Conference Program

2025 the International Conference on Software System and Information

2025 年软件系统与信息处理国际会议

Chengdu, China (中国成都)

December 26-28, 2025 UTC+8 | 2025 年 12 月 26-28 日

Crowne Plaza 成都武侯渝江皇冠假日酒店
Add: No. 2, Chaoyin Road, Wuhou District, Chengdu City, Sichuan Province, China
地址：四川省成都市武侯区潮音路 2 号

Co-sponsored by (主办单位)

Hosted by (承办单位)

Patrons (支持单位)

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General Information

Conference Venue

Crowne Plaza
成都武侯渝江皇冠假日酒店
Add: No. 2, Chaoyin Road, Wuhou District, Chengdu City, Sichuan Province, China
地址：四川省成都市武侯区潮音路 2 号

Onsite Registration

Go to the registration desk→ Inform the staff of your paper ID→ Sign-in→ Claim your conference kit.

Devices Provided by the Organizer

Laptops (with MS-Office & Adobe Reader) / Projectors & Screen / Laser Sticks

Materials Provided by the Presenter

Oral Session: Slides (pptx or pdf version). Format 16:9 is preferred.

Official language: English.

Duration of Each Presentation

Keynote Speech: 50min, including 5 min Q&A.

Invited Speech: 25min, including 5 min Q&A.

Oral Session: 15min, including 3 min Q&A.

Notice

- Please wear your delegate badge (name tag) for all the conference activities. Lending your participant card to others is not allowed.
- Please take good care of your valuables at any time during the conference. The conference organizer does not assume any responsibility for the loss of personal belongings of the participants during conference day.

※ **UTC+8. Time in Chengdu, China. Please be aware of time difference between this and your region/country.**

Online Presentation Tips

Meeting ID	Meeting Link
88375951134	**https://us02web.zoom.us/j/88375951134**

Zoom Download

ICSSIP 2025
Ms Lee
Email: icssip_conf@vip.163.com
Tel.: +86-19382255134

Welcome Message

On behalf of the conference committees, we warmly welcome you to the 2025 the International Conference on Software System and Information Processing (ICSSIP), held in Chengdu, China from December 26 to 28, 2025, co-sponsored by University of Electronic Science and Technology of China and IEEE, hosted by School of Information and Communication Engineering (UESTC), China.

The goal and feature of this conference is to bring together a rich diversity of authors and speakers from university, government and industry around the globe to share their knowledge, experiences and research results, to discuss the practical challenges encountered and the solutions adopted on a wide range of Software System and Information Processing.

The conference will include discussions on topics such as Intelligent communication systems and signal processing methods with integrated sensing; Digital communication and wireless transmission technologies; Sensor-based image analysis and digital signal processing. 3 keynote speeches will be delivered by Prof. Kun Yang (Fellow of IEEE & IET), from Nanjing University, China, Prof. Tony Quek (Fellow of IEEE), from Singapore University of Technology and Design, Singapore, and Prof. Guanghui Liu (Senior Member, IEEE), from University of Electronic Science and Technology of China (UESTC), Chengdu, Sichuan, China. In addition, invited speech given by Assoc. Prof. Hongliang He, from China University of Geosciences, China.

On behalf of all the conference committees, we feel deeply grateful to all that have contributed to make this event possible: authors who contributed papers, keynote speakers, invited speakers, session chairs and the diligent reviewers. Your high competence, enthusiasm, valuable time and expertise knowledge, enabled us to prepare this conference program smoothly. Special thanks are also extended to the conference administrative committee for their tireless efforts throughout the course of the conference.

We have an exciting program at this conference that will allow members to reflect upon and celebrate our past accomplishments, renew friendships and extend our networks, and jointly explore current and future research directions. We hope that you will have a productive and fun-filled time at this very special conference. We would like to thank all of the sponsoring organizations for providing their generous financial support. Lastly, we would like to thank all of the conference participants for their contributions which are the foundation of this conference. We welcome different opinions from all participants and look forward to the better development of ICSSIP in the coming years.

Finally, I would like to express our profound appreciation to all the organizing and supporting institutions, the Program Committee members, and every member of the organizing team. Your months of dedicated effort and hard work have made this conference possible. Most importantly, thank you—every participant here today. Your presence and contributions are what truly give this meeting its value and vitality.

We wish you all a fruitful and engaging experience at ICSSIP 2025. We also hope you find some time to enjoy the unique charms of this city beyond the conference halls.

Best regards,

Conference Organizing Committee

ICSSIP 2025

CONFERENCE COMMITTEE 2025

Organizing Committee

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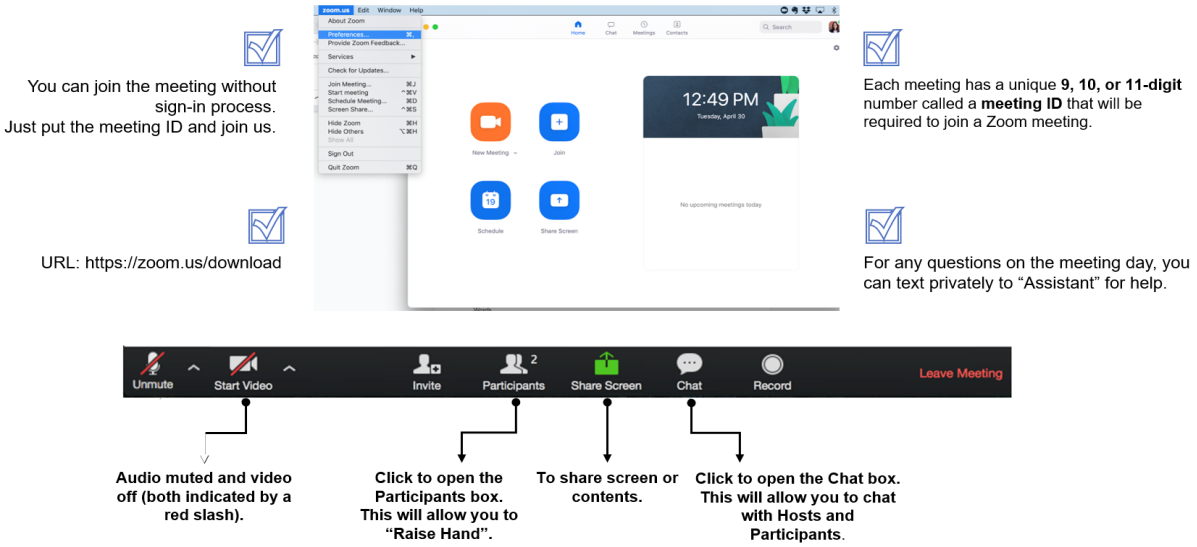
AGENDA OVERVIEW

December 26| Friday (UTC+8)	
Online Pre-test Session	**ZOOM ID: 88375951134** **ZOOM Link: https://us02web.zoom.us/j/88375951134**
14:00-15:30	SP039 SP040 SP017 SP015 SP023 SP013 SP036 SP048 SP042 SP038 SP1001 SP022 SP006 SP018 SP031
	Other online participants, includes but not limited to keynote speaker, invited speaker, session chair, committee member, delegate.

Participants who are going to make online presentation are required to join the rehearsal in Zoom on Friday, December 26, 2025.
Duration: 3min apiece. Feel free to leave after you finish the test.
We will test control panel including screen sharing, audio, video and "Raise Hand" feature, etc. Please get your presentation slides
and computer equipment prepared beforehand.

You are required to set your display name before joining the online meeting.
Author/Presenter: Paper ID-Name < SP001_Li Lei > Delegate: Delegate-Name < Delegate_Li Lei >

Zoom Guidance



AGENDA OVERVIEW

December 27 | Saturday (UTC+8)

Keynote Session (Onsite & Online)

< Room No. 8, Crowne Plaza | 5F >
<五楼 8 号厅>

ZOOM ID: 883 7595 1134
ZOOM Link: https://us02web.zoom.us/j/88375951134

Chairman: Prof. Yizhe Zhao, University of Electronic Science and Technology of China, China

9:00-9:10	**Opening Remarks** **Prof. Supeng LENG, University of Electronic Science and Technology of China, China**
9:10-10:00	**Keynote Speech I:** AI-enabled Self-driving Communication Networks **Prof. Kun Yang (Fellow of IEEE & IET), Nanjing University, China**
10:00-10:50	**Keynote Speech II:** From Theory to Practice in 6g Ai-Native Network **Prof. Tony Quek (Fellow of IEEE), Singapore University of Technology and Design, Singapore**
10:50-11:10	Group Photo & Morning Coffee Break
11:10-12:00	**Keynote Speech III:** Physical-Layer Waveform Design for Mobile Communications **Prof. Guanghui Liu (Senior Member, IEEE), University of Electronic Science and Technology of China (UESTC), Chengdu, Sichuan, China**
12:00-13:30	Lunch Time | < TBA >

Onsite Session: Intelligent Communication Systems and Signal Processing Methods with Integrated Sensing
< Room No. 8, 5F | 五楼 8 号厅 >

13:30-15:10	*Part A:* SP011 (Invited Speech) SP014 SP032 SP019 SP024 SP025 *Chairperson: Assoc. Prof. Hongliang He, China University of Geosciences, China*
15:40-17:10	*Part B:* SP010 SP020 SP021 SP016 SP1002 SP041 *Chairperson:*

Online Session: <ZOOM ID: 88375951134>
https://us02web.zoom.us/j/88375951134

13:30-15:30	*Online Session 1: Digital Communication and Wireless Transmission Technologies* SP039 SP040 SP017 SP015 SP013 SP023 SP036 SP031 *Chairperson:*
15:45-17:30	*Online Session 2: Sensor-based Image Analysis and Digital Signal Processing* SP042 SP038 SP1001 SP022 SP006 SP018 SP048 *Chairperson:*

Note

*Zoom Meeting online conference room will be open 30 mins before scheduled time. Please enter your room 10-15 minutes early.
*All online attendees are required to join the pre-test on Friday, December 26 Start from 14:00 (UTC+8).
*A paper not presented or presented by a non-author without prior written approval by the Conference TPC will be removed from the final conference proceedings.

INTRODUCTION OF KEYNOTE SPEAKERS (UTC+8)

09:10-10:00 **December 27 (Saturday), 2025**	**< Room No. 8, 5F | 五楼 8 号厅 >** **ZOOM ID: 88375951134** **ZOOM Link: https://us02web.zoom.us/j/88375951134**

Prof. Kun Yang
Fellow of IEEE, IET

Nanjing University, China

Kun Yang received his PhD from University College London (UCL), UK. He is currently the founding Director of the Institute of Nanjing Intelligent Networks and Communications (NINE), Nanjing University, China. He is also an affiliated professor of University of Essex, UK. His main research interests include wireless networks and communications, communication-computing cooperation, and new AI (artificial intelligence) for wireless. He has published 500+ papers and filed 50 patents. He serves on the editorial boards of a number of IEEE journals (e.g., IEEE WCM, TVT, TNB). He is a Deputy Editor-in-Chief of IET Smart Cities Journal. He is the Chair of IEEE ComSoc Smart Grid Communications Technical Committee (2024-2025). He has been a Judge of the GSMA GLOMO Award at World Mobile Congress – Barcelona since 2019. He was a Distinguished Lecturer of IEEE ComSoc (2020-2021) and a Recipient of the 2024 IET Achievement Medals. He is a Member of Academia Europaea (MAE), a Fellow of IEEE, a Fellow of IET and a Distinguished Member of ACM.

TALK

AI-enabled Self-driving Communication Networks

Modern Artificial Intelligence (AI) has proven to be a powerful enabler that has gained success in many vertical fields. There is a clear evidence of determined effort in the communication and network community to explore the AI power to deliver 6G mobile network's promises of being faster, greener and smarter. This talk starts with a brief introduction of 6G mobile communication systems, and then looks into how new AI technologies come into play in 6G from different perspectives. It covers new trends in 6G communication research such as data-driven end-to-end communication system design, network architecture and semantic communications, digital twin networks (DTN). One major objective of these researches is to achieve self-driving communication networks where lengthy standardization of such as communication waveforms or protocol design can be somehow reduced or even eliminated, thus enabling 6G to self-drive to versatile requirements from vertical industries.

10:00-10:50 December 27 (Saturday), 2025	< Room No. 8, 5F | 五楼 8 号厅 > ZOOM ID: 88375951134 ZOOM Link: https://us02web.zoom.us/j/88375951134

Prof. Tony Quek
Fellow of IEEE

Singapore University of Technology and Design, Singapore

Tony Q.S. Quek received the B.E. and M.E. degrees in Electrical and Electronics Engineering from Tokyo Institute of Technology, respectively. At Massachusetts Institute of Technology, he earned the Ph.D. in Electrical Engineering and Computer Science. Currently, he is the Associate Provost (AI & Digital Innovation) and Cheng Tsang Man Chair Professor with Singapore University of Technology and Design (SUTD). He also serves as the Director of the Future Communications R&D Programme, and the ST Engineering Distinguished Professor. His current research topics include wireless communications and networking, AI-RAN, non-terrestrial networks, open radio access network, and 6G. Dr. Quek received the 2008 Philip Yeo Prize for Outstanding Achievement in Research, the 2012 IEEE William R. Bennett Prize, the 2016 IEEE Signal Processing Society Young Author Best Paper Award, the 2017 CTTC Early Achievement Award, the 2017 IEEE ComSoc AP Outstanding Paper Award, the 2020 IEEE Communications Society Young Author Best Paper Award, the 2020 IEEE Stephen O. Rice Prize, the 2020 Nokia Visiting Professorship, the 2022 IEEE Signal Processing Society Best Paper Award, the 2024 IIT Bombay International Award For Excellence in Research in Engineering and Technology, and the IEEE Communications Society WTC Recognition Award 2024. He is an IEEE Fellow, a WWRF Fellow, and a Fellow of the Academy of Engineering Singapore.

TALK

From Theory to Practice in 6g Ai-Native Network

With 5G cellular technologies being deployed around the world for a few years, the research community has embarked on the pathway to define the sixth generation (6G) wireless system as early as 2018. Based on the timeline, 6G commercial deployment is anticipated to be ready by 2030, following the completion of IMT-2030 specifications. Building on 5G advancements, 6G technology is expected to represent the next transformative step in wireless communication that is needed for future XR and generative AI applications. In this talk, we will share about the outlook of 6G and focus on AI-native network design in 6G. In conclusion, we will also share some of our related work in this area through AI-RAN Alliance and Future Communications R&D Programme.

11:10-12:00 December 27 (Saturday), 2025	< Room No. 8, 5F | 五楼 8 号厅 > ZOOM ID: 88375951134 ZOOM Link: https://us02web.zoom.us/j/88375951134

Prof. Guanghui Liu
Senior Member, IEEE

University of Electronic Science and Technology of China (UESTC), Chengdu, Sichuan, China

Guanghui Liu earned his M.Sc. and Ph.D. degrees both in Electronic Engineering from UESTC, Chengdu, China, in 2002 and 2005, respectively. In 2005, he joined Samsung Electronics, Suwon, South Korea, as a Senior Engineer. He returned to UESTC in 2009, serving as an Associate Professor with the School of Electronic Engineering before being promoted to Full Professor in 2014. Since 2022, he has served as the Dean of Glasgow College Hainan, UESTC. His research interests focus on wireless and mobile communications, signal processing for transceiver design, deep learning and its interdisciplinary applications. He has undertaken over 20 scientific research projects, including key projects of the National Natural Science Foundation of China (NSFC) and provincial key research projects, etc. He has published more than 100 academic papers, including over 30 in IEEE Transactions (e.g., IEEE TWC, TCOM, TSP, TIP, TCSVT, TVT, TMM, etc.) and over 40 in CCF-A international conferences (e.g., ICCV, AAAI, ACM MM) as well as IEEE flagship conferences (e.g., ICC, Globecom, VTC, ISCAS, BMSB, etc.). He has filed more than 60 patents, with over 40 granted Chinese patents and 6 US patents. He has been honored with multiple academic awards, including the Second Prize of Natural Science Award, the Second Prize of Science and Technology Progress Award, both from Chinese Ministry of Education, as well as the Sichuan Provincial Science and Technology Progress Award. His research on faster-than-Nyquist (FTN) transmission was recognized with the "Outstanding Technical Cooperation Achievement" award by Huawei Technologies Co., Ltd. in 2021.

TALK

Physical-Layer Waveform Design for Mobile Communications

Modern mobile communication systems follow a "decade-per-generation" evolution paradigm. While the 1G to 4G prioritized communication capacity enhancement, the fifth-generation (5G) mobile communication system has achieved significant improvements in key performance indicators (KPIs) such as peak data rate, high-speed mobility support, and end-to-end latency. The 5G has opened the door for the Internet of Everything (IoT) by shifting some of its focus from connecting people with enhanced mobile broadband (eMBB) to connecting things with ultra-reliable low-latency communication (URLLC) and massive machine type of communication (mMTC). As the successor to 5G, 6G is supposed to support more vertical application scenarios, which puts forward higher requirements for the physical layer waveform design. The orthogonal frequency division multiplexing (OFDM) waveform adopted in current standards, however, suffers from inherent drawbacks including high peak-to-average power ratio (PAPR), large out-of-band emission (OOBE), and excessive pilot overhead, making it incompetent to support the complex communication scenarios of 6G. Against this backdrop, this talk will focus on the physical-layer waveform design for mobile communications. Specifically, orthogonal time frequency space (OTFS) and affine frequency division multiplexing (AFDM) waveforms are discussed, along with the waveform enhancement schemes, such as faster-than-Nyquist (FTN) transmission as well as index modulation (IM) technology targeting high spectral efficiency requirements. Deep-learning-aided optimization lays a foundation for the end-to-end physical-layer solution based on an all-neural network architecture for next-generation mobile communication systems.

INTRODUCTION OF INVITED SPEAKER (UTC+8)

13:30-13:55 December 27 (Saturday), 2025	< Room No. 8 | 5F > 五楼 8 号厅

Assoc. Prof. Hongliang He

China University of Geosciences, China

Hongliang is an associate professor at China University of Geosciences (Wuhan). He received the B.S. degree from Harbin Engineering University in 2013 and the Ph.D. degree from Xi'an Jiaotong University in 2019. His research focuses on wireless communications, intelligent communication systems, and information security. He has been actively engaged in fundamental and applied research on next-generation communication technologies and secure transmission, with an emphasis on theoretical modeling and system-level design.

Speech Title: Secure Signal Design for Co-located Legitimate and Eavesdropping Nodes

Abstract: Physical-layer security relies on the channel dif-ference between the legitimate channel and the eavesdropper's channel. However, when the eavesdropper and the legitimate receiver have the same location, it almost has the same channel as the legitimate receiver, which brings serious challenges to security. Target at this problem, we consider a two-user multiple access scenario and propose a new feedback-aided jamming scheme in this paper. Under the help of the legitimate receiver, the proposed scheme enables two users to transmit private information via multiple access, and guarantees interference-free at the destination by self-interference cancellation. However, even if the eavesdropper receives identical signals to the legiti-mate destination, its complete elimination of user interference and artificial noise remains elusive. We address the problem of maximizing the secrecy rate through power allocation and determine the optimal factor for achieving the maximum secrecy rate. Finally, the numerical results verify our theoretical analysis.

ONSITE SESSION (UTC+8)

Onsite Session: Intelligent Communication Systems and Signal Processing Methods with Integrated Sensing < Room No. 8, 5F | 五楼 8 号厅 >		
Part A **13:30-15:10**		*Chairperson: Assoc. Prof. Hongliang He, China University of Geosciences, China*
13:30-13:55	Invited Talk	Secure Signal Design for Co-located Legitimate and Eavesdropping Nodes ***Hongliang He,*** *China University of Geosciences, China* *Abstract*— Physical-layer security relies on the channel dif-ference between the legitimate channel and the eavesdropper's channel. However, when the eavesdropper and the legitimate receiver have the same location, it almost has the same channel as the legitimate receiver, which brings serious challenges to security. Target at this problem, we consider a two-user multiple access scenario and propose a new feedback-aided jamming scheme in this paper. Under the help of the legitimate receiver, the proposed scheme enables two users to transmit private information via multiple access, and guarantees interference-free at the destination by self-interference cancellation. However, even if the eavesdropper receives identical signals to the legiti-mate destination, its complete elimination of user interference and artificial noise remains elusive. We address the problem of maximizing the secrecy rate through power allocation and determine the optimal factor for achieving the maximum secrecy rate. Finally, the numerical results verify our theoretical analysis.
13:55-14:10	SP014	An Enhanced *lq* Iterative Reweighted Norm for MIMO Radar DOA Estimation ***Yinghao Li,*** *University of Electronic Science and Technology of China, China* Abstract—Numerous direction-of-arrival (DOA) estimation methods have been developed specifically for use within multiple-input multiple-output (MIMO) radar systems to achieve high-resolution imaging of terrestrial targets. Despite the existence of various techniques such as Capon filters and iterative adaptive approach (IAA) for data-dependent beamformers, their imaging performance is significantly reduced due to the lack of snapshots and high sidelobe levels. To mitigate these issues, this paper introduces an enhanced lq iterative reweighted norm (lq-IRN) approach for DOA estimation in MIMO radar systems. This approach employs a signal recovery technique grounded in the lq norm to estimate target coefficients, thereby providing a more accurate reconstruction of targets in comparison to conventional methods. In the optimization procedure, the update of the weighting coefficient effectively reduces the number of iterations and improves the iteration accuracy. In addition, reducing the value of q brings the lq norm regularization closer to the sparser and faster-converging l0 norm regularization, reducing average iterations and improving estimation efficiency. Representative simulations demonstrate excellent performance of the proposed method under single snapshot and high noise conditions.
14:10-14:25	SP032	Reinforcement Learning empowered Dynamic Task Scheduling in UAV Networks ***Mai Baddour,*** *University of Electronic Science and Technology of China, China* Abstract—Unmanned Aerial Vehicles (UAVs) have been used in a wide range of applications in different industries. Due to the limitation in computing resources, when a UAV encounters computation-intensive tasks, it cannot process them by itself. State-of-the-art solutions usually distribute the tasks across multi-hop routes to edge or cloud nodes, yet consistently neglect the computing resources available at relay UAVs. This paper consid-ers the computing resources in both the cloud and the relay UAVs and jointly optimizes the task offloading route as well as the task allocation among the cloud and the UAVs in this route. A joint optimization model is formulated, and a MAPPO-TOS algorithm is proposed to achieve the optimal task offloading strategy and task completion time. Extensive simulation results demonstrate that our proposed

		MAPPO-TOS algorithm significantly reduces task completion time and enhances overall system efficiency compared to traditional offloading strategies, even in dynamic environments with limited and fluctuating resources.
14:25-14:40	SP019	Adaptive Task Offloading f or S pace Missions: A State-Graph-Based Approach ***Jiaqi Cao,*** *Hangzhou Zhiyuan Research Institute Co., Ltd, China* *Abstract*—Advances in space exploration have led to an ex-plosion of tasks. Conventionally, these tasks are offloaded to ground servers for enhanced computing capability, or to adjacent low-earth-orbit satellites for reduced transmission delay. How-ever, the overall delay is determined by both computation and transmission costs. The existing offloading schemes, while being highly-optimized for either costs, can be abysmal for the overall performance. The computation-transmission cost dilemma is yet to be solved. In this paper, we propose an adaptive offloading scheme to reduce the overall delay. The core idea is to jointly model and optimize the transmission-computation process over the entire network. Specifically, to represent the computation state migra-tions, we generalize graph nodes with multiple states. In this way, the joint optimization problem is transformed into a shortest path problem over the state graph. We further provide an extended Dijkstra's algorithm for efficient path finding. Simulation results show that the proposed scheme outperforms the ground and one-hop offloading schemes by up to 37.56% and 39.35% respectively on SpaceCube v2.0.
14:40-14:55	SP024	Accuracy–Efficiency Trade-offs in Lightweight Deepfake Detection Models: CNN and Transformer Benchmarks on Raspberry Pi 5 ***Nhi Phan Quynh Le,*** *FPT University, Viet Nam* *Abstract*—Deepfake media pose increasing threats to security, privacy, and trust in online communication. While state-of-the-art detection methods achieve strong performance on servers, their high computational demands limit deployment on resource-constrained devices where real-time filtering is most needed. In this work, we systematically benchmark eight lightweight con-volutional and transformer-based architectures—MobileNetV2, MobileNetV3, ShuffleNetV2, Xception, ViT-Tiny, DeiT-Tiny, and LeViT-256—for deepfake detection under a unified training and evaluation pipeline. Experiments are conducted on the FaceForensics++ dataset with additional preprocessing (face lo-calization, gradient-based variants, and compression-aware aug-mentation) to enhance robustness. Models are fine-tuned on GPUs and exported to ONNX for evaluation on a Raspberry Pi 5 using ONNX Runtime. We report both forensic metrics (accuracy, precision, recall, F1) and deployment-centric indicators (latency and model size). Results show a clear trade-off: CNNs such as ShuffleNetV2 achieve the lowest latency and smallest memory cost, while ViT-Tiny delivers the highest accuracy (83.8%) at moderate runtime overhead. These findings provide practical insights into balancing accuracy and efficiency for real-world, on-device deepfake detection.
14:55-15:10	SP025	A Heterogeneous Ensemble Framework Combining Gradient Boosting and SVM for Robust Parkinson's Disease Diagnosis ***Nguyen Dang Thao Phuong,*** *FPT University, Viet Nam* Abstract—Parkinson's disease (PD) is a rapidly growing neurodegenerative disorder where early diagnosis remains a significant clinical challenge. While vocal biomarkers offer a promising non-invasive avenue for detection, machine learning applications in this domain frequently suffer from overfitting due to data scarcity and the indiscriminate aggregation of classifiers in ensemble methods. This study proposes a robust "Diversity-Driven Selective Voting" framework to enhance di-agnostic accuracy on limited biomedical data. We conducted a rigorous comparative analysis of seven state-of-the-art al-gorithms, including Support Vector Machine (SVM), Logistic Regression, and advanced Gradient Boosting variants (XGBoost, LightGBM, CatBoost), optimizing each via GridSearchCV within a Stratified 10-Fold Cross-Validation pipeline. Empirical re-sults demonstrated that while modern gradient boosting models (LightGBM and CatBoost) achieved a high baseline accuracy of 94.82%, traditional

		stacking architectures failed to improve performance (92.24%) due to predictive redundancy and meta-learner overfitting. By strategically selecting a heterogeneous subset of the top-4 performers—combining the hierarchical decision capability of Gradient Boosting (LightGBM, CatBoost, XGBoost) with the margin-maximization of SVM—our proposed ensemble effectively mitigated individual biases. This diversity-aware approach broke the performance plateau, achieving a su-perior classification accuracy of 95.34%. These findings validate that in small-scale medical diagnostics, the strategic selection of algorithmically diverse models is more critical than simply increasing the ensemble size.
Part B 15:40-17:10		Chairperson:
15:40-15:55	SP010	Evaluating the Usability of ChatGPT Among University Students in Saudi Arabia: A Comparative Analysis Using SUS and CSUQ ***Obead Alhadreti,*** *Umm Al-Qura University* *Abstract*—This study investigates the perceived usability of the ChatGPT system from the perspectives of university students in the Kingdom of Saudi Arabia. To evaluate usability, two standardized instruments were employed: the System Usability Scale (SUS) and the Computer System Usability Questionnaire (CSUQ). The research also examined the relationship between these two measures and explored the influence of demographic attributes and frequency of use on participants' usability ratings. The findings indicate that ChatGPT demonstrates a good level of usability and is generally well received by students, suggesting that the system operates effectively, efficiently, and is easy to understand. A strong positive correlation was observed between SUS and CSUQ scores, indicating that both instruments largely assess the same underlying construct of perceived usability. Moreover, a significant effect of ChatGPT usage frequency was found on both SUS and CSUQ outcomes, underscoring the role of user familiarity in shaping usability perceptions. Overall, these findings provide valuable insights into ChatGPT's usability within Arabic-speaking educational contexts and highlight the importance of using multiple evaluation instruments to capture the multidimensional nature of user experience comprehensively.
15:55-16:10	SP020	Design of a Miniaturized 30MHz-6GHz Wideband RF Transceiver System for Counter-Unmanned Aerial Vehicle ***Haiya Pi,*** *Hangzhou Zhiyuan Research Institute CO., Ltd, China* *Abstract*—"Low, Slow, and Small" (LSS) drones have been widespread application in military reconnaissance and civilian fields due to their low cost and high maneuverability. Simultaneously, they pose a new threat to the security of critical infrastructure. Counter-drone measures primarily include RF detection, radar, electro-optical tracking, and jamming/interception. Among these, RF detection has become a key technology due to its ability to identify drone communication signals. However, traditional superheterodyne-based RF detection systems have inherent drawbacks in size and power efficiency. This paper presents a miniaturized RF transceiver system that employs a Zero-IF (Zero Intermediate Frequency) scheme to replace the conventional superheterodyne one. The system utilizes a co-processing platform with two FPGAs and a CPU, enabling eight-channel signal processing across 30 MHz to 6 GHz frequency range with 200 MHz of instantaneous bandwidth. Through a compact layout and optimized integration between the RF and baseband boards, this design achieves a significant reduction in physical size while maintaining system performance. This system is suitable for portable, vehicle-mounted, and ship-borne counter-drone applications.
16:10-16:25	SP021	Deep Learning-Based Codebook Optimization Approach for Data over Voice Systems ***Junyu Xie****, Beijing Institute of Technology, China* Abstract—In this work, we investigate the codebook opti-mization problem in data over voice systems. To address the challenge of capturing the signal processing characteristics within the voice channels, we propose a deep learning-based codebook

		optimization approach. Specifically, we first define the essential characteristics of the ideal transmission codebook under voice channel conditions. Then, we design a codebook generation neural network (CGNN) with the multi-loss joint optimization strategy, where each individual loss corresponds to a specific characteristic in the ideal codebook. Furthermore, due to the lack of semantic structure in the codebook generated by CGNN, we introduce a codeword classification neural network and develop an end-to-end offline training framework to improve the training efficiency. Simulation results demonstrate that our approach achieves lower bit error ratios compare to the short harmonic codebook under AMR-WB and EVS vocoders. Moreover, our approach exhibits reliable transmission performance under real voice channel conditions.
16:25-16:40	SP016	*Semantic Segmentation of High-Resolution Remote Sensing Imagery Using U-Net with EfficientNet-B7: A Custom Dataset Benchmark* ***Le Ngoc Anh Thu,*** *FPT University, Viet Nam* *Abstract*—Semantic segmentation of high-resolution satellite imagery is essential for applications in urban planning, en-vironmental monitoring, and infrastructure management. Yet, the inherent multi-scale variability and fine-grained structures of remote sensing data present significant challenges for deep learning models. This study introduces a comprehensive dataset by integrating the DeepGlobe Land Cover and Dubai Aerial Imagery datasets, forming twelve semantic classes that encompass both global land cover and urban categories. Using this dataset, we benchmark fifteen state-of-the-art backbones within the U-Net framework, spanning lightweight networks (MobileNetV2, EfficientNet-B0), classical models (VGG16/19), residual architectures, and the compound-scaled EfficientNet family. Results reveal that lightweight encoders offer efficiency but limited feature capacity, while deeper residual and compound-scaled models yield consistent accuracy gains. Notably, EfficientNet-B7 achieves the best performance with a mean Intersection-over-Union of 68.8% and accuracy of 79.4%, demonstrating superior recovery of both fine boundaries and large homogeneous regions. This work establishes a reproducible benchmark and provides practical insights for backbone selection in U-Net-based satellite image segmentation.
16:40-16:55	SP1002	AttnFocusUNet: A Lightweight Siamese Network with Coordinate Attention Fusion and Hybrid Loss for Efficient Building Change Detection ***Wafaa I. M. Hussin,*** *University of Electronic Science and Technology of China (UESTC), China* Abstract—The current trend in Building Change Detection (BCD) favors heavy Transformer-based models like Change-Former to push accuracy limits. However, we argue that this ”complexity-for-accuracy” trade-off creates unnecessary computational barriers for real-world deployment. To prove that efficiency doesn’t have to sacrifice performance, we introduce AttnFocusUNet, a streamlined Siamese CNN. We replaced the usual method of simply concatenating features with a lightweight Coordinate Attention (CoordAtt) module. This mechanism allows the decoder to selectively prioritize important spatial information and filter out noise without the massive overhead of Transformer blocks. We also optimized the training process by using a Hybrid Loss (combining Focal and Dice Loss) to tackle class imbalance and sharpen the segmentation results. Our experiments on the LEVIR-CD and WHU-CD datasets validate this strategy; Attn-FocusUNet delivers accuracy comparable to heavy Transformer models but is far more efficient. This demonstrates that intelligent architecture is often more effective than raw complexity.
16:55-17:10	SP041	Preserving Spatial Structural Information in Deep Convolutional Neural Networks: A Novel Integration of Coordinate Attention with ResNet101 for Fine-Grained Facial Emotion Recognition ***Le Ngoc Anh Thu****, FPT University, Viet Nam* Abstract—Facial Emotion Recognition (FER) in unconstrained environments remains a significant challenge due to the subtle morphological variations of facial expressions and the presence of background clutter. Standard Convolutional Neural Networks

		(CNNs), while effective at feature extraction, often struggle to capture fine-grained spatial dependencies required to distinguish between structurally similar emotions. To address this limita-tion, this paper proposes a novel deep learning architecture that integrates the Coordinate Attention (CA) mechanism into a ResNet101 backbone. Unlike traditional channel attention methods that discard positional information, the CA module decomposes channel attention into two parallel 1D feature en-coding processes, enabling the network to capture long-range dependencies while preserving precise spatial coordinates. We rigorously evaluate the proposed method on the heterogeneous Human Face Emotions dataset, collected from diverse open-source platforms. Comparative experiments against state-of-the-art baselines, including MobileNet, Inception, and standard ResNet variants, demonstrate the superiority of our approach. The proposed ResNet101 + CA model achieves an F1-score of 0.80, marking a significant improvement over the baseline and validating the critical role of coordinate-aware feature recalibration in robust emotion classification.

ONLINE SESSION (UTC+8)

December 27 (Saturday) 13:30-15:30	<ZOOM ID: 88375951134> <https://us02web.zoom.us/j/88375951134>

Online Session 1: Digital Communication and Wireless Transmission Technologies
Chairperson:

13:30-13:45	SP039	Low-Latency Initial Access Using Hierarchical Beam Sweeping in LEO Satellite Communication Systems ***Song Li,*** *Nanjing Research Institute of Electronics Engineering, China* *Abstract*—Low Earth orbit (LEO) satellite communication has emerged as a key enabler for future sixth-generation (6G) wireless networks due to its capability of providing seamless connectivity, high capacity, and wide-area coverage. However, due to long propagation distances, rapid satellite movement, a large number of narrow beams, and highly dynamic channel conditions, it is challenging to establish a reliable satellite-to-ground link, particularly during the initial access stage. These problems make conventional exhaustive beam search costly in both time and computation. Furthermore, the limited processing capability of LEO satellites restricts the feasibility of computation-intensive beam management methods. To address these challenges, we propose a hierarchical beam sweeping procedure that leverages the spatial correlation among beams in the satellite codebook. The proposed initial access framework significantly mitigates the beam measurement expiration problem and reduces access latency. Simulation results show that our method achieves comparable beam alignment accuracy while reducing the beam search time by 25% compared with the exhaustive search. The proposed approach provides a practical and efficient solution for fast link establishment in LEO satellite communication systems.
13:45-14:00	SP040	A Low-Power Link Measurement Method for LEO Satellite Communications ***Yalun Mei,*** *CETC LES Information System Co., Ltd, China* *Abstract*—Low Earth Orbit (LEO) satellite communication which can provide global wireless service has emerged as a key technology for next-generation communication systems. Compared to conventional terrestrial networks, LEO satellites are characterized by high mobility, short overpass duration, and highly dynamic channel condition. These characteristics result in frequent link quality variations, which in turn require ground terminals to perform frequent link measurements to ensure reliable satellite–ground connectivity. However, existing energy-saving schemes are primarily designed for stationary or low-mobility scenarios, leading to incompatibility with dynamic satellite-terrestrial environment. To address this challenge, this paper proposes a low-power link measurement algorithm that introduces multiple feature metrics to achieve energy-efficient link measurement from the perspectives of frequency-point selection and periodic relaxation. Experimental results show that the proposed algorithm significantly reduces the measurement frequency compared with

		full-frequency and fixed-period schemes, while maintaining communication performance.
14:00-14:15	SP017	Design of a DenseBlock-based Autoencoder System for Aerial Cooperative Relay Communications ***Xiaoling Han,*** *Dalian Maritime University, China* Abstract—The rapid expansion of the aviation services has intensified the demand for highly reliable, long-range aerial communications. However, the inherently complex and dynamic aerial wireless channel poses severe challenges to communication reliability. To address these challenges, this paper proposes a DenseBlock-based autoencoder system for aerial cooperative relay communications, named Relay-AE. Specifically, an aerial cooperative relay communication framework is constructed, which consists of an encoder, a relay, and a decoder. The Relay-AE leverages DenseBlock's cross-layer connectivity and feature reuse mechanisms to effectively extract hierarchical signal features. Furthermore, a long short-term memory (LSTM) layer is incorporated to capture temporal dependencies in transmission signals, thereby solving long-term dependency issues. Simulation results demonstrate that the Relay-AE consistently outperforms the benchmark, achieving a lower block error rate (BLER) and higher communication reliability through its cooperative relay framework. Additionally, the cooperative relay framework not only extends the communication range but also boosts the robustness of the system.
14:15-14:30	SP015	Exploiting Multipath for Localization with a Single Access Point in Tunnel Environments ***Ze Li,*** *School of Communications and Information Engineering, Chongqing University of Posts and Telecommunications, China* Abstract—As the demand for traffic safety and efficiency grows, accurate localization in pedestrian tunnels has become increasingly important, particularly for swift emergency re-sponse. Traditional tunnel localization methods typically depend on multiple access points of commercial networks and high-bandwidth signals, such as ultra-wideband, to mitigate the effects of severe multipath propagation. However, this study introduces a novel perspective, suggesting that the structural characteristics of tunnels can actually make them ideal environments for multipath-assisted localization. Based on this insight, this paper proposes a multipath-assisted localization system for tunnel environments, built upon a single input multiple output-based network. Then leveraged the unique structure of the tunnel to enhance localiza-tion accuracy. Finally, we conducted a comprehensive evaluation of the system using ray tracing software to validate its effective-ness.
14:30-14:45	SP013	Federated Contrastive Learning for Platform-Agnostic Malware Detection in Heterogeneous IoT Networks ***Caihong Wang,*** *University of Electronic Science and Technology of China, China* *Abstract*—The rapid proliferation of heterogeneous IoT de-vices, featuring diverse

		operating systems and hardware, has significantly expanded the attack surface of modern networks. This diversity undermines traditional malware detection that relies on platform-specific features. To address this, we present a federated contrastive learning method for cross-platform mal-ware detection in heterogeneous IoT settings. Our approach lets distributed devices collaboratively learn platform-agnostic malware representations. It also preserves data privacy and reduces computational overhead. We introduce adaptive temper-ature control to dynamically balance heterogeneous feature con-tributions, thereby improving model generalization and detection accuracy. Experiments on real-world IoT malware datasets show our method consistently outperforms baselines in cross-platform detection accuracy and robustness.
14:45-15:00	SP023	High-Accuracy Indoor Ranging Using Carrier Phase in Multipath Environments ***Ze Li,*** *School of Communications and Information Engineering, Chongqing University of Posts and Telecommunications, China* Abstract—In the context of Internet of Things (IoT) applica-tions, the wireless signal range plays a crucial role. An increasing number of technologies utilize multipath information to enable localization, tracking, and intrusion detection. However, current ranging techniques based on signal strength do not provide sufficient accuracy, while Time-of-Flight (ToF) estimation using super-resolution algorithms is limited by bandwidth, we require centimeter-level ranging accuracy. To estimate the distance of the Line-of-Sight (LoS) path, we introduce a carrier phase-based ranging method. However, the measured phase contains phase offset, and in indoor environments, there is multipath interference. In this paper, we use round-trip signals to eliminate phase offset. However, this method introduces additional spurious multipath, resulting in more multipath interference that affects the ranging accuracy. To mitigate spurious multipath interfer-ence, we use an algorithm for recovering the forward or reverse channels and estimating the actual multipath. We validate the effectiveness of our proposed algorithm through experimental evaluations.
15:00-15:15	SP036	Distributed Multimodal UAV Sensing and State Prediction in ISAC Networks ***Wenfeng Wu,*** *Nanjing University, China* *Abstract*—In low-altitude urban environments, unmanned aerial vehicles (UAVs) demand reliable localization and motion tracking to sustain stable communication links. Conventional base-station–centric sensing, however, is susceptible to blockage and environmental clutter, leading to degraded localization ac-curacy and reduced link reliability. To overcome these limita-tions, we introduce a distributed-camera, multimodal integrated sensing and communication (ISAC) framework that enables omnidirectional UAV perception. Leveraging time-synchronized camera arrays, the proposed architecture provides full-viewpoint UAV localization and effectively eliminates sensing blind zones. The camera-driven perception module further enhances UAV motion prediction, thereby facilitating proactive beamforming and

		improving end-to-end communication performance. A mul-timodal state estimation and prediction model is developed to ensure robust UAV tracking under complex urban conditions. To validate the framework, we construct a realistic simulation environment on the Genesis robotics platform, generating diverse, temporally aligned multimodal datasets for training and per-formance assessment. Experimental results demonstrate that the proposed approach substantially improves sensing robustness and achievable communication rate relative to conventional single-viewpoint sensing schemes.
15:15-15:30	SP031	YOLOv7-Based Monocular Indoor Planar Localization for Intelligent Mobile Robots ***Lei Feng,*** *Chang'an University, China* *Abstract*—Accurate and low-cost indoor localization is essential for intelligent mobile robots in industrial automation and service applications. This paper presents a monocular vision–based planar localization method using the YOLOv7 object detection framework. The robot's pixel coordinates are extracted from real-time images and mapped to the global plane through camera calibration and a perspective transformation model. Experiments conducted in a 5 m × 3 m indoor environment show that the proposed method achieves localization errors below 2 cm on the X-axis and 3 cm on the Y-axis. Comparative experiments with a traditional color-segmentation–based detection method demon-strate that YOLOv7 delivers higher accuracy and smoother trajectories. These results highlight the effectiveness of YOLOv7 for reliable indoor planar localization using only a single camera.

ONLINE SESSION (UTC+8)

December 27 (Saturday) 15:45-17:30	<ZOOM ID: 88375951134> <https://us02web.zoom.us/j/88375951134>

Online Session 2: Sensor-based Image Analysis and Digital Signal Processing
Chairperson:

15:45-16:00	SP042	Generalizing Gaussian Noise Removal Methods to Realistic Image Denoising ***Yuanmin Wang,*** *University of Electronic Science and Technology of China, China* *Abstract*—Many denoising methods model noise as additive white Gaussian noise, however the sources of noise in realistic scenario are diverse and complex, which cause Gaussian noise removal methods generate severe artifacts when handling realistic noise image. To generalize those methods to realistic noise removal task, we utilize the spatial correlation feature of noise and propose a generalization method. The proposed method adopt hard thresholding on each frequency in local image patch based on the Guided Filtering result of initial denoising image. Numerical experiments show that the artifacts of the generalized results are well removed and the PSNR are greatly improved.
16:00-16:15	SP038	Contactless Atrial Fibrillation Detection via 1D Time-Frequency Information Integration Network using mmWave Radar ***Yuntian Yan,*** *University of Science and Technology of China, China* *Abstract*—Continuous and non-contact monitoring of atrial fibrillation (AF) is essential for early stroke prevention. Existing radar-based approaches often suffer from low signal-to-noise ratios and insufficient feature representations for subtle arrhyth-mias. We propose a 1D Time-Frequency Information Integration Network (1D-TFINet), which fuses temporal radar data with global frequency context, inspired by cardiac electromechanical coupling. A spatial-to-channel embedding encodes 4D radar voxel data into 1D sequences, preserving micro-motion features. We further adapt the Invertible Neural Operator (INO) for lossless timefrequency interaction and introduce an auxiliary ECG recon-struction task to enhance feature discrimination. Experiments on a collected mmWave radar dataset show that our method achieves an F1-score of 0.8337, outperforming single-domain baselines.
16:15-16:30	SP1001	Analysis of Methods for Underwater Electromagnetic Field Sensing against Low-Frequency Marine Environmental Interference ***Runnan Hui,*** *Dalian Institute of Measurement and Control Technology, China* *Abstract*—Sea surface waves, swells, and currents are among the ubiquitous marine hydrodynamic phenomena. These hydrodynamic activities interact with the geomagnetic field to generate low-frequency induced electromagnetic fields, with energy primarily concentrated in the frequency band below 0.2 Hz, and the amplitude closely related to sea conditions. This paper employs array signal processing and

		reference filtering methods to suppress electromagnetic fields in marine environments, and conducts experimental verification in typical sea areas.
16:30-16:45	SP022	Multi-Scale Feature Fusion SNN with Temporal Self Attention for UAV RF Signal Classification ***Yunling Yang,*** *National University of Defense Technology, China* Abstract—Addressing the energy efficiency and discriminabil-ity challenges in low-altitude UAV RF signal recognition, this work proposes a fusion architecture based on Spiking Neural Net-work. Building on the SpikingResformer framework, we design a Multi-Scale Convolution Block and Temporal Dual Spiking Self-Attention to simultaneously enhance dual-band time-frequency feature extraction and temporal long-range dependency model-ing. Evaluations of the DroneRFa dataset demonstrate that the proposed scheme achieves a classification accuracy of 99.16%. Its single-inference energy consumption is 1.365 mJ, representing a significant reduction compared to that of Artificial Neural Net-works. Overall, the method achieves a favorable energy efficiency-performance trade-off while maintaining high accuracy, making it suitable for resource-constrained edge monitoring scenarios.
16:45-17:00	SP006	Information Supplementary Distillation based on Separate Reconstruction for Continual Self-Supervised Learning ***Haoyang Cheng,*** *The 29th Research Institute of China Electronics Technology Group Corporation, China* *Abstract*—Continual self-supervised learning (CSSL) is a cru-cial task in computer vision, which aims at performing self-supervised learning in a stable and continual manner over time. Existing methods primarily focus on contrastive learning based CSSL framework, ignoring compatibility with masked autoencoders (MAE), which limits their effective extension to MAE based CSSL framework. In this paper, we propose a novel method for MAE based CSSL framework called separate reconstruction (SR). SR fuses the rehearsal images and current images as input, and performs separate reconstruction during the masked reconstruction to maximize the separation of previous and current information. Based on this, we further propose infor-mation supplementary distillation based on separate reconstruc-tion (ISDSR) to mitigate the problem of information disclosure in existing methods. ISDSR constrains the consistency between the masked features of current model and the whole features of previous model in current image reconstruction, inheriting previous information to alleviate catastrophic forgetting while also assisting in the reconstruction of current images to learn new knowledge. Meanwhile, ISDSR constrains all features of current model to be consistent with all features of previous model in rehearsal image reconstruction, maximizing the prevention of information disclosure from previous model. The experimental results demonstrate that the proposed method can effectively alleviate catastrophic forgetting in MAE based CSSL framework and achieve stable performance improvement on various CSSL benchmarks.

17:00-17:15	SP018	An AI-Driven Dialogue System for Ideological and Moral Education in Higher Education ***Yu Guo***, *Guangzhou Songtian Polytechnic College, China* *Abstract*—The development of students' ideological and moral competencies has become a central objective in contemporary higher education. However, many existing AI-powered dialogue systems remain limited to short-term, context-dependent responses and lack the ability to account for learners' evolving ideological understanding across extended interactions. To address this limitation, this study presents an enhanced version of IdeaL-Talk, a dialogue system built upon the BART architecture that integrates both pre-encoded ideological and moral educational resources and a learner-centered long-term modeling mechanism. Unlike conventional dialogue frameworks that treat interactions as isolated exchanges, the proposed system maintains and continuously updates a learner profile to capture individual value orientations, comprehension levels, and developmental trajectories over multiple dialogue turns. By combining dynamic learner modeling with domain-specific educational knowledge, the system generates responses that are not only contextually coherent but also adaptive to learners' long-term ideological and moral development. Experimental results demonstrate that the proposed approach outperforms traditional dialogue models in terms of contextual consistency, pedagogical relevance, personalization effectiveness, and sustained educational impact. These findings suggest that incorporating long-term learner modeling into AI-driven dialogue systems offers a promising direction for supporting ideological and moral education in higher education settings.
17:15-17:30	SP048	Analyzing and Comparing the Cryptographic Algorithms of AES and ECC ***Stephanos Mavromoustakos,*** *Indiana Institute of Technology, United States* *Abstract*—This paper analyzes and compares two of the most widely used cryptographic algorithms in cybersecurity, namely Advanced Encryption Standard (AES) and Elliptic Curve Cryptography (ECC). Exploring the algorithmic structure of these algorithms will help understand the capabilities and vulnerabilities each encryption scheme has and how they are exploitable.

Delegate List

Yan Yingyue, *University of Science and Technology of China, China*

ZHAO ZHICHUN, *Shenzhen MSU-BIT University, China*

NOTE