Chapter 4

A Conceptual Framework for Social Network Data Security: The Role of Social Network Analysis and Data Mining Techniques

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ABSTRACT

In recent times, there has been a tremendous increase in the number of social networking sites and their users. With the amount of information posted on the public forums, it becomes essential for the service providers to maintain the privacy of an individual. Anonymization as a technique to secure social network data has gained popularity, but there are challenges in implementing it effectively. In this chapter, the authors have presented a conceptual framework to secure the social network data effectively by using data mining techniques to perform in-depth social network analysis before carrying out the actual anonymization process. The authors’ framework in the first step defines the role of community analysis in social network and its various features and temporal metrics. In the next step, the authors propose the application of those data mining techniques that can deal with the dynamic nature of social network and discover important attributes of the social network. Finally, the authors map their security requirements and their findings of the network properties which provide an appropriate base for selection and application of the anonymization technique to protect privacy of social network data.

DOI: 10.4018/978-1-4666-4213-3.ch004
INTRODUCTION

Social Network can be defined as a collection of people that form groups or communities based on similar interests or features. In a social network structure, the individuals or the members of the group are represented by nodes and the relationship among them is represented by edges that join any number of nodes together. Backstrom et al. (2006) address some important issues regarding group formation and evolution, and discussed them in detail.

There are different kinds of users in a social network like creators, critics, collectors, joiners, spectators and inactives (Li, 2007).

- **Creators:** Creator is a person who creates a social media and publicises it to the world. It includes creation of a web page, blog, uploading videos and other information.
- **Critics:** Critic is a person who responds to the information posted by others by posting his/her ratings, reviews about the product or services and updates on the social media.
- **Collectors:** Collectors are the ones who use the content for themselves as well as for others by using RSS feeds. They vote for websites online and add tags to web pages.
- **Joiners:** Joiners are people who join different social networking sites and maintain and update their profiles. They generally have multiple profiles on various social networking sites.
- **Spectators:** Spectators include people who read blogs, view user generated content and check for products with user ratings and reviews.
- **Inactives:** Inactives are people who do not participate in any social networking activity but are members of the social network.

Social network analysis is the study of such networks where users exist in the form of groups or communities and analysis of the network is done to find out interesting relationships and patterns. Social network analysis is not limited to finding patterns and relationships but it also provides valuable information like strong relationships in the graph, degree, density, power and centrality. This information can be used for evaluation of critical parameters and evolution of social network with time which can further serve as an important base for application of anonymization technique to achieve the desired level of privacy with minimum possibility of any security breach. Social networks inherently appear in groups that change and evolve with time. Community analysis is one of the major parts of social network analysis that is used to study the structure, evolution and behaviour of the social network. Our framework proposes the use of community analysis by using data mining techniques that can track the dynamic nature of social network. To study the temporal nature of social networks we found dynamic clustering technique to be the most appropriate and our framework proposes to use the same. Dynamic clustering techniques provide an in depth analysis of changes that occur in social networks with time and are also consistent with the previous releases of data. These techniques will provide all the necessary information about the network that can be very critical from security point of view. This information will hence, serve as an important base for application and selection of the correct anonymization technique. Our framework provides the mapping of the parameters provided by social network analysis with the security requirements that will prove as the deciding factor for the selection of correct anonymization technique to achieve better security.

This chapter is organized as follows: Section two presents the related research and motivation. Section three outlines the research methodology.
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