Limiting Spectral Distribution of Stochastic Block Model

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(Joint work with Giap Van Su, May-Ru Chen, and Hao-Wei Huang)

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ABSTRACT

The stochastic block model (SBM) is an extension of the Erd˝os–R´enyi graph and has applications in numerous fields, such as data analysis, recovering community structure in graph data and social networks. In this paper, we consider the normal central SBM adjacency matrix with K communities of arbitrary sizes. We derive an explicit formula for the limiting empirical spectral density function when the size of the matrix tends to infinity. We also obtain an upper bound for the operator norm of such random matrices by means of the Stieltjes transform and random matrix theory.

Keywords: Stochastic block model; clustering; semi-circular law; spectral distribution.

On the Limiting Properties of Empirical Spectral Distributions in Community-structured Networks

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ABSTRACT

The stochastic block model (SBM) generalizes the Erdős-Rényi graph by partitioning nodes into distinct subsets known as blocks or communities. In this talk, we will briefly review the foundational framework for analyzing the convergence of the empirical spectral distribution (ESD) of large-dimensional random matrices as their dimensions grow. Then we demonstrate that, under certain conditions, the ESD converges in a different sense. Additionally, I will discuss the asymptotic behavior of the ESD of random matrices and examine the limiting ESD of relative SBMs.

Keywords: random matrix, stochastic block model, empirical spectral distribution

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