University of California, Irvine
Statistics Seminar

Bayesian Inference on Brain Connectivity Networks Based on Multiple Graphs

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Thursday, March 8, 2018
4 p.m., 6011 Bren Hall
(Bldg. #314 on campus map)

Functional magnetic resonance imaging (fMRI) techniques, a common tool to measure neuronal activity by detecting blood flow changes, have experienced an explosive growth in the past years. Statistical methods play a crucial role in understanding and analyzing fMRI data. Bayesian approaches, in particular, have shown great promise in applications. Fully Bayesian approaches allow flexible modeling of spatial and temporal correlations in the data, as well as the integration of multi-modal data. In this talk I will first briefly show "NPBayes-fMRI", a newly released user-friendly software for Bayesian spatio-temporal modeling of task-based fMRI data. I will then introduce Gaussian graphical models as a tool to estimate brain connectivity, i.e., how brain regions cooperate within functional networks to handle specific cognitive processes. I will consider in particular a model formulation that employs hidden Markov models to allow the interactions among brain regions to vary during the course of the experiment, an aspect of dynamic connectivity. The proposed model formulation achieves joint modeling of the task-related activations, in addition to the estimation of the dynamics of individual functional connectivity. I will show results on simulated data and on individual healthy subjects.

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