THE UNIVERSITY OF CHICAGO

Department of Statistics

STATISTICS COLLOQUIUM

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Convexified Modularity Maximization for Degree-Corrected Stochastic Block Models

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Refreshments following the seminar in Jones 111

ABSTRACT

The stochastic block model (SBM) is a popular framework for studying community detection in networks. This model is limited by the assumption that all nodes in the same community are statistically equivalent and have equal expected degrees. The degree-corrected stochastic block model (DCSBM) is a natural extension of SBM that allows for degree heterogeneity within communities. This paper proposes a convexified modularity maximization approach for estimating the hidden communities under DCSBM. This approach is based on a convex programming relaxation of the classical (generalized) modularity maximization formulation, followed by a novel doubly-weighted `1-norm k-median procedure. In view of a novel degree-corrected density gap condition, we establish non-asymptotic theoretical guarantees for both approximate clustering and perfect clustering. In the special case of SBM, these theoretical results match the best known performance guarantees of computationally feasible algorithms. Numerically, we provide an efficient implementation of our algorithm, which is applied to both synthetic and real-world networks. Experiment results show that our method enjoys competitive empirical performance compared to the state-of-the-art tractable methods in the literature.

This is a joint work with Yudong Chen and Jiaming Xu.
