

# Modeling, Estimation and Control Across Scales in Neuroscience

Full Day American Control Conference Workshop

Tuesday, July 5th

Clarendon room, Boston Marriott Copley Place

<http://acc2016.a2c2.org/workshops.html>

**Organizers:** Jason Ritt (Boston University)  
ShiNung Ching (Washington University, St. Louis)  
Sridevi Sarma (Johns Hopkins University)

In this workshop, an array of speakers will present the state of current research in neurocontrol, and outline the key challenges and future directions for applications in research and clinical settings. An organizing principle for the workshop is the question of scale; a central goal is to bridge the gaps in methods typically employed from single neurons to macroscopic brain regions. The workshop will introduce models of single neurons and neural ensembles commonly used in computational neuroscience. We will cover biophysical-based models of neurons, mean field models of populations of neurons, and hybrid models of neural networks. We will discuss algorithms to estimate parameters of these models and describe their use in various applications, including characterization of neurons in diseased networks (e.g. Parkinson's disease, epilepsy), and the effect of deep brain stimulation control. We will conclude with a moderated discussion on outstanding control problems in neuroscience.

9:40	Introductory remarks	
9:50	<b>Brandon Westover</b> Massachusetts General Hospital	Why neurocritical care needs closed-loop control
10:30	<b>Rodolphe Sepulchre</b> Cambridge University	Neurons as feedback circuits
11:10	<b>BREAK</b>	
11:20	<b>Christopher Rozell</b> Georgia Institute of Technology	Moving toward in vivo closed-loop optogenetic control of neural activity
12:00	<b>LUNCH</b>	
1:30	<b>Sujith Vijayan</b> Boston University	A Stimulating Sleep: Interventions During Sleep to Enhance Memory
2:10	<b>Jr-Shin Li</b> Washington University, St. Louis	TBA
2:50	<b>Sabatino Santaniello</b> University of Connecticut	Thalamocortical LFP feedback for closed-loop DBS: A model-based approach
3:30	<b>BREAK</b>	
3:40	<b>Uri Eden</b> Boston University	Closed loop interruption of hippocampal replay using marked point process filters
4:20	<b>Demba Ba</b> Harvard University	TBA
5:00-5:30	Summary and Discussion	