

UNDERSTAND CUSTOMER BEHAVIOR USING SOCIAL MEDIA IN RECOMMENDATION SYSTEM

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Abstract—With the proliferation of electronic commerce and knowledge economy environment, organizations generate and consume a large amount of online information. Because of large amount of product information on internet, customer has to face difficulty in selection of items. This difficulty can be reduced by recommendation systems [RS]. Many websites such as youtube, e-Bay and amazon have their own versions of recommendation systems, which are having some drawbacks like insufficient data, changing data, changing user preferences and uncertain items. In this paper we do literature review of collaborative filtering, content based filtering and hybrid recommendation algorithms which address issues such as insufficiency of data and change in user preference problem in e-commerce domain. In this paper we have proposed recommendation system which is integrated with social network trust. In this paper, at first a trust score is calculating using social interaction between users. Then trust based recommendation model is proposed.
Index Terms—Recommendation system algorithm; Social network-trust; Recommendation model using social trust

I. INTRODUCTION

Recommender systems or recommendation systems is one type of information filtering and for suggest a limited set of an items to user with help of some algorithm. The most popular ones are probably movies, music, news, books, research articles, search queries, social tags, and products in general. However, there are also recommender systems for experts, jokes, restaurants, financial services, live insurances, persons (online dating), and twitter followers. Traditionally recommendation system classified in to- collaborative or content-based filtering. Collaborative filtering approaches are based on user's past behaviour and build a model on that (items previously purchased or selected and/or numerical ratings given to those items) as well as similar decisions made by other users; then use that model to predict items (or ratings for items) in which user may have an interested. Content-based filtering approaches in which item with special characteristic are recommend to user based on his past item characteristic. Combination of this two algorithm known as hybrid recommendation algorithm. A recommendation system helps the seller to sell more diverse items and enables the user to select items that might be hard to find without a recommendation. A well designed recommendation system can also improve the experience of the users of websites or other services. Users need

recommendations because they do not have enough knowledge to make autonomous decisions. Various researchers have tried to understand the factors that lead to the acceptance of a recommendation by a given user. The social network data provides an important source of information to help improve such tasks.[1]

II. RELATED LITERATURE

Many current literatures evaluate different types of recommendation system model, and their real life applications [2]. In content based recommendation system techniques, a recommendation system learns to recommend items that are similar to the ones that the users liked in the past. A recommendation could be based on specific domain knowledge about how certain item features meet users' needs and preferences. In acknowledge based systems, a similarity function is used to estimate how much the users' needs match the recommendations. But community based recommendation system recommends items based on the preferences of the users friends. Here, the recommendation system recommends items based on the preferences of the users' friends or social contacts. This technique becomes more useful especially in the social network based recommendation system. Because each of these recommendation techniques has its shortcomings, hybrid recommendation systems have been developed to combine two or more techniques so that the advantages of a system fix the problems of the other recommendation systems. [1] Privacy preserving in recommendation system has been a challenge in recent times. Recommendation systems exploit users' data to generate personalized recommendations. This clearly has negative impacts on the privacy of the users. Diversity of the items recommended to a target user is another issue to discuss. In a recommended list, it is more likely that the user will find a suitable item if there is a certain degree of diversity among the items. There are many situations, especially in the early stage of a recommendation process, in which the users want to explore new and diverse directions. In such cases, the user is using the recommender as a knowledge discovery tool [3]. This is an issue that needs to be incorporated into the evaluation of system.

III. SOCIAL NETWORK BASED RECOMMENDATION SYSTEM

Although many researchers have discussed the usefulness of social network based predictions, recommendation system in social networking area is still in its early phase. In [2] which

describes non-social network based recommendation system such as collaborative filtering as traditional methodology, and discussed its flaws and weaknesses. Collaborative filtering approaches assume that users are independent and identically distributed, and ignore the social trust relationships between users, which is inconsistent with reality. Therefore, with the growing research on trust in social networks, as well as the popularity of online social networks, many social trust-based recommendation approaches [8, 9, 10, 11, 12, 13, and 14] have been proposed to address this problem. The solutions to the problem identified in the traditional recommendation systems could be developed by applying social network data in recommendation systems. Integration of social networks can theoretically improve the performance of current recommender systems. First, in terms of the prediction accuracy. Second, with friends' information in social networks, it is no longer necessary to find similar users by measuring their rating similarities. When people are friends, there are certain things in common among them. Therefore the social network based recommendation system makes the community based recommendation technique more powerful and useful. In recent times, there have been opportunities for novel recommender applications on the social web that directly involve humans in a recommendation process, in which users make recommendations to other users. This is called crowd recommendations. [1]

IV. RECOMMENDATION TECHNIQUE AND PROBLEMS

One of research in the social-network based recommendation is documented in [5], in which it describes recommendations can be influenced by many factors and how they can be modeled in a recommendation system. As describe earlier recommendation systems are traditionally classified into three areas: content-based recommendations, collaborative recommendations and hybrid recommendations [4]. To improve the recommendation performances, we can use the additional relationships from the user's social contexts. With the advances of technologies, there is emerging presence of social media and social networking systems. In [6] was introduced a Random Walk approach using social tagging information. In [7] explored the PageRank algorithm and proposed a FolkRank algorithm to provide ranking and recommendations for the folksonomy structure that exists in a social system. There are some common limitations and problems with these recommendation systems and they could be summarized in several general categories:

1. New user problem [1]: A recommendation system has no information to make recommendations about a new user. This is also called cold start problem.
2. Sparsity problem [1]: Due to the large amount of items and users, it is natural that users will only have ratings on a few items that are most relevant to themselves. This leaves a large amount other items not rated or not having social contacts by the users.
3. Over-specialization [6]: This is a problem when the system can only recommend the items that the user

already saw or those with high scores and the user is limited to being recommended to the items that are similar to those already rated.

4. Limited content analysis [1]: This is similar to the new user problem and many times. We don't have enough information regarding the items.

From the literatures we have reviewed, we summarized a comparison grid in Table I as an overview of different recommendation techniques.

Recommendation Systems		
Approaches	Heuristic-Based	Model-based
Content-based	TF-IDF (information retrieval) Clustering	Bayesian classifiers Clustering Decision trees Artificial neural Networks
Collaborative	Nearest neighbor (cosine, correlation) Clustering Graph theory	Bayesian networks Clustering Artificial neural networks Probabilistic models Linear regression
Hybrid	Linear combination of predicted ratings Various voting schemes Incorporating one component as a part of the heuristic for the other	Incorporating one component as a part of the model for the other Building one Unifying model.

Table 1: Comparison of different recommendation techniques

V. RECOMMENDATION BASED ON USER'S SOCIAL TRUST SCORE

Social network (facebook) provides a data about user's activities and interaction. This data used to calculate trust between two friends. facebook provide the following data: photo tagging, mutual friend count, group membership, common interest between any two users, number of friends, current location and home town, interaction time span , feed likes and other information. Using this data we find out social trust using following formula.

$$\text{Trust (A} \longrightarrow \text{B)} = (l \cdot w(l) + c \cdot w(c) + a \cdot w(a) + pu \cdot w(pu) + pf \cdot w(pf) + pl \cdot w(pl) + pc \cdot w(pc) + m \cdot w(m) + i \cdot s(i) + c \cdot s(c)) / (l + c + a + pu + pf + pl + pc + m + i + c)$$

Where "l" is for feed like, "c" is for feed comment, "a" for feed address, "pu" for photo tagged friends by user, "pf" for photo tagged user by friend, "pl" is for photo like, "pc" for photo comment, "m" for mutual friend count, "i" for inbox conversion and "c" for inbox chat.

w(l),w(c),w(a),w(pu),w(pf),w(pl),w(pc),w(m),w(i),w(c), are respectively represent the value of weighted factor that of above operation.

We use that trust value to predict an unrated item's rating for user based on his/her friend's rating on that item. After calculation of rating of items which are unrated by user we recommend an items in order which has maximum predicted rating first and so on. To find out predicted rating we first normalize the trust score value using following formula.

Normalized trust (A \rightarrow B) = Trust (A \rightarrow B) / maximum trust value.

So the value of trust is now between zero and one. To calculate predicted rating we use the following formula.

Predicted rating = Σ (trust score * rating value) / Σ trust score.
 Here, trust score value is from 0 to 1 and rating value is from 0 to 5 which is value rated by user's friends.

Figure 1 shows proposed model for our system. As shown in model first we provide user interface in which user is required to login with facebook. After login user has to accept the facebook application permission that we access during our work. After permission assign by user we find out his/her friend list according to interaction in facebook network and assign a trust scores according to his/her interaction. This trust score is then use as a user relation in recommendation system.

Proposed model

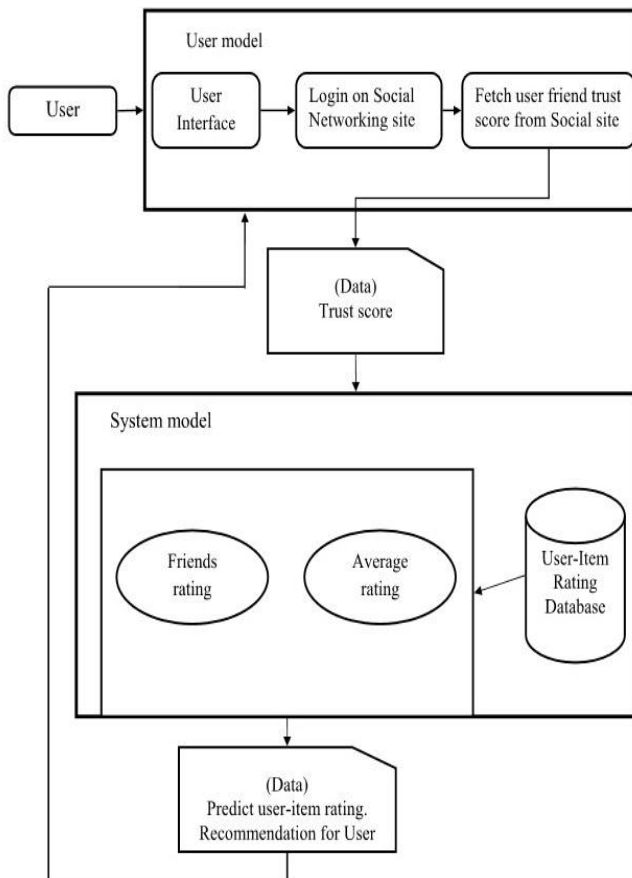


Figure 1: Model for predict rating to user with help of facebook trust score

On other side the item rating with user id which is same as facebook user id is stored in database. Now using this database we look out the user's friend's id which is already stored. Now from his/her friends rating we predict a rating for user. And we recommends item with highest rating by his/her friends. So in this model we consider the facebook trust score to predict an item rating to user which is currently unrated by user.

VI. EXPERIMENTS AND RESULTS

To find proper weight score we take survey from facebook user with following weight sets shown in table 2.

Weight	Set 1	Set 2	Set 3	Set 4	Set 5
w(l)	1	1	2	3	Random set()
w(c)	1	2	4	2	
w(a)	1	1	3	1	
w(pu)	1	3	2	2	
w(pf)	1	2	1	1	
w(pl)	.125	.5	1	1	
w(pc)	.5	.25	1	.5	
w(c)	.125	.75	.5	.5	

Table 2: Algorithm set with different weighted factor

Figure 2 describe the relation between algorithm set and user voting on that algorithm set. As shown in figure the set 1 is maximum rated so we take weighted factor of algorithm set 1. So from this survey set 1 is the best to find the trust score.

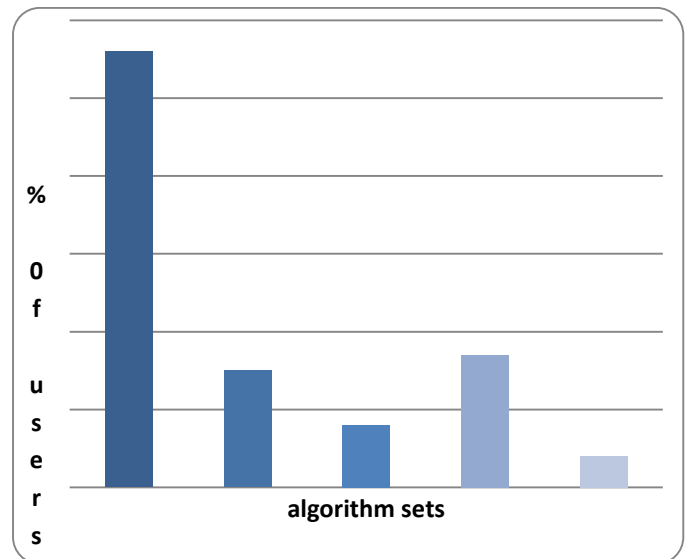


Figure 2: % of users vs algorithm sets

According to my algorithm set 1. Figure 3 shown an item list which according to my friend's rating. Figure 3 shows a two type of rating to user general type ratings and predicted rating. General type rating average rating of an item by all users. While predicted rating (recommend rating) is rating of an item calculate with social trust, means it's a weighted average rating done by only user's friends.

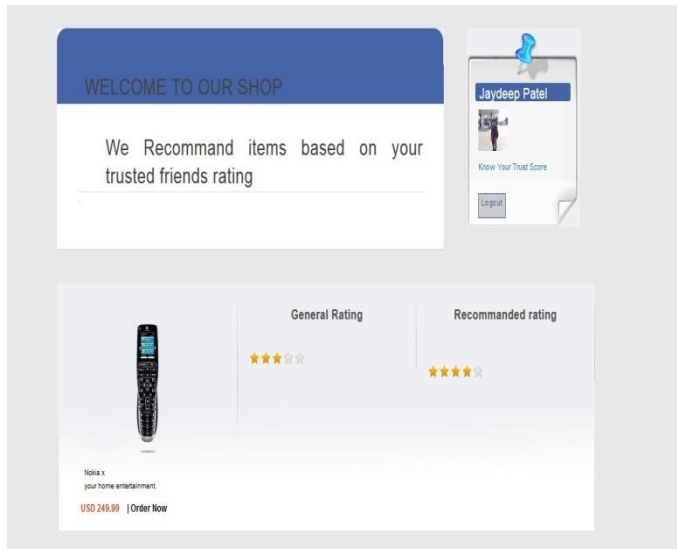


Figure 3: Final outputs which suggest recommend item based on friend rating

VII. CONCLUSION

In this paper we gave introduction of recommendation system and we discussed about problem faced by traditional recommendation system. We have used social network data in recommendation system. We have proposed a social trust based recommendation system with the help of social network data. We don't merge our system with traditional approaches. In traditional algorithms like collaborative filtering and content based algorithm users are independent and identically distributed, and social trust relationships between users are ignored, which is inconsistent with reality. Our proposed approach uses social trust relationship between users to solve the above problem.

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