

## Call for Papers

### Special Issue on “Advances in AI, Graph Computing, GNNs, and LLMs for Power System Applications”

#### Important Dates

**Full Paper Submission: March 31, 2025**

**Final Decision Notification: June 30, 2025**

**Publication of Special Issue: September 30, 2025**

The rapid evolution of power systems, driven by the increasing complexity of grid operations and the integration of renewable energy sources, necessitates innovative solutions to overcome the limitations of traditional methods in planning, operation, control, and asset management. Artificial Intelligence (AI), with its capacity for fast, robust, and adaptive decision-making, offers a promising avenue to address these challenges. However, most existing AI models lack the ability to detect connections and traverse relationships within diverse datasets effectively. This is where graph-based technologies, such as Graph Computing, Graph Neural Networks (GNNs), and Knowledge Graphs (KGs), come into play. By representing entities as nodes and their relationships as edges, these technologies can uncover and navigate complex relationships across data, revealing context and enabling more informed decision-making. The fusion of AI with graph computing technologies thus holds immense potential to revolutionize power system management by providing new insights and capabilities. Furthermore, the integration of Large Language Models (LLMs) into this framework opens up additional avenues for innovation. LLMs, with their advanced natural language processing capabilities, can enhance the interpretability and accessibility of complex data and AI-driven insights within power systems. By incorporating LLMs, the power system industry can benefit from more intuitive communication of technical information, improved user interaction, and streamlined decision-making processes. The interpretability, interaction between human and machines, and the integration of the data-driven and the knowledge-driven methods draw attention in AI and power researches.

This special issue seeks to explore the cutting-edge research and practical graph-based applications of AI, GNNs, and LLMs (including Multi-modal large model and Large Data Model), in power systems. We invite contributions that demonstrate how these technologies can be harnessed to enhance the planning, operation, and control of power systems, address scalability and efficiency challenges, and drive the future of intelligent power system management.

Topics of interest include, but are not limited to:

- Development of graph computing, AI, GNNs, and LLMs methods and tools will help address power system planning, operation, control and asset management critical issues such as performance, usability, accuracy, interpretability and confidence;
- Applications for Graph Computing, AI, GNNs, LLMs in power system planning, including spatial-temporal load forecast, capacity optimization, site selection, and simulation calculation;
- Applications for Graph Computing, AI, GNNs, LLMs in power system operation, including On-line, real-time dynamic security assessment (DSA), OPF/SCUC/SCED approximation and speed up OPF/SCUC/SCED solution;
- Applications for Graph Computing, AI, GNNs, LLMs in power system control and protection,

including preventive and corrective control, SPS, fault detection, alarm processing;

- Applications for Graph Computing, AI, GNNs, LLMs in power system asset management, including outage management, asset management, equipment maintenance and cyber security;
- Applications for Graph Computing, AI, GNNs, LLMs in electricity market, including day-ahead, intra-day and real-time market, retail market, demand side management and vehicle-grid integration;
- Demonstration project and practical experience of graph computing, AI, GNNs, and LLMs applications.

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