

# DEPARTMENT OF MECHANICAL ENGINEERING

## WILLIAM MAXWELL REED SEMINAR SERIES

### “Control of Systems with Constraints: Theory, Algorithms, and Applications”

Claus Danielson, Ph.D.

Mitsubishi Electric Research Laboratories

**Abstract:** This talk will discuss the technical challenges and theoretical foundations of controlling systems subject to constraints on their inputs and outputs, with a focus on their practical application to real-world problems. The talk will begin with an overview of invariant sets and model predictive control, which are two fundamental tools in constrained control. These tools will be demonstrated through their application to autonomous driving, advanced manufacturing, and cancer treatment. We will then discuss algorithms for real-time optimization and their application to battery cell balancing. Finally, we will discuss theoretical developments merging model predictive control with machine learning as well as applications to heating ventilation and air condition (HVAC) and automatic train stopping.

**Bio:** Claus Danielson received his PhD in 2014 from the renowned Model Predictive Control Laboratory at the University of California, Berkeley. He is currently a Principal Research Scientist at Mitsubishi Electric Research Laboratories in Cambridge, MA. He previously held research positions with the Air Force Research Laboratories and General Dynamics, as well as collaborating with Ford Motor Company. Dr. Danielson’s research interests are in predictive and constrained control and his specialty is developing methods for exploiting structure in large-scale or complex control and optimization problems. He has applied his research to a variety of fields including energy storage networks, heating ventilation and air conditioning, adaptive optics, spacecraft guidance and control, atomic force microscopy, autonomous vehicles, cancer treatment, and robotics.

**Date:** Wednesday, January 30<sup>th</sup>

**Place:** CB 114

**Time:** 3PM

**Contact:** Dr. Alexandre Martin 257-4462

Meet the speaker and have refreshments  
Attendance open to all interested persons