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Enabling Large Language Models to Perform Power System Simulations with Previously Unseen Tools: A Case of Daline



贾孟硕

Senior Scientist, ETH Zürich

摘要:

The integration of experiment technologies with large language models (LLMs) is transforming scientific research, offering AI capabilities beyond specialized problem-solving to becoming research assistants for human scientists. Establishing LLMs as research assistants has significant potential for advancing power system studies, which heavily rely on simulations. However, LLMs face significant challenges in power system simulations due to limited pre-existing knowledge and the complexity of power grids. To address this issue, this talk will present a four-module framework we recently developed, which integrates expertise from both the power system and LLM domains. This modular framework enhances LLMs' ability to perform power system simulations on previously unseen tools. Validated using 34 simulation tasks in Daline, a (optimal) power flow simulation and linearization toolbox not yet exposed to LLMs, the proposed framework improved GPT-4o's simulation coding accuracy from 0% to 96.07%, also outperforming the ChatGPT-4o web interface's 33.8% accuracy (with the entire knowledge base uploaded). Overall, the above results highlight the potential of LLMs as research assistants in power systems. Yet, there are still many open questions that deserve further investigation.

简介:

Mengshuo Jia is a Senior Scientist and guest lecturer at ETH Zürich, where he fast-tracked this promotion after serving as a postdoctoral associate for two years. He is also a principal investigator sponsored by the Swiss National Science Foundation, a research fellow in the Swiss National Centre of Competence in Research «Automation», an associate editor for both the IEEE Systems Journal and the IET Renewable Power Generation, and an invited session chair at top conferences like the Power Systems Computation Conference and IEEE PowerTech. He holds a Ph.D. in Electrical Engineering from Tsinghua University (2021) and a B.E. in Electrical Engineering from North China Electric Power University (2016).

He received the Springer Thesis Award in 2021, two High-Influence Paper Awards by the Proceedings of the CSEE in 2023, and the Outstanding Ph.D. Thesis Award from Tsinghua University in 2021. Additionally, he earned two Outstanding Ph.D. Graduate Awards from the Beijing Government and Tsinghua University, as well as the Principal Scholarship from North China Electric Power University, the highest honor awarded to less than 10 students in that university per year.