2024 第七届 IEEE 国际无人系统大会
特邀专题简介表

特邀专题名称
健壮可靠的自主无人系统关键技术

组织者
1.王程博，博士后研究员，中国科学技术大学
2.高洪波，研究员，中国科学技术大学
3.王亚飞，副教授，上海交通大学
4.严瑞东，副教授，北京交通大学
5.邬明宇，博士后研究员，上海交通大学

个人简介

王程博，博士，中国科学技术大学博士后，英国利物浦约翰摩尔斯大学 Visiting Lecturer，2023 年取得大连海事大学工学博士学位，英国海洋工程科学技术协会（IMarEST）会员，英国皇家造船工程师学会（RINA）会员，中国自动化学会会员，中国人工智能学会会员。主要从事强化学习决策理论、自主船舶决策规划技术及海上无人平台等研究。发表相关学术论文 29 篇，其中 1 项成果入选 ESI 高被引论文，2 项成果入选交通运输领域重大科技创新成果库。参与编撰专著《Offshore Robotics》，授权/申请国家发明专利 13 项，授权软件著作权 2 项。获得 2021 年博士研究生国家奖学金、2021 年度人民网奖学金、2023 年辽宁省优秀毕业生。担任 IEEE TNNLS、IEEE TITS、IEEE TASE、OE、JEET、CCS 等多个国际权威期刊和 TRB、CAC 等国际高影响力会议的审稿人。
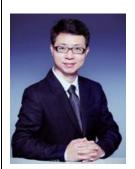

高洪波，博士，中国科学技术大学信息科学与技术学院研究员、博士生导师。他于 2016 年 11 月在北航师从李德毅院士指导下获得博士学位，并曾在清华大学工作。主持了包括国家自然科学基金重点项目、科技部重点研发计划总体课题、子课题以及教育部人工智能专项在内的十余项项目，总资助超过 1200 万元人民币。作为第一作者/通讯作者，发表

了 22 篇 JCR 一区/二区 SCI 论文（其中 16 篇发表在 JCR 一区顶级期刊），单篇 SCI 引用最高达 171 次，1 篇 ESI 高被引论文，Google Scholar 引用次数 1721 次，H 因子为 22，SCI 因子超过 5.0 的论文超过 20 篇，获得 5 项国际期刊会议论文奖。获得了 22 项发明专利，1 项美国专利和 1 项 PCT 专利。曾获安徽省杰青、安徽省"特支计划"创新领军人才、中国指挥与控制学会科技进步奖一等奖（排名第一）、中国通信学会科技创新青年奖、中国指挥与控制学会优秀青年科学家奖、安徽省人工智能技术奖杰出奖（排名第三）等奖项。目前担任中国指挥与控制学会理事长、青年工作委员会副主任，安徽省机器人学会监事长、青年工作委员会主任，安徽省院士专家协会、安徽省科技人才企业家协会执行理事，中国指挥与控制学会青年工作委员会副主任。他还担任 IEEE TNNLS 和 TASE 两大人工智能领域顶级 SCI 期刊的副主编，《国际先进机器人系统》知名 SCI 期刊的副主编，两次 EI 期刊编委，九次领域主席和客座主编。曾多次受邀参加国际和国内会议发表演讲，次数超过 5 次。

王亚飞，博士，上海交通大学机械与动力工程学院副教授/博导，国家级高层次青年人才、交通运输部青年拔尖人才。研究方向为无人驾驶矿车、车路协同感知定位。现任上海交通大学智能网联电动汽车创新中心副主任、机械与动力工程学院智能汽车研究所书记。主持科技部重点研发计划课题、国家自然科学基金和企事业单位合作项目 40 余项，发表论文 100 余篇，申请/授权国内外发明专利 50 余项。现任《IEEE Vehicular Technology Magazine》副主编、《汽车工程学报》青年编委、《汽车工程》青年编委、中国汽车工程学会青委会副秘书长等职。

严瑞东，博士，硕士生导师，目前就职于北京交通大学。他于 2017 年从北京航空航天大学获得博士学位；毕业后，他在清华大学车辆与运输学院从事博士后研究工作。他长期从事自动驾驶感知、决策和控制的研究，并发表了包括 IEEE Trans. 系列在内的 30 余篇学术论文。

邬明宇，博士，上海交通大学机械与动力工程学院博士后。2023 年从清华大学获得工学博士学位。他长期从事自动驾驶载运车辆动力学机理建模和重载矿卡性能退化表征研究。以第一作者身份发表了高水平 SCI/EI 论文 11 篇，以第一发明人身份授权/申请发明专利等知识产权 14 项，参与编写专著 1 册。于 2022 年在清华大学获得博士研究生国家奖学金，进站后入选上海交通大学砺远博士后计划。正主持国家资助博士后研究计划、清华大学智能绿色车辆与交通全国重点实验室开放基金等项目，并作为项目总负责人承接两个校企合作横向项目课题。

特邀专题简介

　　随着人工智能技术的快速发展，当今的自主无人系统（autonomous unmanned systems，AUS）可更加智能化地在各种复杂动态自然环境中运行。AUS 是一个新兴的跨学科领域，依靠大数据、人工智能以及其他科学技术的进步来创造具有集成任务、运动规划、决策和推理能力的无人系统，具有自主性、智能性和协作性等特征。由于其物理组件、网络基础设施和社会环境的无缝集成和动态性质，此类工程系统必须以越来越高的自主性和智能水平进行操作，以做出决策和操纵其环境。因此，需要发展健壮可靠的关键技术来提升自主无人系统性能。

　　本特邀专题邀请以下与"健壮可靠的自主无人系统关键技术"主题相关的包含创新思想、概念、新发现、改进以及新应用的原创论文。

- 健壮可靠的人工智能模型
- 先进认知与理解技术
- 高精度自主定位与导航技术
- 自主规划与智能控制技术
- 环境自适应与进化技术
- 人机混合智能技术
- 自主无人船技术
- 自主水下机器人技术
- 自主无人车技术

IEEE ICUS 2024
Invited Session Summary

Title of Session
Key Technologies for Robust, Reliable and Autonomous Unmanned Systems

Organizers
1. Dr. Chengbo Wang   University of Science and Technology of China   **2. Prof. Hongbo Gao**   University of Science and Technology of China   **3. Assoc. Prof. Yafei Wang**   Shanghai Jiao Tong University, China   **4. Assoc. Prof. Ruidong Yan**   Beijing Jiaotong University, China   **5. Dr. Mingyu Wu**   Shanghai Jiao Tong University, China

Biosketches of Organizers
Dr. Chengbo Wang, is a postdoctoral researcher at University of Science and Technology of China, a visiting lecturer from Liverpool John Moores University of UK. In 2023, he obtained his Ph.D. degree in Traffic Information Engineering and Control from Dalian Maritime University, China. He is a member of the Institute of Marine Engineering, Science, and Technology (IMarEST) and the Royal Institution of Naval Architects (RINA) in the United Kingdom, as well as a member of the Chinese Association of Automation and the Chinese Association for Artificial Intelligence. His research primarily focuses on reinforcement learning decision theory, autonomous ship decision planning technology, and unmanned platforms at sea. Wang has published 29 related academic papers, with one inclusion in the ESI highly cited papers, and two included in the Major Technological Innovation Achievements Library of Transportation. He contributed to the compilation of the book "Offshore Robotics" and holds 13 granted/applied national invention patents and 2 software copyright grants. Dr. Chengbo Wang has received numerous accolades, including national scholarships, the 2021 People's Net Scholarship, and being recognized as an

outstanding graduate by Liaoning Province. He serves as a reviewer for several prestigious international journals and conferences such as IEEE TNNLS, IEEE TITS, IEEE TASE, OE, JEET, CCS, TRB and CAC.

Dr. Hongbo Gao, Researcher, Doctoral Supervisor, School of Information Science and Technology, University of Science and Technology of China. He graduated with a PhD from Beihang University in November 2016 under the supervision of Academician Deyi Li, and worked at Tsinghua University. Chaired more than 10 projects including key projects of the National Natural Science Foundation of China, integrated project topics, sub-topics of the Key R&D Program of the Ministry of Science and Technology of China, and special projects on artificial intelligence of the Ministry of Education, with total funding of more than 12 million RMB. He has published 22 JCR Zone 1 / Zone 2 SCI papers as first/corresponding author (16 papers in top JCR Zone 1 journals), with the highest single SCI citations of more than 171, one ESI highly cited paper, 1721 Google Scholar citations, H-factor of 22, more than 20 papers with SCI factor > 5.0, and 5 international journal conference paper awards. He has been granted 22 invention patents, 1 US patent and 1 PCT patent. He has been awarded the Anhui Province Outstanding Youth, the "Special Support Plan" Innovation Leader of Anhui Province, the First Prize of Science and Technology Progress Award of China Command and Control Society (rank 1), the Science and Technology Innovation Youth Award of China Communications Association, the Young Scientist Award of China Command and Control Society, and the Outstanding Award of Anhui Province Artificial Intelligence Technology Award (rank 3). He is currently the director of the China Command and Control Society and the deputy director of the Youth Working Committee, the chairman of the supervisory board and the chairman of the youth working committee of the Anhui Robotics Society, the executive director of the Anhui Association of Academicians and Experts and the Anhui Association of Scientists and Entrepreneurs, and the deputy chairman of the youth working committee of the China Command and Control Society. He serves as Associate Editor of IEEE Trans. on Neural Network and Learning System, a leading SCI journal in artificial intelligence, and IEEE Trans. on Automation Science and Engineering, a leading SCI journal in robotics, Associate Editor of the well-known SCI journal Int. J. Adv. Robot. Syst, Editorial Board member of EI journals for two

times, Section Chair and Guest Editor-in-Chief for nine times. He has been invited to present at international and national conferences more than 5 times.

Dr. Yafei Wang is an Associate Professor at Shanghai Jiao Tong University, and he is mainly interested in automated driving for special vehicles, vehicle-road collaboration and positioning technologies. His research is funded by MOST, NSFC, JKW, and industrial collaborators, and he published over 100 papers. He is currently an Associate Editor of IEEE Vehicular Technology Magazine, Youth Editor of "Automotive Engineering" and "Journal of Automotive Engineering", he also serves as Vice Secretary General of the Youth Committee of the Chinese Society of Automotive Engineering, Member of the Vehicle Control and Intelligence Committee of the Chinese Society of Automation, and Member of the Intelligent Driving Committee of the Chinese Society of Artificial Intelligence.

Dr. Ruidong Yan, Master's degree advisor, currently working at Beijing Jiaotong University. He received a doctoral degree from Beijing University of Aeronautics and Astronautics in 2017; After graduation, he engaged in postdoctoral research in the school of vehicles and transportation of Tsinghua University. He has been engaged in the research of autonomous driving perception, decision-making and control, and has published more than 30 academic papers including IEEE Trans. series.

Dr Mingyu Wu is a postdoctoral researcher with the School of Mechanical Engineering, Shanghai Jiao Tong University. He received PhD degree in mechanical engineering from Tsinghua University, Beijing, China, in 2023. He has been engaged in research on autonomous vehicle dynamic mechanism modeling and performance degradation characterization of heavy-duty mining trucks. As the first author, he has published 11 high-level SCI/EI papers, authorized/applied for 14 invention patents and other intellectual property rights as the first inventor, and participated in the compilation of 1 monograph. In 2022, he won the National Scholarship for doctoral students at Tsinghua University and was selected into the

Liyuan Postdoctoral Program of Shanghai Jiao Tong University in 2023. He is presiding projects such as the state-sponsored postdoctoral research program and the State Key Laboratory of Intelligent Green Vehicles and Mobility program, and is undertaking two corporate projects as the general project leader.

Details of Session

With the rapid development of artificial intelligence technology, today's Autonomous Unmanned Systems (AUS) can operate more intelligently in various complex and dynamic natural environments. AUS is an emerging interdisciplinary field that relies on advancements in big data, artificial intelligence, and other scientific technologies to create unmanned systems with integrated capabilities for tasks, motion planning, decision-making, and reasoning, characterized by autonomy, intelligence, and collaboration. Due to the seamless integration and dynamic nature of its physical components, network infrastructure, and social environment, such engineering systems must operate with increasingly high levels of autonomy and intelligence to make decisions and manipulate their environments. Therefore, there is a need to develop robust and reliable key technologies to enhance the performance of autonomous unmanned systems.

The invited session invites original papers of innovative ideas and concepts, new discoveries and improvements, and novel applications relevant to the following selected topics of "Robust and Reliable Key Technologies for Autonomous Unmanned Systems".

- Robust and reliable artificial intelligence models

- Advanced cognition and understanding technologies

- High-precision autonomous positioning and navigation technologies

- Autonomous planning and intelligent control technologies

- Environmentally adaptive and evolutionary technologies

- Human-machine hybrid intelligent technologies

- Autonomous unmanned ship technologies

- Autonomous underwater robot technologies

- Autonomous unmanned vehicle technologies