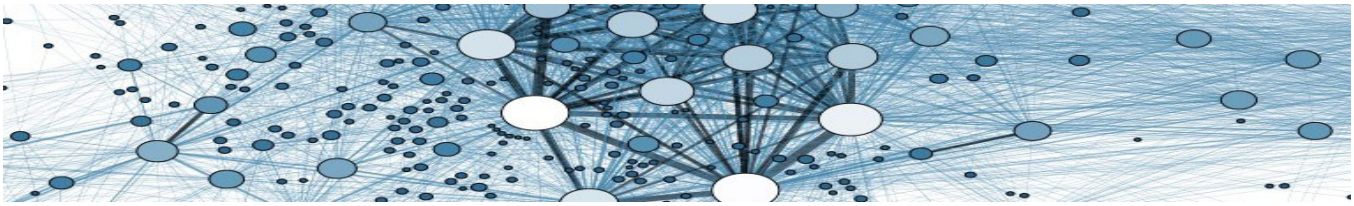

Department of Statistics Seminar

Tuesday, May 23, 2017

3:45 – 4:45 p.m., Room 420, Olmsted Hall

Reception in Olmsted 1331 at 3:15 p.m.

Bayesian Approaches for Detecting Activations and Connectivity in fMRI Data

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Abstract:

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 will then discuss a multi-subject vector autoregressive (VAR) modeling approach for inference on effective connectivity based on resting-state functional MRI data. Our framework uses a Bayesian variable selection approach to allow for simultaneous inference on effective connectivity at both the subject- and group-level. Furthermore, it accounts for multi-modal data by integrating structural imaging information into the prior model, encouraging effective connectivity between structurally connected regions.

Biography:

Dr. Guindani received his Ph.D. in Statistics from the Università Bocconi in Milan, Italy, in 2005. Since 2016, he has been the Editor for Bayesian Analysis and the Associate Editor of Biometrics. He has also been the Associate Editor of CSDA since 2015. Dr. Guindani's research interests include the following: (I) Analysis of high-dimensional data, including genomic and imaging data; (II) Data integration for combining information from several data platforms, and relating them with measurable outcomes (integrative genomics, imaging genomics); (III) Statistical decision making under uncertainty; (IV) Multiple comparison problems; (V) Clustering; (VI) Bayesian modeling; (VII) Bayesian Nonparametrics.