

University of Rochester
Department of Electrical and Computer Engineering Colloquia

Data-Driven Control and Optimization for Urban Infrastructures

Dr. Shuo Han

Wednesday, March 1st
12:00 PM – 1:00 PM
Computer Studies Building (CSB) 209

Abstract: Recent advances in sensing technology and autonomy have brought a myriad of new access points for sensing and control in urban infrastructures. This leads to the concept of "smart cities", in which urban infrastructures are operated at an increased level of autonomy with the aid of sensing and control. A key component of smart cities is algorithms that convert data collected from sensors to decisions used for city operation. In many applications, data are used for modeling certain stochastic phenomena (e.g., human demand in cities) upon which decisions are made. In order to provide rigorous performance guarantees in decision making, it is often desirable to not only obtain from data a nominal (probabilistic) model of the stochastic phenomenon but also uncertainty in the model. In this talk, I will present an optimization-based framework that explicitly quantifies and handles probabilistic model uncertainty for decision-making. A distinctive feature of the framework is that it models the unknown stochastic phenomenon by a set of probability distributions that are consistent with data. For a large class of problems including several planning and scheduling problems in smart cities, I will show that the resulting optimization problem can be reformulated as a convex optimization problem whose solution can be computed efficiently. Using examples from power systems and transportation, I will show that our framework offers several advantages over conventional ways of modeling uncertainty.

Bio: Shuo Han is a postdoctoral researcher in the Department of Electrical and Systems Engineering at the University of Pennsylvania. He received his Ph.D. in Electrical Engineering from the California Institute of Technology in 2014. His current research focuses on developing rigorous frameworks for data-driven decision making that enable reliable and efficient operations of networked systems such as power and transportation networks. He was a finalist for the Best Student Paper Award at the 2013 American Control Conference.

Pizza and soda provided.