

R. Clifton Bailey Statistics Seminar Series

Network Representation Using Graph Root Distributions

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April 13, 2018

11:00 A.M. - 12:00 Noon

Abstract: Exchangeable random graphs serve as an important probabilistic framework for the statistical analysis of network data. At the core of this framework is the parameterization of graph sampling distributions, where existing methods suffer from non-trivial identifiability issues. In this work we develop a new parameterization for general exchangeable random graphs, where the nodes are independent random vectors in a linear space equipped with an indefinite inner product, and the edge probability between two nodes equals the inner product of the corresponding node vectors. Therefore, the distribution of exchangeable random graphs can be represented by a node sampling distribution on this linear space, which we call the "graph root distribution". We study existence and uniqueness of such representations, the topological relationship between the

graph root distribution and the exchangeable random graph sampling distribution, and the statistical estimation of graph root distributions.