



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

Monitoring and Learning Algorithms for Future Power Grids

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Abstract: The pressing need to modernize the aging power grid has culminated into the smart grid vision, which entails the widespread use of state-of-the-art sensing, control, and information technologies. Instrumental for leveraging these smart technologies are novel approaches to monitoring and grid data analytics. In this context, the present talk starts with pertinent signal processing algorithms for power system state estimation based on semi-definite relaxation, decentralized solvers and circuit breaker reconfiguration tools, as well as optimal placement of phasor measurement units. Machine learning paradigms are also presented for identifying line outages, which is a critical task for preventing cascade failures. By accounting for the consumers' responsiveness to prices, real-time pricing is also performed via online convex optimization to elicit desirable demand response and thus reduce peaks in load curves. The efficacy of the novel approaches is assessed using standard IEEE power grid benchmarks.

Bio: Georgios B. Giannakis (Fellow'97) received his Diploma in EE from the Ntl. Tech. Univ. of Athens, Greece, 1981. From 1982 to 1986 he was with the Univ. of Southern California, where he received his MSc. in EE, 1983, MSc. in Math, 1986, and Ph.D. in EE, 1986. Since 1999 he has been a professor with the Univ. of Minnesota, where he now holds an ADC Chair in Wireless Telecom. in the ECE Dept., and serves as director of the Digital Technology Center. His general interests are in communications, networking, and statistical signal processing. Current research focuses on big data analytics, wireless cognitive radios, mobile ad hoc networks, power grid, renewable energy, gene-regulatory, and social networks. He is the (co-) inventor of 21 patents issued, and the (co-) recipient of 8 best paper awards from the IEEE Signal Processing (SP) and Communications Socs. He also received a Young Faculty Teaching Award, and the G. W. Taylor Award for Distinguished Research from the University of Minnesota. He is a Fellow of EURASIP, and has served the IEEE in a number of posts, including that of a Distinguished Lecturer.