

ACMS Statistics Seminar

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Tues, December 5
154 Hurley Hall
3:30– 4:30 PM



Community Structure in Stochastic Networks

The first part of the talk studies community detection in degree-corrected block models (DCBMs). We derive asymptotic minimax risks of the problem for a misclassification proportion loss under appropriate conditions. The minimax risks are shown to depend on degree-correction parameters, community sizes, and average within and between community connectivities in an intuitive and interpretable way. In addition, we propose a polynomial time algorithm to adaptively perform consistent and even asymptotically optimal community detection in DCBMs. In the second part of the talk, we study the problem of testing for community structure in networks using relations between the observed frequencies of small subgraphs. We propose a simple test for the existence of communities based only on the frequencies of three-node subgraphs. The test statistic is shown to be asymptotically normal under a null assumption of no community structure, and to have power approaching one under a composite alternative hypothesis of a degree-corrected block model. Our approach achieves near-optimal detection rates for the presence of community structure, in regimes where the signal-to-noise is too weak to explicitly estimate the communities themselves, using existing computationally efficient algorithms.

The Department of Applied and Computational
Mathematics and Statistics

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