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Recommendation On E-commerce based Structural Balance Theory over Big Rating Data

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***Abstract*— Recommending appropriate product items to the target user is becoming the key to ensure continuous success of Ecommerce. Today, many E-commerce systems adopt various recommendation techniques, e.g., Collaborative Filtering (abbreviated as CF)-based technique, to realize product item recommendation. Overall, the present CF recommendation can perform very well, if the target user owns similar friends (user-based CF), or the product items purchased and preferred by target user own one or more similar product items (item-based CF). While due to the sparsity of big rating data in E-commerce, similar friends and similar product items may be both absent from the user-product purchase network, which lead to a big challenge to recommend appropriate product items to the target user.**

Keywords— Big Data, E-Commerce, Structural Balance Theory, Similar Friends, Enemy's enemy is a friend

I. INTRODUCTION

With the popularity of network, E-commerce has gained fast development and accumulated a huge number of faithful online users all over the world. Through E-commerce, users can browse, compare and select the product items that they like in a more convenient manner, which brings great facility to the Ecommerce users. Today, many E-commerce companies (e.g., Amazon, eBay, Flipkart) have provided various product items to their massive online users. Generally, in each E-commerce company, there are a variety of product items that are ready to be compared, selected and purchased by target users. Therefore, from the perspective of E-commerce companies, accurately predicting target user's preference and further recommending appropriate product items to him/her, is becoming the key to ensure the continuous success of Ecommerce companies. In view of this, many recommendation approaches are brought forth, e.g., the well known Collaborative Filtering (i.e., CF)- based recommendation. Concretely, through observing the big rating data in user-product purchase network, we can determine the similar friends of target user, or the similar product items of target user's preferred product items, and further put forward CF recommendation methods, such as item-based one, user-based one, or hybrid one.

II. RELATED WORKS

Through analyzing the existing big user- product rating data, we can recognize user interest and preference precisely and further recommend appropriate product items to the target user, so as to improve the online product sales significantly.

Time-aware recommendation is introduced, where time is considered as an important factor for predicting product quality. However, work only the objective quality prediction, without considering the subjective preferences of different users. Matrix factorization technique is introduced to realize the recommendation purpose; however, if the user-product rating matrix is very sparse, the recommendation effect is not as good as expected (e.g., overfitting problem).

CAP approach is introduced to predict missing quality of product items, which is mainly based on the clustering idea; afterwards, precise product item recommendation is realized. However, CAP requires that the user-product rating matrix is dense; and therefore, CAP is not very suitable for product item recommendation with sparse rating data. CF-based recommendation approach (named CF+QoS) is proposed, which recommends product items to the target user by considering the product items liked by usertarget's similar friends. However, when usertarget does not have any similar friend, the recommendation accuracy of CF+QoS is low. A bidirectional recommendation approach named WSRec is put forward, which integrates user-based CF and item-based CF together, for high-quality recommendation results. While the recommendation quality of WSRec is low, when usertarget does not have similar friends and usertarget's preferred product items do not have similar product items simultaneously.

Monte Carlo algorithm named MCCP is brought forth to measure different user's personalized preferences towards different product items. According to MCCP, usertarget's similar friends can be found by trust propagation; and afterwards, the missing product item quality could be

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predicted based on the obtained similar friends. Generally, MCCP can work very well if usertarget has similar friends. However, as introduced previously in this paper, we only focus on the specific recommendation situations when usertarget does not have similar friends; therefore, prediction accuracy and recall of MCCP are not as good as expected, which has been validated by the experiments. In our previous work, a recommendation approach SBT-SR is put forward, for dealing with the specific recommendation scenarios where usertarget has no similar friends and the product items liked by usertarget do not have similar product items. While SBT-SR approach has two shortcomings. First, only "enemy's enemy is a friend" rule is recruited in SBT- SR. Second, SBT-SR only adopts user-based CF recommendation, while neglects item- based CF recommendation as well as their integration. Therefore, the recommendation effect of SBT-SR is not as satisfactory as expected.

In view of the shortcomings of above approaches, we put forward a novel product item recommendation approach SBT-Rec. Through "enemy's enemy is a friend" and "enemy's friend is an enemy" rules in Structural Balance Theory, SBT-Rec can make full use of the valuable structural balance information hidden in user-product purchase network, and further make precise product item recommendation. Moreover, SBT-Rec integrates both user-based CF recommendation and item-based CF recommendation; therefore, the recommendation recall could be improved. Finally, through a set of experiments deployed on MovieLens-1M dataset, we validate the feasibility of SBT-Rec in terms of recommendation accuracy, recall and efficiency.

III. EXISTING SYSTEM

Topic in E-commerce domain. Through analyzing the existing big user-product rating data, we can recognize user's interest and preference precisely and further recommend appropriate product items to the target user, so as to improve the online product sales significantly. Many people have investigated this recommendation problem and put forward various solutions. In time-aware recommendation is introduced, where time is considered as an important factor for predicting product quality. However, work only discusses the objective quality prediction, without considering the subjective preferences of different users.

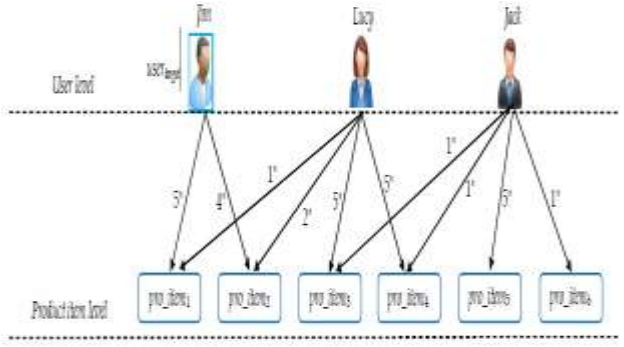
Matrix factorization technique is introduced in to realize the recommendation purpose; however, if the user-product rating matrix is very sparse, the recommendation effect is not as good as expected (e.g., over fitting problem).
In CAP approach is introduced to predict missing quality of product items, which is mainly based on the clustering idea; afterwards, precise product item recommendation is realized. However, CAP requires that the user-product rating matrix is dense; and therefore, CAP is not very suitable for product item recommendation with sparse rating data. In a CF-based recommendation approach (named CF+QoS) is proposed, which recommends product items to the target user by considering the product items liked by user target's similar friends. However,

In a bidirectional recommendation approach named WSRec is put forward, which integrates user-based CF and item-based CF together, for high-quality recommendation results. While the recommendation quality of WSRec is low, when user target does not have similar friends and user target's preferred product items do not have similar product items simultaneously.

In a Monte Carlo algorithm named MCCP is brought forth to measure different user's personalized preferences towards different product items. According to MCCP, user target's similar friends can be found by trust propagation;

IV. PROPOSED SYSTEM

We are proposing Structural Balance Theory- based Recommendation (i.e., SBT-Rec) approach over big rating data in E-commerce. where we look for "similar friends" or "similar product items" directly, in SBT-Rec, we first look for the target user's dissimilar "enemy" (i.e., antonym of "friend"), and furthermore, we look for the "possible friends" of E-commerce target user, according to "enemy's enemy is a friend" rule of Structural Balance Theory afterwards, the product items preferred by the target users



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V. SYSTEM MODULES

Rate Items

The list of databases with has their own ratings which will be given as input dataset for the SBT layer for processing the data and after processing it will store the data of the restaurant data which is prepared on Rating of particular user in the Mysql.

Search Item

UserID will be specified to get Prediction search which is the SBT home page which is opened using the URL and here we will give the specific userid for the predicting the Figure 1. User-product purchase network where the target user has no similar friends and similar product items: an example

"possible friends" are regarded as the recommendation candidates for target user; likewise, for the product items preferred by target user, we first determine their "possibly similar product items" based on "enemy's enemy is a friend" rule of Structural Balance Theory and regard them as the recommendation candidates for target user. restaurant. If the user is new then we have to update the user n database using Sql.

Recommendation

SBT recommendation is performed to give the predicted list this is the methodology which we are using to find out the enemy of the friend using the threshold value of the particular product or the restaurants.

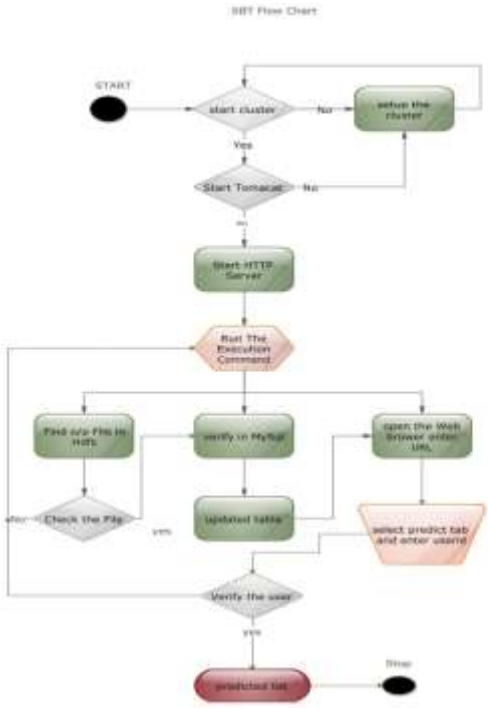
Predict Rate

Provides the predicted rate for the users which specify which user has the highest rate and which user has the lowest rate here we will consider based in the overall rating for the particular dataset.

VI. ADVANTAGES

This would help to perform analytics on the current data and improve the item leads on e- commerce portal. Our comparison analysis would represent that SBT-Rec has better result with reference to other approach.

FLOW CHART



VII. CONCLUSION

According to the big rating data in E- commerce, a novel product item recommendation approach named SBT-Rec is brought forth in this paper, for dealing with the specific recommendation situations when the target user has no similar friends and the product items preferred by target user have no similar product Rec-items. On one hand, SBT- makes full use of the valuable structural balance information hidden in user-product purchase network for precise recommendation, by considering "enemy's enemy is a friend" rule and "enemy's friend is an enemy" rule in Structural Balance Theory.

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