Instance Learning with Heterogeneous Graph Neural Network for lncRNA-Disease Association Prediction

*Aohang Liu; Bofei Zhang; Pan Zeng*

#### ScalCom-4

**Session Chair: Yang Li, Northwestern Polytechnical University**

Hierarchical Agglomerative Clustering Optimization for Massive Data

*Wenyun Dai; Muge Zhang*

#### ScalCom-5

**Session Chair: Yang Yang, Beijing Institute of Technology**

Optimization of Intelligent Reflecting Surface Dimensions Under Partial Blockages

*Hiroaki Hashida; Yuichi Kawamoto; Nei Kato*

Hierarchical Exploration and Machine Learning with Exploration Results for Autonomous Control of Standalone-Intelligent Reflecting Surface

*Ryuhei Hibi; Hiroaki Hashida; Yuichi Kawamoto; Nei Kato*

Toward Automated End-To-End Workflow Deployment in Dynamic Large-Scale Data Center Network with Multi-Vendor Devices

*Ronal Kumar; Jun Liu; Tavia Stone Gibbins; Tina Declerck*

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## SWC-1

**Session Chair: Sheng Qiang, Beijing Jiaotong University**

Reducing Wind-Induced Noise in Millimeter-Wave Radar Point Cloud Data to Enhance Accuracy in Human Motion Monitoring

*Entao Chen; Runhe Huang; Zeyang Cui*

A Multimodal Feature Learning Framework with Graph Structure Learning and CLIP for Apparent Personality Analysis

*Rongquan Wang; Xianyu Xu; Yang Hao; Lin Wei; Tao Wang*

Exploring Physiological and Psychological Responses to Different Types of Green and Blue Spaces through Two Virtual Media

*Yang Yang; Xi Gao; Mo Han; Xinlei Hu; Ziwen Sun*

Effects of Virtual Reality Blue-Green Spaces on Human Mental Health: A Systematic Review

*Xi Gao; Yang Yang; Mo Han; Xinlei Hu; Ziwen Sun*

A Multimodal Personality Detection Method with Behavioral Action Feature and Association Features

*Hao Yang; Ruicong Zhi; Rongquan Wang; Xianyu Xu; Lin Wei*

Exploring Environment and Behavior Logic in Virtual Space Through MMOG Game Map Design

*Qiang Sheng*

## SWC-2

**Session Chair: Xi Gao, Beijing Institute of Technology**

Improving Human Activity Recognition by Converting Time-Series Point Cloud Data from mmWave Radar into Images

*Taku Watanabe; Qingxiang Wang; Yanbo Ma*

AgriGlow: An IoT Multi-Spectral Light Sensing Device for Distributed In-Greenhouse Monitoring

*Scott Adams; Egan H. Doeven; Michael Vernon; Abbas Z. Kouzani*

Multilevel Drowsiness Detection Using Multimodal Physiological Signals

*Kentaro Taki; Ao Guo; Jianhua Ma*

AI in Sustainability: Assessing its Functions and Environmental Impact

*Khawla T Alhasan; Liming Chen*

An Edu-Metaverse Service Platform and Its Experiments on Physical Education Class in PKU

*Zhong Chen; Anming Xie; Robert Wang*

Efficient Resource Allocation in Vehicular Networks Using Embedding-Enhanced MAPPO

*Wen Qiu; Xun Shao; Wei Zhao; Hiroshi Masui*

## SWC-3

**Session Chair: Yang Yang, Beijing Institute of Technology**

Identity Recognition Through Anthropometric Feature Analysis of mmBody Data

*Yu Zhang; Jianshan Peng; Runhe Huang*

FMCW Radar-Based Sleep Posture Recognition with Transfer Learning and Range-Aware Dataset

*Chang Lu; Walid Brahim; Haotian Wang; Jianhua Ma*

A Comparative Study of Deep Learning Models for Activity Recognition and Fall Detection Using FMCW Radar

*Yibo Wang; Walid Brahim; Jianhua Ma*

Real-Time Respiratory Apnea Detection Using mmWave Radar  
*Rai Nakajima; Kentaro Taki; Haotian Wang; Jianhua Ma*

#### SWC-4

**Session Chair: Yidi Li, Taiyuan University of Technology**

RFNet: A Redundancy-Reduced and Frequency-Aware Feature Fusion Network for RGB-T Semantic Segmentation  
*Yixin Guo; Zhenxue Chen; Xuewen Rong; Chengyun Liu; Yidi Li*

Joint Semantic and Spatial Feature Learning for Audio-Visual Speaker Tracking  
*Yun Zhao; Yankun Liu; Chongwei Yan; Zihan He; Yunxu Liang; Yidi Li*

Motifs-Based Multi-Scale Graph Convolution Learning Framework for Attention Deficit/Hyperactivity Disorder Classification  
*Xubin Wu*

Large Model Based Crossmodal Chinese Poetry Creation  
*Liwen Yang; Zhidong Zhang; Kaipeng Niu; Sitian Pan; Weiping Zhu; Chao Ma*

Application and Development of OPM-MEG Technology  
*Ziqi Ji; Xiaolin Ning; Yang Gao*

#### SWC-5

**Session Chair: Zichu Yang, Beijing Film Academy**

Exploring the Mental Health of Virtual Soundscape: A Systematic Review  
*Tian Zhong; Ziwen Sun; Chenxiao Liu; Lin Shen; Yue Qi; Yuchen Du*

Creating and Preserving the Architectural Heritage and Environment of Ancient Towers in the Game Space Based on Digital Measurement and Computing Technology: Fangshan Ancient Pagoda, Beijing  
*Kui Yuan; Mo Han*

The Impact of Mobile Device Design on the Development of Mobile Gaming  
*Zichu Yang; Xitong Lu; Jialong Yin; Guanrou Yue; Mengya Liu*

The Revolution in 3D Animation Film Production Process Under Artificial Intelligence Technology  
*Mengya Liu; Xiangning Yan; Chi Zhang; Zichu Yang*

# The UIC 2024 Presentation Program

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### Session Chair: Kaixing Zhao, Northwestern Polytechnical University

Anti-Spoofing Detection on Zero-Shot Synthetic Audios with Self-Supervised Representation Learning

*Ben Niu; Shiqi Zhou; Jiayu Li; Jin Cao; Yuqiao Hou*

VRMAN: Variational Refined Multi-Head Attention Network for Intrusion Detection

*Yu Dai; Xiang Wang; Han Liu; QianChen Ren; Yilin Wang; Yuliang Tang*

Trans-Mamba: The Cross-Network of Transformer and Mamba for Traffic Flow Prediction

*Qian Liu; Haonan Jia; Junchen Ye; Jinyan Feng; Fayang Lan; Bowen Du; Runhe Huang*

CAPter: Controllable Data Privacy Enhancement for Deep Learning Inference Services

*Shimao Xu; Xiaopeng Ke; Hao Wu*

CLNet: A Federated Learning Approach for Privacy-Aware Cognitive Load Evaluation While Walking Using Smart Shoes

*Zehua Cao; Wenwu Deng; Qijun Ying; Huajun Long; Yuchen Zhong; Xiaohui Cai*

## UIC-2

### Session Chair: Le Liu, Northwestern Polytechnical University

TRL-SN: Trajectory Representation Learning with Spatial Networks for Travel Mode Identification

*Weiyao Liu; Xiangjie Kong; Hang Lin; Tao Tang; Zhaolin Deng; Guojiang Shen*

Stable Task Assignment for Socially Aware Collective Computing Systems

*Hao Zhou; Yang Li; Yunlong Zhao; Chunyan Liu*

ECG-DPM: Electrocardiogram Generation via a Spectrogram-Based Diffusion Probabilistic Model

*Lujundong Li; Tong Xia; Haojie Zhang; Dongchen He; Kun Qian; Yoshiharu Yamamoto; Björn W. Schuller; Bin Hu; and Cecilia Mascolo*

HiCrowd: Hierarchical Multi-Hop Crowdsourcing Delivery by Leveraging the Crowd of Taxis

*Mingyan Li; Jinghan Xu; Chao Chen; Wanyi Zhang; Xianlei Long; Songtao Guo*

Improving 3D Human Body Reconstruction Using Millimeter-Wave Radar-Based Kansformer

*Jianshan Peng; Runhe Huang; Hiroshi Hosobe*

Evaluating and Bridging the Effectiveness of Privacy Desensitization Algorithms of Different Principles Based on Information Loss

*Yuechi Tian; Fenghua Li; Zejun Zhou; Shoukun Guo; Ben Niu*

## UIC-3

### Session Chair: Holger Hermanns, Saarland University

ViT-MGI: Context-Aware Lightweight Malicious Gradient Identification for Federated Vision Transformer Systems Against Poisoning Attacks

*Shujie Yang; Tengfei Li; Zan Zhou; Hao Hao; Tianyu Xu; Bo Wang; Jianfeng Guan; Tianhang Zhou; Su Yao*

WhoAmION: A Technique to Determine Whether All Devices are Being Used by the Same Person

*Anuja Achyut Pinge; Amey Damle; Rishav Mukherji; Bhargav Nagaraj; Surjya Ghosh; Sougata Sen*

Addressing Non-IID Data in Federated Learning with Dual Attention Mechanism for Edge Computing Applications

*Chong Zhang; Aiting Yao; Jun Bai; Youyang Qu; Azadeh Ghari Neiat; Xiao Liu*

A Federated Class Incremental Learning Framework for Edge Intelligence

*Yuxian Chen; Ying Zhang; Wei Ren; Bin Guo; Zhiwen Yu*

Lyapunov-Based Network Slicing and Resource Optimization in Air-Ground Integrated Networks  
*Wenhui Ye; Qianchen Ren; Han Liu; Yuanyu Wang; Yuliang Tang*

The Right to Explanation in the European AI Act  
*Georg Maria Borges*

#### UIC-4

**Session Chair: Minling Dang, Northwestern Polytechnical University**

The Prediction Error Bound in Urban Crime: Temporal Predictability  
*Minling Dang; Zhiwen Yu; Liming Luke Chen; Zhu Wang; Bin Guo; Chris Nugent*

VG-Net: Sensor Time Series Anomaly Detection with Joint Variational Autoencoder and Graph Neural Network  
*Shuai Wang; Shenghao Liu; Xiaoxuan Fan; Haijun Wang; Yinxin Zhou; Hanjun Gao; Hongwei Lu; Xianjun Deng*

CPIMAC: MEC-Assisted Message Dissemination Based on Traffic Prediction at Intersections  
*Bingyi Liu; Xun Shao; Haoxiang Zhao; Enshu Wang; Zhi Liu*

Traffic Prediction Approach Based on Deep Learning for Heterogeneous Communication Networks  
*Yinming Shen; Licheng Zhang; Yuanyuan Jing; Xingang Liu*

Intelligent Architecture for Multi-Domain Aerial-Surface-Underwater Networks with Hybrid Radio-Acoustic-Optical Communications  
*Licheng Zhang; Xingang Liu; Shaozhi Wu*

#### UIC-5

**Session Chair: Binbin Zhou, Hangzhou City University**

InfraTag: Customizable Infrastructure Interaction Activity Recognition on Resource-Constrained Hardware  
*Qingyu Wu; Jianfei Shen; Feiyi Fan; Yang Gu; Yiqiang Chen*

Camera-Based HRV Prediction for Remote Learning Environments  
*Kegang Wang; Yantao Wei; Jiankai Tang; Yuntao Wang; Mingwen Tong; Jie Gao; Yujian Ma; Zhongjin Zhao*

A Lightweight Real-Time Gait Event Detection Method Using Wearable Inertial Sensors  
*Hao Wang; Hongxing Pei; Chaowei Cui; Fangmin Sun*

Multi-Modal Fusion and 1D-CNN Based Elderly Fall Risk Prediction During Treadmill Walking  
*Xuan Huang; Bo Wu; Xiaokang Zhou; Shoji Nishimura*

#### UIC-6

**Session Chair: Xun Shao, Toyohashi University of Technology**

Multistage Disturbances Label Mixing for Weakly-Supervised Medical Image Segmentation  
*Hao Tang; Bingfeng Zhang; Hanyang Chi; Jin Wang*

Reasoning Semantic Augmentation for Long-Tailed Recognition  
*Lei Peng; Zhiming Luo; Yuliang Tang; Shaozhi Li*

USwin-HDRI: High Dynamic Range Imaging in Dynamic Scenes Combining Unet and Transformer  
*Juwei Mu; Shangbo Zhou; Yuhui Huang; Xingjie Sun*

Multi-Modal Digital Human Identity Attribute Synthesis  
*Yapeng Ji; Yunji Liang; Bin Guo; Zhiwen Yu*

AMMFNet: An Attention-Based Multimodal Multiscale Fusion Framework for Alzheimer's Disease Diagnosis  
*Maixin Shen; Weimin Li; Jingchao Wang*

Meta-Path and Meta-Schema Hierarchical Aggregation for Heterogeneous Graph Neural Networks  
*Ling Wu; Pingping Gao; Kun Guo*

#### UIC-7

##### Session Chair: Xiaokang Wang, Hainan University

Enhancing Dual Attention Matching Network Through Multi-Scale Neighborhood Aggregation of Long-Tail Entities  
*Jianyu Wang; Yang Li; Yunlong Zhao; Chunyan Liu*

Heterophilic Graph Representation Learning Based on Multi-Order Information Extraction and High and Low Pass Filters  
*Ling Wu; Xinyu Li; Yingjie Yang; Kun Guo; Qishan Zhang*

Clustering Algorithms with Balanced Weights for Geographic Data Processing  
*Qi Huang; Jerome Yen; Kenneth B. Kent; Wenming Jin; Yang Wang*

AH-UNet: An Efficient and Enhanced Network for Accurate Melanoma Segmentation  
*Yinhao Ma; Zixun Zeng; Wenyuan Li; Yang Tang; Gaiying Li*

Road Damage Detection Across Borders: Federated Learning Insights From Japan, China, Norway and the USA  
*Shubham Kumar Dwivedi; Deeksha Arya; Yoshihide Sekimoto*

Quadruped Robot Mastering Obstacle Avoidance: Integrating Perception and Decision-Making  
*Kaixing Zhao; Jiayu Zhang; Wenyu Liu; Rui Lai; Bin Guo; Liang He*

#### UIC-8

##### Session Chair: Zhongqi Lin, Hangzhou City University

DNS Tunneling Detection with New Patterns Emerging for Intelligent Agriculture: A Forest-Based Classifier with an Unknown Option  
*Huijuan Dong; Zengwei Zheng; Liang Zhang; Feiping Nie; Jun Wu; Shenfei Pei*

Semi-Supervised Dimensionality Reduction with Adaptive Neighbors for Intelligent Agriculture  
*Li Ma; Zengwei Zheng; Feiping Nie; Shenfei Pei*

Visually Impaired Assistance with Large Models  
*Rong Xiang; Yi Zhao; Yilin Zhang; Jing Li; Ming Liao; Yushi Li*

Human Interface Design in Mobile Apps: Managing Information for Effective Evacuation Strategies  
*Ziarmal Hussain; Ruo Chen Cao*

A Visualization Approach to Enhance Maintenance in Electric Power Communication Networks  
*Chen Wang; Le Liu; Zhiqiang Wang; Jinchen Xie; Pengchao Gou; Kaixing Zhao*

#### UIC-9

##### Session Chair: Xun Shao, Toyohashi University of Technology

Document Information Extraction Framework Based on Graph Enhanced Language Model  
*Zhengli Li; Yang Li; Chunyan Liu; Yunlong Zhao*

VIDF-SR: A Multispectral Super-Resolution Method Based on Visible-Infrared Difference Feature Maps  
*Yuanzhe Wang; Jin Yi; Xu Wang; Yuqiao Zeng; Yidong Li*

Optimal Partitioning Method Among Heterogeneous Edge Nodes in CNN Models  
*Ryoya Okamoto; Xun Shao*

Proof of Similarity: Searchability-Enhancing Blockchain Consensus for Industrial Digital Twins  
*Shuang Chen; Shichang Xuan; Jiaying Shen*



## UIC-10

### Session Chair: En Xu, Tsinghua University

Deployment and Offloading Optimization for Space-Air-Ground Integrated Network with Improved Differential Evolution Algorithm

*Jingjing Zheng; Jianshan Zhang; Xing Chen; Hongqiang Zheng*

A Method for User Identification Across Multiple Transportation Systems Using Trajectories

*Jun Li; Juanjuan Zhao; Li Sun; Xitong Gao; Kejiang Ye*

Illumination-Aware Infrared and Visible Image Fusion for Nighttime Object Tracking

*Fan Gao; Bo Shen; Jiancun Li; Gang Yang; Zhu Wang*

Autonomous Planning for On-Board Adaptive Remote Sensing Transmission

*Jing Sun; Peng Wang; Fanjiang Xu; Yumeng Liu*

LiteATNet: Predicting APT Attack Using Transformer Model with MITRE ATT&CK Framework

*Shuqin Zhang; Xiaohang Xue; Zihao Wang; Yong Wang; Shaoyun Liu; Haoran Wang*

An Offloading Scheme for Diverse Inter-Dependent Tasks in Vehicle Edge Computing

*Dan Cai; Dun Cao; Bo Peng; Jin Wang*

## UIC-11

### Session Chair: Lei Han, Xidian University

DiagnoCare: A Diagnostic Analysis System for Electronic Medical Records Combining Medical Knowledge Graph and Large Language Model

*Shiwang Huang; Guofeng Luo; Jiaru Wang; Longbiao Chen*

A PUF-Based Mutual Authentication Protocol for Trustless Fog Computing Environments

*Yongding Zhang; Zhenbin Guo; Shaojing Fu*

FedAH: Aggregated Head for Personalized Federated Learning

*Pengzhan Zhou; Yuepeng He; Yijun Zhai; Kaixin Gao; Chao Chen; Zhida Qin; Chong Zhang; Songtao Guo*

Automated Grading Hemifacial Spasm Using Smartphone Cameras

*Ka I Chan; Bo Hei; Linghao Meng; Ruen Liu; Yuntao Wang; Chang Chen; Qingpei Hao; Yuanchun Shi*

Revisiting Adversarial Attacks on Deep Neural Networks via Correlating Adaptive Gradient-Based Features

*Yatie Xiao; Huakun Huang; Zhenbang Liu*

Summit Vitals: Multi-Camera and Multi-Signal Biosensing at High Altitudes

*Ke Liu; Jiankai Tang; Zhang Jiang; Yuntao Wang; Xiaojing Liu; Dong Li; Yuanchun Shi*

A Blockchain-Based Hierarchical Dynamic Collaborative Storage Model

*Qile Yuan; Xiangzhi Liu; Yu Wang; Yunfeng Dong; Haoyu Jia; Xiaoming Wu*

## UIC-12

### Session Chair: Yasan Ding, Northwestern Polytechnical University

RaftFed: An Efficient Federated Learning Framework for Vehicular Crowd Intelligence

*Yaxing Chen; Changan Yang; Qianyue Fan; Yao Zhang; Shiqian Wang; Li Di; Zhiwen Yu*

A Privacy-Preserving Decentralized Federated Learning Framework Based on Differential Privacy

*Lin Wang; Di Zhang; Min Guo; Xun Shao*

An Intelligence Energy Consumption Model Based on CNN-LSTM Neural Network in the Data Centers

*Zhou Zhou; Hongbing Cheng*

A Meta-Learning-Based Domain-Invariant Method for Cuff-Less Blood Pressure Estimation  
*Jinpeng Guo; Feiyi Fan; Renju Liu; Yuan Jin; Wei Zhang; Yiqiang Chen; Yang Gu*

UbiPen: Digitizing Analogue Pens with a Finger-Mounted IMU  
*Yilei Shi; Moritz Alexander Messerschmidt; Haimo Zhang; Yuting Chen; Kaixing Zhao*

Cost and QoS-Aware Service Migration in Vehicular Edge Computing Networks with Limited Backhaul Capacity  
*Hui Xiao; Zhigang Hu; Aikun Xu; Meiguang Zheng*

A Method for Efficient Heterogeneous Parallel Compilation: A Cryptography Case Study  
*Zhiyuan Tan; Liutong Han; Mingjie Xing; Yanjun Wu*

## UIC-13

**Session Chair: Yuefeng Du, City University of Hong Kong**

Blockchain and Distributed Digital Watermarking Effort on Federated Learning: Innovating Intellectual Property Protection  
*Kailin Chao; Junjie Li; Yirui Jiang; Jianmao Xiao; Yuanlong Cao*

EFLSS: An Efficient Federated Learning Security Scheme in Byzantine Attack Scenarios  
*Gang Shen; Zhiqiang Fu; Shaohua Liu*

Using Blockchain and Proxy Re-Encryption to Achieve the Anonymously and Reliable Data Secure Sharing  
*Yixuan Li; Minghong Yu; Yumeng Zhan; Haiping Huang; Lingyan Xue*

Industrial Data Space Framework Design and Feasibility Analysis - A Case Study of China's New Energy Industry  
*Shihua Wang; Xueliang Geng; Tianle Gao; Li Zhang; Ming Jing; Jiguo Yu*

Bidirectional Anonymous Private Set Intersection Based on Obfuscation  
*Peng Tang; Yusheng Dong; Weidong Qiu; Zheng Huang*

CLPCare: Bootstrapping Multimodal Large Language Models for Ultrasound Cleft Lip and Palate Recognition and Analysis  
*Jiaru Wang; Guofeng Luo; Haolun Yan; Shiwang Huang; Zhenghan Liao; Shiyi Zhang; Jinzhun Wu; Xiaoqin He; Longbiao Chen*

## UIC-14

**Session Chair: Yimeng Liu, East China Normal University**

Underwater Image Compression and Reconstruction Based on VQ-VAE-2  
*Qiuling Yang; Hansheng Fei; Zhipeng Zhang; Huanhuan Yu; Jianan Chen; Yunuo Zhang*

EmotionPass: Unobtrusive Emotion-Based User Authentication on Glasses  
*Ying Hao; Chengzhang Yu; Noman Ahmed; Yincheng Jin; Zhanpeng Jin*

A Priority-Aware Task Offloading Method with Knowledge Distillation in Edge Computing  
*Tingtong Zhu; Hao Tian; Wanchun Dou*

Computation Pre-Offloading for MEC-Enabled Vehicular Networks via Trajectory Prediction  
*Ting Zhang; Bo Yang; Zhiwen Yu; Xuelin Cao; George C. Alexandropoulos; Yan Zhang; Chau Yuen*

Discovering Attacks Against Smart Contracts Using Opcode Sequences With Feature Fusion  
*Wanyi Gu; Guojun Wang; Peiqiang Li; Xiangyong Liu; Yuheng Zhang; Guangxin Zhai*

FireInvestLLM: Leveraging Large Language Models for Improved Fire Investigation Inquiries  
*Yunqian Li; Lijuan Weng; Guofeng Luo; Qi Chen; Zhuohan Ye; Wenqi Zeng; Cheng Wang; Longbiao Chen*

Droflsim: A Collective Behavior Analysis and Evaluation Tool  
*Rui Zhu; Yudian Zeng; Chuying Yang; Bangchuan Wang; Nenggan Zheng*

## UIC-15

### Session Chair: Yao Zhang, Northwestern Polytechnical University

Efficient and Atomic Cross-Blockchain Transaction Processing for Decentralized Web3 Applications  
*Yuqin Wang; Jiannong Cao; Shan Jiang; Shan Wang; Hongbo Liu; Zhixuan Liang*

Real-Time Fine-Grained Gesture Recognition Based on Millimeter Wave Radar  
*Juan Fang; Yong Xu; Wei Liu; Cheng Li; Qun Fang; Xin He*

Themis: Adaptive CPU Resource Allocation for VMs on Heterogeneous Multicore Architectures  
*Yecheng Yang; Pu Pang; Jiawen Wang; Quan Chen; Weiwei Chen; Li Li; Minyi Guo*

An Algorithm Combining Deep Reinforcement Learning and Dynamic Programming for Solving TSP-D  
*Zhaoxin Liang; Yunwei Dong; Dian Zhang*

STLL: Spatio-Temporal Graph and Lane Sequence Based Lightweight Vehicle Trajectory Prediction  
*Lei Huang; Yuzhen Liu; Xiaoliang Wang; Yuanyuan Ai; Xiaolan Zhou*

Quantifying and Analyzing Speculative Execution Risks: A Quantitative Security Framework  
*Yusha Zhang; Ziyuan Zhu; Yuxin Liu; Ruoqia Li; Wenjing Cai; Dan Meng*

## UIC-16

### Session Chair: Jinke Wang, Henan University

QMLFQ: A Quantization-Based Queue Scheduling Framework for Efficient LLM Serving  
*Jiali Wu; Hao Dai; Jiashu Wu; Wenming Jin; Yang Wang*

CoDSDF: Constrained Decoding of SDF Quantized Vectors for Single-View 3D Reconstruction Using Conditional Generation  
*Deli Zhu; Yijie He; Yunong Yang; Haibin Fu*

CERG-KBQA: Advancing KBQA-Systems Through Classification, Enumeration, Ranking, and Generation Strategies  
*Junyu Chen; Hui Gao; Yuhang Wang; Xucheng Wu*

EIMViT: A Model Integrating EEG Microstates and Deep Learning Methods for Depression Recognition  
*Yun Su; Qi Chang; Yueyang Zhou; Wenbing Zhu; Kun An; Runhe Huang*

ID-YOLOv7: A Method for Steel Surface Defect Detection Combining Residual Attention and Dynamic Upsampling  
*Shanshan Liu; Xiangzhi Liu; Jiazheng Man; Bingyang Cao; Yunfeng Dong; Xiaoming Wu*

An Approach to New Bearing Fault Diagnosis Utilizing Deep Transfer Learning  
*Huijuan Hao; Yue Feng; Hongge Zhao; Sijian Zhu*

## UIC-17

### Session Chair: Yongjian Fu, Tsinghua University

MPSI: A Cross-Layer Multi-Path QUIC Approach for Mobile Video Streaming Services  
*Haopeng Zhang; Ming Jiang; Jinquan Nie; Yuehua Fan; Yuanlong Cao*

A Self-Attention Spiking Neural Network for Human-to-Human Interaction Recognition Based on Wi-Fi Signals  
*Jinlong Wang; Bobai Zhao; Siye Wang; Yi Liu*

A Crowd Counting Method Based on Connected Field Image Generation of CSI Phase Difference  
*Jieming Yang; Mingchen Han; Yun Wu*

KCIN: A Kolmogorov-Arnold Convolutional Network-Based Model for Transportation Mode Recognition with Incomplete Sensor Series  
*Hao Xiong; Haiyong Luo; Jiayi Gong; Fang Zhao; Juan Wang; Xuepeng Ma*

Unveiling Contactless Sensing with Lidar Mobility  
*Junying Hu; Yongjian Fu; Lili Chen; Xinyi Li; Ju Ren; Yaoxue Zhang*

An Adaptive Goal Decomposition Decision Model for Satellite Tracking with Noncooperative Ground-Based Equipment  
*Xiaoyu Zhang; Meng Zhang; Wen Wang*

## UIC-18

**Session Chair: Shan Jiang, The Hong Kong Polytechnic University**

Knowledge Graph Embedding via Delicate Negative Sampling and Efficient Biased Learning  
*Fuzhao Liu; Yan Song; Heming Chu; Ru Zeng*

Audio-Driven Talking Face Generation with Blink Embedding and Hash Grid Landmarks Encoding  
*Yuhui Zhang; Hui Yu; Wei Liang; Sunjie Zhang*

Interpretable Dual-Branch Network with Multi-Modal Multi-Prototype Attributes for Dynamic Region-Based Zero Shot Learning  
*Zhe Kong; Yifei Zhang; Neng Gao; Yuhan Liu*

Feature Rotation Invariance Learning for Point Cloud Analysis  
*Lu Shi; Qi Cao; Guoqing Zhang; Jin Yi; Yansen Huang; Yigang Cen*

Collaborative Multi-Agent Proximal Policy Based Resource Allocation in Clustered IoV Networks  
*Arif Raza; Junfan Xiang; Salabat Khan; Shivanshu Shrivastava; Muhammad Wasim Abbas Ashraf; Lu Wang*

Dynamic QoS Prediction for Edge Intelligence with Multi-Modal Data Fusion  
*Yuanyi Chen; Yangbo Qi; Jiaying Shen; Peng Yu; Zhengzhe Xiang; Zengwei Zheng*

## UIC-19

**Session Chair: Ruochen Cao, Taiyuan University of Technology**

An Elastic LatticeKrig Generative Model for Non-Ideal Spatial Datasets  
*Gang Xu; Di Wu; Christina Carrozzo Hellevik; Yushan Pan*

A Grasping Posture Selection Method Based on Large Language Model  
*Qiji Feng; Yan Ma; Kaixing Zhao; Liang He*

How to Make Your Multi-Image Posts Popular? An Approach to Enhanced Grid for Nine Images on Social Media  
*Qi Xi; Shulin Li; Zhiqi Gao; Zibo Zhang; Shunye Tang; Jingchao Zhang; Liangxu Wang; Yiru Niu; Yan Zhang; Binhui Wang*

Personalized Multi-Behavior Sequential Recommendation with Temporal-Aware Contrastive Learning and Self-Attention  
*Feiyun Wang; Yanhui Zhou*

MaxMind: A Memory Loop Network to Enhance Software Productivity Based on Large Language Models  
*Yuchen Dong; Xiaoxiang Fang; Yuchen Hu; Renshuang Jiang; Zhe Jiang*

Heterogeneous Intelligent Accelerator Experiment Platform for Ship Information Infrastructure  
*Da Song; Kai Huang; Chen Ma; Wanhai Xu*

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**Session Chair: Jianfei Shen, Institute of Computing Technology, Chinese Academy of Sciences**

A Residual Graph Convolutional Network Algorithm Based on Unfolded WMMSE for Power Allocation  
*Jinhong Yang; Chunwei Miao; Jian Zhang*

Design and Experiment of a VSLAM System by Calculating Feature Points with a Wide-Angle Camera

*Guangyu Fan; Kang Zhou*

AG-HCRL: Air-Ground Collaborative Crowdsensing Based on Deep Reinforcement Learning in City Sensing  
*Kaixing Zhao; Yingying Zhou; Huiwen Xue; Lige Ding; Liang He; Bin Guo*

Explainable Traffic Accident Severity Prediction with Attention-Enhanced Bidirectional GRU-LSTM  
*Auwal Sagir Muhammad; Rufai Yusuf Zakari; Abdullahi Baba Ari; Cheng Wang; Longbiao Chen*

Data Sinks Deployment for Backbone-Assisted Real-Time PD-NOMA Networks Based on Reinforcement Learning  
*Zhenjie Lv; Chaonong Xu; Jiachen Wei*

Gesture Recognition with Residual Attention Using Commodity Millimeter Wave Radar  
*Siyu Chen; Weiqing Bai; Chong Han; Jialiang Ma; Ying Wang*

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**Session Chair: Xiao Liu, Shanghai Univeristy**

Not Just Imitation: Enhancing Role-Playing Through Retrieve Fine-Tuned Collaborative Large Language Model  
*Yating Zeng; Bin Guo; Yao Jing; Hao Wang; Yasan Ding; Yunji Liang; Zhiwen Yu*

SKSP: Selected Kernel Spatial Pattern Analysis in Euclidean and Hilbert Space for Decoding Motor Imagery  
*Zhibin Zhang; Jianwei Niu; Lu Ren; Zhenchao Ouyang; Shasha Mo*

Deep Reinforcement Learning with Heterogeneous Graph Neural Network for Flexible Job Shop Scheduling Problem  
*Boyan Liu; Huayi Yin*

Intensify Knowledge Tracing for Learning Performance Prediction via Tensor-Based Self-Attention  
*Jihong Ding; Yingao Geng; Huazhong Liu; Wenxuan Zhang; Feng Ji; Peng Tan; Kai Li*

ASD Classification Framework Based-On Temporal Neural Features  
*Wenhao Bi; Guangwei Zhang; Guangcheng Dongye; Li Zhang; Ming Jing; Jiguo Yu*

Behavior Cognition Association Analysis with Heterogeneous Multimodal Causal Discovery  
*Shuang Wu; Yingwei Zhang; Yiqiang Chen*

## **UIC-22**

**Session Chair: Zhaohui Yang, Zhejiang University**

Guardians of Discourse: Evaluating LLMs on Multilingual Offensive Language Detection  
*Jianfei He; Lilin Wang; Jiaying Wang; Zhenyu Liu; Hongbin Na; Zimu Wang; Wei Wang; Qi Chen*

An Enhanced Deep Learning Model for Efficient and Accurate Anti-Cancer Peptide Identification Surpassing Traditional Machine Learning Methods  
*Jiaqi Peng; Fa Tian*

EDNet: Edge-Optimized Small Target Detection in UAV Imagery - Faster Context Attention, Better Feature Fusion, and Hardware Acceleration  
*Zhifan Song; Yuan Zhang; Abd Al Rahman M. Abu Ebyayeh*

## **UIC-23**

**Session Chair: Hua Li, Hainan University**

EM-Mamba: An Edge-Mix Enhanced Long-Range Sequential Modeling Mamba for Kidney Segmentation in CT Scans  
*Shaowei Feng; Zheng Li; Mengmeng Zheng; Yang Yang; Xin Wang; Caili Guo*

Overview of the Comprehensive Evaluation of Large Language Models  
*Liya Lin; Dongyun Zhu; Jingwei Shang*

News-ExplaiNER: An Automated Fake News Detector and Explainer with Deep Learning and NLP  
*Wanyu Hu; Zhongmin Dai; Vrizzlynn L. L. Thing*

Modeling Larval Tumbling Locomotion Based on Differentiable Material Point Method  
*Weishi Wang; Weihao Tang; Yue Tang; Nenggan Zheng*

Children and Dogs Classification in CPD Application  
*Yehui Shi; Jianhong Shi; Yanbo Ma; Yunlong Luo; Yihong Qi; Chengfeng Wu; Hanchun Yang*

A Transformer-Based Approach for Effective Visual Question Answering  
*Rufai Yusuf Zakari; Jim Wilson Owusu; Ke Qin; Auwal Muhammad Sagir*

## UIC-24

**Session Chair: Xiaodong Bai, Hainan University**

Motion Magnification Method Based on Hybrid Channel and Window Attention Mechanism  
*Deli Zhu; Haibin Fu; Yunong Yang; Yijie He*

TL-Fuser: Layout-Sensitive Scene Generation for Autonomous Driving  
*Tian Shen; Yunji Liang; Zizhe Wang; Haopeng Duan; Bin Guo; Zhiwen Yu*

Complementary Learning and Smooth Representation for Multi-View Subspace Clustering  
*Yuyu Zeng; Luyao Teng; Zefeng Zheng; Peipei Kang; Qingfa Lin; Shaohua Teng*

Discriminative and Semantic Reinforcement Learning for Domain Adaptation  
*Yukang Fang; Shaohua Teng; Luyao Teng; Zefeng Zheng; Wei Zhang; Peipei Kang*

Enhancing Visual Question Answering with Fine-Tuned Graph Convolutional Networks  
*Jim Wilson Owusu; Rufai Yusuf Zakari; Ke Qin; Tao He*

EPIC: Ensembled Poisoning Identification and Classification for LLM Backdoor Defense  
*Moe Thu Kyaw; Zhongmin Dai; Vrizzlynn L. L. Thing*

## UIC-25

**Session Chair: Jihong Ding, Hainan University**

Diagnosis of Major Depressive Disorder Based on Anomaly Detection with sMRI Gray Matter Slices  
*Yao Xiao; Xin Liu; Yurong Qian; Bo Huang; Panrui Tang; Zuping Zhang*

Negative Bidirectional Distillation Model Based on Self-Supervised Learning  
*Hewei Yu; Tianyi Duan*

An Information-Augmented Approach for Graph Similarity Computation  
*Junyan Chen; Hui Gao; Xucheng Xu*

Integrating Retrieval-Augmented Generation for Enhanced Code Reuse: A Comprehensive Framework for Efficient Software Development  
*Kai Wang; Yujie Ding; Shuai Jia; Tianyi Ma; Yin Zhang; Bin Cao*

An Online Learning Prediction System for MOOCs Using Deep Learning Approaches  
*Guangyu Fan; Jiajia Guo; Songlin Cheng; Dingyu Yang*

Question Answering Over Temporal Knowledge Graphs Based on Hierarchical Semantic Extraction  
*Jian Wang; Wenjuan Zhang; Danfeng Zhao; Qi He*

## UIC-26

Session Chair: Xixun Yu, Hainan University

Dual Knowledge Aware Graph Convolutional Networks Over Aspect Based Sentiment Analysis

*Haoying Si; Jianxia Chen; Lei Mao; Liang Xiao; Haitao Gan; Zhina Song*

HCMANet: Hierarchical Cross-Modality Attention Network for Underwater Salient Object Detection

*Yu Wang; Wenjie Li; Haowei Wen; Yi Xue; Zhiyang Yu; Hua Li*

Multi-Concept Interactive Representation Learning for Knowledge Graph Completion

*Changlong Wang; Xijie Wang; Xiujuan Sang; Yuan Gao; Yi Liu*

A Multi-Prototype Fusion Approach for Few-Shot Relation Extraction

*Jin Jin; Xizhong Qin; Ruihan Shao; Ye Dong*

Research on Machine Unlearning Verification Based on Predictive Cross-Entropy

*Xinghui Yue; Jiale Peng; Meiqi Liu; Haitao He; Yuqing Zhang*

RGB-D Mirror Segmentation via Semi-Supervised Learning

*Zhengyi Liu; Guanghui Zhang; Rui Zhang*

## UIC-27

Session Chair: Jiawei Wang, The University of Warwick

UWBOri: Enabling Accurate Orientation Estimation with Ultra-Wideband Signals

*Zhaoxin Chang; Fusang Zhang; Jie Xiong; Xinyu Xue; Zeyu Wang; Badii Jouaber; Daqing Zhang*

IFVONet: Integrating Inter-Frame Variation and Occlusion Awareness for 3D Hand Mesh Reconstruction

*Shiyao Wu; John Panneerselvam; Lu Liu; Rajeev Raman; Tianjin Huang*

Ensemble Based Unsupervised Anomaly Detection with Concept Drift Adaptation for Time Series Data

*Danlei Li; Nirmla Nair; Kouichi Sakurai; Kevin I-Kai Wang*

OE-VI<sup>2</sup>: Occlusion Effect-Based Narrow-Bandwidth In-Ear Voice Input Interface for Earphones

*You Zuo; Feiyu Han; Panlong Yang; Dawei Yan; Yubo Yan*

Practical Self-Supervised Contrastive Driver Maneuver Interaction Learning via Augmenting Inertial Measurement Unit Signals

*Yawen Deng; Suining He; Hao Wang*

Policy-Based Management of Human-Device and Device-Device Interactions in IoT Collectives: A Simulation-Based Study

*Amna Batool; Seng W. Loke; Niroshinie Fernando; Jonathan Kua*

MoodCam: Mood Prediction Through Smartphone-Based Facial Affect Analysis in Real-World Settings

*Rahul Islam; Tongze Zhang; Sang Won Bae*

## UIC-28

Session Chair: Yingbing Liu, Hainan University

Virtual Keyboard Based on IMU

*Yiwen Song; Ci Wang*

Contrastive Learning Based on Diffusion Graph for Implicit Collaborative Filtering

*Zhao Shi; Erjia Chen; Shenghao Liu; Bang Wang*

Innovative Sentiment Analysis of Mobile App Review Texts Based on MHA-MLP-Mixer

*Fanqi Meng; Manjun Qi; Songbin Bao*

Make It Easy: Action Quality Assessment of Cyborg Animals Based on Spatial-Temporal Pose Inference  
*Qiqi Li; Le Han; Pengfei Wang; Nenggan Zheng*

Double-RIS Aided Full-Duplex Communication System: Uplink, Downlink and Rate Maximization  
*Maolamu Mamitimin; Xizhong Qin; Junlong Yang; Zhenhong Jia*

A Blind Driving System Leveraging Multimodal Feedback  
*Ruizhe Zhang; Sha Zhao; Wei Yang; Shijian Li; Gang Pan*

## UIC-29

**Session Chair: Jiayang Sun, Huazhong University of Science and Technology**

Mask Refinement with Reverse Attention for Few-Shot Medical Image Segmentation  
*Rong Wang; Zhiming Luo; Zeyun Zhao; Yuliang Tang; Shaozhi Li*

MAI-Unet: A Multi-Scale Attention Interactive Network for Multivariate Long-Term Time Series Forecasting  
*Xinhua Dong; Lifeng Jiang; Zhigang Xu; Hongmu Han; Chuang Li; Zhongpeng Wang*

Generate Unrestricted Adversarial Examples by Diffusion Model Based on Labels  
*Chenghai He; Xiaoqian Li; Hailing Li; Xiaohang Zhang; Gang Xiong; Kai Zhang*

Multi-Stage Interaction and Multi-Scale Reconstruction: A Hybrid Attention Network for Skin Lesion Image Segmentation  
*Wei Wang; Yuewen Luo; Xin Wang*

A Speed-And-Performance Balancing Lightweight Network for Real-Time Semantic Segmentation  
*Guang Wang; Junchang Zhang; Hong Chen; Hai Huang; Yucui Shi; Qing Wang*

Multi-Level Feature Calibration for Adversarial Training Against Attack  
*Yancong Wang; Ze Tao; Jian Zhang*

## UIC-30

**Session Chair: Longbiao Chen, Xiamen University**

MAPPO Based Single-Hop Task Offloading with Dynamic Vehicle Prediction in RSU-Assisted IoV  
*Wei Zhao; Dongling Yang; Tangjie Weng; Xinwei Xu; Xun Shao; Zhi Liu*

Driving Toward Safety: A Personalized Approach to Traffic Risk Assessment Leveraging Driver Behaviour Data  
*Auwal Sagir Muhammad; Rufai Yusuf Zakari; Abdullahi Baba Ari; Cheng Wang; Longbiao Chen*

Topology-Aware Visualization for Interactive Graph Structure Exploration  
*Tianyuan Cao; Yunzhe Wang; Yushi Li; Qiming Fu; You Lu; Jianping Chen*

Situational Design for Equitable Home Safety: Bio-Psycho-Social Approach Based on Data-Driven Situational Risk Assessment  
*Shunsuke Sasaki; Mikiko Oono; Koji Kitamura; Tatsuhiko Yamanaka; Yoshifumi Nishida*

Enhancing Emotional Understanding Through Multimodal Fusion: A Dual Channel Approach with Self-Attention Mechanism and Transfer Learning  
*Mengcheng Ji; Yixin Gan; Mingxin Yang; Rui Hou*

Assessing Perceived Factors and Effects of Mobile Phone Health Software on Users' Health Behavior  
*Jun Liu; Binxin Hu; Hongtao Wu; Yuxuan Hua*



## UIC-31

### Session Chair: Zhou Zhou, Changsha University

SGNet: A Multi-Scale Method for Steel Surface Defect Detection

*Shanshan Liu; Xiangzhi Liu; Jiazheng Man; Bingyang Cao; Yunfeng Dong; Xiaoming Wu*

AcaPigeon: A Large Language Model-Based Academic Information Consultation Assistant

*Yilu Sun; Xiaolin Su; Guofeng Luo; Binmei Shen; Longbiao Chen; Cheng Wang*

A Human-Machine Reinforcement Learning Framework with Multi-Dimensional Human Feedback Fusion

*Wei Gao; Zhiwen Yu; Hui Wang; Bin Guo*

Enhancing UAV Coverage Path Planning via Deep Reinforcement Learning with Intrinsic Curiosity

*Yinxin Zhou; Yanxi Chen; Renyu Wang; Haiping Huang; Shenghao Liu; Xianjun Deng*

Dual-Branch Network with Transformer and CNN for Underwater Semantic Segmentation

*Xiaowen Chen; Yutong Li; Zifeng Huang; Mengyu Ren; Shuo Wang; Hua Li*

Few-Shot Industrial Anomaly Detection via Proxy Task Learning on Normal Samples

*Shiwen He; Rong Xu; Wei Huang; Yuehan Chen; Liangpeng Wang*

## UIC-32

### Session Chair: Muhan Xiao, Zhejiang University

Multi-View Decoupling Framework for Emotion Recognition in Conversations

*Feifei Xu; Qinghan Du; Luobin Huang; Xiaoyan Yu; Zixi Wu; Tao Sun*

BNKG: BERT-Based Non-Sampling Knowledge Graph Enhanced Recommendation

*Cheng Li; Yong Xu; Gongbin Chen; Xin He; Yujun Zhu; Qun Fang*

KGViT: Knowledge Graph Integrated Vision Transformer for EEG-Based Emotion Recognition

*Qianzhong Chen; Weining Weng; Jianfei Shen; Yiqiang Chen; Yang Gu*

GIN-LDP: A Graph Isomorphism Network-Based Model for Loan Default Prediction

*Jiayun Jin; Zengwei Zheng; Jianhua Ma; Binbin Zhou*

RetNAS: Reinforce Evolutionary Trend in Lightweight Neural Architecture Search

*Muhan Xiao; Shijian Li; Li Zhang; Gang Pan*

MERIT: Multimodal Wearable Vital Sign Waveform Monitoring

*Yongyang Tang; Zhe Chen; Ang Li; Tianyue Zheng; Zheng Lin; Jia Xu; Pin Lv; Zhe Sun; Yue Gao*

## UIC-33

### Session Chair: Ruizhe Zhang, Zhejiang University

Multi-Level Causal Reasoning for Emotion Recognition in Conversations

*Feifei Xu; Tao Sun; Wang Zhou; Ziheng Yu; Jiahao Lu; Qinghan Du*

Causality-Aware Next Location Prediction Framework Based on Human Mobility Stratification

*Xiaojie Yang; Zipei Fan; Hangli Ge; Takashi Michikata; Shibasaki Ryosuke; Noboru Koshizuka*

Influence Maximization on Dynamic Social Networks with Conjugate Learning Automata

*Chong Di; Fangqi Li; Zhipu Xie; Bin Yang; Xin Wang; Jinchao Huang*

Human-Machine Task Allocation Based on Predictive Confidence and Dynamic Cost

*Jingyu Wang; Jiaqi Liu; Zhiwen Yu; Hui Wang; Bin Guo*

Multi-View Session-Based Social Recommendation with Self-Supervised Learning

*Jiamian Li; Xiao Liu; Yixing Guo*

DACA: A Distributed Algorithm for Task Partitioning and Offloading in Mobile Edge Computing Networks Supporting Transformer

*Yehan Deng; Jingjing Li; Na Tang*

#### **UIC-34**

**Session Chair: Jia Wang, Xi'an Jiaotong-liverpool University**

Deep-TransVOD: Improved Video Object Detection with Low-Rank Tensor Decomposition

*Xinpeng Liu; Yanjie Fang; Weihua Liu*

Advanced Liveness Detection for Facial Recognition: Combating Fake Faces with Reflectivity Analysis

*Xinpeng Liu; Wen Wang*

A Dirty Data Identification Method in Mechanical Equipment Condition Monitoring

*Huijuan Hao; Hongge Zhao; Sijian Zhu; Yue Feng*

Shape Topology-Driven Network for Unsupervised Keypoint Detection

*Feijia Yao; Yushi Li; Rong Chen; Qiufeng Wang; Rong Xiang; Yunzhe Wang; Chengtao Ji*

VisionPlay: An Interactive Ball Game Using Computer Vision and Augmented-Reality Overlay

*Ruoxuan Cao; Jiayun He; Yiran Peng; Zeyu Chen; Qilei Sun*

Comparative Performance Analysis of Rendering Optimization Methods in Unity Tuanjie Engine, Unity Global and Unreal Engine

*Muyi Bao; Zeren Tao; Xiaohan Wang; Jiashuo Liu; Qilei Sun*

Language-Based Audio Retrieval with Co-Attention Networks

*Haoran Sun; Zimu Wang; Qiuyi Chen; Jianjun Chen; Jia Wang; Haiyang Zhang*

#### **UIC-35**

**Session Chair: Uzair Aslam Bhatti, Hainan University**

Enhanced Multi-Objective Optimization Approach for Low-Interference UAV Communication Based on Collaborative Beamforming

*Chao Zhang; Hui Kang; Geng Sun; Jiahui Li; Boxiong Wang; Bo Xu*

A Lightweight Transformer-Based Model for Efficient Industrial Fault Diagnosis

*Wei Wu; Nan Zhou; Xiaojun Liang; Weihua Gui; Chunhua Yang; Yiqi Liu*

Design and Experiment of a Glass Detection System Based on Context and Edge Attention Using Deep Learning Methods

*Guangyu Fan; Yapeng Liu; Songlin Cheng*

A Speech Dataset for the Recognition and Analysis of COVID-19 Coughs

*Hengyu Wang; Bing Wei; Xiaobo Zhao; Jingyu Zou; Jiaqi Shi*

A Speech Dataset for Snoring Detection in Sleep Based on Deep Learning

*Xiaobo Zhao; Bing Wei; Hengyu Wang; Jiaqi Shi; Jingyu Zou*

Trans-EffNet: A Hybrid Model for Brain Tumor Detection Using EfficientNet and Transformer Encoder

*Abdul Haseeb Nizamani; Zhigang Chen; Ahsan Ahmed Nizamani; Mughair Aslam Bhatti; Hauwei Ma; Wencai Du*

#### **UIC-36**

**Session Chair: Uzair Aslam Bhatti, Hainan University**

LDQN: A Lightweight Deep Reinforcement Learning Model

*Wenjin Liu; Yuheng Li; Hao Tang*

State-Of-The-Art Approach: Boosting IoT Sensor Network Security with Visual Secret Sharing  
*Sijjad Ali; Jia Wang; Victor Chung Ming Leung; Bhatti Uzair Aslam; Mughair Aslam Bhatti*

Development of a Speech Dataset for Emotion Recognition and Analysis  
*Yi Wu; Haoming Liu*

Efficient Design of Prefix Adders Based on Relational Graph Convolutional Network  
*Shaohua Dong; Zengyuan Song; Uzair Bhatti; Younjung Hwang; Qian Chen*

Multi-Step ENSO Forecasting Using Kolmogorove Arnold Networks  
*Ahsan Ahmed Nizamani; Jun Long; Abdul Haseeb Nizamani; Uzair Bhatti; Hao Tang*

Dynamic Segmentation Enhanced Asynchronous Non-Linear Federated Learning for Fault Diagnosis Using Incremental Aggregation Mechanism  
*Luo Fang; Jiafu Wan; Hao Tang; Bhatti Uzair Aslam; Jinbiao Tan*

Prototype Guided Personalized Federated Intrusion Detection System  
*Long Cheng; Huiru Yan; Hanlin Zhou; Ying Wang; Haichuan Tang; Fang Fang*

### UIC-37

#### Session Chair: Weihao Tang, Zhejiang University

FSPB: Filtered Semantic Paths and BERT for Knowledge Graph Completion  
*Yun Su; Kun An; Yunhao Zhu; Xushui Shi; Qi Chang; Yueyang Zhou*

Multi-Label Text Classification for Judicial Texts via Dual Graph and Label Feature Fusion  
*Qiliang Gu; Qin Lu*

Adversarial Attacks on Influence Maximization in Homogeneous Hypergraphs  
*Tianwei Lin; Yanhao Sun; Zeyu Wang; Nuan Song; Kaige Xie; Jie Wu; Dong Li*

Tailored Temperature for Student in Knowledge Distillation  
*Hongjin Chen; Tiantian Zeng; Kai Xiao; Shaozhi Wu; Xingang Liu; Han Su*

Learning Inverse Dynamics of Multi-Segmented Larval Crawling Neuromechanics  
*Weihao Tang; Hao Zhang; Zhefeng Gong; Nenggan Zheng*

ARR: An Attention-Based Robust Residual Network Architecture  
*Yunlong Li; Qingguo Xu; Fei Zheng; Fei Zheng; Guoquan Qiang*

### UIC-38

#### Session Chair: Canyang Guo, Fuzhou University

Context-Prompt-Align: An Architecture for Few Posts Based Social Bots Detection  
*Weibin Yang; Xianxing Fang; Liangru Xie; Hao Wang; Ruitao Zhang; Yushan Pan; Di Wu*

SCDet: Scale-Aware and Context-Rich Feature Fusion Network for Traffic Sign Detection  
*Xin Li; Yan Ke; Wendong Zhang; Bo Wang*

Intelligent Urban Emergency Response: Integrating Large Language Models, Multi-Objective Optimization, and Reinforcement Learning  
*Siyao Chen; Guofeng Luo; Longbiao Chen*

A Vulnerability-Driven Gym for Training Autonomous Cyber Agents with Reinforcement Learning  
*Weixia Cai; Huashan Chen; Han Miao; Feng Liu; Yong Zhang; Xiaojia Yang*

A Label-Focused Transformer for Generating Illness-Aware Medical Reports

*Siyuan Zhou; Hongxia Bie*

The Spatio-Temporal Graph Convolution Network for Alzheimer's Disease Classification  
*Wenlong Xu; Lele Zheng; Jianping Qiao*