PSERC Power Systems Engineering Research Center

# PSERC WEBINAR

## Generative AI for Data Challenges in Electric Power Engineering

**Dr. Yi Hu**
Michigan Tech

The digital transformation of modern power systems has created a strong dependence on data for real-time operation, planning, and decision-making. However, the use of smart meter data is often constrained by data scarcity, incompleteness, and privacy concerns, which limit the deployment of advanced analytics and machine learning methods. This study explores Generative Artificial Intelligence (AI) to address these challenges in power system applications. First, a GAN-based framework is developed to generate synthetic load profiles that preserve temporal dynamics and spatial correlations among customers, enabling privacy-preserving and data-rich analysis. Second, a BERT-based deep learning model is introduced for restoring missing segments in smart meter data, achieving higher accuracy than conventional imputation methods. Third, this work demonstrates that fine-tuned Large Language Models (LLMs) can perform time-series restoration with comparable accuracy while requiring significantly less training data and computation. Together, these contributions advance the vision of scalable, secure, and adaptive energy systems through generative AI–driven data analytics.

**NOVEMBER 19, 2025** | **1:00-2:00 P.M. ET**

LINK TO WEBINAR

(10:00-11:00 A.M. PT)

Yi Hu is an Assistant Professor in the Department of Electrical and Computer Engineering at Michigan Technological University. He received his Ph.D. in Electrical Engineering from North Carolina State University in 2025, where he conducted research at the FREEDM Systems Center. He also holds an M.S. degree from Peking University and a B.S. degree from Chongqing University of Posts and Telecommunications, both in Electrical Engineering. His research focuses on power system data analysis, with an emphasis on leveraging advanced analytical and computational methods to improve grid reliability, efficiency, and situational awareness. His recent work includes large-load characterization, behind-the-meter analysis, and synthetic data generation for power system modeling and event detection.