PSERC Power Systems Engineering Research Center

PSERC WEBINAR

The Dual Frontier between AI and the Power Grid

Dr. Hao Zhu
UT Austin

AI/ML technologies are rapidly reshaping the paradigm of operating electric power grids. Meanwhile, the hyperscale and dynamic energy demands of AI datacenters pose significant challenges to grid reliability. In this talk, I will explore the dual frontier between AI and the power system, with a focus on grid dynamic modeling and analysis. First, to effectively apply AI tools to grid dynamics, it is crucial to consider not only computational/memory efficiency but also the unique characteristics of dynamic systems. To address this, we introduce TRASE-NODEs—Trajectory Sensitivity-aware Neural ODEs—which leverage the classical dynamic sensitivity concept to significantly improve data efficiency and control performance in neural dynamic models. Second, we examine the impact of large-scale AI datacenters on wide-area power system oscillations. By developing a stochastic model to represent sustained, periodic power fluctuations, our numerical studies reveal that factors such as datacenter sizing and geographic distribution can influence oscillation levels. This quantitative analysis highlights the need for developing mitigation strategies at both the grid and hardware levels to support the continued growth of AI-driven energy demand.

OCTOBER 29, 2025 | **1:00-2:00 P.M. ET**
(10:00-11:00 A.M. PT)

LINK TO WEBINAR

Hao Zhu is an Associate Professor of Electrical and Computer Engineering (ECE) at The University of Texas at Austin. She received the B.S. degree from Tsinghua University in 2006, and the M.Sc. and Ph.D. degrees from the University of Minnesota in 2009 and 2012, all in electrical engineering. Dr. Zhu's research focus is on developing algorithmic solutions for machine learning and optimization problems in future energy systems. Her current research interests include machine learning for power system operations and resilience enhancements, and grid integration of hyperscale AI datacenters. She is a recipient of the NSF CAREER Award and the faculty advisor for four Best Student Papers awarded at the North American Power Symposium. She is currently an Associate Editor for IEEE Transactions on Smart Grid and IEEE Transactions on Control of Network Systems.