



復旦大學

数据科学与深度学习 青年学者论坛

Mixed-membership amid Continuous Latent Structures



石兆阳

(Harvard Unveristy)

时间: 2025年11月25日 10:00-11:00

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Abstract:

Many data-science problems involve complex data evolving over time or space and governed by latent structures. Recovering these hidden representations is essential for characterizing dynamics and achieving generalization beyond observed data. This talk presents a unified framework for learning continuous latent structures under mixed membership, linking two domains: dynamic networks with irregular continuous-time interactions and nonparametric density mixtures where each observation arises from mixtures of latent generative densities. A central insight is that simplex geometry underlies these latent structures. We exploit this geometry using time-kernel smoothing for networks and topic-modeling-based unmixing for density mixtures. Leveraging random matrix theory and concentration inequalities, we develop methods that are statistically minimax-optimal, computationally efficient, and tuning-free. Applications include causal inference with interference on evolving networks and multi-agent reinforcement learning, where latent community structures support coordination and transfer.

个人简介:

Dr. Zhaoyang Shi is a Postdoctoral Fellow in Statistics at Harvard University working with Dr. Zheng (Tracy) Ke. He received his Ph.D. in Statistics from UC Davis and his B.S. in Mathematics from Fudan University. His research spans statistical network analysis, dense associative memory (Hopfield networks), and statistical inference, with a focus on links between associative memory and modern AI architectures. He is a recipient of the Peter Hall Graduate Fellowship and INFORMS APS Travel Awards.