

# Opinion leaders selection in the social networks based on trust relationships propagation

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## Abstract

Today, social networks become very popular and include a wide range of users. In these networks, some users have a great influence ratio to other users who are called opinion leaders. They can use their influence on many issues, such as political, economic, education, social, etc. In this paper, we propose a new framework to select the opinion leaders in online communities. The framework uses the trust relationship between the users and evaluates the total trust value (TTV) of primary opinion leaders between other users to select the highest of them. According to the obtained results, the proposed framework in comparison of top in-degree method, top out-degree method, top centrality method and hybrid IO-degree method provides better results in the social network marketing (SNM) campaigning.

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*Keywords:* Opinion leader; Social networks; Trust; Similarity; Sociality

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## 1. Introduction

Online communities are becoming more and more popular as it is shown by the growth on the number of their members [8]. Also, the popularity of social networks has led to new ideas and caused to use that in different cases, like combining with Cloud/Grid computing [17,18,20,22,24,28], Peer-to-Peer networks [19], Expert Cloud [2,17,18,21,23], cooperative games [3] or in therapeutical cases [1]. All the registered users in these communities are not enough honestly or reliable. When information is to be shared or a user is

interested in knowing the opinions of others, uncertainty might be a problem. It would be desirable to have a tool that aids users in overcoming this uncertainty, where the trust plays an essential role [8].

Online public opinions closely are connected with the various contradictions and sensitive issues in the social transformation period. In the process of public opinion transmission, any Internet users expressed their ideas who can be familiar with computers operating in a particular way, such as participating in the topic discussion or social networks Ref. [32]. Opinion leaders play an important role in improving communication and encouraging group members in order to have a greater level of information exchange Refs. [4,33]. Their superior status, education, and social prestige enabled them to influence followers, which

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are element key to making the connected community and make the best group performance. With attention to prominent and effective diffusion strategy, using opinion leaders has been studied in many fields such as anthropology, sociology, and business Refs. [6,34]. Also, opinion leaders have demonstrated significant impact in political participations and discussed to sustain any prolonged political action Ref. [35]. Opinion leaders have identified a prerequisite for guiding and interfering public opinion on the Internet due to the identification of opinion leaders is very important and meaningful [14].

In this paper, we introduce a framework to increase the accuracy of opinion leaders' selection method in the social networks. At the first step, we have removed the duplicate comments, self-trust statements, and troll's opinions, then try to select the opinion leaders that have a maximum amount of trust between users.

The rest of this paper is organized as follows. Section 2 discusses the related works; Section 3 presents the research framework; Section 4 presents discussions and comparison of the proposed mechanism with the existing methods; in Section 5, concludes the paper with some suggestion for future research directions.

## 2. Related works

In recent years, the identification of opinion leaders is a subject which has been a great interest. So far, some researchers were studied on opinion leaders where first of them is situated within the field of sociology. Numerous studies such as [5,10,16,26,29,30] have been conducted in order to understand the concept of opinion and characteristics of leaders distinguishing them of their followers. The studies on opinion leader identification can be divided into two parts: (1) link-based opinion leader identification methods that consider the social interactive structure of the network; and (2) mixture of opinion leader identification methods that combine the social link information with semantic-based information embodied in documents [9,12,15,27].

As an example of link-based opinion leader selection, Carson, Tesluk et al. [4] have identified opinion leaders with an excellent edge rank algorithm based on excellent network theory, applied it to rank excellent edges and used the ranking result to identify opinion leaders in opinion excellent network model. Alternatively, Li, Ma et al. [13] have proposed an improved combined framework identifying the

opinion leader in online learning communities, which ranked opinion leaders based on four distinguishing features: expertise, novelty, influence, and activity. Furthermore, the performances of opinion leaders were further investigated in terms of longevity and centrality.

In another study, Cho, Hwang et al. [6] have found that those opinion leaders are the optimum marketing choice in terms of diffusion speed and maximum cumulative number of adopters, used a social network method and threshold model and conclude that opinion leaders with a high sociality and centrality (users who have high degree of connections to other people) are the best ones for fast diffusion.

In case of SNM, about 78% of the trust of customers to the social network communities are based on opinion leaders' recommendations for products and services [25]. So, how to identify the opinion leaders effectively is the key to raise sales and brand awareness. In sales and marketing field, some studies focus on developing various indexes such as in-degree, out-degree, betweenness and closeness in social network analysis (SNA) to identify opinion leaders. These studies are interested in identifying opinion leaders who will forward be marketing messages to other users via their trust and distrust networks. Moreover [11] Table 1 provides side by side comparison of the reviewed methods.

Trust can assist entities making decisions before establishing collaborations. It is desirable to simulate the behavior of users as in social environments where they tend to trust users who have common interests or share some of their opinions, i.e., users similar to them. In this direction Ref. [36] in a research introduce the concept of context similarity among entities and derive a similarity network. Then, it defines a trust model that allows to establish trust along a path of entities. Also, many other methods for evaluating trust in the social community are proposed, for example, in Ref. [11] three methods (Knowledge Score, Matching coefficient, Jaccard coefficient) which obtain trust degree between users in social networks are introduced. Which knowledge score reflect both the evaluation score and the intensity of a relationship between two users and two other methods are acting based on the structural and social similarity between two users.

## 3. Research framework

For selecting opinion leaders in the social network, at first, we must have access to relationships between

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