Chapter 15
Influential Nodes in Social Networks:
Centrality Measures

Kousik Das
Vidyasagar University, India

Rupkumar Mahapatra
Vidyasagar University, India

Sovan Samanta
 https://orcid.org/0000-0003-3200-8990
Tamralipta Mahavidyalaya, India

Anita Pal
National Institute of Technology Durgapur, India

ABSTRACT

Social network is the perfect place for connecting people. The social network is a social structure formed by a set of nodes (persons, organizations, etc.) and a set of links (connection between nodes). People feel very comfortable to share news and information through a social network. This chapter measures the influential persons in different types of online and offline social networks.

INTRODUCTION

Humans are social person and best decision maker. They cannot stay alone, they want to make friends, share news, information etc. Social network (Fig.1) is the perfect place for connecting people. Social network is a social structure formed by a set of nodes (persons, organizations etc.) and a set of links (connection between nodes). People feel very comfort to share news, information through social network. Recently online social networks like Twitter, Facebook and LinkedIn etc. have grown extremely popular in human life. A statistic (Tab.1) on social network in 2018 is given below.

Table 1. A statistic of population and network users.

Sl. No.	Particulars	Numbers (Billion)
01	World population	7.7
02	Mobile users	5.135
03	Internet users	4.021
04	Social networks users	3.196
05	Facebook users	2.27\

Figure 1. An example of social network.

There are some advantages of social networks in our daily life. In the field of education, it has big applications. Students, teachers, researchers and scientists have been spending lots of time in the social networks to talk about education works. Schools and colleges also use social network to keep in touch with students and teachers. Many companies also use social network to reach at customers. So it is the place for marketing products. But there are also some disadvantages of social network. Cybercrime is a big problem for people. Sexual exploitations and addictions to social network is also disadvantages for human. A fundamental problem in social network is to find influential node or central node (for example, head of cybercrime in crime network) within the network. Centrality indicates most important node or central node or influential node within a network. Hence measure of centrality is a very essential task in social network.

Many centrality measures (Das, Samanta and Pal, 2018) have been introduced over the years. The very simple centrality measure is degree centrality (Shaw, 1954). It is measured by the number of direct connections. This measure considers only local importance. Closeness centrality (Sabidussi, 1996) of a node is defined by the inverse sum of geodesic distances from that node to all others nodes. Betweenness centrality (Shaw, 1954; Freeman, 1977; Freeman et al., 1991) is defined by the number of the shortest paths pass through a node. This measure gives also global information in the network. Influential node is closely related to high degree, high betweenness and high closeness. Beside these standard centrality measures, there are many centrality measures i.e. eccentricity centrality (Hage and Harary, 1995), information centrality (Stephenson and Zellen, 1989), stress centrality (Shimbel, 1953), eigenvector centrality (Bonacich, 1972; Bonacich, 2001), katz centrality (Katz, 1953), subgraph centrality (Estrada

Related Content

Understanding Big Data
Naciye Güliz Uurand Aykut Hamit Turan (2020). *Big Data Analytics for Sustainable Computing (pp. 1-29).*
www.irma-international.org/chapter/understanding-big-data/238602

Residual Life Estimation of Humidity Sensor DHT11 Using Artificial Neural Networks
Pardeep Kumar Sharmaand Cherry Bhargava (2020). *AI Techniques for Reliability Prediction for Electronic Components (pp. 81-96).*
www.irma-international.org/chapter/residual-life-estimation-of-humidity-sensor-dht11-using-artificial-neural-networks/240492

Artificial Higher Order Neural Network Nonlinear Models: SAS NLIN or HONNs?
Ming Zhang (2009). *Artificial Higher Order Neural Networks for Economics and Business (pp. 1-47).*
www.irma-international.org/chapter/artificial-higher-order-neural-network/5275

Enhanced Footsteps Generation Method for Walking Robots Based on Convolutional Neural Networks
Sergei Savinand Aleksei Ivakhnenko (2019). *Handbook of Research on Deep Learning Innovations and Trends (pp. 16-39).*
www.irma-international.org/chapter/enhanced-footsteps-generation-method-for-walking-robots-based-on-convolutional-neural-networks/227842

Applications of Big Data and AI in Electric Power Systems Engineering
Tahir Cetin Akinci (2022). *Research Anthology on Artificial Neural Network Applications (pp. 783-803).*
www.irma-international.org/chapter/applications-of-big-data-and-ai-in-electric-power-systems-engineering/288986