

A MULTILAYER PROBIT NETWORK MODEL FOR COMMUNITY DETECTION WITH DEPENDENT EDGES AND LAYERS

Speaker: Dapeng Shi
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Time&Venue:

SCMS Room 102, Nov. 13 (Thursday), 14:00-15:30

Abstract:

Community detection in multilayer networks, which aims to identify groups of nodes exhibiting similar connectivity patterns across multiple network layers, has attracted considerable attention in recent years. Most existing methods are based on the assumption that edges within the same layer are dependent, or that the layers are either independent or follow specific dependence structures. In this article, we propose a novel method for community detection in multilayer networks that accounts for a broad range of inter-layer dependence structures, as well as edge dependence. The proposed method integrates the multilayer stochastic block model for community detection with a multivariate probit model to capture dependence structures both between layers and within the same layer. To facilitate the parameter estimation, we develop a constrained pairwise likelihood method coupled with an efficient alternating updating algorithm. The asymptotic properties of the proposed method are also established, with a focus on examining the influence of edge dependence, as well as inter-layer dependence structures and strength on parameter estimation and community detection. The theoretical results are supported by extensive numerical experiments on both simulated networks and a real-world multilayer trade network.

Biography:

Dr. Shi is currently a postdoctoral fellow in the Department of Statistics at the Chinese University of Hong Kong. He earned his PhD from the Shanghai Center for Mathematical Sciences at Fudan University, where he was supervised by Professor Zhiliang Ying. His research interests include machine learning, network modeling, and causal inference. His work has been published in *Statistics in Medicine*, *Cell Reports Sustainability*.