

Comparative Analysis on Social Trust Computation in Trust Based Personalised Recommender Systems

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ABSTRACT: At present Social media greatly enables people to participate in online activities such as Networking, tagging and commenting by using various sites. Twitter, Facebook, Linked In, etc are the major things people used to share information in any time and in any place. All the sites having the user information's like bio-data, area of interest like that and it gives recommendations based on that gathered knowledge. Recommender systems take a benefit of active and collective knowledge to make personalized recommendations to each user. It attempt to recommend items of interest to particular users based on their explicit and implicit preferences shown in collected survey. Basically, huge volume of information on the Internet generates a lot of problems for users of commercial websites and social networks; so that the competition between their owners in providing appropriate, sufficient and reliable information for their users has been stimulated. In this paper, identifying influential users of micro-blogging services and creating new user profile based on tweets around twitter are the problem statements taken for comparison. By the way a hybrid recommender system, based on trust with individual and group views is presented and Individual trust is calculated based on item points which are earned by users. Group trust regard to a particular method in clustering puts in one group the users who have similar tastes in selecting items.

KEYWORDS: Recommender System, Social Networks, Social Trust, Multiple facets of Trust, Twitter, Mean Absolute Error, Root Mean Square Error

I. INTRODUCTION

In the recent years, the Web information has undergone a tremendous and immense growth of multimedia in order due to omnipresent access of Internet at any time and any place through Internet-enabled mobile devices such as smart phones and tablets. Nowadays, trust valuation has become a significant and most important issue with the development of Web applications, including e-commerce, P2P networks, multi-agent systems, recommendation systems, social networks and service-oriented computing. Recently, social network information can be utilized to improve recommendation qualities; the research of social recommender systems becomes popular. Such research is based on the sociological idea that users are more liable to have similar opinions to people that they know and trust. Two major Internet techniques which are used in analysis are search system and recommender system developed to help online users handle the information overload problem in Medias. In the search system, users actively express their needed information queries to the search system, and then the system tries to find the items in the collection that best thing match with the queries. In the recommender system, recommenders aim to provide people with suggestions of products they will appreciate based upon their past preferences, history of purchase, or demographic information which is same as Google process. The aim of Recommender Systems is providing personalized recommendations for the users. Recommender systems are a subclass of information filtering systems that consider user preferences and recommended items that match with user interests. Traditional recommendation techniques normally consider the user-item rating matrix for computing recommendations. In general, most of the social recommendation methods are based on the matrix factorization framework, which is both effective and efficient in generating recommendations. Our goal is to identify influential users and creating new profile based on tweets around social trust based recommendation.

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USAGE OF COMPUTATIONAL TRUST

Computational trust is applied to many fields in artificial intelligence, recommender systems, file sharing, Spam detection, networks security, etc. Most computational models are fitted to their application fields and context. In particular, we describe the ways that trust information can help to improve the quality of the recommendations through overview of general structure of trust, the bases of trust and the concepts of trust in different dimensions. From last few years, several computational trust models have been proposed in the trust based recommender system literature by formalizing, implementing and evaluating trust models that rely on trust theory which allow computational intelligence to make trust based decisions. Most of the existing computational trust models have focused on the aggregation of different trust aspects in order to predict the exact recommendation using trustworthiness. This paper completely focused on the concept of influential user blogging and new profile creation based on the tweets for analysis.

The rest of this paper is organized as follows. Section 2 introduces overview of existing methods that are related to this work. Section 3 details the finding of influential users and profile creation for new users in the literature. The effectiveness of our approach is evaluated and presented in Section 4. Finally, the conclusion and the future work are presented in Section 5.

II. RELATED WORK & METHODOLOGY

Trust is an abstract concept and social phenomenon. Trust has become important topic of research in many fields including sociology, psychology, philosophy, economics, business, law, and information technology. There is no generally accepted and uniformed definition for trust, even though it has been intensively examined in different research area, due to the multifaceted norms of trust as well as the multidimensionality of trust. Trust is viewed as structural for sociologists, interpersonal phenomenon for psychologists and rational choice mechanism for economists, security and privacy for computer science and so on, which can lead to more complex definitions. As a social concept, the many facets and influences of social trust has been extensively addressed in sociology and social psychology literature. Social trust is hard to model into computational trust due to the factors many similar past experiences, psychological social conditioning factors, opinion influence, etc. But modeling of computational trust in social networks is essential so that it can be used in computation that will benefit users.

JianshuWeng, Ee-Peng Lim, Jing Jiang, focused on the problem of identifying influential users of micro-blogging services. They stated Twitter, one of the most notable micro-blogging services, employs a social-networking model called “following”, in which each user can choose who she wants to “follow” to receive tweets from without requiring the latter to give permission first. They observed variety of datasets and conclude that 72.4% of the users in Twitter follow more than 80% of their followers, and 80.5% of the users have 80% of users they are following follow them back. It reveals that the presence of “reciprocity” can be explained by phenomenon of homophily. Based on that finding, TwitterRank, an extension of PageRank algorithm, was proposed to measure the influence of users in Twitter. TwitterRank measures the influence taking both the topical similarity between users and the link structure into account. Experimental results show that TwitterRank outperforms the one Twitter currently uses and other related algorithms, including the original PageRank and Topic-sensitive PageRank.

Fabian Abel, Qi Gao, Geert-Jan Houben, Ke Tao investigate user modeling strategies for inferring personal interest profiles from Social Web interactions. In particular, they analyze individual micro-blogging activities on Twitter and compared different strategies for creating user profiles based on the Twitter messages a user has published and study how these profiles change over time. Moreover, they evaluate the quality of the user modeling strategies in the context of personalized recommender systems and show that those strategies which consider the temporal dynamics of the individual profiles allow for the best performance.

XiaomingZheng et al proposed a new trust prediction model based on trust decomposition and matrix factorization, considering all the existing influential factors and differentiating both personal and interpersonal properties. In their model, they first decompose trust into trust tendency and tendency reduced trust for prediction

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system. Then, based on tendency reduced trust ratings, matrix factorization with a regularization term is leveraged to predict the tendency reduced values of missing trust ratings, incorporating both propagated trust and the similarity of users' rating habits. In the end, the missing trust ratings are composed with predicted tendency-reduced values and trust tendency values. Experiments conducted on a real world dataset illustrate significant improvement delivered by our approach in trust prediction accuracy over the state-of-the-art approaches.

In order to evaluate the prediction accuracy of proposed approach, they compare their accuracy with two recent and promising approaches at trust inference model (MATRI) and a matrix factorization with social regularization model (MFISR).

- MATRI: This approach considers trust tendency and propagated trust to predict missing trust ratings. The factors calculated from trust tendency and propagated trust are treated as some of the latent factors when conducting matrix factorization while other latent factors in matrix factorization are kept unchanged.
- MFISR: This approach adds social regularization into conventional matrix factorization by introducing average-based and individual-based social regularization terms separately. In addition, matrix factorization with individual-based social regularization (MFISR) was proved to be more effective and accurate than that with average-based regularization.

Generally, Trust provides information to find answers for the questions from whom we should collect information and with whom we should share information. A recommender system is a technique in user modeling to estimate the relevance of an item to a user such as documents, websites, movies, events or other users through search query logs, ratings from similar users, social connections and much more to predict unknown relevance. Unlike search engines, which lets users search for known or desired information, recommender systems strive to present each user with previously unknown yet interesting items. Generally, traditional recommender systems can be divided into two categories: memory-based and model-based methods. Memory-based recommender systems, also known as neighborhood-based methods are the most popular prediction methods and are widely adopted in commercial collaborative filtering systems. In the model-based approaches, training datasets are used to train a predefined model. Examples of model-based approaches include the clustering model, aspect models, the latent factor model, the Bayesian hierarchical model and the ranking model.

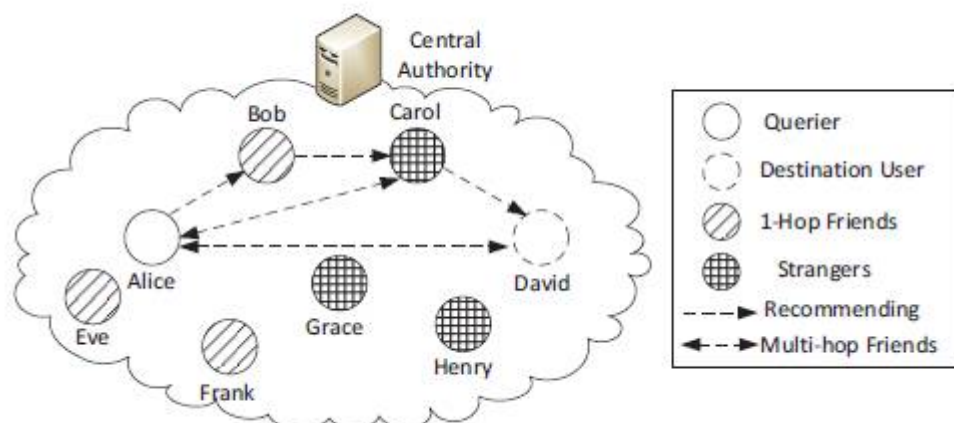


Figure 1: Model of Communication

Modern recommender systems embrace the effectiveness of data by combining multiple algorithms that predict relevance in various ways by considering different aspects of users and items when making predictions, and the aggregation methods provide rating predictions that rely on much evidence. Recommender systems are incredibly powerful tools which can accurately predict how users' tastes for solving the information overload problem. Recently,

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several matrix factorization methods have been proposed for collaborative filtering due to the efficiency in dealing with large datasets. These methods all focus on fitting the user-item rating matrix using low-rank approximations, and use it to make further predictions. The matrix factorization methods or low-dimensional factor models are very efficient in training since they assume that in the user-item rating matrix, only a small number of factors influences preferences, and that a user's preference vector is determined by how each factor applies to that user. Following figure describes the important labels which are parameters for trust based recommender system takes example as twitter data.

III. RESULTS & DISCUSSION

The computational trust process includes three sub-processes steps which takes the trust information as input and generates a numerical trust value as output as shown in figure-1. This process divided into the three generic sub-processes steps filtering, weighting and aggregation. Depending on the computation, the sub-processes steps are iterative and cycle due to predict the exact trust value in the trust networks. The first two steps, filtering and weighting preprocess the data for the subsequent aggregation. The first sub-processes step concerns the exact and optimum trust information for further processing (filtering). The second sub-processes step concerns the relevancy of the information for the specific aspects of the trust (weighting). Finally, in the third sub-processes the weighed trust values are aggregated to calculate one or several trust values. Depending on the algorithm, the whole computation process or single process steps can be run through for multiple times.

Four major computational tasks which are used as parameters for trust are

- Representing trust
- Measuring trust
- Applying trust
- Incorporating distrust

In the area of prediction and recommendation, Mean Absolute Error (MAE) and the Root Mean Square Error (RMSE) are the most common and important parameters used to measure the prediction accuracy of every model.

Mean absolute error for calculating predicted value and actual value are formulated as follows

$$MAE = \frac{1}{n} \sum_{i=1}^n |y_i - \hat{y}_i| = \frac{1}{n} \sum_{i=1}^n |e_i|.$$

Where,

$$AE = |e_i| = |y_i - \hat{y}_i|$$

$$\text{Actual value} = y_i$$

$$\text{Predicted value} = \hat{y}_i$$

JianshuWeng et al demonstrated LDA (Latent Dirichlet Allocation) model which is an unsupervised machine learning technique as their proposed method and calculate the measures belong to the required parameters. It is used to identify latent topic information from large document collection. Below figure is the graphical representation of LDA model.

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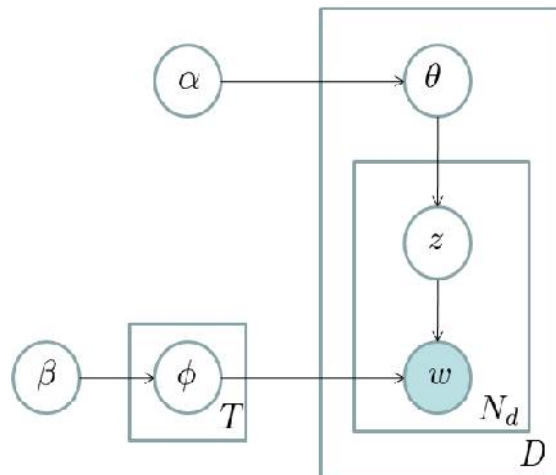


Figure 2: Graphical Representation of LDA Model

This model uses a “group of words” assumption, which treats each document as a vector of word counts. Based on this assumption, each document is represented as a probability distribution over some topics, while each topic is represented as a probability distribution over a number of words. It also assumes a generative process for generating each document as follows:

- For each document, pick a topic from its distribution,
- Sample a word from the distribution over the words associated with the chosen topic,
- Process is repeated for all the words in the document till end.

Fabian Abel et al analyzed the temporal dynamics of user profiles inferred from users' Twitter activities. They presented a user modeling framework that allows for the creation of strategies which extract the semantics of individual Twitter messages and allow for the generation of user interest profiles and it specify to which degree a user is interested into a given concept. They first analyzed the characteristics of topics discussed on Twitter and discovered that the representation of a topic changes over time concepts related to a topic may gain or lose importance. For event like topics identified different groups of users under two categories. Long-term adopters join the discussion early and continuously contribute to the discussion while Short-term adopters join the discussion later and participate just sporadically being influenced by public trends.

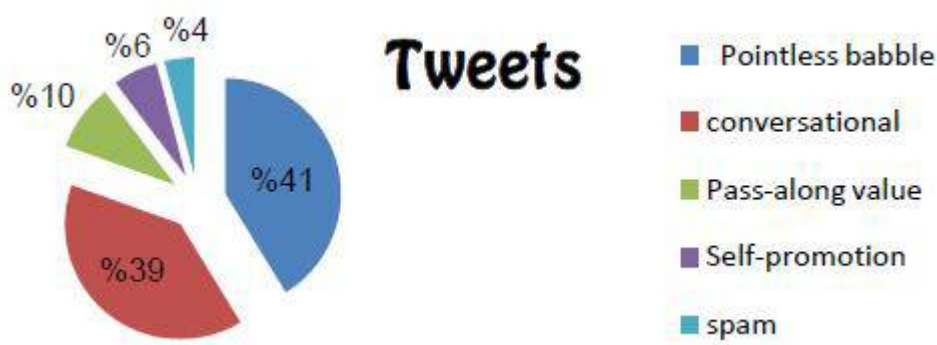


Figure 3: Tweets label example

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Problem Description Based on Recommender System:

Problem approach in this research article is different from traditional recommender systems because the latter normally considers only the user-item rating matrix. Here, we will also incorporate users' social network trust information to improve recommender systems. The Figure 4 is the example of social recommendation with its two central elements. Figure 4(a) shows the real world social process of recommendation which can essentially be modeled by the examples of social network graph and the user-item matrix for rating prediction, which made by the favors of social network friends is in Figure 4(b).

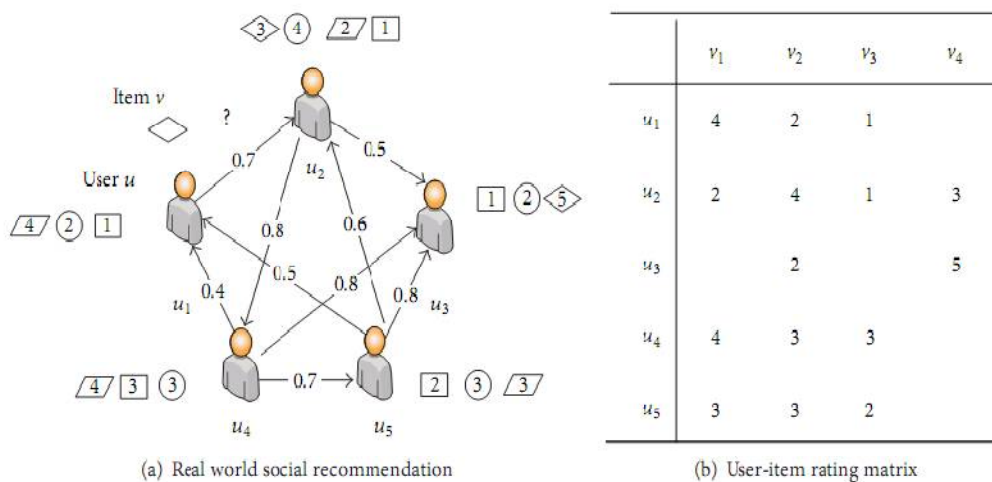


Figure 4: Example for trust-based recommendation problems.

IV. CONCLUSION

In this paper we have provided a comparative analysis of two different approaches in trust enhanced recommender systems based on Twitter. Furthermore, we have presented a concept of identifying influential users of micro-blogging services and creating new user profile based on tweets around twitter. This approach analyzes the relationship between social network users and filtering algorithm will be used in the calculation of trust between users. Literature provides the definitions of trust along with computational properties of trust to analyze the main aspects of trust from the analysis it was identified that combining multi-aspects of trust have not received enough attention through the examined models and therefore new approaches are needed for incorporating combining multi-aspects of trust in the trust enhanced recommender system. For trust based approaches, we recommend a Commended Social Network Rating system that facilitates rating and suggesting trending social sites for current news. The seasonal and trending newsfeed data will be updated and recommended to the frequent internet users through commendations given by this rating system in social networking websites. Through complete analysis of interest and bio-data from the personal profile classification and according to the trusted recommenders references internet users can browse securely and recommendations will be enabled based on the recommender system.

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