

# Analyzing Networks with Multiple Links and Attribute Information using Stochastic Block Model

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Identifying clusters based on observed patterns or attributes and analyzing the interaction of actors within and outside these clusters allows to uncover hidden information about a network. Stochastic Block Model(SBM) is a generative model and one of the benchmark models for community detection. In this dissertation, Variational Expectation-Maximization algorithm approach of SBM is used to estimate the model parameters and Integrated Complete Data Likelihood(ICL) is used to compute optimal number of communities in the network. In real world, nodes are connected to other nodes with a string of multiple relationships, where each relationship defines its influence and meaning within a network. The SBM is used to fit all the links separately treating each link as a individual network. The resultant set of clusters and model parameters from the set of fitted models specific to each link are compared against each other and the node attributes to identify the connection between cluster formation, actor attributes and link type. This process is applied to Lawyer Lazega Dataset which is a network of lawyers working in a law firm connected to each other by multiple links- Friends, Advice and Work. The results show that there exists a relationship between the clusters formed across different link types; with many clusters behaving and containing same node attributes as of the clusters belonging to other link type.