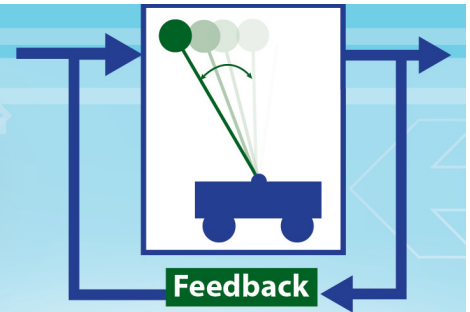


COLLEGE OF ENGINEERING

# Control Seminar



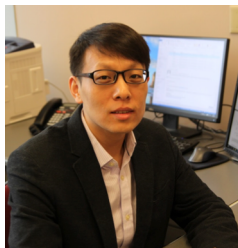
Sponsored by: Bosch, Ford, and Toyota

## Tractable Algorithms for Hybrid Systems and Differential Games

**Wei Zhang**

Ohio State University

Department of Electrical and Computer Engineering



**Friday, January 26, 2018**

**3:30 – 4:30 pm • 1500 EECS**

**ABSTRACT:** HJB/HJI equations play a fundamental role in a variety of control and decision problems. Although solutions to these equations in general suffer from the curse of dimensionality, tractable algorithms exist for certain classes of problems. In this talk, I will discuss two such cases. The first one is about optimal control of hybrid systems. I will discuss how approximate dynamic programming (ADP) can be used to solve the so-called switched LQR problems with guaranteed suboptimal performance. The main challenge lies in handling the combinatorial complexity due to the discrete control input and in analyzing the ADP algorithm without a discount factor. I will also briefly discuss how the proposed undiscounted ADP approach leads to systematic construction of control-Lyapunov functions, enabling solutions to several fundamental stabilization problems of switched systems. The second half of my talk will focus on differential games. I will first show how Hamilton-Jacobi reachability can be used to solve coordination and planning problems under adversarial uncertainties. Then I will talk about a particular scalable algorithm for solving multiplayer pursuit evasion games in both convex and nonconvex domains. The results will be demonstrated through some field experiments in which the proposed strategy is used to provide decision support to human players through GPS-equipped smartphones.

**BIO:** Wei Zhang is an Associate Professor of Electrical and Computer Engineering at the Ohio State University. He received the B.S. in Automatic Control from the University of Science and Technology of China in 2003, and the M.S. in Statistics and the Ph.D. in Electrical Engineering both from Purdue University in 2009. From January 2010 to August 2011, he was a Postdoctoral Researcher in the EECS Department at UC Berkeley. His research interests include hybrid systems, optimal control, game theory, stochastic systems, and their applications in power systems, robotics, and intelligent transportations. He is a recipient of the NSF CAREER award and the Lumley Research Award at OSU.