UCF DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

Spring 2016 Seminar Series

INTELLIGENT INFRASTRUCTURE FOR A SUSTAINABLE FUTURE

TUESDAY MARCH 15, 2016

10:30 AM – HEC 356

A key challenge for modernizing our infrastructure is in capturing the close interplay of three major elements that affect their operations: physical control mechanisms, information technology, and economic and social aspects introduced by humans in the loop. This talk examines this important challenge in the context of electricity demand side management (DSM) programs in smart power grids. DSM schemes offer electricity end-users the ability to have a more flexible and price-aware consumption behavior. This would help increase market efficiency and margins of safety in power systems, particularly under high levels of renewable energy integration.

A significant amount of flexibility that DSM programs aim to harness will be due to electricity consumption that supports the delivery of goods and services by societal-scale networked infrastructure systems. Examples include: cloud computing services and Internet data centers, electric transportation systems, etc. In the first part of my talk, I study the role of DSM in coupling the operations of power grids with that of other infrastructure systems by introducing new feedback loops. To enable DSM in such coupled infrastructure, I present a novel stylized model of demand flexibility for infrastructure systems. Then, I present a collaborative pricing scheme that would allow independent system operators to move a large population of infrastructure users towards a socially optimal congestion pattern and energy footprint.

In the second part of my talk, I discuss the communication, control, and economic challenges of managing residential electricity demand under a dynamic stochastic settings. By tackling these challenges in a systematic fashion, I introduce a holistic direct scheduling framework that enables electricity retailers to talk to and manage large heterogeneous populations of electric loads in a scalable and near-optimal fashion, while respecting users' privacy.

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Mahnoosh Alizadeh is a postdoctoral fellow in the department of Electrical Engineering at Stanford University. She is broadly interested in designing communication, control, and economic mechanisms for societal-scale cyber-human-physical infrastructure. More specifically, she has worked extensively on electricity load forecasting and control, renewable energy integration technologies, and the effects of large-scale adoption of electric vehicles on power and transportation systems. She obtained her BSc in Electrical Engineering from Sharif University of Technology in 2009 and her PhD in Electrical and Computer Engineering from the University of California Davis in August 2014, where she was the recipient of the Richard C. Dorf award for outstanding research accomplishment.