Stanford University

TomKat Center for Sustainable Energy
Precourt Institute for Energy
Energy and Environment Affiliates Program
Civil and Environmental Engineering
Department of Electrical Engineering

Stanford SmartGrid Seminar

Integrating data-driven and physics-based analytics for predictive operations in smart grid

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1pm-2pm, Thursday, May 1st, Y2E2 101

Abstract: This talk concerns the handling and utilization of streaming data (such as synchrophasors and smart meters) for enhancing power system real-time physical and market operations. The first part of the talk analyzes the dimensionality of the phasor measurement unit (PMU) data under both normal and abnormal conditions. We observe that the underlying dimensionality is extremely low despite the high dimensions of the raw PMU data. Justification of this observation is proposed using linear dynamical systems theory. A novel early anomaly detection algorithm based on the switch of core subspace at the occurrence of an event is proposed. Then we present the work of quantifying benefits of incorporating look-ahead dispatch with responsive demand from ERCOT data. Demand elasticity at ERCOT is estimated, and the market price behavior with price responsive demand is analyzed.

Bio: Le Xie is an Assistant Professor in the Department of Electrical and Computer Engineering at Texas A&M University, College Station, Texas, where he is affiliated with the Electric Power and Power Electronics Group. He received his B.E. in Electrical Engineering from Tsinghua University, China in 2004. He received S.M. in Engineering Sciences from Harvard University in June 2005. He obtained his Ph.D. from Electric Energy Systems Group (EESG) in the Department of Electrical and Computer Engineering at Carnegie Mellon in 2009. Dr. Xie received National Science Foundation CAREER Award. He is an Editor of IEEE Transactions on Smart Grid, and the founding chair of IEEE Power and Energy Society Task Force on Big Data Analytics for Grid Operations.