Department of Applied and Computational Mathematics and Statistics Colloquium

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Bootstrapping Networks with Latent Geometric Structure

A core problem in statistical network analysis is to develop network analogues of classical statistical techniques. The problem of bootstrapping network data stands out as especially challenging, owing to the dependency structure of network data and the fact that one typically observes only a single network, rather than a sample. We propose two methods for obtaining bootstrap samples for networks drawn from latent space models, a class of network models in which unobserved geometric structure drives network topology. The first of these two bootstrap methods leverages the structure of these models to generate bootstrap samples of whole networks. The second method generates bootstrap samples of network statistics that are expressible as U-statistics in the latent geometry, a class of functions that includes subgraph densities and a number of other useful network summaries. We prove the consistency of both of the proposed bootstrap methods under the random dot product graph, a latent space model that includes the popular stochastic blockmodel as a special case, though our methods are applicable to any latent space model in which the latent geometry can be recovered suitably accurately. We give motivating examples throughout and demonstrate the effectiveness of our methods on synthetic data.

Bio: Keith Levin is a Postdoctoral Research Fellow in the Department of Statistics at the University of Michigan. He completed his Ph.D. in Computer Science at Johns Hopkins University in 2017. Prior to that, he worked as a data analyst for BBN Technologies while completing his undergraduate education at Northeastern University. His research focuses on statistical and computational methods for analyzing network data, with a focus on applications to neuroscience.

This talk is based on a joint work with Hau-Tieng Wu.

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4:15PM – 5:15 PM
127 Hayes-Healy Center

Colloquium Tea 3:45 PM to 4:15 PM 101A Crowley Commons Room