



Personalized Recommender System

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ABSTRACT

Recommender systems have become more important toolkit of web personalization and absolutely necessary part of a human daily life. These personalized systems provide most of the services to the human beings in almost every field. The recommender systems are considered as one of the key factor in the success of e-commerce contexts, such as product recommendations and movie recommendations. With the popularity of social networks, most of the people like to spend their time in the social networks and they like to share their experiences, likes and dislikes with their friends. By utilizing this advantage we can combine the social network with E-commerce site to develop an efficient recommender system. The social network factors like interpersonal influence and interest based on friends circle provides more opportunities and helps to solve cold start and sparsity problem. In this paper, we consider three social factors, personal interest, interpersonal interest similarity and interpersonal influence.

KEYWORDS

recommender system, social networks, personal interest, interpersonal influence

INTRODUCTION

Recommender system is an emerging technology in the field of E-commerce. The recommender systems [1] have been used successfully to solve problem overwhelming. In E-commerce sites, Such as Amazon, Flipkart, Snapdeal, Mynthra, it is important to handle the mass scale of information, to recommend user preferred items and products. Some of the researches show that more than 25 percent of the sales in the E-commerce sites are from the work of the recommender system. So it is important to make a recommender system which can produce meaningful recommendations to the users.

Due to the tremendous growth in the amount of available information and the number of visitors to web sites the traditional techniques had become unqualified to produce high quality recommendations. And some techniques may not produce recommendations to the cold start users. New recommender systems are needed that can produce high quality recommendations, even for cold start users. In this paper we proposed a personalized recommender system by combining the user interest with the social circle factors. The new factors of social network like interpersonal influence and interest based on circles of friends bring opportunities for recommender system to solve the cold start and sparsity problem of datasets. Three social factors, personal interest, interpersonal interest similarity and interpersonal influences are used in the personalized recommender system.

RESEARCH CHALLENGES

The challenges which are considered in this paper are as follows.

1- Cold Start problem:-

Cold start problem refers to the situation when a new user or items newly added to the system [3]. With rapid increasing of registered users various products, the problem of cold start occur [4]. Three kinds of cold start problems are: new user problem and new item problem. In such cases, it is very difficult to provide recommendation, as in case of new user, there is very less information about user that is available. For a new item, no ratings are usually available. Most important factor in social network is individual preferences and interpersonal relations such as "friend circle" [1] helps to solve the cold start problem.

2- Sparsity Problem:-

Sparsity problem is one of the major problems encountered by recommender system is data sparsity has great influence

on the quality [5] of recommendation. The main reason behind data sparsity is that most users do not rate most of the items and the available ratings are usually sparse. In collaborative filtering [6] technique it is important that the more users are required to be rated the item. Though high rating [2] given by few users leads to problem of sparsity. To prevail over the sparsity problem, one can use user profile information [2] while calculating user similarity item with others. Similarity in users can be calculated using the correlation based similarity.

3- Overspecialization:-

It prevents user from discovering new items and other available options [2]. However, diversity of recommendations is a desirable feature of all recommendation system. After solving the problem using genetic algorithms, user will be provided with a set of different and a wide range [2] of alternatives. Overspecialization occurs if system recommends only items which having high rating against the user profile. For example if a person has no experience with chinese foods will never receive recommendation [6] though the chinese restaurant are available in the city. Similarity fusion and probabilistic fusion are used to solve the problem of overspecialization.

THE APPROACH

The proposed personalized recommendation approach uses three social factors: user personal interest, interpersonal interest similarity, and interpersonal influence to recommend user interested items. The illustration of our approach is shown in Figure 1. Among the three factors, user personal interest and interpersonal interest similarity are the main contributions of the approach and all related to user interest.

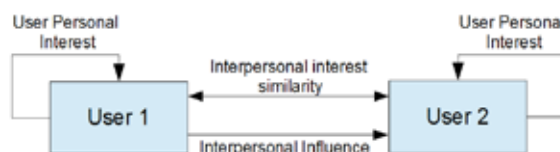


Figure 1. Three main social factors in the recommendation model, including user personal interest, interpersonal interest similarity, and interpersonal influence.

User Interest Factor

Besides the trust values between friends in the same category [1], user interest is another significant factor to affect users' decision-making process, which has been proved by psychology and sociology studies. However, there are two main differences of the user interest factor in our model to individual preference. First is the independence of user interest. It means we can recommend items based on user interest at a certain extent. In other words, we utilize user's connection with the items to train the latent feature vectors, especially for the experienced users. Second is Interest circle inference. In this we divide the tested social network into several sub-networks, and each of them correspond to a signal category of items. Considering the cold start users who has a few rating records, we use friends' interest in the same category to link user latent feature vector.

Personalized Recommendation Model

The personalized recommendation model contains the following three aspects: 1) Interpersonal influence [1], which means whom you would trust. 2) Interest circle inference, which means whose interest is similar to yours. 3) User personal interest which has effect on what items you would interest in.

In personalized recommender system, the system aims at recommending user interested items based on their historical behavior and interpersonal relationship of social networks. We predict the ratings of user u on an unknown item i to measure how much user u interested in item i in the site. In recom-

mender system, we have a set of users \mathbf{U} and a set of items \mathbf{P} . The ratings expressed by users on items are given in a rating matrix $\mathbf{R}=[R_{u,i}]M \times N$. In this matrix, $R_{u,i}$ denotes the rating of user u on item i . It can be any real number. In a social rating network, each user u has a set of friends, and $S_{u,v} \in [0,1]$ denotes the value of user u trust on user v or the influence of user v to user u . The trust values are given in a matrix $\mathbf{S}=[S_{u,v}]M \times M$. Note that \mathbf{S} is asymmetric in general, because the influence of user v to user u maybe different from the influence of user u to user v . Meanwhile, $W_{u,v} \in [0,1]$ denotes the interest similarity of user u to user v . The interest similarity values are given in a matrix $\mathbf{W}=[W_{u,v}]M \times M$, which is symmetric in general. And $Q_{u,i} \in [0,1]$ denotes the relevance of user u 's interest to the topic of item i . The relevance values are given in a matrix $\mathbf{Q}=[Q_{u,i}]M \times N$, which represents users' personal interests. Based on the matrices \mathbf{R} , \mathbf{S} , \mathbf{W} and \mathbf{Q} , we predict the rating for u on item i using the matrix factorization, thus we get the recommendations for the users.

CONCLUSIONS

In this paper, a personalized recommendation approach was proposed by combining social network factors: personal interest, interpersonal interest similarity, and interpersonal influence. In particular, the personal interest denotes user's individuality of rating items, especially for the experienced users, and these factors were fused together to improve the accuracy and applicability of recommender system. Thus the problem of cold start users and sparsity problems are resolved.

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