

**Department of Statistics** and Data Science Faculty of Science



## INFERENCES ON MIXING PROBABILITIES AND RANKING IN **MIXED-MEMBERSHIP MODELS**

## Abstract

Network data is prevalent in numerous big data applications, including economics and health networks, where it is of prime importance to understand the latent structure of the network. In this paper, we model the network using the Degree-Corrected Mixed Membership (DCMM) model. In the DCMM model, for each node i, there exists a membership vector consisting of the weight that node i puts in community k. We derive novel finite-sample expansion for the weights, which allows us to obtain asymptotic distributions and confidence intervals of the membership mixing probabilities and other related population quantities. This fills an important gap on uncertainty quantification on the membership profile. We further develop a ranking scheme of the vertices based on the membership mixing probabilities on certain communities and perform relevant statistical inferences. A multiplier bootstrap method is proposed for ranking inference of individual member's profile with respect to a given community. The validity of our theoretical results is further demonstrated via numerical experiments in both real and synthetic data examples (Joint work with Sohom Bhattacharya and Jikai Hou).

## **Biography**

Jianging Fan is a distinguished figure in the fields of statistics, financial econometrics, and data science, holding the position of Frederick L. Moore '18 Professor of Finance at Princeton University. Fan received his Ph.D. in Statistics from the UC Berkeley in 1989. He joined Princeton University in 2003 and has been instrumental in directing the Committee of Statistical Studies and chaired the Department of Operations Research and Financial Engineering from 2012 to 2015. His expertise extends across operations research, financial engineering, and statistics. Fan has made significant contributions to statistical theory and methods within various domains, including data science, statistical machine learning, finance, economics, computational biology, and biostatistics. Fan has been recognised with numerous awards and honours, including the COPSS Presidents' Award in 2000, the Morningside Gold Medal for Applied Mathematics in 2007, the Guggenheim Fellowship in 2009, the Pao-Lu Hsu Prize in 2013, the Guy Medal in Silver in 2014, the Noether Distinguished Scholar Award in 2018, and the Le Cam Award and Lecture in 2021. Additionally, Fan has held editorial roles in several prestigious journals and has been an active member and leader in professional statistical associations worldwide.



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