

Popularity Adjusted Block Models are Generalized Random Dot Product Graphs

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January 18, 2022

Abstract

We connect two random graph models, the Popularity Adjusted Block Model (PABM) and the Generalized Random Dot Product Graph (GRDPG), demonstrating that a PABM is a GRDPG in which communities correspond to certain mutually orthogonal subspaces of latent vectors. This insight leads to the construction of new algorithms for community detection and parameter estimation for the PABM, as well as improve an existing algorithm that relies on Sparse Subspace Clustering. Using established asymptotic properties of Adjacency Spectral Embedding for the GRDPG, we derive asymptotic properties of these algorithms. In particular, we demonstrate that the absolute number of community detection errors tends to zero as the number of graph vertices tends to infinity. Simulation experiments illustrate these properties.

Keywords: network analysis, community detection, sparse subspace clustering, spectral clustering