Department of Applied and Computational Mathematics and Statistics Colloquium

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Bayesian approaches for the analysis of fMRI data

In this talk, I will discuss the use of a unified Bayesian framework for the analysis of task-related brain activity in multi-subject fMRI experiments. In the fMRI literature, it is customary to conduct two-stage "group analysis" approaches, which separate the inference on the individual fMRI time courses from the inference at the population level. In our modeling approach we consider a spatiotemporal linear regression model and specifically account for the between-subjects heterogeneity in neuronal activity via a spatially informed multi-subject nonparametric variable selection prior. For posterior inference, in addition to Markov chain Monte Carlo sampling algorithms, we develop suitable variational Bayes algorithms. We show that variational Bayes inference achieves satisfactory results at a more reduced computational costs than using MCMC, allowing scalability of our methods.

I am also planning to discuss an integrated Bayesian framework for imaging genetics, to link brain connectivity across multiple individuals to their genetic information. By combining single-nucleotide polymorphism (SNP) arrays and functional magnetic resonance imaging (fMRI), I will discuss a risk prediction model that allows to discriminate between individuals with schizophrenia and healthy controls, based on a sparse set of discriminatory regions of interest (ROIs) and SNPs. Inference on a regulatory network between SNPs and ROI intensities (ROI-SNP network) is used in a single model framework to inform the selection of the discriminatory ROIs and SNPs. I will discuss the performance of our model on simulation data as well as data collected from individuals with schizophrenia and healthy controls.

Monday, October 10, 2016
4:15 PM – 5:15 PM
127 Hayes-Healy Center

Colloquium Tea 3:45 PM to 4:15 PM 154 Hurley Hall