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REVIEW

Analyzing negative ties in social networks: A survey

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Abstract Online social networks are a source of sharing information and maintaining personal contacts with other people through social interactions and thus forming virtual communities online. Social networks are crowded with positive and negative relations. Positive relations are formed by support, endorsement and friendship and thus, create a network of well-connected users whereas negative relations are a result of opposition, distrust and avoidance creating disconnected networks. Due to increase in illegal activities such as masquerading, conspiring and creating fake profiles on online social networks, exploring and analyzing these negative activities becomes the need of hour. Usually negative ties are treated in same way as positive ties in many theories such as balance theory and blockmodeling analysis. But the standard concepts of social network analysis do not yield same results in respect of each tie. This paper presents a survey on analyzing negative ties in social networks through various types of network analysis techniques that are used for examining ties such as status, centrality and power measures. Due to the difference in characteristics of flow in positive and negative tie networks some of these measures are not applicable on negative ties. This paper also discusses new methods that have been developed specifically for analyzing negative ties such as negative degree, and h^* measure along with the measures based on mixture of positive and negative ties. The different types of social network analysis approaches have been reviewed and compared to determine the best approach that can appropriately identify the negative ties in online networks. It has been analyzed that only few measures such as Degree and PN centrality are applicable for identifying outsiders in network. For applicability in online networks, the performance of PN measure needs to be verified and further, new measures should be developed based upon negative clique concept.

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1. Introduction

Online social networks are becoming popular among large number of people, as a source of forming virtual communities online. These communities are developed by creating profiles and maintaining personal contacts of each user through social interactions. Schneider et al. [1] defined social network as "OSNs form online communities among people with common interests, activities, backgrounds, and/or friendships. Most OSNs are Web-based and allow users to upload profiles (text, images, and videos) and interact with others in numerous ways". Social interactions in these networks are crammed full with positive and negative relations. Positive relations are formed by support, endorsement and friendship and thus, create a network of well-connected users which is useful for the promotion of market products, brands, services and new research ideas on social media [2]. Negative relations, on the other hand, are a result of opposition, distrust, antagonism and avoidance. Negative relationships represent a persistent, recurring set of negative social intentions toward another person. Negative relations are central to clusterability theory [3], balance theory [4,5], their generalizations [6], semigroup work [7] and social network analysis [8]. Many areas of negative networks need extensive research such as bullying, group conflicts and social exclusion. Because of the increase in criminal activities in online networks such as people masquerade others by creating fake profiles and conspire against business rivals by presenting fake reviews of products being promoted on these networks, there is a need to identify these negative actors of network by observing their connection patterns. In another example, one political party opposes the policies and efforts made by other parties on these networks by commenting against them and exaggerating their own policies by pretending them to be in welfare of public. Therefore, these undesirable activities of political parties need to be monitored.

Many researchers have focused on studying negative ties in different fields of research. Bohn et al. [9] have analyzed the access to social capital in OSNs by examining the actual communication ties (positive and negative) among actors, whereas, Box-Steffensmeier and Christenson [10] studied the interest group coalition by considering positive and negative ties. Smith et al. [11] have accessed the phenomenon of homophily in social networks by studying network ties of both positive and negative nature. De Jong et al. [12] analyzed the impact of negative relationships on attitudes of each team member and performance in teams. Recently, many researchers have dedicated their research on investigating negative ties to explore different concepts in social networks such as studying attitude diffusion [13] and analyzing aspects of inter-ethnic relationships between secondary school students [14].

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