LEARNING AND CONTROL IN POWER DISTRIBUTION GRIDS

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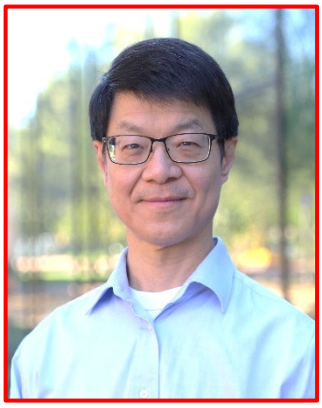
OVERVIEW

The power distribution system, where most smart grid innovations will happen, is not well modeled, with the topology and line parameters poorly documented, inaccurate or missing. This makes maintaining voltage stability challenging as renewable generation continues to proliferate. We present three results to address this challenge. The first result is a method to exactly identify the topology and line admittances of a radial network from voltage and current measurements even when measurements are available only at a subset of the nodes, provided every hidden node has a degree at least 3. The second result is a learning-augmented feedback controller that can leverage real-time measurements to stabilize voltages without explicit knowledge of the network model. We provide convergence guarantee for the proposed method. Finally, we describe the design and deployment of a large-scale EV charging system and an open-source research facility built upon it.



BIO

Dr. Steven Low is the Gilloon Professor of the Department of Computing & Mathematical Sciences and the Department of Electrical Engineering at Caltech. He is an awardee of the IEEE INFOCOM Achievement Award and the ACM SIGMETRICS Test of Time Award, and is a Fellow of the IEEE, ACM, and CSEE. He received his BS from Cornell and PhD from Berkeley; both in EE.