

Chapter 25

Graph Tools for Social Network Analysis

Nadeem Akhtar

Aligarh Muslim University, India

Mohd Vasim Ahamad

Aligarh Muslim University, India

ABSTRACT

A social network can be defined as a complex graph, which is a collection of nodes connected via edges. Nodes represent individual actors or people in the network, whereas edges define relationships among those actors. Most popular social networks are Facebook, Twitter, and Google+. To analyze these social networks, one needs specialized tools for analysis. This chapter presents a comparative study of such tools based on the general graph aspects as well as the social network mining aspects. While considering the general graph aspects, this chapter presents a comparative study of four social network analysis tools—NetworkX, Gephi, Pajek, and IGraph—based on the platform, execution time, graph types, algorithm complexity, input file format, and graph features. On the basis of the social network mining aspects, the chapter provides a comparative study on five specialized tools—Weka, NetMiner 4, RapidMiner, KNIME, and R—with respect to the supported mining tasks, main functionality, acceptable input formats, output formats, and platform used.

1. INTRODUCTION

In present era, social networks are the fastest growing applications over the web. It has become the main interaction medium among people around the world. A social network can be considered as a graph having nodes and edges, where nodes represents actor or people and edges connect actors in communication (Alan Mislove, 2007). Social networks and the techniques to analyze them existed since decades (Carington, 2011). In earlier decades, social networks are analyzed to understand the behavior and evolution of human networks (J. Scott., 1994; S. Wasserman, 1994). A social network can be an email network, a telephone network or a collaborative network. But nowadays, most popular and most visited social

DOI: 10.4018/978-1-7998-7297-9.ch025

networks are Facebook, Twitter, LinkedIn, Myspace and Google+ which have acquired huge number of users. Facebook is said to have about 1.71 billion monthly active users, as of second quarter of 2016.

The structure of social networks and their analysis has evolved from graph theory, statistics and sociology. Social network analysis is used in several other fields like information science, business application, communication, economy etc. Since, social network mimics the structure of graphs, analyzing a social network is quite similar to the analysis of a graph. There are a number of tools for graph analysis that are in existence from decades. But they are not able to analyze a social network graph because of its huge size and complex properties. It may contain millions of nodes and edges. Social networks are dynamic i.e. there is continuous evolution and expansion. In a social network, a node or actor usually has several attributes. There can be small and large communities within social networks. Because of the complex structure and very large size of the social networks, old graph analysis tools are not designed to analyze social networks.

In this chapter, we present a comparative study of such tools based on the general graph aspects as well as the social network mining aspect. While considering the general graph aspects, we present the comparative study of some social network analysis tools based on the platform, execution time, Graph types, algorithm complexity, input file format, graph features. Under the social network mining aspect, we are dedicated to provide a comparison study of some specialized tools with respect to the supported mining tasks, main functionality, acceptable input formats, output formats, and platform used.

2. SOCIAL NETWORK ANALYSIS

The internet has revolutionized the sharing of information through number of information sharing systems, including the Web. As of July 2015, number of internet users are 3.17 billion. Out of them, 2.3 billion users are active on social media having an average of 5.54 social media accounts. As of April 2016, Instagram has over 400 million users, and LinkedIn has over 450 million users. Facebook is said to have about 1.71 billion monthly active users, as of second quarter of 2016. These numbers significantly shows how popular social networks are.

Social network analysis (SNA) is the methodical analysis of social networks through the use of network structure and graph theories. Social network analysis views social relationships in terms of network theory, consisting of nodes (representing individual actors within the network) and ties (which represent relationships between the individuals, such as friendship, kinship, organizational position, social relationships, etc.) (Monclar, 2011).

Analysis tasks of social networks includes following:

- Discovering the structure of social network
- Finding various attribute values for the network- Ex. radius, diameter, centrality, betweenness, shortest paths, density etc.
- Finding communities in the social network
- Visualizing the whole or part of the social network

Several works has been done on various social networks to analyze and discover various kinds of relationships and information (N. Akhtar, 2013; Zelenkauskaitė, 2012; Li, 2010; Alan E. Mislove, 2009).

14 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/graph-tools-for-social-network-analysis/270309

Related Content

Emerging Trends and Innovations in Blockchain-Digital Twin Integration for Green Investments: A Case Study Perspective

Muhammad Usman Tariq (2024). *Harnessing Blockchain-Digital Twin Fusion for Sustainable Investments* (pp. 148-175).

www.irma-international.org/chapter/emerging-trends-and-innovations-in-blockchain-digital-twin-integration-for-green-investments/340762

Counseling Supervisors' Clinical Healthcare Leadership Development: A Phenomenological Study

John Grady, William Quisenberry and Robert H. Kitzinger Jr. (2023). *Applied Research Approaches to Technology, Healthcare, and Business* (pp. 171-198).

www.irma-international.org/chapter/counseling-supervisors-clinical-healthcare-leadership-development/331648

Leading Anywhere Workers: A Scientific and Practical Framework

Christianne T. Varty, Thomas A. O'Neill and Laura A. Hambley (2021). *Research Anthology on Digital Transformation, Organizational Change, and the Impact of Remote Work* (pp. 279-310).

www.irma-international.org/chapter/leading-anywhere-workers/270299

Determining the Accessibility of e-Government Websites in Sub-Saharan Africa Against WCAG 2.0 Standard

Silas Formunyuy Verkijika and Lizette De Wet (2021). *Research Anthology on Digital Transformation, Organizational Change, and the Impact of Remote Work* (pp. 1385-1404).

www.irma-international.org/chapter/determining-the-accessibility-of-e-government-websites-in-sub-saharan-africa-against-wcag-20-standard/270355

Digital Technologies and the Intangible Cultural Heritage of the Rural Destination

Aditya Ranjan and Priya Chaturvedi (2022). *Disruptive Innovation and Emerging Technologies for Business Excellence in the Service Sector* (pp. 196-218).

www.irma-international.org/chapter/digital-technologies-and-the-intangible-cultural-heritage-of-the-rural-destination/300544