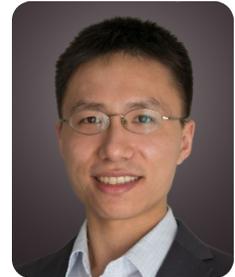




Seminar Announcement

Dr. Shuo Han
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Thursday, March 10, 2016
Green Hall, Room 0120
10:10 AM

Data-Driven and Privacy-Aware Optimization for Smart Cities

Abstract: Advances in the internet of things have enabled us to collect large amounts of data for optimal control and operation of smart cities. In this talk, I will address two major research challenges in data-driven control and optimization of smart cities: (i) How should we incorporate data directly into decision-making? (ii) How can we ensure that user privacy is preserved when data are collected from human individuals? Firstly, I will present a data-driven optimization framework based on robust optimization. Specifically, we consider the problem of distributionally robust optimization, in which the uncertainty set is a set of probability distributions that are constructed directly from available data. We are able to generalize previous results and show that the problem can be solved using finite-dimensional convex optimization for a wide variety of cost functions and constraints. As an application, we study the problem of storage allocation in power grids with renewable generation and present numerical results for the IEEE 14-bus test case with realistic wind generation data. Secondly, I will discuss the problem of data-driven optimization under privacy constraints. We consider the setting of distributed constrained optimization in which the sensitive user information is contained in the constraints. When being solved using traditional algorithms such as projected gradient descent, the messages exchanged between the central mediator and users may be exploited to breach the privacy of users. We adopt the notion of differential privacy for its strong probabilistic guarantees and robustness to side information. We show that differential privacy can be preserved by introducing additive noise to the gradients that are used in the gradient descent method. We also quantify the trade-off between the level of privacy and the loss of utility using tools from optimization theory.

Bio: Shuo Han is a postdoctoral researcher in the Department of Electrical and Systems Engineering at the University of Pennsylvania. He received his B.E. and M.E. in Electronic Engineering from Tsinghua University in 2003 and 2006, and his Ph.D. in Electrical Engineering from the California Institute of Technology in 2013. His current research focuses on developing rigorous frameworks for data-driven decision making that enable reliable and efficient operations of networked cyber-physical systems, including many smart city applications such as power and transportation networks. He was a finalist for the Best Student Paper Award at the 2013 American Control Conference.

Host: Dr. Arye Nehorai