2026 第九届 IEEE 国际无人系统大会

特邀专题简介表

特邀专题名称
数据赋能的无人系统态势感知、智能规划与协同控制

组织者
1.曲桂娴，副研究员，北京航空航天大学/天目山实验室
2.邱天，副研究员，北京航空航天大学/天目山实验室
3.甘宸宇，博士后，北京航空航天大学
4.高自强，博士后，天目山实验室
5.郭侃，讲师，北京工业大学

个人简介

曲桂娴，北京航空航天大学副研究员。从事人工智能与空天动力系统交叉研究：复杂系统故障诊断与健康管理；无人系统自主感知控制技术。入选北京科协"高创计划"青年人才托举工程。主持国家自然科学基金青年基金、航空发动机及燃气轮机基础科学中心重点项目、北京市自然基金面上项目等 4 项；代表性成果在 IEEE 国际权威汇刊如《IEEE Transactions on Vehicular Technology》，《IEEE Transactions on Mobile Computing》等国际知名期刊/会议上发表学术论文 20 余篇。

邱天，北京航空航天大学副研究员。北京航空航天大学"未来航空发动机协同设计中心"副主任，长期从事航空发动机系统科学研究。"教育部先进航空发动机协同创新中心"、"教育部超循环气动热力前沿科学中心"核心骨干。国家重点型号支撑团队及某型发动机联合设计团队现场技术牵头人，长期在型号研制一线工作，第一时间发现并利用基础研究积累解决问题，中国航发四川燃气涡轮研究院首位"柔性引智"专家，入选军科委"科技领域青年人才托举工程"。

甘宸宇，北京航空航天大学博士后，北京航空航天大学博士、北航-Cranfield 双学位公派硕士。致力于航空发动机系统安全性、可持续航空燃料安全评估研究及应用工作。共发表包括安全性领域顶刊 Reliability Engineering & System Safety 等学术论文 16 篇，申请国家发明专利 6 项、软件著作 2 项。参与科研项目十余项，在 4 个项目中担任负责人或专题负责人。曾获国家留学基金委创新型人才、北京市优秀博士毕业生、中国航空学会博士学位论文托举工程等荣誉称号或奖项。

高自强，博士后。长期专注于航空涡扇发动机总体性能分析、空气系统与热端部件的流动换热仿真与设计，以及面向 eVTOL 的高推力密度、低噪声涵道风扇系统设计与性能评估。发表多篇高水平学术论文及 10 余项国家发明专利。长期扎根航发一线，为中国航发沈阳发动机研究所、中国航发四川燃气涡轮研究院、中国航发商用航空发动机有限责任公司、中国航发湖南动力机械研究所等研究单位提供了优质的技术服务与解决方案。

郭侃，讲师。主持国家自然科学基金委员会青年科学基金项目 1 项，在时间序列数据、注意力机制、图卷积网络、图注意力网络和图表示学习等方面进行了深入的理论研究并取得了多项重要研究成果。发表论文收录在《Proceedings of the AAAI Conference on Artificial Intelligence》、《IEEE Transactions on Intelligent Transportation Systems》、《IEEE Intelligent Transportation Systems Magazine》等国际人工智能与智能交通领域顶级会议与 SCI 检索期刊上，其中一作 2 篇为 ESI 高被引论文；作为研究骨干，参与国家自然科学基金项目 2 项，北京市自然科学基金项目 1 项。

特邀专题简介

　　本专题聚焦于数据驱动技术在自主无人系统（UAV/UGV/UUV）中的全链路应用，旨在探讨如何利用海量数据与人工智能算法，实现从环境感知、任务规划到动力执行的深度融合。专题致力于展示数据赋能下，无人系统在复杂动

态环境中的智能化水平提升，特别关注新型动力推进系统与智能控制策略的耦合优化，以及多智能体间的协同作业能力，为解决高维、非线性及不确定性条件下的自主控制难题提供理论突破与工程实践参考。

主要征稿范围（包括但不限于）：

1. 数据驱动的态势感知与认知：聚焦复杂非结构化环境下的环境理解难题，涵盖多源传感信息（视觉/雷达等）融合技术、基于边缘计算的实时数据处理与特征提取，以及高精度的态势理解与语义建图方法等。

2. 智能决策与动态规划：探讨不确定性环境下的自主决策机制，包括面向多任务场景的智能任务分配与行为决策算法、基于深度强化学习（DRL）的轨迹规划，以及复杂动态约束下的实时避障与在线航路优化技术等。

3. 动力系统建模与鲁棒控制：针对新型推进系统研究其高保真动态建模方法、在线参数辨识技术以及应对外部扰动的鲁棒控制策略等。

4. 系统协同与运维：多智能体编队协同控制与通信拓扑优化，以及基于数字孪生与数据驱动的动力系统健康监测（PHM）及预测性维护技术等。

IEEE ICUS 2026
Invited Session Summary

Title of Session

Data-Enabled Situational Awareness, Intelligent Planning, and Cooperative Control of Unmanned Systems

Organizers

1. **Assoc. Prof. Guixian Qu**
   Beihang University/Tianmushan Laboratory, China
2. **Assoc. Prof. Tian Qiu**
   Beihang University/Tianmushan Laboratory, China
3. **Dr. Chenyu Gan**
   Beihang University, China
4. **Dr. Ziqiang Gao**
   Tianmushan Laboratory, China
5. **Dr. Kan Guo**
   Beijing University of Technology, China

Biosketches of Organizers

Guixian Qu is currently an Associate Research Fellow. Her research interests lie in the interdisciplinary field of Artificial Intelligence and Aerospace Propulsion Systems, with a specific focus on fault diagnosis and health management (PHM) of complex systems, as well as autonomous perception-control technologies for unmanned systems. She has been selected for the "High-Innovation Program" Youth Talent Lift Project by the Beijing Association for Science and Technology. She serves as the Principal Investigator (PI) for four research projects, including the National Natural Science Foundation of China (Youth Fund), a Key Project of the Basic Science Center for Aero-Engines and Gas Turbines, and a General Program of the Beijing Municipal Natural Science Foundation. She has published over 20 academic papers in renowned international journals and conferences, with representative results appearing in authoritative journals such as IEEE Transactions on Vehicular Technology and IEEE Transactions on Mobile Computing.

Tian Qiu is currently an Associate Research Fellow. He serves as the Deputy Director of the Collaborative Design Center for Future Aero-Engines at Beihang University. He has long been dedicated to research in aero-engine system science. He is a core member of the Collaborative Innovation Center for Advanced Aero-Engine and the Frontiers Science Center for Ultra-Cycle Aerodynamics and Thermodynamics, both under the Ministry of Education. He serves as the on-site technical lead for the National Key Model Support Team and the Joint Design Team for a specific engine model. With extensive experience on the front lines of model development, he specializes in promptly identifying critical issues and leveraging fundamental research to provide effective solutions. He is the first expert appointed under the "Flexible Talent Introduction" scheme at the AECC Sichuan Gas Turbine Establishment. Additionally, he has been selected for the "Youth Talent Lift Project" in the technology field by the Science and Technology Commission of the Central Military Commission (CMC).

Chenyu Gan is currently a Postdoctoral Fellow at Beihang University. He holds a Ph.D. from Beihang University and a Dual Master's degree from Beihang University and Cranfield University (State-sponsored). His research focuses on aero-engine system safety and the safety assessment of Sustainable Aviation Fuels (SAF). Dr. Gan has published 16 academic papers, including articles in top-tier journals such as Reliability Engineering & System Safety, and has applied for 6 national invention patents and 2 software copyrights. He has participated in over ten research projects, serving as the Project Leader or Topic Lead in four of them. His honors include the China Scholarship Council (CSC) Innovative Talent Award, the title of Outstanding Doctoral Graduate of Beijing, and the Doctoral Dissertation Sponsorship Project of the Chinese Society of Aeronautics and Astronautics (CSAA).

Ziqiang Gao is currently a Postdoctoral Researcher. His research interests focus on the overall performance analysis of turbofan engines, flow and heat transfer simulation and design for air systems and hot-section components, as well as the design and performance evaluation of high thrust density and low-noise ducted fan systems for eVTOL aircraft. He has published multiple high-level academic papers and holds over 10 national invention patents. With extensive experience working on the front lines of aero-engine development, Dr. Gao has provided high-quality technical services and solutions to major research institutes, including the AECC Shenyang Engine Research Institute, AECC Sichuan Gas Turbine

Establishment, AECC Commercial Aircraft Engine Co., Ltd., and AECC Hunan Aviation Powerplant Research Institute.

Kan Guo is currently a Lecturer. He serves as the Principal Investigator (PI) for a Youth Science Fund project under the National Natural Science Foundation of China (NSFC). His research involves in-depth theoretical exploration in fields such as time series data, attention mechanisms, Graph Convolutional Networks (GCN), Graph Attention Networks (GAT), and graph representation learning, where he has achieved significant results. His work appears in top-tier international conferences and SCI-indexed journals, such as the Proceedings of the AAAI Conference on Artificial Intelligence, IEEE Transactions on Intelligent Transportation Systems, and IEEE Intelligent Transportation Systems Magazine. Notably, two of his first-author papers are designated as ESI Highly Cited Papers. Additionally, as a core researcher, he has participated in two NSFC projects and one project funded by the Beijing Municipal Natural Science Foundation.

Details of Session

This special topic focuses on the full-chain application of data-driven technologies in autonomous unmanned systems (UAVs, UGVs, UUVs). It aims to explore how massive data and artificial intelligence algorithms can facilitate the deep integration of environmental perception, mission planning, and propulsion execution. The topic seeks to showcase the intelligence enhancements of unmanned systems in complex dynamic environments under the empowerment of data. Particular emphasis is placed on the coupling optimization of novel propulsion systems with intelligent control strategies, as well as the cooperative operational capabilities among multi-agents. By doing so, this session provides a platform for theoretical breakthroughs and engineering practices to address autonomous control challenges under high-dimensional, nonlinear, and uncertain conditions.

Scope of Topics (including but not limited to):

1. **Data-Driven Situational Awareness and Cognition**

Focusing on environment understanding in complex unstructured settings, including multi-source sensor fusion (vision, LiDAR, etc.), real-time data processing and feature extraction based on edge computing, and high-precision situational understanding and semantic mapping.

2. **Intelligent Decision-Making and Dynamic Planning**

Exploring autonomous decision-making mechanisms in uncertain environments, covering intelligent task allocation and behavioral decision algorithms for multi-mission scenarios, trajectory planning based on Deep Reinforcement

Learning (DRL), and real-time obstacle avoidance and online route optimization under complex dynamic constraints.

3. Propulsion System Modeling and Robust Control

Researching high-fidelity dynamic modeling methods, online parameter identification techniques, and robust control strategies against external disturbances, specifically tailored for novel propulsion systems.

4. System Synergy and Maintenance

Covering cooperative formation control and communication topology optimization for multi-agents, as well as power system health monitoring (PHM) and predictive maintenance driven by digital twins and data-driven approaches.