CMAI: Artificial Intelligence Colloquium Series
The Chinese University of Hong Kong

This CMAI AI Colloquium Series is organized by Centre for Mathematical Artificial Intelligence (CMAI), under Department of Mathematics at CUHK.

Date: Feb 21, 2024 (Wednesday)
Time: 10:00 am-12:00 pm (Hong Kong Time)
Zoom Meeting: 905 330 9693

Energy Data Recovery in Power Systems via Low-Rank Models

Speaker: Ming Yi
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Abstract: The past decades have witnessed the booming growth of smart meters in energy systems. The massive amount of data from smart meters provide better visibility of energy systems, such as energy system dynamics and detailed load profiles. However, high-fidelity, intelligent data processing is still beyond the capability of the existing energy data analytic tools. My research aims to bridge the gap between high-dimensional data analysis and energy system monitoring by developing advanced machine learning algorithms. One of the key observations is that despite the high-dimensional data in energy systems, many data have intrinsically low dimensionality. My past research focused on developing efficient information extraction methods to solve real power system challenges by exploiting intrinsic low-rank structures. I built new paradigms upon two low-rank models: dictionary learning and matrix completion, to solve the energy disaggregation and synchrophasor data recovery problems. In particular, in this talk, I will try to answer some of the basic questions in power systems: 1. How can data-driven methods estimate renewable energy such as Behind-the-Meter(BTM) solar generations, without fully labeled historical data? 2. Can the algorithm provide an uncertainty measure to measure the reliability of the disaggregation results? 3. How to provide a confidence measure for synchrophasor data recovery and how to recover simultaneous and consecutive missing data/cyber attacks? 4. How to recover the synchrophasor data with missing data/cyber attacks with nonlinear dynamics?

Bio: Ming Yi is a postdoctoral research scientist at Data Science Institute in Columbia University. He obtained his Ph.D. degree in 2022 from the Department of Electrical, Computer, and Systems Engineering at Rensselaer Polytechnic Institute(RPI). He was an intern at the Argonne National Laboratory. He was the recipient of RPI founder award of excellence and RPI Charles M. Close '62 Doctoral Prize. His current research focuses on machine learning, energy storage, power system economics and resilience.