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A Zero-Inflated Poisson Latent Position Cluster Model

The latent position model is a popular approach for the statistical analysis of network data. A key aspect of this model is that it assigns nodes to random positions in a latent space, and the probability of an interaction between each pair of nodes is determined by their distance, allowing researchers to visualize nuanced structures via a latent embedding of the graph. Missing data is a common issue in statistical network analysis, often leading to an excess of observed zeros in interaction data. In this talk, I will focus on non-negatively weighted social networks. By treating missing data as "unusual" zero interactions, we propose a combination of the zero-inflated Poisson distribution with the latent position cluster model. Our framework extends the latent position model to accommodate the clustering of individuals and to simultaneously model weighted interactions, handle missing data, perform clustering, and produce three dimensional visualizations of real networks. Statistical inference is based on a partially collapsed Markov chain Monte Carlo algorithm, which involves a new truncated absorb-eject move, and selects the number of groups automatically by leveraging a mixture of finite mixtures framework.

Keywords/Topics

Clustering; latent position models, zero inflated distributions

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