2025 第八届 IEEE 国际无人系统大会
特邀专题简介表

特邀专题名称
AI 驱动的空地一体无人系统通信网络

| 组织者 |
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| 2. 熊　涛，副教授，国防科技大学 |
| 3. 卢晓珍，副教授，南京航空航天大学 |
| 4. 胡国杰，副教授，火箭军工程大学 |
| 5. 冯智斌，讲师，陆军工程大学 |
| 6. 陈润丰，讲师，陆军工程大学 |

个人简介

汪西明，国防科技大学校聘副教授，研究方向为智能抗干扰通信、无人系统通信、无线网络资源优化等。在 IEEE CM/WCM/WCL 等通信领域国际权威期刊和多个国际知名学术会议发表论文 20 余篇，是多个期刊和学术会议的审稿人，授权国家发明专利 4 项。主持国家自然科学基金青年科学基金、国家自然科学基金地区科学基金子课题、基础加强计划基金子课题等项目 3 项。

熊涛，国防科技大学副教授，学校优秀教师，研究方向为智能无线通信、盲信号处理、电磁频谱监测等。在 IEEE AWPL/WCL 等通信领域国际期刊和多个国际学术会议发表论文 10 余篇。主持军队级科研项目 3 项，授权发明软著专利 7 项，获军队级科技进步三等奖 1 项。
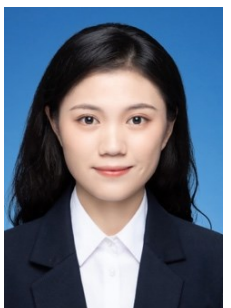
卢晓珍，南京航空航天大学副教授，研究方向为无线安全通信、无人机安全通信、强化学习、分布式学习等。在 IEEE TIFS/TMC/TDSC 等国际期刊和国际学术会议发表论文 40 余篇。主持国家自然科学基金青年项目、江苏省自然科学青年基金项目及国家自然科学基金联合基金重点项目课题。

胡国杰，火箭军工程大学副教授，研究方向为无线物理层安全、智能反射面／可移动天线增强的无线通信等。在 IEEE TCOM/TMC/TVT/WCL/CL/SPL 等通信领域国际权威期刊和多个国际知名学术会议发表论文 20 余篇，是多个期刊和学术会议的审稿人，授权国家发明专利 2 项。主持国家自然科学基金青年科学基金一项、参与国家自然科学基金面上项目等三项。

冯智斌，陆军工程大学讲师，研究方向为无线通信对抗、认知频谱决策理论等。在 IEEE TCOM/TVT/WCL/通信学报等通信领域国内外权威期刊和国际知名学术会议发表论文 30 余篇，是多个期刊和学术会议的审稿人，授权国家发明专利 3 项。主持国家自然科学基金青年科学基金、陆军工程大学青年自主创新基金各 1 项，参与国家和省部级重大科研项目多项，获中国指挥与控制学会科学技术一等奖。

陈润丰，陆军工程大学讲师，研究方向为无人集群通信、博弈学习、多智能体决策理论等。在 IEEE TVT/IoT 等通信领域国际期刊和多个国际学术会议发表论文 20 余篇，是多个期刊和学术会议的审稿人，授权国家发明专利 3 项，获中国指挥与控制学会科技进步一等奖、创客行动一等奖各 1 项。

特邀专题简介

随着人工智能与通信技术的深度融合，空地一体无人系统通信网络在支撑未来智能交通、应急救援、智慧城市等领域的发展扮演着重要角色。该网络通过整合无人机、无人车、卫星、地面基站等多维度通信节点，构建全域覆盖、动态协同的立体通信架构，为有人、无人系统提供无缝连接与实时决策能力。然而，传统通信理论与技术在应对空地网络的高动态性、网络易受无线攻击及异构资源约束时面临显著局限。AI 技术凭借其强大的模式识别、优化决策与自主学习能力，为解决空地一体无人系统通信网络中的频谱环境认知、任务规划、动态拓扑调整、分布式协同决策、传输方案优化等复杂性问题提供了创新路径。

本特邀专题围绕"AI 驱动的空地一体无人系统通信网络"主题征求原创稿

件，并借此机会为研究人员交流新思想和新方法、探讨相关问题和挑战提供平台。

- 机器学习在空地一体无人系统通信网络中的应用
- 强化学习在空地一体无人系统通信网络中的应用
- 深度学习在空地一体无人系统通信网络中的应用
- 联邦学习在空地一体无人系统通信网络中的应用
- 生成式 AI 在空地一体无人系统通信网络中的应用
- 任务驱动的空地一体无人系统通信网络分布式协同
- 分布式天线相干增强在空地一体无人系统通信网络中的应用
- 可移动天线技术在空地一体无人系统通信网络中的应用
- 空地一体无人系统通信网络组网技术
- 空地一体无人系统通信网络抗干扰技术
- 空地一体无人系统通信网络物理层安全技术

IEEE ICUS 2025
Invited Session Summary

Title of Session
AI-driven Air-ground Integrated Unmanned System Communication Network

Organizers
1. Assoc. Prof. Ximing Wang
National University of Defense Technology, China
2. Assoc. Prof. Tao Xiong
National University of Defense Technology, China
3. Assoc. Prof. Xiaozhen Lu
Nanjing University of Aeronautics and Astronautics, China
4. Assoc. Prof. Guojie Hu
Rocket Force University of Engineering, China
5. Dr. Zhibin Feng
Army Engineering University, China
6. Dr. Runfeng Chen
Army Engineering University, China

Biosketches of Organizers

Ximing Wang is an Associate Professor in National University of Defense Technology, his research interests include intelligent anti-jamming communication, unmanned system communication network, wireless network resource optimization, etc. He has published more than 20 papers in IEEE CM/WCM/WCL and other international journals and conferences. He is the reviewer of many journals and academic conferences, and has authorized 4 national invention patents. He has hosted 3 national and military projects.

Tao Xiong is currently an Associate Professor in National University of Defense Technology. His research interests include intelligent wireless communications, blind signal processing, electromagnetic spectrum monitoring, etc. He has published more than 10 papers in IEEE AWPL/WCL and other international journals and conferences. He has hosted 3 military

projects, authorized 7 invention patents and software copyrights, and won the third prize of Military Science and Technology Progress Award.

Xiaozhen Lu is currently an Associate Professor at Nanjing University of Aeronautics and Astronautics. Her research interests include secure wireless communication, secure communication for unmanned aerial vehicles, reinforcement learning, and distributed learning. She has published over 40 papers, such as IEEE TIFS/TMC/TDSC, and has hosted several projects.

Guojie Hu is currently an Associate Professor with Rocket Force University of Engineering. His research interests include wireless physical-layer security, intelligent reflecting surface/movable antenna enhanced wireless communications, etc. He has published more than 20 papers in IEEE TCOM/TMC/TVT/WCL/CL/SPL and other international journals and conferences. He is the reviewer of many journals and academic conferences, and has authorized 2 national invention patents. He has hosted one Youth Science Fund project of National Natural Science Foundation and participated in other three projects including the general project of National Natural Science Foundation.

Zhibin Feng is a lecturer in Army Engineering University, his research interests include wireless communication, countermeasure, cognitive spectrum decision-making theory, etc. He has published more than 30 papers in IEEE TCOM/TVT/WCL/ Journal on Communications and other international journals and conferences. He is the reviewer of many journals and academic conferences, and has authorized 3 national invention patents. He has hosted 2 national/university-level projects and won the first prize of science and technology of CICC.

Runfeng Chen is a lecturer in Army Engineering University, his research interests include unmanned swarm communication, game-theoretical learning, and multi-agent decision theory, etc. He has published more than 20 papers in IEEE TVT/IoT and other international journals and conferences. He is the reviewer of many journals and academic conferences, and has authorized

3 national invention patents. He was awarded the First Prize for Scientific and Technological Progress of the Chinese Institute of Command and Control, and First Prize of the Maker Initiative.

Details of Session

With the deep integration of artificial intelligence and communication technologies, air-ground integrated unmanned system communication networks are playing a pivotal role in supporting the development of future intelligent transportation, emergency rescue, smart cities, and other fields. By integrating multi-dimensional communication nodes such as unmanned aerial vehicles (UAVs), autonomous vehicles, satellites, and ground base stations, this network constructs a three-dimensional communication architecture with full-domain coverage and dynamic collaboration, providing seamless connectivity and real-time decision-making capabilities for both manned and unmanned systems. However, traditional communication theories and technologies face significant limitations in addressing the high dynamics of air-ground networks, vulnerability to wireless attacks, and constraints on heterogeneous resources. AI technologies, with their powerful pattern recognition, optimization decision-making, and autonomous learning capabilities, offer innovative pathways to solve complex challenges in air-ground integrated unmanned system communication networks, including spectrum environment cognition, task planning, dynamic topology adjustment, distributed collaborative decision-making, and transmission scheme optimization.

The invited session calls for original papers relevant to the following selected topics of "AI-Driven Air-Ground Integrated Unmanned System Communication Networks", aiming to provide a platform for researchers to exchange new ideas, explore innovative methods, and discuss emerging issues and challenges in this field.

- Machine learning for air-ground integrated unmanned system communication network
- Reinforcement learning for air-ground integrated unmanned system communication network
- Deep learning for air-ground integrated unmanned system communication network
- Federated learning for air-ground integrated unmanned system communication network

- Generative AI for air-ground integrated unmanned system communication network
- Task-driven distributed collaboration in air-ground integrated unmanned system communication network
- Distributed antenna coherence enhancement technologies for air-ground integrated unmanned system communication network
- Movable antenna technologies for air-ground integrated unmanned system communication network
- Networking technologies for air-ground integrated unmanned system communication network
- Anti-jamming technologies for air-ground integrated unmanned system communication network
- Physical layer security technologies for air-ground integrated unmanned system communication network