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

海上无人系统关键技术

组织者

1. 韩玮，研究员，中船智海创新研究院

2. 彭艳，教授，上海大学

3. 刘勇，教授，浙江大学

4. 金博，教授，大连理工大学

5. 林友芳，教授，北京交通大学

6. 向先波，教授，华中科技大学

个人简介

韩玮，研究员，博导，中船集团首席专家，国家级领军人才，享受国务院政府特殊津贴，央企领军人才。担任无人系统领域多个高层次专家组专家，中国造船学会水面无人装备学委会副主任委员、中国指挥与控制学会集群智能与协同控制专委会副主任委员、中国系统工程学会副主任委员。长期从事海上无人系统领域研究工作，提出并建立了海上无人系统自主可控的全套软硬件架构、技术体制、“玄龙”无人装备操作系统，研制了大中小型水面无人艇的单艇和集群等系列化产品。承担了国家级重大、重点项目 10 余项，获得省部级科技进步一等奖、三等奖，中船集团科技进步特等奖，一等奖和二等奖等多项，获得中船贡献奖，创新团队等多项荣誉，发表论文 20 余篇、授权专利 30 余项。

彭艳，教授，博导，现任上海大学未来技术学院院长，人工智能研究院执行院长，无人艇工程研究院院长。国家杰出青年科学基金、何梁何利基金科学与技术创新奖获得者，推动了我国无人艇技术和装备进程，研制的无人艇在南海、南极、东海等执行大量任务，服务极地科考、南海建设、海上重大事故应急探测、水下考古等。发明了磁通突变机电转化新方法，实现了海洋无人系统“海能海用”重要突破；创新性提出基于海洋温盐背景场梯度特征的探测航迹规划新方法。研究成果发表论文 180 余篇，授权国家发明专利 200 余项，获国家科

技进步二等奖 1 项、国家技术发明二等奖 1 项、教育部科学技术进步奖一等奖 1 项、上海市科技进步一等奖 2 项等。

刘勇，博士，浙江大学控制科学与工程学院教授，浙江大学控制学院智能驾驶与未来交通中心主任，浙江省机器换人专家。获浙江省自然科学一等奖、浙江省科学技术一等奖、浙江省科学技术进步一等奖、浙江省自然科学学术二等奖、浙江省杰出青年科学基金项目，入选中组部万人计划青年拔尖人才、浙江省有突出贡献青年科技人才和浙江省 151 人才项目。主要研究方向为：自主机器人与智能系统、机器人自主规划与导航控制、视觉识别与模式识别、SLAM 技术及多传感器融合技术。

金博，大连理工大学教授、博导，辽宁省高等学校创新人才人选，科技部中长期发展规划专家组成员。主要研究领域涵盖数据挖掘、大数据分析等。主持了国家自然科学基金面上项目、青年项目，教育部—中国移动科研项目，辽宁省重点研发项目，辽宁省高校科研项目，国家重点实验室开放课题等项目，作为核心成员参与和承担多个科技部国家重点研发计划项目、国家自然科学基金重大研究计划培育项目、重点项目和面上项目、863 计划项目等国家级课题，承担了华为、联想、小米等知名公司应用课题的研究工作。在重要国际期刊和国际顶级学术会议（TKDE、KDD、AAAI、ICDM、SDM 等）发表论文 100 余篇。作为 IEEE、ACM 高级会员，以及 CCF 杰出会员，连续多次担任人工智能和数据挖掘领域顶级会议程序委员。

林友芳，现任北京交通大学网信办、信息中心主任、北京交通大学大数据研究院院长、交通数据分析与挖掘北京市重点实验室常务副主任，新一代信息技术及应用北京市高精尖学科负责人，计算机学科数据与知识工程学科方向负责人，中国计算机学会(CCF)高级会员，CCF 大数据专家委员会委员，CCF-AI 专委会通讯委员，曾任计算机与信息技术学院副院长。目前主要从事数据挖掘、机器学习、复杂网络、智能技术与系统、交通数据分析与

挖掘、民航大数据处理、数据中心运维大数据、信息物理系统、领域自动驾驶等领域的应用基础研究工作，主持和参与科研项目 100 余项，其中主持 50 余项，多数为服务于中大型企业的科研项目。在 TKDE、TITS、TNSRE、TWEB、TCI、TIST、KBS、Physic Review E、JCST 等学术期刊和 AAAI、CVPR、IJCAI、ACM MM、ICDE、KDD、ECML PKDD 等高级别国际学术会议上发表论文 60 余篇，其中 CCF A 类国际期刊、CCF A 类会议论文 19 篇。著有《交通大数据》一书，译著三本，是经典书籍《数据仓库》的主要译者。

向先波，华中科技大学教授，船舶与海洋工程学院副院长。中国海洋工程咨询协会监事、湖北省人工智能学会副理事长。主要从事海洋机器人、船海智能装备研究，主持国家自然科学基金重点项目、国家重点研发计划国合重点专项、湖北省自然科学基金创新群体等 30 余项，发表论文 200 余篇，授权国内外发明专利 50 余项，研究成果纳入 2 部国家标准。担任英国皇家造船工程师学会会刊副主编，《Applied Ocean Research》《华中科技大学学报》《水下无人系统学报》等国内外期刊编委，IEEE USYS2018 国际会议主席。曾入选第四批国家级青年人才计划，2020 年起连续入选爱思唯尔中国高被引学者，以第一完成人获中国商业联合会技术发明特等奖、日内瓦国际发明展特别嘉许金奖、中国交通运输协会技术发明一等奖等。

特邀专题简介

随着海上无人系统与人工智能技术的深度融合，具备自主感知、规划和决策能力的智能型海上无人装备正不断涌现。作为一项蓬勃发展的前沿技术，海上无人系统在海洋勘测、资源开发、环境监测等领域展现出重要应用价值。本专题将聚焦海上无人系统的核心技术，深入探讨感知与定位、路径规划与导航、自主决策与智能控制等关键环节。前沿技术方面包括不限于具身智能、多模态信息融合、基于大模型的高级别语义理解，视觉语言导航等。通过系统分析这些技术，将揭示海上无人系统在实现智能化、自主化任务执行中所面临的挑战、潜在解决方案，以及未来的发展方向和应用前景。

本特邀专题邀请以下与“海上无人系统”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。

- 海上无人系统的总体设计
- 海上无人系统的智能感知
- 海上无人系统的自主决策
- 海上无人系统的智能控制
- 海上无人系统的博弈对抗
- 海上无人系统的维修保障
- 海上无人系统的试验测试

IEEE ICUS 2025
Invited Session Summary

Title of Session

Key Technologies of Marine Unmanned Systems

Organizers

1. Prof. Wei Han

Zhihai Innovation Research Institute, CSSC, China

2. Prof. Yan Peng

Shanghai University, China

3. Prof. Yong Liu

Zhejiang University, China

4. Prof. Bo Jin

Dalian University of Technology, China

5. Prof. Youfang Lin

Beijing Jiaotong University, China

6. Prof. Xianbo Xiang

Huazhong University of Science and Technology, China

Biosketches of Organizers

Wei Han, researcher and doctoral supervisor, chief expert of CSSC Group, national leading talents, enjoying special government subsidies of The State Council, leading talents of central enterprises. He served as an expert in several high-level expert groups in the field of unmanned systems, vice chairman of the surface unmanned Equipment Committee of the Chinese Society of Naval Architecture, vice chairman of the Cluster Intelligence and Collaborative Control Committee of the Chinese Society of Command and Control, and vice chairman of the Chinese Society of Systems Engineering. He has been engaged in research in the field of Marine unmanned systems for a long time, proposed and established a complete set of hardware and software architecture, technical system and "Xuanlong" unmanned equipment operating system of Marine unmanned systems, and developed a series of products such as single boat and cluster of large, small and medium-sized surface unmanned boats. It has undertaken more than 10 national major and key projects, won the first and third prizes of provincial

and ministerial science and technology Progress, the special prize, first and second prizes of CSSC science and technology Progress, won the CSSC Contribution Award, innovation team and other honors, published more than 20 papers and authorized more than 30 patents.

Yan Peng, professor and doctoral director, is currently the dean of the School of Future Technology, executive director of the Institute of Artificial Intelligence, and director of the Institute of Unmanned Boat Engineering at Shanghai University. She is the winners of National Science Fund for Outstanding Young Scholars and He Liang He Li Foundation Award for Scientific and Technological Innovation. She has promoted the process of unmanned boat technology and equipment in China, and the unmanned boats have carried out a large number of tasks in the South China Sea, Antarctica, East China Sea, etc., and have been serving the scientific research in the Polar Regions the construction of the South China Sea, the detection of major accidents in the sea in case of emergency, and the underwater archaeology. She invented a new method of flux mutation electromechanical transformation, realizing an important breakthrough in the "sea energy and sea use" of marine unmanned systems; innovatively put forward a new method of detecting trajectory planning based on the gradient characteristics of the ocean temperature and salt background field. She has published more than 180 papers and authorized more than 200 national invention patents, and won one second prize of National Scientific and Technological Progress, one second prize of National Technological Invention, one first prize of Science and Technology Progress Award of the Ministry of Education, and two first prizes of Science and Technology Progress Award of Shanghai Municipality, etc. She has been awarded the first prize of National Scientific and Technological Progress Award of Shanghai Municipality.

Yong Liu, Ph.D., Professor of College of Control Science and Engineering, Zhejiang University, Director of Research Center for Intelligent Driving and Future Transport, College of Control Science and Engineering, Zhejiang University. He is also an expert in the Zhejiang Province Machine Substitution Expert Group. He won the first prize of Zhejiang Province Science and Technology Progress Award in 2021, the first prize of Zhejiang Provincial Natural Science Award in 2017, the first prize of Zhejiang Provincial Science and Technology

Award in 2013, the second prize of Zhejiang Provincial Natural Science Academic Award in 2012, the 2011 Zhejiang Outstanding Youth Science Foundation, and he was selected as the national young top-notch talent of "Ten Thousand Talents Program" in 2019, the outstanding young scientific and technological talents of Zhejiang Province and the 151 talent project of Zhejiang Province. His research interests include autonomous robots and intelligent systems, robot perception systems, autonomous robot planning and navigation control, visual recognition and pattern recognition, SLAM technology and multi-sensor fusion technology.

Bo Jin, Professor and Doctoral Supervisor at Dalian University of Technology. He is selected as an innovative talent in Liaoning Province's higher education institutions and a member of the expert group for the mid- and long-term development plan of the Ministry of Science and Technology. His main research areas cover data mining, big data analysis, etc. He has presided over projects such as the National Natural Science Foundation's general project and youth project, the Ministry of Education - China Mobile Scientific Research Project, the Liaoning Provincial University Scientific Research Project, and the National Key Laboratory Open Project. As a core member, he has participated in and undertaken multiple national-level projects such as the Ministry of Science and Technology's national key research and development plan projects, the National Natural Science Foundation's major research plan cultivation projects, key projects, and general projects, as well as 863 Plan projects. He has also undertaken research projects for well-known companies such as Huawei, Lenovo, and Xiaomi. He has published more than 100 papers in important international journals and top international academic conferences (TKDE, KDD, AAAI, ICDM, SDM, etc.). As a senior member of IEEE and ACM, as well as a distinguished member of CCF, he has served as a program committee member for top conferences in the field of artificial intelligence and data mining for many consecutive times.

Youfang Lin, the Director of the Network Information Office and Information Center of Beijing Jiaotong University, the director of the Big Data Research Institute of Beijing Jiaotong University, the executive deputy director of the Beijing Key Laboratory of Traffic Data Analysis and Mining, the person in charge of the New Generation of Information Technology and

Application in Beijing, the person in charge of the Data and Knowledge Engineering discipline of Computer Science, and the senior member of China Computer Society (CCF). Member of CCF Big Data Expert Committee, CCF-AI Special Committee communication member, used to be the deputy dean of the School of Computer and Information Technology. At present, he is mainly engaged in applied basic research work in data mining, machine learning, complex network, intelligent technology and system, traffic data analysis and mining, civil aviation big data processing, data center operation and maintenance big data, information physics system, domain automatic driving and other fields. He has presided over and participated in more than 100 scientific research projects, of which he presided over more than 50. Most of them are scientific research projects serving medium and large enterprises. In academic journals such as TKDE, TITS, TNSRE, TWEB, TCI, TIST, KBS, Physic Review E, JCST and AAAI, CVPR, IJCAI, ACM MM, ICDE, KDD, ECML More than 60 papers have been published in high-level international academic conferences such as PKDD, including 19 papers in CCF Class A international journals and CCF Class A conferences. He is the author of the book "Traffic Big Data" and has translated three books, and is the main translator of the classic book "Data Warehouse".

Xianbo Xiang, Professor of Huazhong University of Science and Technology, Vice Dean of the School of Shipbuilding and Ocean Engineering. Supervisor of China Ocean Engineering Consulting Association, Vice chairman of Hubei Artificial Intelligence Society. He is mainly engaged in the research of Marine robots and Marine intelligent equipment, presided over more than 30 key projects of the National Natural Science Foundation, key projects of the National Key research and development Program, and innovation groups of the Natural Science Foundation of Hubei Province, published more than 200 papers, authorized more than 50 invention patents at home and abroad, and the research results were included in 2 national standards. He served as deputy editor of the Journal of the Royal Institution of Naval Architects, editorial board member of Applied Ocean Research, Journal of Huazhong University of Science and Technology, Journal of Underwater Unmanned Systems and other domestic and foreign journals, and chairman of IEEE USYS2018 International Conference. He has been selected into the fourth batch of national Young Talents Program, and has been selected into

Elsevier China's Highly Cited Scholars since 2020, and won the Special Award of Technical Invention by China Business Federation, the Special Gold Award of Geneva International Invention Exhibition, and the first prize of Technical invention by China Transportation Association, etc.

Details of Session

With the deep integration of Marine unmanned systems and artificial intelligence technology, intelligent Marine unmanned equipment with autonomous perception, planning and decision-making capabilities is emerging. As a flourishing frontier technology, Marine unmanned systems have shown important application value in Marine survey, resource development, environmental monitoring and other fields. This topic will focus on the core technology of maritime unmanned systems, and deeply explore the key links such as perception and positioning, path planning and navigation, autonomous decision-making and intelligent control. Cutting-edge technologies include not limited to embodied intelligence, multi-modal information fusion, high-level semantic understanding based on large models, visual language navigation, etc. Through systematic analysis of these technologies, we will reveal the challenges, potential solutions, and future development directions and application prospects of unmanned Marine systems in realizing intelligent and autonomous mission execution.

This special invitation invites the following original papers containing innovative ideas, concepts, new discoveries, improvements and new applications related to the topic of Unmanned Systems at Sea.

- General design of Marine unmanned systems
- Intelligent awareness for Marine unmanned systems
- Autonomous decision making for maritime unmanned systems
- Intelligent control of Marine unmanned systems
- Game confrontation of Marine unmanned systems
- Marine unmanned system test technology