Domain-Sensitive Recommendation Using Collaborative Filtering For E-Commerce Business

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Abstract- *Recommendation of product is one of the most successful recommendation approaches to cope with information overload in the real world. However, typical Collaborative Filtering (CF) methods equally treat every user and item, and cannot distinguish the variation of user's interests across different domains. This violates the reality that user's interests always centre on some specific domains, and the users having similar tastes on one domain may have totally different tastes on another domain. Motivated by the observation, in current paper, we express a novel Domain-sensitive Recommendation (DsRec) algorithm, to make the rating prediction by exploring the user-item subgroup analysis simultaneously, in which a user-item subgroup is deemed as a domain consisting of a subset of items with similar attributes and a subset of users who have interests in these items. The proposed framework of DsRec includes three components: a matrix factorization model for the observed rating reconstruction, a bi-clustering model for the user-item subgroup analysis, and two regularization terms to connect the above two components into a unified formulation. Collaborative Filtering (CF) is an effective and widely adopted recommendation approach.*

Keywords- Domain sensitive recommendation,Collaborative Filtering,Context-aware recommendation system, Recommendation system for E-Commerce.

I. INTRODUCTION

With the wide variety of products and services available on the web, it is difficult for users to choose the product or service that most meets their needs. In order to reduce or even eliminate this difficulty, recommender systems have emerged. A recommender system is used in various fields to recommend items of interest to users. One of the main areas where this concept is currently used is e-commerce that interacts directly with customers by suggesting products of interest with the aim of improving its sales. For this purpose, making the use of context is important work. Context is a multifaceted concept that has been studied across different research disciplines, including computer science (primarily in artificial intelligence and ubiquitous computing), cognitive science, linguistics, philosophy, psychology, and organizational sciences. The contextual information can be obtained in a number of ways, including Explicitly, Implicitly, Inferring. Context-aware recommendation system is categories into three types: 1) Contextual pre-filtering (or contextualization of recommendation input): In this recommendation paradigm, contextual information drives data selection or data construction for that specific context. In other words, information about the current context is used for selecting or constructing the relevant set of data records (i.e., ratings). Then, ratings can be predicted using any traditional 2D recommender system on the selected data.2) Contextual post-filtering: In this recommendation paradigm, contextual information is initially ignored, and the ratings are predicted using any traditional 2D recommender system on the entire data. Then, the resulting set of recommendations is adjusted (contextualized) for each user using the contextual information.3) Contextual modeling: In this recommendation paradigm, contextual information is used directly in the modeling technique as part of rating estimation

II. RELATED WORK

Y. Zhang, A big challenge in using collaborative filtering methods is the data sparsity problem which often arises because each user typically only rates very few items and hence the rating matrix is extremely sparse. This paper address this problem by considering multiple collaborative filtering tasks in different domains simultaneously and exploiting the relationships between domains. It is referred as a multi-domain collaborative filtering (MCF) problem. To solve the MCF problem, he proposes a probabilistic framework which uses probabilistic matrix factorization to model the rating problem.

X. Zhang , Collaborative Filtering assumes that similar users have similar responses to similar items. However, human activities exhibit heterogeneous features across multiple domains such that users own similar tastes in one domain may behave quite differently in other domains. Moreover, highly sparse data presents crucial challenge in preference prediction. It is necessary to learn preference

profiles from the correlated domains instead of the entire user-item matrix. In order to mine communities as well as the corresponding topics, a semi-supervised probabilistic topic model is utilized by integrating user guidance with social network.

Y. Jiang [3], In this paper, a novel product recommendation method called TCRec was developed, which takes advantage of consumer rating history record, social-trust network and product category information simultaneously. Compared experiments are conducted on two real-world datasets and outstanding performance is achieved, which demonstrates the effectiveness of TCRec.

Pedro G. Campos et al. (2013)[16] has proposed a scheme which is addressed by conducting an empirical comparison of several pre-filtering, post-filtering and contextual modelling approaches on the movie recommendation domain. To acquire confident contextual information, a user study is performed where participants were asked to rate movies, stating the time and social companion with which they preferred to watch the rated movies.

L. Ungar, Finding optimal clusters is tricky because one group should be used to help determine another group and vice versa. He present a formal statistical model of collaborative filtering, and compare different algorithms for estimating the model parameters including variations of K-means clustering and Gibbs Sampling. This formal model is easily extended to handle clustering of objects with multiple attributes.

Gediminas Adomavicius et al. (2008) [24] proposed combining multiple pre-filtering, post-filtering, and contextual modelling methods to generate better predictions is discussed, focusing primarily on combining multiple pre-filters the context aware recommendation process stages of the recommendation process. It is well-documented in recommender systems literature; often a combination several solutions provide significant performance improvements over the individual approaches. Instead of using individual method combination of several methods is used.

III. PROPOSED SYSTEM

The title of this project is the "Efficient approach for Context Aware Recommendation System". This project gives the efficient approach for the Context Aware Recommendation Systems. Domain-sensitive Recommendation Algorithm and Item-based Recommendation Generation Algorithm are combined in this method. This method provides the efficient way to identify the domain and them grouping them into subgroups depending on area of interest. So the performance of the Context Aware Recommendation Systems will improve and give better recommendations. This project gives the efficient way to improve the performance of the existing methods. This project proposed "Efficient approach for Context Aware Recommendation System", by combining the existing methods to improve the performance of the systems and better prediction can be made using proposed method.

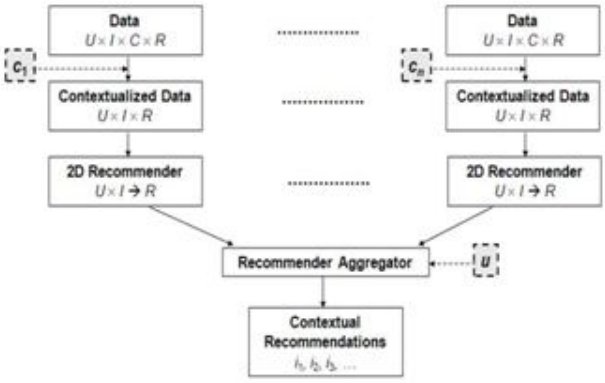

Figure 1: Combined Multiple Approach

Model-based algorithms:

Model-based collaborative filtering algorithms provide item recommendation by first developing a model of user ratings. Algorithms in this category take a probabilistic approach and envision the collaborative filtering process as computing the expected value of a user prediction, given his/her ratings on other items. The model building process is performed by different machine learning algorithms such as Bayesian network, clustering, and rule-based approaches. The Bayesian network model formulates a probabilistic model for collaborative filtering problem. The clustering model treats collaborative filtering as a classification problem and works by clustering similar users in same class and estimating the probability that a particular user is in a particular class C, and from there computes the conditional probability of ratings. The rule-based approach applies association rule discovery algorithms to find association between co-purchased items and then generates item recommendation based on the strength of the association between items.

Module Description

Modelling of proposed methodology

Modelling is the representation of a method which is used by simulation. Models may be mathematical, physical, or logical representations of a system, entity, phenomenon, or

process. Models are, in turn, used by simulation to predict a future state. Modelling refers to the process of creating models. The Models of proposed method are as follows:

• Domain-sensitive Recommendation Systems

Domain-sensitive Recommendation (DsRec) algorithm is a novel approach proposed to make the rating prediction by exploring the user-item subgroup analysis simultaneously, in which a user-item subgroup is deemed as a domain consisting of a subset of items with similar attributes and a subset of users who have interests in these items. Collaborative Filtering (CF) is an effective and widely adopted recommendation approach. Different from content-based recommender systems which rely on the profiles of users and items for predictions, CF approaches make predictions by only utilizing the user-item interaction information such as transaction history or item satisfaction expressed in ratings, etc. CF systems become increasingly popular, since they do not require users to explicitly state their personal information. There still exist some problems which might limit the performance of typical CF methods. On one hand, user's interests always centre on some specific domains but not all the domains. On the other hand, the fundamental assumption for typical CF approaches is that user's rate similarly on partial items, and hence they will rate on all the other items similarly. However, it is observed that this assumption is not always so tenable. Usually, the collaborative effect among users varies across different domains. In other words, two users have similar tastes in one domain cannot infer that they have similar taste in other domain. Numerous efforts have been paid on this direction. Generally, these efforts can be divided into two types. The first type is to discover domains with the help of external information such as social trust network, product category information, etc. In the proposed method, the user's data is stored in database and used for rating predictions and product recommendation. DsRec is nothing but the result of combine working of memory-based algorithm and model-based algorithm.

• Memory-Based Algorithm

Memory-based algorithm utilizes the entire user-item database to generate prediction. These systems employ statistical techniques to find a set of users, known as neighbours that have similar history with the target user. Once a neighbourhood of users is formed, these systems use different algorithms to combine the preferences of neighbours to produce a prediction or top-n recommendations for the active user. This technique, is also known as nearest-neighbour or user-based collaborative filtering, is more popular and widely used. For example, Suppose there is a user A who search for Asus product maximum time and the another user B search for Apple products, the database will store the searching history of both the users A and B. Memory-based algorithms provide quality predictions. Database will contain the user history as well as product details. Then by using memory based algorithm the entire database is utilized for calculating the rating predictions of all products. Using different algorithms top-N recommendations are calculated.

• Model-based Algorithm

This algorithm works on the assumption that a high rating score rated by a user to an item encourages the user and the item to be assigned to the same subgroups together. As a result, the items highly rated by the same user are probably grouped together, and the same to the case that the users who prefers to the same item. Accordingly, some user-item subgroups each consisting of a subset of items and a group of users who interested in those items can be obtained. Model-based collaborative filtering algorithms provide item recommendation by first developing a model of user ratings. The model building process is performed by machine learning algorithms such as Bayesian network, clustering and rule-based approaches. After domain detection the clusters of those domains are formed. The user having same area of interest and same recommendations are placed in one cluster.

IV. RESULT

The tools help in analysing the user and the admin analysis graphs which help both user and the admin to know which products are the topic of discussion recently. To evaluate the behaviour of the user the parameters like user interest, count, user reviews are used.

Fig 2.User reviews graph

V. CONCLUSION

The proposed scheme consists of three algorithms that are Domain Sensitive Recommendation algorithm (DsRec), Memory-based algorithm and Model-based algorithm. The proposed method provides the efficientapproach to find the appropriate rating predictions. In other words provides the better recommendations to the users of same interest. This approach calculates the ratings of the items searched by the users. After that the top-N items are searched and recommended to the other users having similar area of interest.

The analysis of the products history is carried out to show which product is good and getting better response. The reviews on the product help in the analysis phase. The use of few recommendations optimize the less time required for calculation of ratings using all recommendations. It makes the analysis phase easy. It also takes less time to find quality recommendations.

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