

Chapter 13

Applications of Social Graphs: Author, Email, Telephone Using Graph Mining Techniques

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ABSTRACT

The chapter focuses on the applications of three social graphs, namely author, email, and telephone. The important application of author graph is the real network communications among the authors publishing research papers. The authors have proposed an algorithm to extract sub-graphs of authors. Individual email sending is more frequently within a group rather than group sending. Such group entities can be detected and analyzed further for knowledge discovery. For this, the authors have proposed an algorithm for extraction of strong and weak communicator's sub-graph. The telephone graph with multiple distinct types of connectivity information can be derived as layers and considered an important application. Therefore, the information retrieval can be represented as multi-layer graphs. Each layer has its own set of edges over the same underlying nodes of base-layer. Therefore, the edges of different layers typically are related but unique in behavior. For this, the authors have proposed an algorithm for representation of telephone graph as a multi-layer graph.

INTRODUCTION

Social networks are generally modeled as graphs, which sometimes referred as a social graph. The entities are the nodes or vertices, and an edge or arc connects two nodes if they are related. Social graphs are undirected or directed depending on the kind of relationships. The degree of the relationship is represented by labeling the edges. There are some examples of social networks. They are Friends

DOI: 10.4018/978-1-5225-3646-8.ch013

Network, Authors Networks, Collaboration Networks of Authors and Papers, Collaboration Networks of Teachers, Students, and Text Books, Facebook, Twitter, Google+, Email Networks, Telephone Networks, Collaboration Networks of Authors and Papers, Information Networks, Infrastructure Networks, Biological Networks and so on by Cook et al (2007) and Rajaraman et al (2011). In case of Facebook social network's friends' graph is considered as undirected graph by Cook et al (2007). Sometimes social graphs can also be directed graphs. In this case the graph of followers on Twitter or Google+ is considered as directed graph by Cook et al (2007). So "Social Network" is a network which represents the broader class of networks by Cook et al (2007). This chapter is meant for some applications of social graphs such as Authors graph, Email graph, and Telephone graph. From these graphs, the authors have retrieved successfully information using graph mining techniques. For these applications the authors have proposed three algorithms. To implement those algorithms, the authors have proposed three graphs namely Authors, Email, and Telephone.

LITERATURE REVIEW

Data Mining is the process of discovering interesting, non-trivial, implicit, previously unknown and potentially important information and patterns from data by Cook et al (2007). A graph can represent any complex relationships between data objects in pictorial way. The entities are mapped to vertices and the relationship is represented as an edge between the related pair of vertices. Hence graph based data mining is called as graph mining which aims at discovering the interesting sub-structures within a structural data. The authors have proposed an algorithm for discovering sub-graphs such as individual authors published papers, authors associated with individually published papers and authors associated with others having no individual published papers from authors graph using graph mining techniques.

Email mining includes spam detection, email categorization, contact analysis, email network property analysis and email visualization proposed by Tang et al (2014). Graph based ranking algorithms for email correspondents according to their degree of expertise on subjects of interests proposed by Dom et al (2003). A graph based mining approach for email and document classification proposed by Aery et al (2014). Hence the authors have proposed an algorithm for discovering sub-graphs such as weak connected and strong connected from email graphs using graph mining techniques.

The fundamental study of networks in the study of complex network systems in biological, social, information, engineering, and physical sciences can be seen in Boccaletti et al (2006), Newman (2010) and Estrada (2011). In traditional studies of networks, generally the nodes are connected to each other by a single type of static edge that forms all connections between them. It is overall a gross over simplification. This kind of static connection leads to misleading results and lack of addressing certain problems. So the inter-layer connections have the ability to generate new structure in the form of dynamic correlations between components of a system. Hence it is necessary to develop a framework that solves all the common problems related to the network by De Domenico et al (2013).

For example, a social network user may currently be logged into Facebook but not logged into some other social networking site such as Google+, Twitter etc. The presence of nodes in multi-layer systems of social network guarantees the possibility of self-interactions in a particular social network. This feature is not similar to the functions in interdependent networks, which were the ideas in interconnected communities within a single and larger network by Buldyrev et al (2010) and Dickison et al (2012).

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