

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

数据驱动的无人系统自主感知与安全控制

组织者

1. 柏明明，助理研究员，浙江大学
2. 杨楷翔，副教授，华南理工大学
3. 王孟志，副教授，北京化工大学
4. 徐金明，研究员，浙江大学
5. 许 涛，助理研究员，北京理工大学

个人简介



柏明明，浙江大学工业控制技术全国重点实验室助理研究员，南洋理工大学先进机器人技术创新中心(CARTIN)博士后，分别于中国地质大学(武汉)和哈尔滨工程大学获工学学士和工学博士学位，读博期间赴加拿大麦吉尔大学开展为期一年的联合培养，研究兴趣包括多源信息融合、集群协同导航、网络分布式感知等。近5年以第一/通信作者身份在 IEEE TAC/IEEE TSMC/IEEE TII/IEEE TAES 等国际顶级期刊和 ICRA/IROS/ICASSP 等国际知名会议发表论文 18 篇，获授权专利 6 项，注册软件注册权 4 项。作为负责人主持中国博士后科学基金第 5 批特别资助(站前)、中国博士后科学基金第 74 批面上资助、浙江省基础公益研究计划(探索青年)等项目，作为骨干参与 NSFC 重点项目、联合重点等多项科研任务，担任多个著名期刊审稿人。



杨楷翔，华南理工大学副教授，博士生导师。分别于电子科技大学、哈尔滨工业大学、华南理工大学获得学士、硕士和博士学位；2021 年 1 月至 2023 年 1 月，在浙江大学工业控制技术全国重点实验室从事博士后研究。研究兴趣包括机器学习、数据挖掘、工业智能、无人系统感知等，在国际重要学术期刊和会议发表论文 40 余篇，其中以第一/通讯作者身份发表 IEEE 系列汇刊 13 篇，申请/授权国家发明专利 15 项。主持国家和省部级项目 3 项，担

任多个 SCI 期刊客座编委，曾获 ACM 广州新星奖、CCF 自然科学二等奖、吴文俊人工智能科学技术奖二等奖等。



王孟志，北京化工大学副教授。2019 年 6 月获北京理工大学控制科学与工程专业博士。2017 年 12 月至 2018 年 11 月在加拿大阿尔伯塔大学访问交流。2019 年 7 月至 2023 年 12 月，在浙江大学控制科学与工程学院从事博士后研究工作。2024 年 1 月加入北京化工大学信息科学与技术学院。主要研究方向为智能模型预测控制、数据驱动控制、多智能体协同控制等。在控制领域权威期刊 IEEE TAC、IEEE TCyber、IEEE TIE、IEEE TII 等发表多篇高水平论文。主持国家自然科学基金青年基金、第 16 批博士后特别资助（站中）、浙江省重点研发计划项目子课题、国网电科院项目等多项课题，作为主要参与人承担科技部重点研发计划项目课题、基金委重大项目课题等多项国家级项目。受邀担任 IEEE SmartGridComm 2022、IEEE iSCI-2022 等知名国际会议程序委员会委员。



徐金明，浙江大学研究员、博士生导师，入选国家青年人才计划。2016 年获新加坡南洋理工大学电子信息工程系博士学位。随后分别赴美国亚利桑那州立大学和普渡大学开展博士后研究工作；于 2019 年 9 月加入浙江大学控制科学与工程学院。长期致力于分布式优化和学习基础理论和方法，及其在大规模信号处理、机器学习和多智能体系统等方面应用的研究。主持国家重点研发计划课题、国家自然科学基金面上项目等。在 IEEE TAC、IEEE TSP、Automatica 和 ICML、AISTATS 等国际主要期刊和会议上发表论文 40 余篇，其中一项成果提出的梯度跟踪理论框架攻克了长期以来分布式优化算法无法在时变异步网络下达到线性收敛的难题，并得到分布式优化和学习领域学者的广泛采用。



许涛，北京理工大学助理研究员，入选北京理工大学“特立博士后”支持计划，2022年毕业于北京大学工学院力学系统与控制专业，获工学博士学位。主要研究方向包括分布式事件驱动控制、数据驱动控制等，以第一作者身份在 Automatica、IEEE Trans. 等国际权威期刊与知名会议上发表论文 10 余篇，2 篇入选 IEEE TOP 50 最受欢迎文档，主持中国博士后科学基金 2 项，担任第 4 届系统可靠性与安全工程国际会议、第 7 届全国集群智能与协同控制大会专题分会主席，荣获 2021 年 IEEE 控制系统北京分会青年作者提名奖等荣誉。

特邀专题简介

无人系统以其自主性和灵活性等优势，在军事和民用领域都发挥着举足轻重的作用。然而，在高动态、强干扰、密攻击的开放环境下开展导航、探测、跟踪和控制等复杂任务在当前仍是一项极具挑战性的难题。随着微小型传感器技术和人工智能技术的不断进步，海量数据得以涌现，为复杂环境下无人系统的发展带来了新的机遇。在这一背景下，本专题将探讨数据驱动方法在可靠感知与安全控制中的最新进展和重要突破，寻求能克服模型依赖、提高抗扰性能、增强时变响应、保证系统稳定的新理论新方法，以推动自主无人系统的安全、可靠与弹性发展。本专题会议拟邀请多篇原创的、新颖的高水平学术论文，主要包括（但不限于）以下研究主题：

- 复杂噪声条件下的多模态信息融合理论与导航、跟踪、建图等技术；
- 数据驱动的态势感知理解、时空数据分析以及目标检测分类等理论与技术；
- 数据驱动的故障诊断、攻击检测、威胁识别以及噪声建模等理论与技术；
- 数据驱动的容错控制、弹性控制以及无人系统自我修复等理论与技术。

IEEE ICUS 2024

Invited Session Summary

Title of Session

Data-Driven Autonomous Sensing and Safety Control for Unmanned Systems

Organizers

1. Dr. Mingming Bai

Zhejiang University, China

2. Assoc. Prof. Kaixiang Yang

South China University of Technology

3. Assoc. Prof. Mengzhi Wang

Beijing University of Chemical Technology, China

4. Prof. Jinming Xu

Zhejiang University, China

5. Dr. Tao Xu

Beijing Institute of Technology, China

Biosketches of Organizers



Mingming Bai is a postdoctoral fellow at Centre for Advanced Robotics Technology Innovation (CARTIN), Nanyang Technological University, Singapore, and also an assistant Researcher at State Key Lab of Industrial Control Technology, Zhejiang University, China. He received his B.S. degree and Ph.D from China University of Geosciences (Wuhan) and Harbin Engineering University, respectively. During his Ph.D. he visited McGill University for one year. His research interests include multi-source information fusion, cooperative navigation, and network distributed sensing. He has published 18 papers in top journals such as IEEE TAC, IEEE TSMC, IEEE TII, IEEE TAES, and well-known international conferences including ICRA, IROS, ICASSP, obtained 6 authorized patents, and 4 software copyrights. He is also the principal investigator of several projects such as the China Postdoctoral Science Fund No.5 Special Funding (Pre-Station), the China Postdoctoral Science Foundation No.74 General Fund, and the Zhejiang Provincial Natural Science Foundation (Youth Exploration Project). He has participated in key projects of NSFC and joint key projects as a core member and serves as a peer reviewer for several renowned journals.



Kaixiang Yang is an associate professor at South China University of Technology and a Ph.D. supervisor. He received his B.S., M.S., and Ph.D. degrees from the University of Electronic Science and Technology, Harbin Institute of Technology, and South China University of Technology, respectively; from January 2021 to January 2023, he conducted postdoctoral research at the National Key Laboratory of Industrial Control Technology, Zhejiang University. His research interests include machine learning, data mining, industrial intelligence, unmanned system perception, etc. He has published more than 40 papers in important international academic journals and conferences, including 13 papers in IEEE Transactions as the first/corresponding author, and has applied for/authorized 15 national invention patents. He has presided over 3 national and provincial projects, served as guest editorial board member of several SCI journals, and was awarded the ACM Guangzhou Rising Star Award, the second prize of CCF Natural Science, and the second prize of Wu Wenjun Artificial Intelligence Science and Technology Award.



Mengzhi Wang, Associate Professor of Beijing University of Chemical Technology. In June 2019, he received a doctorate in control science and engineering from Beijing Institute of Technology. From December 2017 to November 2018, he visited the University of Alberta as a joint visitor in Canada. From July 2019 to December 2023, he engaged in postdoctoral research at the School of Control Science and Engineering, Zhejiang University. He joined the School of Information Science and Technology of Beijing University of Chemical Technology in January 2024. The main research directions include intelligent model predictive control, data-driven control, multi-agent collaborative control, etc. He has published many high-level papers in top journals in the field of control such as IEEE TAC, IEEE TCyber, IEEE TIE, and IEEE TII. He hosted a number of projects including the Youth Program of National Natural Science Foundation of China, the 16th Batch of Postdoctoral Special Funding, Key R&D Plan Program of Zhejiang Province, Research Program of State Grid Electric Power, etc., and served as a major participant in the Key R&D Plan Program of Ministry of Science and Technology, Major Program of the National Foundation of China, and many other national projects. He was invited to serve as a program committee member of well-known

international conferences such as IEEE SmartGridComm 2022 and IEEE iSCI-2022.



Jinming Xu, a researcher and doctoral supervisor at Zhejiang University, was selected for the National Youth Talent Program. He received his Ph.D. degree in Electronic and Electrical Engineering from Nanyang Technological University, Singapore, in 2016. Subsequently, he carried out postdoctoral research at Arizona State University and Purdue University in the United States; in September 2019, he joined the College of Control Science and Engineering at Zhejiang University. He has long been committed to the basic theory and methods of distributed optimization and learning, as well as their applications in large-scale signal processing, machine learning, and multi-agent systems. He has presided over key national research and development program projects, National Natural Science Foundation of China projects, etc. He has published more than 40 papers in major international journals and conferences such as IEEE TAC, IEEE TSP, Automatica, ICML, AISTATS, etc. Among his achievements, the gradient tracking theoretical framework he proposed has overcome the long-standing problem that distributed optimization algorithms cannot achieve linear convergence in time-varying asynchronous networks, and has been widely adopted by scholars in the field of distributed optimization and learning.



Tao Xu received the B.S. degree in mathematics from Inner Mongolia University, Hohhot, China, in 2017, and the Ph.D. degree in dynamical systems and control from Peking University, Beijing, China, in 2022. He is currently a Postdoctoral Researcher with the School of Mechatronical Engineering, Beijing Institute of Technology, Beijing, China, and also with the Yangtze Delta Region Academy of Beijing Institute of Technology, Jiaxing, Zhejiang, China. His research interests include event-triggered control, data-driven control, and adaptive control. He was a finalist for IEEE CSS Beijing Chapter Young Author Prize in 2021.

Details of Session

Unmanned systems, with their advantages in autonomy and flexibility, play a pivotal role in both military and civilian domains. However, performing complex tasks such as navigation, detection, tracking, and control in highly dynamic, interference-rich, and attack-prone open environments remains a significant

challenge today. With the continuous advancement of micro-sensor technologies and artificial intelligence, a surge of massive data has emerged, bringing new opportunities for the development of unmanned systems in complex environments. Against this backdrop, this special issue will explore the latest advancements and significant breakthroughs in data-driven methods for reliable sensing and safety control, seeking new theories and methods that can overcome model dependency, enhance anti-interference performance, improve time-varying response, and ensure system stability, thereby promoting the safe, reliable, and resilient development of autonomous unmanned systems. This special session invites a number of original, innovative, high-quality academic papers on topics including (but not limited to):

- Multimodal information fusion theories and technologies for navigation, tracking, and mapping under complex noise conditions;
- Data-driven situation awareness understanding, spatiotemporal data analysis, and theories and technologies for target detection and classification;
- Data-driven fault diagnosis, attack detection, threat identification, and noise modelling theories and technologies;
- Data-driven fault-tolerant control, resilient control, and theories and technologies for unmanned system self-repair.