

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

PMU Data Analytics Using Low-Dimensional Models

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(2:00 pm - 3:15 pm, CST) (3:00 am-4:15 pm, EST)

Abstract: Phasor Measurement Units provide fine-grained measurements to enhance the system visibility to the operators and reduce blackouts. The spatial-temporal blocks of PMU data have intrinsic low-dimensional structures due to the correlations governed by the underlying physical system. The central idea of the talk is to show that one can exploit the low-dimensional structure to develop fast model-free methods for information recovery with analytical guarantees. One example is missing data recovery and error correction for synchrophasor data. The low data quality currently prevents the implementation of synchrophasor-data-based real-time monitoring and control. We developed model-free approaches to recover the PMU data even under the extreme scenarios of simultaneous and consecutive data losses and data errors across all channels for some time. By exploiting the low-dimensional structures, we formulated the data recovery problem as nonconvex optimization problems and developed fast algorithms to find the global minimum with a linear rate. The second example is feature extraction from privacy-preserved measurements. One can add noise and quantize the data significantly to hide the information in individual measurements. We developed a method for the central operator to recover the dominant features from many privacy-preserved measurements collectively. This enables the data sharing among different parties without sacrificing the privacy.

Bio: Meng Wang is an Assistant Professor in the Department of Electrical, Computer and Systems Engineering at Rensselaer Polytechnic Institute. She received B.S. and M.S. degrees from Tsinghua University, China, in 2005 and 2007, respectively. She received the Ph.D. degree from Cornell University, Ithaca, NY, USA, in 2012.

Prior to joining RPI, she was a postdoc research scholar at Duke University. Her research areas involve machine learning and data analytics, energy systems, signal processing, and optimization. She is a recipient of Army Research Office Young Investigator Program (YIP) Award. She also received School of Engineering Research Excellence Award from Rensselaer. She is a guest editor of IEEE Journal of Selected Topics in Signal Processing Special Issue on Signal and Information Processing for Critical Infrastructures in 2018.

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