

MICHIGAN STATE UNIVERSITY
Department of Statistics and Probability

COLLOQUIUM

Subhadeep Paul

PhD Student
Department of Statistics
University of Illinois at Urbana-Champaign

Community Detection in Multi-Layer Networks

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10:20 a.m. - 11:10 am

Refreshments 10:00 am

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Abstract

In recent years, there has been an increased interest in statistical analysis of data with multiple types of relations among a set of entities. Such multi-relational data can be represented as multi-layer networks where the set of vertices represents the entities and multiple types of edges represent the different relations between them. In this talk, I will present models, methods and asymptotic theory for community detection in multi-layer networks. I will consider two random graph models and derive consistency results for community assignments from the maximum likelihood estimators (MLEs) in both models when either the number of nodes or the number of types of edges or both grow. Then I will compare the MLEs in the two models with each other and with other baseline approaches in terms of asymptotic conditions for consistency and performance in simulation studies. Using minimax rates of error for community detection, I will then show that the multi-layer models are information-theoretically better than the stochastic block model obtained by aggregating the layers for the problem of community detection. I will illustrate the proposed methodology by analyzing a multi-layer network of British MPs from the Social networking website Twitter. I will also briefly discuss extensions of this work in several directions including a modeling framework and inference strategies for community structure in a group of related networks with applications to neuroimaging data.

To request an interpreter or other accommodations for people with disabilities, please call the Department of Statistics and Probability at 517-355-9589.