

Department of Applied and Computational Mathematics and Statistics Colloquium

Robert Rosenbaum


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will give a lecture entitled:

Stochastic dynamics of neural synapses in health and disease

Abstract

Neurons communicate through chemical synapses: A "spike" in one neuron causes the release of neurotransmitter molecules that induce a current across another neuron's membrane. Synapses are temporarily weakened by periods of fast spiking due to a depletion of neurotransmitter resources. This effect, known as short term synaptic depression, modulates the transfer of signals between neurons. Most computational studies of dynamic synapses use a deterministic mean-field model of synaptic depression despite the fact that neurotransmitter release and recovery are fundamentally stochastic processes. We use stochastic calculus, Markov chain modeling and linear response techniques to show that synaptic stochasticity fundamentally alters the transmission of information between neurons. We then combine our theoretical results with experimentally recorded data to show that the filtering properties of stochastic synapses contributes to the therapeutic efficacy of deep brain stimulation as a treatment for Parkinson's disease.



**Wednesday, March 19, 2014
4:30 p.m. to 5:30 p.m.
127 Hayes-Healy Center**

Colloquium Tea

4:00 p.m. to 4:30 p.m. 154 Hurley Hall