1135-82-472 **Dane Taylor*** (danet@buffalo.edu), **Rajmonda Caceres** and **Peter J Mucha**.

Super-resolution community detection for layer-aggregated multilayer networks.

Inspired by real-world networks consisting of layers that encode different types of connections, such as a social network at different instances in time, we study community structure in multilayer networks. We study fundamental limitations on the detectability of communities by developing random matrix theory for the dominant eigenvectors of matrices that encode random networks. Specifically, we study modularity matrices that are associated an aggregation of network layers. Layer aggregation can be beneficial when the layers are correlated, and it represents a crucial step for discretizing time-varying networks (whereby time layers are binned into time windows). We explore two methods for layer aggregation: summing the layers' adjacency matrices and thresholding this summation at some value. We identify layer-aggregation strategies that minimize the detectability limit, indicating good practices (in the context of community detection) for how to aggregate layers, discretize temporal networks, and threshold pairwise-interaction data matrices. This work provides a guide for small-community detection in temporal networks and paves the way for a new class of 'holistic' methods that simultaneously address the data-preprocessing and network-analysis steps. (Received September 05, 2017)