

IEEE BDA Tutorial Series: Big Data & Analytics for Power Systems

Convergence of AI, Physics, Computing, and Control for Intelligent Power System Control and Beyond

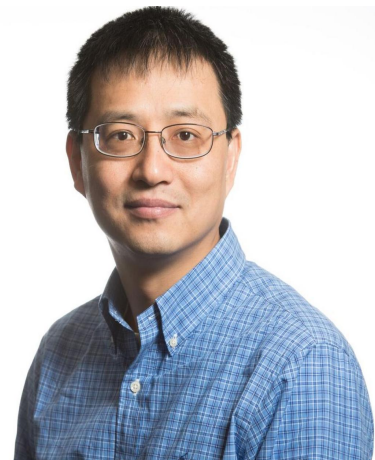
Qihua Huang
UtiliData Inc.



Marianna Vaiman
V&R Energy



Yousu Chen
Pacific Northwest National Lab.



8:00 am-9:30 am, Thursday, July 28, 2022, Pacific Time
(5:00 pm - 6:30 pm, Monday, July 28, 2022, Central European Summer Time)

Abstract: With increased uncertainties and rapidly changing operational conditions in power systems, existing stability control methods and operation paradigms have outstanding issues in terms of either speed, adaptiveness, or scalability. Recent years have seen notable progress in AI and learning-based control methods such as deep reinforcement learning (DRL) for solving challenging control and decision-making problems across many domains such as games, robotics and power systems. However, existing methods have scalability, adaptability, and security issues. To address these challenges, an integrated framework based on the idea of Convergence of AI, Physics, Computing, and Control is developed and employed in the ARPA-E HADREC project. On top of it, scalable, physics-informed DRL algorithms and high-performance computational tools are developed to achieve intelligent stability control for large-scale power systems. We will talk about its integration with V&R's commercial tools and show test results on large-scale power systems. Finally, we will discuss the potential of this framework, when combined with new hardware and software platform, for transforming the grid operation and control from the control rooms to the grid edge.

Bio: Dr. Qihua Huang is currently a Principal Power System Engineer at UtiliData Inc, working on grid digitization and edge intelligence. Before this role, he was a Staff Power System Research Engineer at Pacific Northwest National Laboratory, WA. USA. He received his Ph.D. degree in electrical engineering

from Arizona State University, Tempe, AZ, USA, in 2016, B.Eng. and M.Eng. degrees in electrical engineering from South China University of Technology, Guangzhou, China, in 2009 and 2012, respectively. He is the recipient of the 2019 IEEE Power and Energy Society (PES) Prize Paper Award, 2018 R&D 100 Award and best conference paper awards in IEEE PES General Meeting in 2020 and 2018. He serves as an Associate Editor of IEEE Transactions on Power Systems and served as a Editor of CSEE JPES, Guest Editor of IET Generation, Transmission and Distribution and IET Smart Grid.

Marianna Vaiman is the CEO of V&R Energy. Marianna has 30 years of experience in the electric utility industry. Her areas of expertise include power system stability, optimization, and control; analysis of cascading outages; and use of synchrophasor measurements for enhanced situational awareness and control. Marianna is a Senior IEEE member. She is a member of IEEE PES Industry Technical Support Leadership Committee and a Co-Chair of IEEE PES Corporate Engagement Program. She is active in NERC, WECC, and NASPI communities.

Yousu Chen is a Chief Engineer at Pacific Northwest National Laboratory. His main research interests include high-performance computing & AI/ML applications to power grid, power system modeling and simulations, and power system operations and decision support. Currently he leads the PNNL Advanced Grid Modeling (AGM) program covering mathematics, computing, simulation, machine learning, and data analytics. He is a recipient of the 2016 IEEE Member and Geographic Activities leadership award, a recipient of the 2018 R&D 100 award, and an IEEE PES Distinguished Lecturer.

Link: <https://asu.zoom.us/j/5513218843>