Chapter 1
Social Network Analysis:
Tools, Techniques, and Technologies

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ABSTRACT

Over the last decade, technology has thrived to provide better, quicker, and more effective platforms to help individuals connect and disseminate information to other individuals. The increasing popularity of these networks and its huge content in the form of text, images, and videos provides new opportunities for data analytics in the context of social networks. This motivates data mining experts and researchers to deploy various mining apparatus and application-specific tools for analysing the massive, intricate, and dynamic social media knowledge. The research detailed in this chapter would entail major social network concepts with data analysis techniques. Moreover, it gives insight to representation and modelling of social networks with research datasets and tools.

1. OVERVIEW OF SOCIAL NETWORKING

Starting from Internet Messengers, websites, emails and blogs; Online Social Networks (OSNs) have emerged as a popular media. According to Boyd et al., a social network is defined as "a platform to create social relations among those who share similar interests, activities, backgrounds or real-life connections. Social networks are web-based services that enable people to make public profile, produce a listing of users with who to share connections view and cross the connections within the system". In general, a social network is formed by the nodes and edges where nodes represent the individual identity and edges between the nodes signify interactions or relationship between them. Picture of how social network is represented using nodes and edges is presented in Figure 1. Here, rectangular nodes A to E are the individuals and their social ties are represented by undirected edges. For example A has social relations with B, E, and C.

Figure 1. Social Network
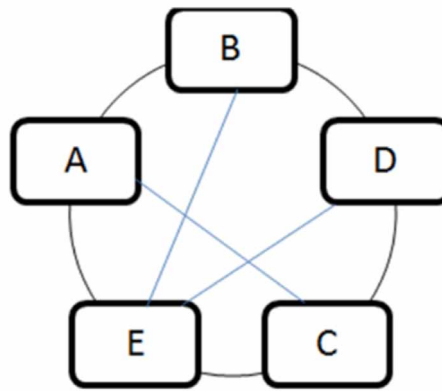
The emergence of online social networks is the golden milestone achieved in the history. There are many well-liked online social networks namely Facebook, Twitter and MySpace which seems to be popular now days. Additionally, variety of multimedia networks like Flickr and YouTube has conjointly seen an increasing level of recognition in recent years. Many other professional and educational social networks have also become popular like LinkedIn and other forums. Moreover, with the escalation of online social media, voluminous amount of social data gets generated (Kaytoue et al, 2015). As the information available online is evolving day by day, it becomes very difficult to manage and process without any help of information processing tools and management. This creates urge for applying suitable metrics for investigating the performance of network in terms of robustness, efficiency etc. and to compare different network statistics accordingly. One of the most critical tasks is to model the social network graph mathematically for further analysis over it (Newman, 2003; Jansen et al, 2015). Modelling is the initial phase to proceed further towards rigorous analysis in social networks. Therefore, there exists the need for experimenting with models for directed and un-directed graphs with high precision.

With the widespread of social networking platforms, the demand for developing models to propagate information among the networked societies is also on the rise. In the recent years information propagation in social network plays a vital role in advertising new products or services, including viral marketing and brand promotion (Kimura et al, 2010). For maximizing the spread of advertisement and promotions, many organizations use social network mining to identify the target audience. The materials in this context will be of great assistance to social network analysts, technical experts and researchers. Readers from generic computer science background without explicit pre-requisites would also find it interesting. Moreover, scholars belonging to social sciences or marketing domain, may find familiarity to learn representations of social network elaborative over datasets, tips, tools, techniques and technologies.

This chapter would be an insight to introduction of social network analysis and its emergence. In the first section, an exhaustive survey of available analytical tools is included with a particular emphasis on datasets, visualization platforms and programming interfaces (Correa, 2011). In the subsequent section, social networking techniques are surveyed that covers survey related to modelling of social network, methods for mining the colossal social data followed by process of diffusion process in networks. The chapter also presents the several key identified challenges in context of selected domains, latest applications and services which have been considered to be of greater eminence for further research.

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