COMPARATIVE ANALYSIS OF QUALITY METRICS FOR COMMUNITY DETECTION IN SOCIAL NETWORKS USING GENETIC ALGORITHM

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Abstract: Web 2.0 has led to the expansion and evolution of web-based communities that enable people to share information and communicate on shared platforms. The inclination of individuals towards other individuals of similar choices, decisions and preferences to get related in a social network prompts the development of groups or communities. The identification of community structure is one of the most challenging task that has received a lot of attention from the researchers. Network community structure detection can be expressed as an optimisation problem. The objective function selected captures the instinct of a community as a group of nodes in which intra-group connections are much denser than inter-group connections. However, this problem often cannot be well solved by traditional optimisation methods due to the inherent complexity of network structure. Therefore, evolutionary algorithms have been embraced to deal with community detection problem. Many objective functions have been proposed to capture the notion of quality of a network community. In this paper, we assessed the performance of four important objective functions namely Modularity, Modularity Density, Community Score and Community Fitness on real-world benchmark networks, using Genetic Algorithm (GA). The performance measure taken to assess the quality of partitions is NMI (Normalized mutual information). From the experimental results, we found that the communities' identified by these objectives have different characteristics and modularity density outperformed the other three objective functions by uncovering the true community structure of the networks. The experimental results provide a direction to researchers on choosing an objective function to measure the quality of community structure in various domains like social networks, biological networks, information and technological networks.

Key words: *community detection, social network, optimization, objective function, Genetic Algorithm, Normalized mutual information*

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