



# Washington University in St. Louis

## SCHOOL OF ENGINEERING & APPLIED SCIENCE

Preston M. Green Department of Electrical & Systems Engineering

### Seminar Announcement

**Justin Ruths, Ph.D.**  
**Assistant Professor**  
**Mechanical Engineering and Systems Engineering**  
**University of Texas at Dallas**



**Thursday, March 1, 2018**  
**Green Hall, Room 0120**  
**10:00 A.M.**

### Quantifying the Capabilities of Attackers in Cyber-Physical Systems

**Abstract:** While the modernization of control processes has led to unprecedented levels of productivity and efficiency, the coupling of the physical processes with an overarching cyber communication control layer opens up new vulnerabilities in such so called Cyber-Physical Systems (CPS). While attacks can be viewed as unknown disturbances or faults in the system, the strategic nature of attacks raises altogether new research challenges. Chief among them is to quantify the effect that an attacker can have, which is determined by the dynamics of the system, the design of the controller and state estimator, and the form of the attack detection method. In this talk I describe our work to quantify the impact that an attacker can have, including the prerequisite step to optimally tune attack detectors to a desired level of performance. I consider two major classes of static and dynamic detectors and show experimental results on scaled-industrial control systems.

**Bio:** Dr. Ruths received a B.S. in Physics from Rice University, M.S. degrees in Mechanical and Electrical Engineering from Columbia University and Washington University in Saint Louis, respectively, and a Ph.D. in Systems Science and Applied Mathematics from Washington University in Saint Louis. In 2011, Dr. Ruths joined Engineering Systems and Design as a founding faculty member of Singapore University of Technology and Design where he served as an assistant professor for five years. As of August 2016 he is an assistant professor with appointments in Mechanical Engineering and Systems Engineering at University of Texas at Dallas. His research includes studying the fundamental properties of controlling networks, bilinear systems theory, attack detection methods for cyber-physical systems, and solving computational optimal control problems focused on neuroscience and quantum control applications.

Host: Jr-Shin Li