Time Based Collaborative Recommendation System by using Data Mining Techniques

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Abstract:- Recommendation of appropriate product to the specific user is becoming the key to ensuring the continued success of E-commerce. Today, many E-commerce systems adopt various recommendation techniques, e.g., Collaborative Filtering (abbreviated as CF)-based technique and Structural Balance Theory-based Recommendation (i.e., SBT-Rec) technique to realize product item recommendation. Overall, the present CF recommendation and as per suggested SBT can perform very well, if the target user owns similar friends (user-based CF) and Structural Balance Theory-based Recommendation (i.e., SBT-Rec) for 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 or the product items purchased and preferred by target user own one or more similar product items (item-based CF). Here both the systems depends on friends and enemies if we are not getting friends or enemies then. So to improve Recommender system we propose a time-aware profile based collaborative Recommendation algorithm. In this algorithm, we will consider only recently submitted ratings and positive reviews to evaluate products quality. Along with this, we propose a novel recommender system in which user will give his requirement about any product as input, and depending on that input we will recommend most appropriate products according to the customer's requirement and ratings given by other customers. Only recent ratings will be considered by the system. Our proposed system will meet personalized product item recommendation requirements in E-commerce and time-aware rating consideration to evaluate current product quality.

Keywords— *E-commerce, Time based collaborative recommendation, Product recommendation, Similar friend, Dissimilar enemy, Big rating data, Structural Balance Theory.*

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1. 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 [1]. 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 [2]. Today, many E-commerce companies (e.g., Amazon, eBay, Bestbuy) 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 users' preference and further recommending appropriate product items to him/her, is becoming the key to ensure the continuous success of Ecommerce companies [3-5]. In view of this, many recommendation approaches are brought forth, e.g., the well known Collaborative Filtering (i.e., CF)-based recommendation [6]. 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' preferred product items, and further put forward CF recommendation methods [7-9], such as item-based one, user-based one, or hybrid one. In case if similar friends are not available, CF will not provide satisfied recommendations. To improve this system, base paper proposes SBT technique. In this technique, integration of both the recommendation methods i.e. item based CF and user based CF will improve the recommendation system. No doubt the proposed system will improve the recommendation system but in case if the user is new in particular product category not having rating data. In that case SBT system could not find out the enemies and as there are no enemies the system will not be able to find out similar friends. To overcome this problem we propose a mix approach in which we will use SBT in presence of rating data as well as for recommender system. And SBT algorithm is a very time consuming method. To improve Recommender system we propose a time aware profile based collaborative Recommendation algorithm. In this algorithm we will consider only recently submitted ratings and positive reviews to evaluate products quality.

Along with this we propose a novel recommender system in which user will give his requirement about any product as input, and depending on that input we will recommend most

appropriate products according to the customer's requirement and ratings given by other customers. Only recent ratings will be considered by the system. Our proposed system will meet personalized product item recommendation requirements in Ecommerce and time-aware rating consideration to evaluate current product quality.

2. RELATED WORK:

Product item recommendation has been a hot research topic in E-commerce domain. 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 on line 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 [6], 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, when user target does not have any similar friend, the recommendation accuracy of CF+QoS is low. In [9], 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 users' personalized preferences towards different product items. According to MCCP, user target's similar friends can be found by trust propagation; and afterwards, the missing product item quality could be predicted based on the obtained similar friends. Generally, MCCP can work very well if user target has similar friends. However, as introduced previously in this paper, we only focus on the specific recommendation situations when user target 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 [4], a recommendation approach SBT-SR is put forward, for dealing with the specific recommendation scenarios where user target has no similar friends and the product items liked by user target do not have similar product items. While SBT-SR approach haves two parts. 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.

In our base paper, SBT-Recommendation technique is proposed. According to author, integration of both the recommendation methods i.e. item based CF and user based CF will improve the recommendation system. No doubt the proposed system will improve the recommendation system but in case if the user is new in particular product category not having rating data. In that case SBT system could not find out the enemies and as there are no enemies the system will not be able to find out similar friends. To overcome this problem we propose a mix approach in which we will use SBT in presence of rating data as well as for recommender system. Along with this we propose a novel recommender system in which user will give his requirement about any product as input, and depending on that input we will recommend most appropriate products according to the customer's requirement and ratings given by other customers. Only recent ratings will be considered by the system. Our proposed system will meet personalized product item recommendation requirements in Ecommerce and time-aware rating consideration to evaluate current product quality.

3. PROPOSED WORK:

In our base paper, Collaborative filtering method & its limitations are discussed. According to the author, For users who don't have any similar friend, CF will not work properly. Therefore to overcome this problem SBT algorithm is proposed. In SBT algorithm, system will Find similar friends indirectly using enemy's enemy is a friend rule. Depending upon users negative ratings, system will

find out user's enemies. But the SBT algorithm is a very time consuming method. To improve Recommender system we propose a time aware profile based collaborative Recommendation algorithm. In this algorithm we will consider only recently submitted ratings and positive reviews to evaluate products quality. Following are the steps of proposed algorithm.

1. Find user profile wise similar users SimU[]
2. If no similar users present find out products having negative comments prod[]
3. Find out users having positive comments / rating ie enemies ENU[]
4. For every Enemy Find out enemies. 2EU[]
5. Simusers[]=2EU[]
6. Find out similar user's preferences pref[]
7. Fetch pref[] wise products prod[]
8. For each prod[]

positive rating = prod[i] positive ratings
Negative rating = prod[i] negative rating
If positive rating > negative rating then
If prod[i] cost <= user budget then
Recprod[i]=prod[i]
Else continue.

9.Recommend Recprod[]

Comparison with some algorithms below

- Context aware Recommender System
  1. Select particular product category
  2. Fetch product category wise probable requirements Req[]
  3. CustReq[]=input customer requirement from Req[]
  4. For i=0 to CustReq.len
     a. match custreq with products from specified category
     b. Prod[]=fetch matching products
     end For
  5. Re-rank Prod[] using ratings and positive reviews
  6. Display Prod[] to user

- Items Association mining

  1. Fetch Recommeded products[]/ Searched products[]
  2. For i=0 to products.len
     a. Fetatures[]=Fetch product features, category, company
     b. AssProds[]=fetch products matching similar features
     c. end for
  3. Display AssProds[] to user

- Opinion Mining

  1. Product Review
  2. Sentiment Identification
     Opinion words or phrases
  3. Feature Selection
     Features
  4. Sentiment Classification
  5. Sentiment Polarity

4. FUTURE WORK

Our Algorithm is enabling to suggest/help customers to buy appropriate product as per his requirement, ratings & reviews. In future we will enhance the algorithm to find out statistical trustworthiness of vendors by tracking their behaviors like order delivery, quality, product life, customer satisfaction for product etc. In this project we are focusing on single user, in future we will focus on similar users' group wise recommendation algorithm.

5. CONCLUSION

According to the product ratings in E-commerce. With a wide verity of recommendation systems, ratings are one of the major issues where we know from various users about the product and then targeted user decide for further action and we are just proposing that as we will consider only recently submitted ratings and positive reviews to evaluate products quality. Only recent ratings will be considered by the system. Our proposed system will meet personalized product item recommendation requirements in E-commerce and time-aware rating consideration to evaluate current product quality.

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