

COLLOQUIUM

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Diffusion MRI and Resting State Functional MRI: Two Brain Imaging Modalities That Need Statistical Help

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A405 Wells Hall

10:20 a.m. - 11:10 a.m.

Refreshments: 10:00 a.m.

Abstract

Over the past three decades, a great deal of work has gone into understanding the statistical properties of algorithms for processing traditional magnetic resonance images (MRI) of the human brain, which are represented by a regular 3D lattice of univariate measurements. Now, however, neuroscientists are confronted by two novel forms of imaging data: diffusion MRI, represented by a 3D lattice of probability distributions defined on the 3D sphere; and functional MRI, represented by a 3D lattice of time series measurements. Many important operations on these modalities, including smoothing, alignment, segmentation, and calculation of population averages are not well understood from a statistical point of view, and it is no surprise that they have a reputation for being noisy and unreliable. In this talk I will give an overview of my collaborations with statisticians and computer scientists who are improving methods for quantifying time series similarity and producing reliable brain segmentations from fMRI; and smoothing and tracing neuron paths through diffusion MRI. Joint work with Lyudmila Sakhanenko, Hans Mueller, Jane-Ling Wang, Ian Davidson, Jie Peng, and Debashis Paul.

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