



# PSERC WEBINAR

## Machine Learning in Distribution Grids

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The increasing integration of distributed energy resources (DERs) calls for new monitoring and operational planning tools to ensure stability and sustainability in distribution grids. One idea is to use existing monitoring tools in transmission grids and some primary distribution grids. However, they usually depend on the knowledge of the system model, e.g., the topology and line parameters, which may be unavailable in primary and secondary distribution grids. Furthermore, a utility usually has limited modeling ability of active controllers for solar panels as they may belong to a third party like residential customers. To solve the modeling problem in traditional power flow analysis, we propose a support vector regression (SVR) approach to reveal the mapping rules between different variables and recover useful variables based on physical understanding and data mining. We illustrate the advantages of using the SVR model over the traditional regression method which finds line parameters in distribution grids. Specifically, the SVR model is robust enough to recover the mapping rules while the regression method fails when 1) there are measurement outliers and missing data, 2) there are active controllers, or 3) measurements are only available at some part of a distribution grid. We will conclude the talk with extensive numerical validation on different scales of distribution grids.

**MARCH 5, 2019**

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**2:00-3:00 P.M. EST**

11:00-12:00 P.M. PST)

**Yang Weng** is an assistant professor at the School of Electrical, Computer and Energy Engineering (ECEE) of ASU. He received his Ph.D. in Electrical and Computer Engineering (ECE) from Carnegie Mellon University, where he also obtained his M.S. degree in Machine Learning from the School of Computer Science. Before joining ASU, Yang was a TomKat postdoctoral scholar at Stanford University, where he was leading the machine learning part of a Department of Energy (DOE) sponsored project on Visualization and Analytics of Distributed Energy Resources (VADER). Yang was the Best Paper Award winner of the 2012 International Conference on Smart Grid Communication. In 2013, his paper was ranked first in the same conference. In 2014, his paper was among the Best Papers at the IEEE Power and Energy Society General Meeting. In 2016, his paper won the Best of Best Paper Award at the International Conference on Probabilistic Methods Applied to Power Systems. In 2017, He earned the best paper award at the IEEE International Conference on Energy Internet and Energy System Integration. Finally, Yang is a taskforce chair at the IEEE PES Subcommittee on Big Data & Analytics for Power Systems.

