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TRUSTWORTHINESS IN ONLINE SOCIAL NETWORKS: A REVIEW

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Abstract: Online social network has been an important and active research topic in the recent years. Basically, it is a social structure of people, related directly or indirectly to each other through a common relation or interest. Eventually, there has been an immense increase in the usage and popularity of OSNs. Recommender systems constitute one of the fastest growing segments of the Internet economy today. They help reduce information overload and provide customized information access for targeted domains. The major focus of trust based decision support system is on the trust value among users which makes more reliable and accurate recommendations. Major researches have been conducted worldwide to find suitable algorithms for inferring the optimal path and the trust value. This paper attempts to review all the major algorithms for inferring the trust values.

Keywords: Online social networks, Recommender systems, Trust value, decision support system, collaborative filtering.

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INTRODUCTION

Online Social networking focuses on reflecting and building of social networks or relations among people sharing same interests, activities or backgrounds. Social networking sites allow users to share ideas, pictures, posts, activities, events and interests with people in their network. Facebook, Twitter, My Space etc are the sites currently dominating the field of social networking. Social networking sites have been great boons in our lives helping people to remain connected. They allow users to share a lot of information among the people in their network. The increasing tendency of people to use online social networks has lead to collection huge amount of information being available [2]. This gives rise to the concept of information overload. As the Internet is continuously growing; it becomes increasingly difficult to sift through all the information available. To organize such a vast and distributed data generated from OSNs, appropriate techniques are required to analyze and manage such massive, complex and frequently changing social network data. Filtering is used to organize and structure the large and complex data. Information filtering can help in obtaining the most appropriate information efficiently [1].

Recommender systems or recommendation systems are a subclass of information filtering that seeks to predict the preference that a user would give to an item. It compares the collected data to similar and dissimilar data collected from others and calculates a list of recommended items for the user. Recommender systems help to overcome the information overload by providing personalized recommendations based on past interactions of a specific user. Social dimensions are also very vital in inferring recommendations like trust, friendship, interaction frequency, relationship duration and social capital [3].

One approach that is being used widely to build recommender systems is collaborative filtering. Collaborative filtering methods are based on collecting and analyzing a large amount of information on users' behaviors, activities or preferences and predicting what users will like based on their similarity to other users. Its key advantage is that it does not rely on machine analyzable content and so it is capable of accurately recommending even complex items. Collaborative filtering algorithms require: 1) users' active participation 2) an easy way to represent users' interests to the system and 3) algorithms that are able to match people with similar interests.

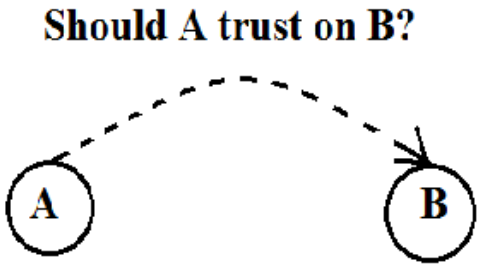

Fig 1: A scenario of trust evaluation

Trust is considered as an important property of social networks. Trust among users in social networks has been of high interest, not just in computer science, but in psychology and sociology as well. There are various elements of trust such as predictability, confidence, bonding, competence, reputation, positive intensions and ethics. Trust focuses on two specific parts: truster & trustee. As the users interact frequently, their relationship bond strengthens and trust develops eventually based on their experience [4].

I. MATERIALS AND METHODS

Now-a-days, social networks and trust are used to generate recommendations for users. In such cases, trust is used directly used to generate the recommendation in decision support systems. There is need of accurate estimate of trust, if it is used in decision support systems [5]. Major researches have been conducted worldwide to find suitable algorithms for inferring the trust values. A brief review of some recent researches is presented as follows:

A. Eigen Trust Algorithm:

Eigen Trust is proposed to infer trust in peer-to-peer networks. In the peer-to-peer networks, there can be two types of peers:

a) Good Peers: These join the network to receive and offer services or send files to others. They share authentic files.

b) Malicious Peers: These join the network to destroy or to take charge of it. They share inauthentic files.

The objective is to reduce the quantity of inauthentic files shared in the network [6]. On the basis of authentic files received from peer, each peer maintains information about the

trustworthiness of peers. A peer obtains direct trust rating for another peer based on past interactions. For those who have not interacted, peer ought to collect information from the network to infer the trustworthiness of that particular peer.

B. Mole Trust Algorithm:

In a social network, some RS algorithms predict a user's rating for an item by traversing the user's neighborhood and querying the item ratings of her direct and indirect friends. Such an approach is referred as Social Network Traversal. Mole Trust mechanism is based on the direct trust statements expressed by users in the trust networks. There is explicit trust relationship among the users. As input, it considers all trustable raters up to the maximum depth, which is independent of any specific user and item. It replaces the similarity based neighborhood selection by the use of trust metric that considers the direct trust propagation distance to estimate the trust weight [7].

C. Tidal Trust Algorithm:

Tidal Trust algorithm was proposed by Golbeck in 2005 [8]. It is used for computing inferred trust amongst users in social network. It uses weighted average of trust information from the neighbors of the source users and performs a modified breadth first search in the trust network. Tidal Trust looks into the trust values along the paths connecting the source and the sink. It balances out limiting the depth of the paths and the accuracy of the computed trust. It uses the shortest search depth that will produce a result. The objective of this algorithm is to determine source's trust towards sink in a graphical structure. Tidal Trust computes trust between two users even if they are not directly connected. When we compute the trust amongst users that are not directly connected, first use is referred as 'source' and trustee is referred as 'sink'. Tidal Trust algorithm has two parts: finding a path from source to sink while rating nodes on the way to the sink, and, once the sink is found, aggregating trust backwards to the source.

D. SWTRUST Algorithm

SWTRUST algorithm emphasizes on generating small trusted graphs for large OSNs that can be used to make trust evaluation algorithms more reliable and efficient. For discovering the short trusted paths, (Jiang et al., 2012) preprocess social network (PSN) by a novel user-domain based trusted acquaintance chain discovery algorithm to form a small world network of the larger

OSN. After that, there is need to build a trust network (BTN) and finally generate the trust graph (GTG) using breadth first search algorithm [9].

E. SUNNY Algorithm:

SUNNY (Kuter et al, 2007) computes an estimate of trust based on only those information sources with high confidence estimates [5]. It is a trust inference mechanism based on probabilistic confidence models. It performs a probabilistic logic sampling procedure (Katz, Y., and Golbeck, J. 2006. vSocial network-based trust in prioritized default logic) over the Bayesian Network generated by representation mapping [10]. SUNNY computes an estimate of trust based on only those information sources with high confidence estimates, and outputs both the computed trust value and a confidence estimate in that value [11]. SUNNY uses lower and upper bounds in the confidence values, which are the minimum and maximum possible confidence values respectively. It then uses heuristics like hill climbing search in finalizing the decision whether to include or not leaf in trust computation.

II. RESULTS & DISCUSSION

The various trust inference mechanisms briefed in the previous section are applied to the OSNs to analyze their efficiency. Table 1 shows the summary of all the trust inference algorithms.

Methods	Results
EigenTrust	Basically useful in p2p networks and experiments prove to minimize the impact of malicious peers on the performance of p2p networks.
MoleTrust	Unlike TidalTrust, it doesn't stop when sink is found. It is based on the direct trust statements expressed by users in the trust networks and performs well even in large social networks
TidalTrust	Tested on FilmTrust, the recommended rating with trust were more accurate than simple average ratings and offers significant benefits for accuracy
SWTRUST	Applying the method resulted in generating trust graphs of high quality and provided better & stable performance
SUNNY	Experimented on FilmTrust network and results demonstrated that it is an effective algorithm for computing trust in social networks

Table 1: Methods and results

III. CONCLUSION

Social trust is emerging as interesting and important and with social relationships, it is difficult to quantify trust. There is need to develop mechanisms for accurately estimating trust between users. More research can be done in this area to produce a more valuable algorithm with higher accuracy. In the future, we need to focus on developing more reliable and efficient trust inference mechanisms and improve their performance. Also, we can step further to perform better in real time OSNs.

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