

Research on betweenness measure and community structure detection algorithms in social networks

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Abstract: This study investigates the role of intermediate measures and algorithms for detecting community structures in social networks. Community detection is a fundamental task in network analysis, revealing hidden organizational principles and functional units. While traditional methods often rely on direct connectivity or modularity optimization, this research focuses on the efficacy of intermediate measures—metrics that capture the bridging and brokerage roles of nodes and edges between communities. We propose and evaluate novel algorithms that integrate these measures to enhance the precision and scalability of community detection. Through extensive experiments on both synthetic benchmarks and real-world social network datasets, we demonstrate that our approach effectively identifies overlapping and hierarchical community structures, outperforming conventional methods in terms of modularity and normalized mutual information. The findings underscore the importance of intermediate nodes in maintaining network cohesion and provide a robust framework for analyzing complex social interactions. This work contributes to the theoretical understanding of network topology and offers practical tools for applications in sociology, marketing, and information dissemination.

Keywords: Centrality measures, community detection, social networks, algorithms