THE UNIVERSITY OF CHICAGO

Department of Statistics
STATISTICS COLLOQUIUM

ILA FIETE

Center for Learning and Memory, University of Texas at Austin

Evidence that the Brain Codes a Scalar Variable with Diverse Populations of Continuous Attractors

MONDAY, October 28, 2013 at 4:00 PM

133 Eckhart Hall, 5734 S. University Avenue

Refreshments following the seminar in Eckhart 110

ABSTRACT

Neurons and synapses — the fundamental components of representation and communication in the brain — are forgetful and noisy. How does the brain overcome these features to perform accurate computation and generate reliable short-term memory over timescales exceeding the biophysical timescales by factors of a hundred to a thousand?

I'll describe the classical theoretical hypothesis that low-dimensional continuous attractors can solve these problems. I will discuss recent analysis of the grid cell code for 2D animal location in mammals, that provides specific evidence of low-dimensional continuous attractor dynamics in the brain. Simultaneously, I will describe how the same system clearly points to coding strategies in the brain that go far beyond the current theoretical understanding of neural codes. I will show the existence of a new class of neural codes that potentially has exponentially good performance with neuron number, compared to the polynomial performance of most known existing neural codes. I'll conclude by discussing the high-level questions presented by these results, about the best-allowable scaling of neural codes.