MICHIGAN STATE UNIVERSITY
Department of Statistics and Probability

COLLOQUIUM

Mark Reimer

Michigan State University

Big data comes to neuroscience: statistical methodology in optical neuro-imaging

Tuesday, April 14, 2015
10:20 a.m. - 11:10 am
Refreshments 10:00 am
C405 Wells Hall

Abstract

New optical imaging technologies are bringing high-throughput data to experimental neuroscience, as big data came to genomics a decade earlier. This talk will discuss several emerging issues in analysis of high-throughput neuroscience data, and illustrate them with recently published work, mostly drawn from animal studies, as well as vignettes drawn from the speaker's own research.

First, as in all emerging technologies there are significant issues in pre-processing, a few of which will be described briefly.

Second, such overwhelming data begs for dimension reduction, but classical statistical dimension reduction strategies capture very limited fractions of variance in neuroscience data. Nevertheless multivariate predictions, change-point detection and decoding have been quite successful. I will illustrate some examples of these successes and discuss the paradox.

Functional change or 'learning' is a distinctive aspect of brain data. I describe a few strategies to characterize plasticity in neural activity and a new approach that seems promising to characterize plasticity in ensembles.

Finally we may anticipate a convergence of computational models in neuroscience with detailed experimental observations, as the heretofore unobservable dynamics of neural networks becomes visible. What might this convergence look like?