Community Detection Using Node Attributes: A Non-negative Matrix Factorization Approach

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Abstract Community Detection uses graph topology and ignores node attributes while decomposing the network into coarse-grained descriptions. Popular algorithms that proliferate in the literature highlight important aspects of the network by detecting modules either by using the modularity maximizing approach or through information theoretic approaches. Each of these techniques has a different optimization criteria and objective function, and hence lead to different community structures. In the past few years, a hybrid category of algorithms were proposed that jointly model network topology and node attributes to detect communities in the network. There are significant challenges to this line of study as additional information has to be factored in but at the same time efficiency constraints of time and space have to be respected. In this paper, a variant of the BIGCLAM model is implemented for detecting communities in graphs. It uses the existing conceptual framework of Affiliate Graph Models and modifies it to consider attributes and not community affiliations as the basis for creating a bipartite graph for partitioning. A mathematical model of this novel approach is provided as well as experimental results on data have been presented to justify the use of this technique.

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