OVERVIEW

The power grid is witnessing increasing adoption of photovoltaic (PV) generation. Meanwhile distributed PV generation is largely “invisible” to power system operators since it is behind the meter on customer premises and not directly monitored by the utility. It essentially adds an unknown negative demand to the system, which injects additional uncertainty into operators’ net load forecasts. This has direct effects on system reliability, cold load pickup, load behavior modeling and hence cost of operation. Thus, it is important to create effective methods of estimating power generation from these invisible sites behind the meters. In the first part of this presentation, we discuss a customizable machine learning framework we have developed to disaggregate PV generation and load from the net measurement. The framework estimates PV generation and load based on measurements collected from transformer, smart meter and weather station data. It uses historical data of PV generation to build a generalized estimation model that can be used in situations with a different weather condition and/or variable PV capacity than the situation in which the model was developed. We discuss the data processing, feature extraction, feature selection, and model training phases developed as part of the framework. Using both real-world (from Maui) and simulation (GridLab-D) data, we show that PV generation can be estimated with accuracy as high as 98% using our framework. The second part of the presentation will give highlights of an ongoing work on a graph-theoretic tool for generating synthetic cyber-power distribution system models.

BIO

Assefaw Gebremedhin is an assistant professor in the School of Electrical Engineering and Computer Science at Washington State University, where he leads the Scalable Algorithms for Data Science (SCADS) Lab. His broad research interests encompass data mining and machine learning, including their use in power grids; network science; high-performance computing; pervasive computing; and bioinformatics. He received the National Science Foundation CAREER Award in 2016 for work on fast and scalable combinatorial algorithms for data analytics. He earned his PhD and MSc in Computer Science from the University of Bergen, Norway and his BSc in Electrical Engineering from Addis Ababa University, Ethiopia.