

Special Session III

Special Session Basic Information:

专栏题目 Session Title

中文：人工智能技术在电力市场、电力系统自动化的应用
英文：The Application of Artificial Intelligence Technology in the Electricity Market and Power System Automation

专栏介绍和征稿主题 Introduction and topics

中文：人工智能技术在电力市场、电力系统自动化的应用

随着全球能源转型加速和新型电力系统加快建设，人工智能技术正深度融入电力市场运营与电力系统自动化环节，成为提升能源系统灵活性、可靠性与绿色性的关键驱动。从高精度预测、智能调控到碳电协同管理，AI为电力市场高效运作、电网安全稳定及碳减排目标落地提供了全新解决方案。本专题聚焦人工智能在电力市场交易、碳排放管理、系统自动化运维及政策仿真等方面的前沿研究，旨在推动“人工智能+能源”领域的创新实践与理论突破。

征稿主题包括但不限于：

1. 市场价格、供需、趋势预测与分析

人工智能技术在电力负荷预测、新能源发电功率预测（如风电、光伏）以及电价波动分析中的应用。

2. 智能交易策略、组合优化、交易风险评估

基于强化学习的电力市场竞价与交易决策，虚拟电厂（VPP）聚合优化，以及市场风险智能管控。

3. 数据监测与核算、碳排放减排策略与优化

人工智能支持碳排放监测、核算，以及通过多能互补系统优化实现减排。

4. 能源系统优化、协作与管理

人工智能在电网智能调度、源网荷储协同、储能优化调控及系统韧性提升中的应用。

5. 能源政策制定、监管与合规检查

人工智能技术在政策效果模拟、合规性智能审查及电力市场规则优化中的支撑作用。

6. 新型电力系统

人工智能技术在提升系统稳定性、灵活性和智能化水平，以及故障预测、负荷优化、网络安全等场景的应用。

7. 电力系统自动化与智能运维

智能巡检与故障诊断：无人机、机器人自动巡检；基于图像识别、声纹分析等技术的设备故障预测与健康管理工作（如输电线路、变压器、电动机等关键设备）。

电网调度与控制自动化：AI驱动电网智能调度辅助决策；配电网实时感知与协同控制；基于强化学习的无功优化与电压自动调节。

现场作业自动化与安全管控：基于AI视觉的作业行为安全监控与风险预警；操作票自动生成与智能许可；应急抢修无人化调度与预案自主生成。

英文：The application of artificial intelligence technology in the electricity market and power system automation

With the acceleration of global energy transition and the rapid construction of new power systems, artificial intelligence (AI) technology is deeply integrated into the operation of power markets and the automation of power systems, becoming a key driver for enhancing the flexibility, reliability, and greenness of energy systems. From high-precision prediction, intelligent regulation and control to carbon and electricity coordinated management, AI provides new solutions for the efficient operation of power markets, the safety and stability of power grids, and the realization of carbon emission reduction targets. This special topic focuses on the cutting-edge research of AI in power market transactions, carbon emission management, system automation operation and maintenance, and policy simulation, aiming to promote innovative practices and theoretical breakthroughs in the field of "AI + Energy".

The topics for submission include, but are not limited to:

1. Market Price, Supply and Demand, Trend Prediction and Analysis

The application of AI technology in power load forecasting, new energy generation power prediction (such as wind power and photovoltaic power), and electricity price fluctuation analysis.

2. Intelligent Trading Strategies, Portfolio Optimization, and Trading Risk Assessment

AI-driven bidding and trading decisions in the power market based on reinforcement learning, virtual power plant (VPP) aggregation optimization, and intelligent market risk management.

3. Data Monitoring and Accounting, Carbon Emission Reduction Strategies and Optimization

AI-supported carbon emission monitoring and accounting, as well as emission reduction through the optimization of multi-energy complementary systems.

4. Energy System Optimization, Collaboration and Management

The application of AI in intelligent power grid dispatching, source-grid-load-storage coordination, energy storage optimization control, and system resilience enhancement.

5. Energy Policy Formulation, Regulation and Compliance Inspection

The supporting role of AI technology in policy effect simulation, intelligent compliance review, and optimization of power market rules.

6. New Power Systems

The application of AI technology in enhancing system stability, flexibility, and intelligence levels, as well as in scenarios such as fault prediction, load optimization, and network security.

7. Power System Automation and Intelligent Operation and Maintenance

Intelligent inspection and fault diagnosis: automatic inspection by drones and robots; equipment fault prediction and health management based on image recognition, voiceprint analysis, etc. (such as transmission lines, transformers, electric motors, and other key equipment).

Grid dispatching and control automation: AI-driven intelligent grid dispatching assistance; real-time perception and collaborative control of distribution networks; reactive power optimization and automatic voltage regulation based on reinforcement learning.

On-site operation automation and safety control: AI vision-based operation behavior safety monitoring and risk warning; automatic generation of operation tickets and intelligent permission; unmanned emergency repair dispatching and autonomous generation of emergency plans.

Special Session Chair(s):

	姓名 Name	张严, Zhang Yan
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Organizer's Brief Biography

中文: 张严, 华南理工大学电工理论与新技术专业获得博士学位, 现任广东财经大学智能计算与大数据技术研究中心主任, 副教授, 硕士生导师。编写教材 2 部, 专著 1 部, 主持教研科研项目 20 余项, 在《Advanced Science》《Artificial Intelligence Review》等主流期刊上发表学术论文 50 余篇; 指导学生获得全国大学生统计建模大赛一等奖、全国大学生智能车竞赛总决赛一等奖、中国教育机器人大赛决赛一等奖; 指导学生项目获得国家级大学生创新创业项目多项。担任广东省发展和改革委员会战略专家、数字广东建设专家委员会专家、全国研究生教育评估监测专家、教育部产学研合作协同育人项目专家、广东省综合评标评审专家、广东省人工智能产业协会智库专家。

英文: Zhang Yan, obtained his Ph.D degree in Electrical Engineering Theory and New Technologies from South China

University of Technology He currently serves as the Director of the Intelligent Computing and Big Data Technology Research Center at Guangdong University of Finance and Economics, an associate professor, and a master's supervisor. He has authored two textbooks and one monograph, led over 20 teaching and research projects, and published more than 50 academic papers in mainstream journals such as *Advanced Science* and *Artificial Intelligence Review*. Under his guidance, students have won first prizes in the National College Student Statistical Modeling Competition, the National College Student Intelligent Car Competition Finals, and the China Educational Robot Competition Finals. Additionally, he has mentored student projects that secured multiple national-level innovation and entrepreneurship grants for college students. He also serves as a strategic expert for the Guangdong Provincial Development and Reform Commission, an expert member of the Digital Guangdong Construction Expert Committee, a national expert in graduate education evaluation and monitoring, an expert in the Ministry of Education's industry-academia collaboration and talent development programs, a comprehensive bid evaluation expert for Guangdong Province, and a think tank expert for the Guangdong Artificial Intelligence Industry Association.

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Organizer's Brief Biography

中文：莫理莉，华南理工大学工学博士，硕士生导师，国家注册电气工程师。中国电工技术学会工业与建筑应用电气专业委员会副主任委员，广东省工程勘察设计行业协会电气及自动化专业委员会副会长，研究方向为建筑综合能源微网、虚拟电厂、新能源电力系统等，发表论文 30 余篇。

英文：Mo Lili, Ph.D. in Engineering from South China University of Technology, Master's supervisor and nationally registered electrical engineer. She is the Deputy Director of the Industrial and Building Application Electrical Professional Committee of the China Electrotechnical Society, Vice President of the Electrical and Automation Professional Committee of the Guangdong Engineering Survey and Design Industry Association. Her research focuses on integrated building energy microgrids, virtual power plants, Building-Grid Interaction Technology and new energy power systems, and she has published over 30 papers.

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Organizer's Brief Biography

中文：梁博士毕业于华南理工大学电力学院，感兴趣的研究方向包括非线性动力学系统建模、电力系统稳定性分析和电气故障诊断等。目前，主要致力于变压器、电机等电气设备的故障诊断研究。

英文：Dr. Liang graduated from the School of Electric Power Engineering at South China University of Technology. His research interests include nonlinear dynamic system modeling, power system stability analysis, and electrical fault diagnosis. Currently, he is primarily engaged in research on fault diagnosis of electrical equipment such as transformers and motors.