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

智能协作无人系统

组织者

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2. 高洪波，教授，中国科学技术大学

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个人简介

刘擎超，江苏大学副教授，博导。兼任美国 TRB 人工智能分委会委员、中国汽车工程学会会员、中国智能交通协会会员。获东南大学博士学位，新加坡南洋理工大学高级访问学者。围绕智能汽车决策规划、队列控制展开研究。

高洪波，中国科学技术大学教授，博导。致力于人工智能、机器人与无人驾驶关键技术研发与产业化工作。现为中国指挥与控制学会理事与青年工作委员会副主任委员，安徽省机器人学会监事长与青年工作委员会主任委员，安徽省院士专家联谊会与安徽省科学家企业家协会常务理事等。

汪奘，香港理工大学副研究员，长期致力于智能网联车辆系统动力学、车辆主动安全控制、数据驱动的交通行为预测等研究。相关成果在 IEEE TITS，TIV，TIE 等国际高水平期刊和会议上发表论文 30 余篇，入选 ESI 高被引论文 2 篇，曾获中国生产力促进中心协会创新发展一等奖，江苏省优秀博士论文，中国机械工程优秀论文等荣誉。担任中国自动化学会智能车工作委员会委员，受邀担任 Chinese Journal of Mechanical Engineering，Journal of Computer Science and Electrical Engineering 等期刊青年编委，Drones 客座编辑。

郑元，东南大学助理教授，硕士生导师。主要研究方向为智能网联/自动驾驶车辆和车队建模控制与优化、智能网联混合交通流建模优化与仿真、微观交通流建模与安全分析。先后参与国家自然科学基金项目 1 项、863 计划等国家级项目 2 项，并多次参与其他省部级项目以及地方项目。在国内外学术期刊和国际会议上已发表和录用论文 11 篇，授权国家专利 10 项，完成行业报告 3 篇。

特邀专题简介

随着人工智能与自主控制技术的深度融合，协作型无人系统正在突破传统工业边界，加速向智慧医疗、城市服务、智能家居及极限任务领域拓展。现代无人系统的核心价值在于实现人机物深度融合，通过高精度环境认知、自适应任务规划与多模态交互技术，构建安全可靠的智能协作生态。在新型人机关系重构背景下，如何强化系统的情境建模能力、动态行为优化与自主协同智能已成为关键突破方向。本专题聚焦跨域协同创新，涵盖先进架构设计、智能算法演进及场景工程化应用，致力推动无人系统向自主化、可信化方向演进，满足社会对柔性制造、精准服务与高危作业的迫切需求。

本特邀专题征集以下与“智能协作无人系统”主题相关的创新研究成果，包含技术突破、理论创新及跨领域应用案例：

- 协作型无人系统设计与柔性驱动架构
- 人机共融交互与多模态接口技术
- 多域感知与场景认理解建模
- 自主决策与动态任务规划
- 多智能体协同与集群自主决策
- 医疗辅助与康养服务无人系统
- 工业 4.0 智能协作系统集成
- 复杂场景协同安全决策控制

IEEE ICUS 2025
Invited Session Summary

Title of Session

Intelligent Collaborative Unmanned Systems

Organizers

1. Prof. Qingchao Liu

Jiangsu University, China

2. Prof. Hongbo Gao

University of Science and Technology of China

3. Prof. Yan Wang

Hong Kong Polytechnic University, China

4. Prof. Yuan Zheng

Southeast University, China

Biosketches of Organizers

Qingchao Liu, Associate Professor and Ph.D. Supervisor at Jiangsu University. He is also a member of the Artificial Intelligence Subcommittee of the Transportation Research Board (TRB), a member of the Chinese Society of Automotive Engineering, and a member of the China Intelligent Transportation Association. He obtained his Ph.D. degree from Southeast University, and was a Senior Visiting Scholar at Nanyang Technological University in Singapore. His research focuses on decision-making planning and platoon control of intelligent vehicles

Hongbo Gao, Professor and Ph.D. Supervisor at the University of Science and Technology of China. He is dedicated to the research, development and industrialization of key technologies of artificial intelligence, robotics and unmanned vehicles. He is now the director and vice chairman of the youth working committee of China Command and Control Society, the supervisor and chairman of the youth working committee of Anhui Robotics Society, and the executive director of Anhui Academician-Expert Friendship Association and Anhui Scientist-Entrepreneur

Association, etc.

Yan Wang is a researcher associate at The Hong Kong Polytechnic University. His research interests include autonomous vehicle system dynamics and intelligent safety control. He has published more than 30 papers, enrolled in 2 ESI highly cited papers. He has been awarded the first prize of Innovation and Development of China Association of Productivity Promotion Centers, Excellent Doctoral Thesis of Jiangsu Province, Excellent paper of Chinese Mechanical Engineering, etc. He is a member of the Working Committee of Intelligent Vehicle of Chinese Automation Society, and has been invited to serve as a young editorial board member of Chinese Journal of Mechanical Engineering, Journal of Computer Science and Electrical Engineering, and a guest editor of Drones.

Yuan Zheng is an Assistant Professor at Southeast University. His main research interests include intelligent network / autonomous driving vehicle and platoon modeling control and optimization, intelligent network hybrid traffic flow modeling optimization and simulation, microscopic traffic flow modeling and safety analysis. He has participated in one National Natural Science Foundation of China project, two national projects such as 863 Program, and many other provincial and ministerial projects as well as local projects. He has published and accepted 11 papers in domestic and international academic journals and international conferences, granted 10 national patents, and completed 3 industry reports.

Details of Session

With the deep integration of artificial intelligence and autonomous control technologies, collaborative unmanned systems are breaking through traditional industrial boundaries and rapidly expanding into fields such as smart healthcare, urban services, smart homes, and extreme mission scenarios. The core value of modern unmanned systems lies in achieving seamless human-cyber-physical integration. By leveraging high-precision environmental cognition, adaptive task planning, and multimodal interaction technologies, these systems aim to build a safe and reliable intelligent collaboration ecosystem. Against the backdrop of redefining

human-system relationships, enhancing capabilities in contextual modeling, dynamic behavior optimization, and autonomous collaborative intelligence has become pivotal for breakthroughs. This feature focuses on cross-domain collaborative innovation, encompassing advanced architecture design, intelligent algorithm evolution, and scenario-based engineering applications. It aims to drive unmanned systems toward greater autonomy and trustworthiness, addressing societal demands for flexible manufacturing, precision services, and high-risk operations.

This special feature invites original contributions related to "Intelligent Collaborative Unmanned Systems," including technological breakthroughs, theoretical innovations, and cross-domain applications:

- Collaborative unmanned system design and flexible drive architectures
- Human-system integration and multimodal interface technologies
- Multi-domain perception and scenario understanding modelling
- Autonomous decision-making and dynamic task planning
- Multi-agent collaboration and swarm autonomous decision-making
- Medical assistance and elderly-care service unmanned systems
- Industry 4.0 intelligent collaborative system integration
- Collaborative safety decision-making and control in complex scenarios