Social Influence Study in Online Networks: A Three-Level Review

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Abstract Social network analysis (SNA) views social relationships in terms of network theory consisting of nodes and ties. Nodes are the individual actors within the networks; ties are the relationships between the actors. In the sequel, we will use the term node and individual interchangeably. The relationship could be friendship, communication, trust, etc. These reason is that these relationships and ties are driven by social influence, which is the most important phenomenon that distinguishes social network from other networks. In this paper, we present an overview of the representative research work in social influence study. Those studies can be classified into three levels, namely individual, community, and network levels. Throughout the study, we are able to unveil a series of research directions in future and possible applications based on the state-of-the-art study.

Keywords social network analysis, review, social influence, individual, community

1 Introduction

Social network analysis (SNA) views social relationships in terms of network theory consisting of nodes and ties. Nodes are the individual actors within the networks; ties are the relationships between the actors. The relationship could be friendship, communication, trust, etc. Compared with traditional social scientific studies, which assume that it is the attributes of individual actors that matter, SNA (social network analysis) puts more emphasis on the relationships and ties between actors within the network. The reason is that these relationships and ties are driven by social influence [1-2], which is the most important phenomenon that distinguishes social network from other networks [3].

In this paper, we present an overview of the representative research work in social influence study. Those researches can be classified into three levels. Fig.1 shows the categorization of social influence study in detail. We shall follow this structure and discuss each of them.

SNA provides a both visual and mathematical analysis of human relationships. According to aforementioned discussion, instead of individual actors, SNA puts more focus on the connections between them. Social networks have also been used to examine how organizations interact with each other, characterizing many informal connections that link executives together, as well as associations and connections between individual employees at different organizations. Moreover, SNA gives companies and stakeholders new opportunities to collect information, design marketing strategies, attract customers, and so on through social networks.

In social psychology, social influence [1-2] occurs when an individual’s thoughts, feelings or actions are affected by other people. A majority of social ties in social networks such as who-believes-whom, who-emails-whom, who-likes-whom or who-borrows-money-from-whom can be concluded as social influence effect. We refer to these networks which are driven by social influence effect as influence-driven social networks. In this paper, we focus on these networks and study how
the social influence phenomenon affects them. For example, Fig. 2 depicts a conversation between users $u_1$ and $v$, which is a common scenario in many kinds of social networks\cite{1,4-9}. Suppose that $v$ recommends a new application of Google+ to his/her neighbors. One of his/her friends $u_1$ sees the recommendation and decides to have a try. In summary, $u_1$ is influenced by $v$ to use a new application. Similarly, $u_2$ is also influenced by $w$ to use this application. Such effects will result in a growth of the Google+ user community, which is shown in Fig. 2(b). Thus, the evolution of a community can be traced back to the effect of social influence. Similar to the evolution of Google+ community, Gtalk user and Android user communities also evolve in this way (i.e., Fig. 2(c)). Such changes will result in the evolution of the whole Google user network. It is obvious that most of the changes and evolutions of social networks can be seen as the result of the atomic social influence effect in Fig. 2(a).

In the following, we shall discuss the existing work and conduct comparisons within each level in sequence.

The rest of this paper is organized as follows. We investigate the individual-level, community-level, and network-level social influence studies in Sections 2~4 sequentially. Section 5 concludes this paper and discusses the future directions over social influence work.

2 Individual-Level Analysis

There are three main research areas with respect to individual-level social influence study: the subject node which influences others, the social tie where influence flows, and the object node which is influenced. We will discuss each of them in sequence.

2.1 Subject Node

Influential mining problem\cite{10-12} is the focus in the research field with respect to subject node. It aims to answer the following question: given a social network, which are the most important nodes with respect to a specific application? In the following, we review some representative work in this field.