Centrality Measures: Identifying Key Elements in Networks

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Centrality measures have been used widely by biologists, sociologists, physicists, psychologists, and economists for analyzing large complex networks. These tools are used to quantify the notion of the importance of nodes in a given network. Centrality measures are real-valued mappings that remain invariant under isomorphic transformation of networks [1]. By definition, a centrality measure is a quantification of the structural importance of a node based on its location, connectivity, or any other structural property. The books by Newman [4], Jackson [3] and Brandes and Erlebach [1] can be referred for detailed survey on the centrality indices and their applications. The most commonly used centrality measures (traditional measures) are degree, closeness, betweenness and eigenvector centrality.

In the last two decades, a major portion of the interdisciplinary work evolved just around the use of these measures to extract information from underlying network data. A major portion of the research work in this direction is concerned with selecting the best of the available traditional measures for a particular application. There exist several other measures which either extend or generalize these traditional measures or limit them to a restricted application. Moreover, various variants of these centrality measures have been proposed which consider a set of nodes and compute its collective centrality, called *group-centrality* [2]. Yet another direction is to combine various centrality measures to achieve better results for answering more complex problems. Such measures are termed as *Hybrid-centralities*.

This talk will start with the basic notion of centrality measures. Then, we cover the definition, application, and comparison of the traditional and few other popular measures. We will also discuss the algorithms to compute these measures. Next, we will look into different possible research directions based on centrality measures.

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