The Center for Theoretical Biological Physics

PRESENTS
Seminar Speaker

Dr. Xaq Pitkow

Assistant Professor
Electrical and Computer Engineering
Rice University

"How Can Single Sensory Neurons Predict Behavior"

Tuesday, April 8, 2014

12:30 - 1:30 PM

BRC, 10th Floor, Room 1060 A/B

Abstract: Single sensory neurons can be surprisingly predictive of behavior in discrimination tasks. We propose that this is possible because the information extracted from a population of neurons is severely restricted, with two possible causes: optimal decoding limited by information-limiting noise, or suboptimal decoding. These causes have different observable consequences for choice correlation, the correlation between a single neuron's responses and the animal's choices. The former cause yields an inverse relationship between choice correlation and a neuron's discrimination threshold; the latter depends on each neuron's preferred stimulus. By examining the mathematical relationships between choice correlation, neural threshold, and tuning curves, we can evaluate the optimality of neural decoding. Neural and behavioral data recorded during heading discrimination are consistent with optimal decoding of neural responses from the vestibular nucleus and the dorsal medial superior temporal area, whereas signals from ventral intraparietal area are unused for this task despite exhibiting high choice correlations.

Bio: Xaq Pitkow is an assistant professor of Computational Neuroscience in the Department of Neuroscience at Baylor College of Medicine and the Department of Electrical and Computer Engineering at Rice University. He is interested in principled approaches to neural computation, and appeals to principles from physics, statistics and machine learning to explain the function of the brain. He has a Ph.D. in Biophysics from Harvard, and did postdoctoral research at Columbia University's Center for Theoretical Neuroscience and in the Department of Brain and Cognitive Science at the University of Rochester.