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

鲁棒可信地面自主无人系统

组织者

1. 魏超，教授，北京理工大学

2. 王涣杰，讲师，北京工业大学

3. 王文硕，教授，北京理工大学

4. 李大川，副研究员，南方科技大学

5. 刘海滨，教授，北京工业大学

个人简介

魏超，北京理工大学机械与车辆学院教授、博士生导师，特种车辆设计制造集成技术全国重点实验室副主任。主要从事无人驾驶车辆总体设计、多传感器融合的感知系统深度学习理论、无人车辆路径规划与轨迹跟踪控制、多智能体协同规划控制、电动汽车总体设计与智能控制技术，以及车辆先进传动技术等研究。近年来主持国家重大项目（973 项目）子课题、国防重大基础研究项目、国家自然科学基金面上项目、传动重点实验室基金项目、上汽集团基金项目、重庆长安工业横向合作项目、内蒙古第一机械集团有限公司横向合作项目等多个重大重点项目，出版教材 1 本，发表 SCI/EI 论文 90 余篇，授权发明专利 33 项，获得国防科技进步一等奖 3 项。

王涣杰，北京工业大学机械与能源工程学院讲师、硕士生导师，院长助理，系副主任。博士毕业于北京理工大学机械与车辆学院，美国加州大学伯克利分校联合培养博士（2018-2020）。长期从事可信自主无人系统、情景认知、驾驶员行为、决策控制和机器学习等相关研究。研究工作主要发表在 IEEE TITS, IEEE TVT 和 IEEE TASE 等国际期刊。主持及参与国家自然科学基金、国家重点研发计划、北京市教委科研计划、装备预研、中国博士后面上和北京市博士后等项目。担任中国汽车工程学会年会论文评审专家，以及 IEEE TITS, IEEE

TNNLS, IEEE TVT, IEEE TTE, IEEE TIV, Engineering Applications of Artificial Intelligence, IEEE/ASME Transactions on Mechatronics, CAAI Transactions on Intelligence Technology 和 IEEE CASE 等多个国际 SCI 期刊和国际会议审稿人。

王文硕，北京理工大学机械与车辆学院教授、博士生导师，国家高层次青年人才。2018 年博士毕业于北京理工大学。攻读博士期间（2015-2018），先后于加州大学伯克利分校、密歇根大学安娜堡分校进行联合培养，师从美国工程院院士 J. Karl Hedrick 教授。博士毕业后，先后于卡内基梅隆大学、加州大学伯克利分校、麦吉尔大学从事博士后研究。长期从事于复杂环境下的移动机器人智能决策、驾驶行为认知与理解、人-机交互/协同与人工智能等交叉领域与前沿研究。获 IEEE T-IV 最佳期刊论文奖、TSE 期刊最佳论文奖、TSE 期刊最佳客座编辑奖、加拿大 IVADO Postdoc Fellowship 奖，获《中国汽车工程学会优秀博士学位论文奖》、《北京理工大学优秀博士论文奖》，入选斯坦福大学 2023 全球前 2%顶尖科学家榜单、全球首份 AI 华人青年学者榜单。发表学术论文 60 余篇（SCI 论文 30 余篇），授权美国发明专利 4 项、中国发明专利 6 项，出版英文学术专著 1 部。目前，主要担任 IEEE TVT、IEEE TIV、Journal of Field Robotics 等多个国际 SCI 期刊的副主编。

李大川，南方科技大学可信自主系统研究院副研究员，深圳市海外高层次人才。博士毕业于清华大学自动化系，加州大学伯克利分校 PATH 研究中心博士后。长期从事自动驾驶系统、自主无人系统决策与规划、可信自主无人系统等研究，在国内外重要学术期刊和会议发表论文 30 余篇，主持国家自然科学基金面上项目、国家科技重大专项、国防科技创新特区重点项目、广东省国际科技合作项目、深圳市基础学科重点项目等课题。担任中国人工智能学会智能决策专委会委员、低速无人驾驶产业联盟标准委员会委员和中国仿真学会智能无人系统建模与仿真专委会委员。获中国航空学会科技进步一等奖、IEEE 并行计算国际会议（ISPA）最佳论文、国际知识工程（KSEM）会议最佳论文等奖项。

刘海滨，北京工业大学机械与能源工程学院教授、博士生导师，中组部“海外高层次人才引进计划”专家。长期从事人工智能理论及应用、智能物流、智能制造及航天系统工程相关研究；曾在日本 Tokyo Electron Limited 及日本摩托罗拉公司工作并担任技术和管理高级职务；曾在中国航天系统科学与工程研究院工作并担任总工程师。主持或参加国家科技重大专项、国家自然科学基金、国家重点研发（863）计划、国家科技支撑计划、国防科技基础科研、国际知名企业科技创新课题等项目 30 余项。获国家科学技术进步二、三等奖各 1 项、航空航天工业部科技进步三等奖 1 项、陕西省科技进步一等奖 1 项等；国家级人才项目评审专家；中央军委科技委专家组成员、国家科技重大计划评审专家、科技部国际科技合作项目评审专家等。

特邀专题简介

地面自主无人系统对现代社会、商业和科学的影响正逐渐凸显，以自主驾驶为主要特征的新一代智能交通和工农业系统是解决产业升级的突破口。作为安全攸关系统，自主无人平台通常包含多个相互关联的模块（如感知、定位、预测、决策、规划和控制等），且在运行过程中面临复杂、部分可观测、强交互且不确定的环境。由此，对于数据和模型协同驱动的自主系统的可解释性、鲁棒性与可信评估衍生出众多挑战。如何兼顾性能与鲁棒可信性是当前自主系统设计亟待解决的问题。通过提高技术的鲁棒可信完备度可有效促进自主无人系统被公众广泛接受并规模化落地推广，进而发挥自主技术在智能经济社会、交通及工农业生产建设中的强大引擎作用。

本特邀专题邀请以下与“鲁棒可信地面自主无人系统”主题相关的包含创新思想、新发现、概念、改进、技术以及新应用的原创论文，主要接收（并不限于）以下方向的研究论文：

- 可信原则、评估与验证
- 面向自主系统的可解释 AI 技术
- 端到端自动驾驶
- 多模态大模型在自动驾驶的应用
- 数据驱动的物体检测或情景认知

- 鲁棒定位与建图
- 多模态不确定性量化
- 交互场景下可解释行为或轨迹预测
- 复杂及不确定环境下自主决策与规划
- 数据驱动或模型驱动的自主系统控制
- 多智能体协同决策、规划和控制

IEEE ICUS 2025
Invited Session Summary

Title of Session

Robust and Trustworthy Unmanned Ground Autonomous Systems

Organizers

1. Prof. Chao Wei

Beijing Institute of Technology, China

2. Prof. Huanjie Wang

Beijing University of Technology, China

3. Prof. Wenshuo Wang

Beijing Institute of Technology, China

4. Prof. Dachuan Li

Southern University of Science and Technology, China

5. Prof. Haibin Liu

Beijing University of Technology, China

Biosketches of Organizers

Chao Wei is a professor and doctoral supervisor of the School of Mechanical Engineering at the Beijing Institute of Technology. He is also the deputy director of the National Key Laboratory of Special Vehicle Design and Manufacturing Integration Technology. His research fields include the overall design of unmanned vehicles, the deep learning theory of multi-sensor fusion perception systems, the path planning and trajectory tracking control of unmanned vehicles, multi-agent collaborative planning control, electric vehicle overall design and intelligent control technology, and advanced vehicle transmission technology. In recent years, he has presided over sub-topics of major national projects (973 projects), major national defense basic research projects, projects of the National Natural Science Foundation of China, fund projects of the National Key Laboratory of Special Vehicle Design and Manufacturing Integration Technology, fund projects of SAIC Motor, and horizontal cooperation projects of Chongqing Changan Industry, Inner Mongolia First Machinery Group CO., Ltd horizontal cooperation project, and many other major key projects. He has published one textbook and more than 90 SCI/EI papers, authorized 33 invention patents, and won

three first prizes for the National Defense Science and Technology Progress Award.

Huanjie Wang is currently an assistant professor and master supervisor in the College of Mechanical and Energy Engineering of Beijing University of Technology. He received the Ph.D. degree from the School of Mechanical Engineering, Beijing Institute of Technology, China. He was a visiting scholar at the University of California, Berkeley, from October 2018 to October 2020. His research interests include trustworthy unmanned autonomous systems, situational awareness, driver behavior, decision control, and machine learning. His research has been mainly published in international journals such as IEEE T-ITS, IEEE T-VT, IEEE T-ASE, and so on. He has presided over or participated in projects funded by the National Nature Science Foundation of China, the National Key R&D Program of China, the R&D Program of Beijing Municipal Education Commission, and equipment pre-research, among others. He serves as a peer expert for the China-SAE Congress and as a reviewer for several authoritative international journals and conferences, such as IEEE TITS, IEEE TNNLS, IEEE TVT, IEEE TTE, IEEE TIV, Engineering Applications of Artificial Intelligence, IEEE/ASME Transactions on Mechatronics, CAAI Transactions on Intelligence Technology, and IEEE CASE.

Wenshuo Wang is a professor at the School of Mechanical Engineering, Beijing Institute of Technology (BIT), and is recognized as a national high-level young talent. He obtained his Ph.D. degree from BIT in 2018. During his doctoral studies (2015-2018), he was jointly trained at the University of California, Berkeley, and the University of Michigan, Ann Arbor, under the supervision of Professor J. Karl Hedrick, a member of the National Academy of Engineering. After completing his Ph.D., he conducted postdoctoral research at Carnegie Mellon University, the University of California, Berkeley, and McGill University. He has long been engaged in interdisciplinary and cutting-edge research in areas such as intelligent decision-making for mobile robots in complex environments, cognitive understanding of driving behaviors, human-machine interaction/collaboration, and artificial intelligence. He has received several awards, including the Best Journal Paper Award from IEEE Transactions on Intelligent Vehicles (T-IV), the Best Paper Award and Best Guest Editor Award from Transportation Safety and Environment (TSE), the IVADO Postdoc Fellowship

Award in Canada, the Excellent Doctoral Dissertation Award from the Chinese Society of Automotive Engineers, and the Outstanding Ph.D. Dissertation Award from BIT. He was also listed in the Stanford University's 2023 Global Top 2% Scientists Ranking and the inaugural list of Top AI Chinese Young Scholars globally. He has published over 60 academic papers (with over 30 SCI-indexed papers), obtained 4 granted patents in the United States and 6 in China, and authored one English academic monograph. Currently, he serves as an associate editor for several international SCI journals, including IEEE Transactions on Vehicular Technology (TVT), IEEE Transactions on Intelligent Vehicles (TIV), and the Journal of Field Robotics.

Dachuan Li received the Ph.D. degree in control science and engineering from Tsinghua University, China, in 2015. He worked as a Post-Doctoral Researcher at California PATH and the Institute of Transportation Studies, University of California at Berkeley, Berkeley, CA, USA, from 2016 to 2018. He is currently a Research Assistant Professor with the Research Institute for Trustworthy Autonomous Systems, Southern University of Science and Technology, China. His research interests include autonomous driving vehicles, trustworthy autonomous systems, intelligent decision-making, and motion planning. He has published over 30 research papers and won the Best Paper Awards of KSEM 2021 and IEEE ISPA 2021 Conferences.

Haibin Liu is a professor and doctoral supervisor at the Beijing University of Technology. He has long been engaged in research related to artificial intelligence theory and its applications, intelligent logistics, intelligent manufacturing, and aerospace system engineering. He received the B.Eng. and the M.Eng. degrees in aeronautics and astronautics engineering from Northwestern Polytechnical University, Xi'an, China, in 1985 and 1988, respectively, and the Ph.D. degree in precision engineering from Hokkaido University, Sapporo, Japan, in 1995. He was a Research Fellow with the Institute of NEC Foundation of Computer and Communication (C&C) Promotion, Japan. From 1998 to 2004, he was a principal scientist with Motorola Japan Ltd., Japan. He was a CTO and full professor at the China Academy of Aerospace Systems Science and Engineering, Beijing, China. He has presided over or participated in more than 30 projects,

including the National Science and Technology Major Project, the National Natural Science Foundation of China, the National High Technology Research and Development Program of China (863 Program), the National Science and Technology Support Plan, the National Defense Science and Technology Basic Research, and international well-known enterprise science and technology innovation projects. He has won 1 second prize and 1 third prize for the national scientific and technological progress award; 1 third prize for the scientific and technological progress of the Ministry of Aviation and Aerospace Industry; 1 first prize for scientific and technological progress in Shaanxi Province, etc.

Details of Session

The impact of unmanned ground autonomous systems on modern society, commerce, and science is gradually becoming more prominent. A new generation of intelligent transportation and industrial and agricultural systems, characterized by autonomous driving, is a breakthrough in industrial upgrading. As safety-critical systems, unmanned autonomous platforms usually contain multiple interrelated modules (such as perception, positioning, prediction, decision-making, planning, and control) and face complex, partially observable, highly interactive, and uncertain environments. As a result, many challenges arise from the interpretability, robustness, and trustworthiness evaluation of data- and model-driven autonomous systems. How to balance performance, robustness, and trustworthiness is an urgent issue in current autonomous system design. By improving the robustness and trustworthiness of autonomous technology, it can effectively promote the widespread acceptance of unmanned autonomous systems by the public and their large-scale implementation and promotion, thereby playing a powerful engine role in the intelligent economy, society, transportation, and industrial and agricultural production.

The invited session invites original papers of innovative ideas and concepts, new discoveries, improvements, technologies, and novel applications relevant to the theme of ‘Robust and Trustworthy Unmanned Ground Autonomous Systems’ and mainly accepts (but is not limited to) submissions related to the following topics:

- Trustworthiness principles, evaluation, and verification
- Explainable AI technologies for autonomous systems
- End-to-end autonomous driving
- Application of multi-modal large models in autonomous driving

- Data-driven object detection or situational awareness
- Robust localization and mapping
- Multi-modal uncertainty quantification
- Interpretable behavior or trajectory prediction in interactive scenarios
- Decision-making and planning in complex and uncertain environments
- Data-driven or model-based control of autonomous systems
- Decision-making, planning, and control of multi-agent collaboration