**Karl Rohe**
**Department of Statistics**
**University of Wisconsin-Madison**

*T - Stochastic Graphs*

**Wednesday, March 20th, 2024**
**11:50 AM**
**96 Frelinghuysen Road, CoRE Building, Room 431**

**Zoom Meeting: Meeting ID: 969 0606 4706**
**Password: 745339**

https://rutgers.zoom.us/j/96906064706?pwd=ZklvbExpRVBJQ3c5dUhhYTFuR2ZrZz09
**Light refreshments will be served in Hill 452, 11:15am**

**Abstract:** Previous statistical approaches to hierarchical clustering for social network analysis all construct an "ultrametric" hierarchy. While the assumption of ultrametricity has been discussed and studied in the phylogenetics literature, it has not yet been acknowledged in the social network literature. We show that "non-ultrametric structure" in the network introduces significant instabilities in the existing top-down recovery algorithms. To address this issue, we introduce an instability diagnostic plot and use it to examine a collection of empirical networks. These networks appear to violate the "ultrametric" assumption. We propose a deceptively simple class of probabilistic models called T-Stochastic Graphs which impose no topological restrictions on the latent hierarchy. Perhaps surprisingly, this model generalizes the previous models. To illustrate this model, we propose six alternative forms of hierarchical network models and then show that all six are equivalent to the T-Stochastic Graph model. These alternative models motivate a novel approach to hierarchical clustering that combines spectral techniques with the well-known Neighbor-Joining algorithm from phylogenetic reconstruction. We prove this spectral approach is statistically consistent.

**Bio:** Karl Rohe is a Professor of Statistics at the University of Wisconsin-Madison, with courtesy appointments in Journalism, Educational Psychology, and Electrical & Computer Engineering. He received his PhD from University of California, Berkeley in 2011 where he received the Evelyn Fix Memorial Prize. He studies PCA and statistical embeddings for modern data science applications.