



THE UNIVERSITY OF
CHICAGO

COMPUTATIONAL AND APPLIED MATHEMATICS
STUDENT SEMINAR

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Understanding the Covariance Matrix Spectrum of Neural Circuits

Friday, May 13, 12-1pm
Jones Laboratory, Room 303

ABSTRACT

The spike count covariance matrix captures the structure of trial-to-trial variability in the activity of a population of neurons. The eigenvalue distribution of this matrix contains information on the dimensionality of the variability (as measured by the participation ratio) and provides a null model for the selection of significant eigenmodes in PCA. Previous works have studied this distribution with random matrix theory. Using free probability, we expand the model by incorporating heterogeneity among neurons. The new model is shown to fit better to monkey electrophysiology data, and predicts that the participation ratio of the covariance inherits that of the firing rate distribution, which is verified in neural data.