

Special Session VIII

Special Session Basic Information:

专栏题目 Session Title	中文：智算中心算-电-冷协同运行与安全控制技术 英文：Coordinated Computing-Power-Cooling Operation and Security Control Technologies for AI Data Centers
专栏介绍和征稿主题 Introduction and topics	
中文：随着人工智能大模型、高性能计算和云边协同应用的快速发展，智算中心正成为新型电力系统中高功率密度、强动态特性和高调节潜力的重要负荷。智算中心内部计算任务、供配电系统、储能设备及冷却系统之间存在显著的多时间尺度耦合关系，其运行状态不仅直接影响能效、可靠性和计算服务质量，也对电网功率平衡、电压稳定、频率响应及安全运行提出新的挑战。面向绿色、高效和安全运行需求，有必要开展算力、电力与冷却系统的协同建模、优化运行、风险评估与安全控制研究，并充分挖掘储能、UPS、可调节计算任务及冷却系统的灵活调节能力，提升智算中心对电网的主动支撑能力。 1. 智算中心算-电-冷多物理域耦合建模与数字孪生； 2. 计算任务、供配电及冷却系统协同优化与多时间尺度调度； 3. 智算中心运行状态感知、风险评估与安全边界分析； 4. UPS、储能及新能源供能系统协同运行与能量管理； 5. 智算中心交直流供配电系统及先进电力电子接口技术； 6. 智算中心负荷灵活性建模、需求响应与电网友好互动； 7. 大规模智算中心接入下电力系统电压、频率及稳定性分析； 8. 面向故障及扰动的智算中心安全控制与韧性运行； 9. 人工智能、多智能体及大模型驱动优化运行与自主控制； 英文：With the rapid development of large-scale artificial intelligence models, high-performance computing, and cloud-edge collaborative applications, AI data centers are emerging as important loads in modern power systems, characterized by high power density, fast dynamics, and significant flexibility potential. Within AI data centers, computing workloads, power supply and distribution systems, energy storage devices, and cooling systems exhibit significant multi-timescale coupling. Their operating conditions not only directly affect energy efficiency, reliability, and quality of computing services, but also introduce new challenges to power balancing, voltage stability, frequency response, and secure grid operation. To meet the requirements of green, efficient, and secure operation, it is necessary to investigate coordinated modeling, optimal operation, risk assessment, and secure control of computing, power, and cooling systems, while fully exploiting the flexibility of energy storage, UPS systems, controllable computing workloads, and cooling systems to enhance the active grid-support capability of AI data centers. 1. Multi-physics coupled modeling and digital twins of computing-power-cooling systems in AI data centers; 2. Coordinated optimization and multi-timescale scheduling of computing workloads, power supply and distribution systems, and cooling systems; 3. Operational state awareness, risk assessment, and security boundary analysis of AI data centers; 4. Coordinated operation and energy management of UPS systems, energy storage, and renewable energy supply systems; 5. AC/DC power supply and distribution systems and advanced power electronic interfaces for AI data centers; 6. Flexibility modeling, demand response, and grid-friendly interaction of AI data centers; 7. Voltage, frequency, and stability analysis of power systems with large-scale integration of AI data centers; 8. Secure control and resilient operation of AI data centers under faults and disturbances; 9. AI-, multi-agent-, and large-language-model-enabled optimal operation and autonomous control.	

Special Session Chair(s):

	姓名 Name	邵俊岩 / Junyan Shao
	称谓 Prefix	讲师 / Lecturer
	部门 Department	先进制造与机器人学院 / Department of Electrical Engineering
	单位 Organization	北京大学 / Peking University
	城市/地区 City/Region	北京 / Beijing

Organizer's Brief Biography	
中文：邵俊岩，北京大学先进制造与机器人学院讲师，主要从事智算中心能源管理、新型电力系统优化运行、数字孪生及人工智能驱动的能源系统控制等方面研究。近年来围绕算-电-冷耦合优化、综合能源系统及电力系统安全稳定开展相关研究工作。 英文：Junyan Shao is a Lecturer at the School of Advanced Manufacturing and Robotics, Peking University. His research interests include energy management of AI data centers, optimal operation of modern power systems, digital twins, and AI-enabled control of energy systems. His recent work focuses on computing-power-cooling coordination, integrated energy systems, and power system security and stability.	

	姓名 Name	郭东波 / Dongbo Guo
	称谓 Prefix	助理研究员 / Assistant Researcher
	部门 Department	电机工程与应用电子技术系 / Department of Electrical Engineering
	单位 Organization	清华大学 / Tsinghua University
	城市/地区 City/Region	北京 / Beijing

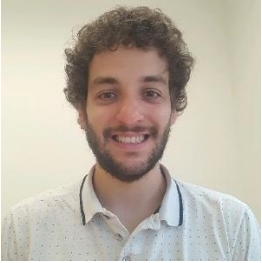
Organizer's Brief Biography	
中文：郭东波，清华大学电机工程与应用电子技术系助理研究员，主要从事新型电力系统电压控制、高效电能变换与利用以及电力电子装备等方面研究，关注先进电能变换技术及其在新型电力系统灵活运行与控制中的应用。 英文：Dongbo Guo is an Assistant Researcher with the Department of Electrical Engineering, Tsinghua University. His research interests include voltage control of modern power systems, high-efficiency power conversion and utilization, and power electronic equipment, with a particular focus on advanced power conversion technologies for flexible power system operation and control.	

	姓名 Name	李曙光 / Shuguang Li
	称谓 Prefix	实验师 / Experimentalist
	部门 Department	电气工程学院 / School of Electrical Engineering
	单位 Organization	东北电力大学 / Northeast Electric Power University
	城市/地区 City/Region	吉林 / Jilin, China

Organizer's Brief Biography

中文：李曙光，东北电力大学电气工程学院教师，主要从事配电网运行分析、故障诊断与定位、电力系统安全与韧性、主动配电网优化调度等方面研究，并关注新能源接入背景下电力系统运行与控制技术。

英文：Shuguang Li is with the School of Electrical Engineering, Northeast Electric Power University. His research interests include distribution system operation and analysis, fault diagnosis and location, power system security and resilience, and optimal operation of active distribution networks, with particular attention to power system operation and control under increasing renewable energy integration.

	姓名 Name	Thales Augusto Fagundes
	称谓 Prefix	博士后研究员 / Postdoctoral Researcher
	部门 Department	电气与计算机工程系 / Department of Electrical and Computer Engineering
	单位 Organization	圣保罗大学圣卡洛斯工程学院 / São Carlos School of Engineering, University of São Paulo
	城市/地区 City/Region	圣卡洛斯，巴西 / São Carlos, Brazil

Organizer's Brief Biography

中文：Thales Augusto Fagundes，圣保罗大学圣卡洛斯工程学院电气与计算机工程系博士后研究员，主要从事微电网、储能系统、能源管理及电力电子控制等方面研究，重点关注储能荷电状态均衡、微电网优化运行、非线性与鲁棒控制以及人工智能驱动的能源管理技术。

英文：Thales Augusto Fagundes is a Postdoctoral Researcher with the Department of Electrical and Computer Engineering, São Carlos School of Engineering, University of São Paulo, Brazil. His research interests include microgrids, energy storage systems, energy management, and power electronic control, with particular emphasis on state-of-charge balancing, optimal microgrid operation, nonlinear and robust control, and AI-enabled energy management.

	姓名 Name	Özgür Çelik
	称谓 Prefix	副教授 / Associate Professor
	部门 Department	能源系统工程系 / Energy Systems Engineering
	单位 Organization	阿达纳阿尔帕尔斯拉·图尔克科学技术大学 / Adana Alparslan Türkeş Science and Technology University
	城市/地区 City/Region	阿达纳，土耳其 / Adana, Türkiye

Organizer's Brief Biography

中文：Özgür Çelik，Adana Alparslan Türkeş Science and Technology University 副教授，主要从事电力电子变换器控制、可再生能源并网及能源效率等方面研究，重点关注新能源系统中的先进电能变换与控制技术。

英文：Özgür Çelik is an Associate Professor at Adana Alparslan Türkeş Science and Technology University, Türkiye. His research interests include control of power electronic converters, grid integration of renewable energy systems, and energy efficiency, with particular emphasis on advanced power conversion and control technologies for renewable energy applications.