Special Session XX

Special Session Basic Information:

专栏题目 **Session Title**	中文：人工智能在超导电力中的应用 英文：Applications of Artificial Intelligence in Superconducting Power

专栏介绍和征稿主题
Introduction and topics

中文：超导技术正从基础研究走向工程应用，能源电力方向涵盖超导带材、超导缆线、超导磁体及超导限流器/储能等能源装备。这些对象在极端工况下多物理场强耦合，传统机理建模面临计算成本高、泛化能力弱等挑战。人工智能方法为突破瓶颈提供了新路径：在带材层级加速性能预测，在缆线层级实现状态监测，在磁体层级探索失超预警，在装备层级开展健康评估与寿命预测。本专题汇集上述方向的同行，推动人工智能在超导能源领域的务实落地。

本专题聚焦人工智能与超导电力交叉领域中当前最具落地潜力的研究方向，征集以下内容（包括但不限于）：

超导带材/导体临界特性数据驱动建模
超导设备多物理场代理模型与快速仿真
基于运行数据的超导电缆/限流器健康状态评估
超导磁体失超预测与早期预警
超导储能系统功率响应的智能学习策略
超导设备退化建模与剩余寿命预测

英文：Superconducting technology is transitioning from fundamental research to engineering applications. In the energy and power sector, this spans superconducting tapes, cables, magnets, and power equipment such as superconducting fault current limiters and energy storage systems. These components exhibit strong multiphysics coupling under extreme operating conditions, posing challenges to conventional mechanism-based modeling, which often suffers from high computational costs and limited generalization capabilities. Artificial intelligence offers a new pathway to overcome these bottlenecks: accelerating performance prediction at the tape level, enabling condition monitoring at the cable level, exploring quench warning at the magnet level, and facilitating health assessment and lifetime prediction at the equipment level. This special session brings together researchers in these directions, aiming to promote the pragmatic implementation of artificial intelligence in the field of superconducting energy.

Topics of interest include, but are not limited to:

Data-driven modeling of critical characteristics for superconducting tapes/conductors
Multi-physics surrogate models and fast simulation of superconducting equipment
Operational-data-based health assessment for superconducting cables and fault current limiters
Quench prediction and early warning for superconducting magnets
Intelligent learning strategies for power response of superconducting magnetic energy storage
Degradation modeling and remaining useful life prediction for superconducting devices

Special Session Chair(s):

姓名 **Name**	杨俊峰
称谓 **Prefix**	讲师
部门 **Department**	电气工程学院 应用超导技术研究中心
单位 **Organization**	北京交通大学
城市/地区 **City/Region**	北京

	邮箱 **Email**	yangjunfeng@bjtu.edu.cn

Organizer's Brief Biography

中文： 长期从事超导电力应用技术研究，主要方向包括超导限流器并网特性分析、三相同轴超导电缆运维关键技术、超导磁体低温测试与性能评估。近年来，主持或参与国家重点研发计划“大容量超导电机技术及装备”（2025－2027）、国网公司“电阻电感混合型超导限流器关键技术和应用评价方法研究”（2025－2026）、南网公司“三相同轴超导电缆运维关键技术和装备研发”（2023－2025）等多项科研项目。在超导设备仿真、运行数据特征提取及健康状态评估方面积累了扎实的研究基础。

英文：Dr. Yang has long been engaged in research on superconducting power applications, with his main interests encompassing the grid-integration characteristic analysis of superconducting fault current limiters, key operation and maintenance technologies for three-phase coaxial superconducting cables, as well as cryogenic testing and performance evaluation of superconducting magnets. In recent years, he has led or participated in multiple research projects, including the National Key R&D Program project "Technology and Equipment for Large-Capacity Superconducting Machines" (2025－2027), the State Grid Corporation project "Research on Key Technologies and Application Evaluation Methods for Resistive-Inductive Hybrid Superconducting Fault Current Limiters" (2025－2026), and the China Southern Power Grid project "Research and Development of Key Technologies and Equipment for Operation and Maintenance of Three-Phase Coaxial Superconducting Cables" (2023－2025). He has established a solid research foundation in areas such as superconducting equipment simulation, operational data feature extraction, and health status assessment.

姓名 **Name**	李超
称谓 **Prefix**	副教授
部门 **Department**	电气自动化与信息工程学院　国家储能技术产教融合创新平台
单位 **Organization**	天津大学
城市/地区 **City/Region**	天津
邮箱 **Email**	xuying@hust.edu.cn

Organizer's Brief Biography

中文： 天津大学英才副教授，剑桥大学电气工程专业博士，德国卡尔斯鲁厄大学访问科学家；英国物理协会青年学者基金获得者；剑桥大学 Cambridge Trust Scholar；从事电力系统保护与控制、储能安全运维、高温超导应用技术等方向的研究。主持国家自然科学基金、科技部重点研发计划子任务、军委科技委国防基础项目、天津市政府重点咨询项目等纵向项目四项，国网总部科技项目等横向项目十余项，发表 SCI 论文 70 余篇。在超导设备电磁设计与智能控制方法的交叉研究方面具有鲜明特色。

英文：

Dr. Chao Li is an Elite Associate Professor at Tianjin University and a supervisor for master's students. He earned his Ph.D. in Electrical Engineering from the University of Cambridge and has served as a Visiting Scientist at Karlsruhe Institute of Technology (KIT) in Germany. He is a recipient of the Institute of Physics (IOP) Young Scientist Award and was a Cambridge Trust Scholar during his doctoral studies. His research interests encompass power system protection and control, safe operation and maintenance of energy storage systems, and applied high-temperature superconductivity technologies. Dr. Li has led four significant government-funded research projects, including grants from the National Natural Science Foundation of China (NSFC), sub-tasks under the Ministry of Science and Technology"s National Key R&D Program, foundational research projects for the Science and Technology Commission of the Central Military Commission, and key consulting projects for the Tianjin Municipal Government. Additionally, he has spearheaded over ten industry-sponsored projects, including those funded by the State Grid Corporation"s headquarters. He has authored or co-authored more than 70 peer-reviewed journal papers indexed by SCI. His research is distinctively characterized by its interdisciplinary focus, integrating electromagnetic design principles with intelligent control methodologies for superconducting devices.

姓名 Name	徐颖
称谓 Prefix	副教授
部门 Department	电气与电子工程学院 超导电力研究与发展中心（RECAS）
单位 Organization	华中科技大学
城市/地区 City/Region	武汉
邮箱 Email	xuying@hust.edu.cn

Organizer's Brief Biography

中文： 长期从事超导电力应用技术研究，主要方向涵盖超导磁体/导体特性建模、超导限流器与超导储能系统动态响应、失超传播机理与早期预警方法等。作为超导电力研究与发展中心教学科研骨干，深度参与多项超导限流器、超导电缆、超导储能领域的国家自然科学基金及国网公司科技项目，在超导材料性能数据建模、多物理场代理模型构建等方面具有扎实积累。

英文：Dr. Xu Ying has long been engaged in research on superconducting power applications, with her main research directions encompassing the characteristic modeling of superconducting magnets/conductors, the dynamic response of superconducting fault current limiters and superconducting magnetic energy storage systems, as well as quench propagation mechanisms and early warning methods. As a core faculty member in both teaching and research at the Superconducting Power Research and Development Center (RECAS), she has deeply participated in numerous projects of the National Natural Science Foundation of China and technology projects of the State Grid Corporation in the fields of superconducting fault current limiters, superconducting cables, and superconducting magnetic energy storage. She has accumulated solid expertise in data modeling of superconducting material properties and the construction of multi-physics surrogate models.