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Department of Medicine  
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## Channing Network Science Seminar

Nov 21, 2014, 11am @ 5th-floor Conference Room



### Lijun Peng

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**Title: Bayesian Ridge-Regularized Covariance Selection with Community Behavior in Latent Gaussian Graphical Models**

**Abstract:** Gaussian graphical models have been extensively used to model conditional independence via the concentration matrix of a random vector. They are particularly relevant to incorporate structure when the length of the vector is large and naive methods lead to unstable estimation of the concentration matrix. In covariance selection, we have a latent network among vector components such that two components are not connected if they are conditionally independent, that is, if their corresponding entry in the concentration matrix is zero. In this work, we expect that, in addition, vector components show a block dependency structure that represents community behavior in the context of biological and social applications, that is, connections between nodes from different blocks are sparse while connections within nodes of the same block are dense. Thus, to identify the latent network and detect communities, we propose a Bayesian approach with a hierarchical prior in two levels: a spike-and-slab prior on each off-diagonal entry of the concentration matrix for variable selection; and a degree-corrected stochastic blockmodel to capture the community behavior. To conduct inference, we develop an efficient routine based on ridge regularization and MAP estimation. Finally, we demonstrate the proposed approach in a meta-genomic dataset of complex microbial biofilms from dental plaque and show how bacterial communities can be identified.

**Bio:** Lijun Peng is a PhD candidate and a research assistant in the Department of Mathematics & Statistics at Boston University, working under the supervision of Prof. Luis Carvalho. Prior to joining BU, she received the bachelor's degree in Mathematics from Zhejiang University China in 2010. Her thesis mainly focuses on network community detection and covariance selection, and her research interests include Bayesian statistics, high dimensional computational statistics and machine learning. For a closer view of her research projects, you can visit her personal website at <http://math.bu.edu/people/lipeng/>.

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