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9940 572 462



6381 907 438



ijirset@gmail.com



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# Enhancement of the Performance of Recommendation System Using User Trust with Item Ratings for Item Recommendation and Rating Prediction

Sonal S. Yallatti<sup>1</sup>, Vipul V. Bag<sup>2</sup>

P.G. Student, Department of Computer Engineering, Nagesh Karajagi Orchid College of Engineering and Technology,  
Solapur, India<sup>1</sup>

Head, Department of Computer Engineering, Nagesh Karajagi Orchid College of Engineering and Technology,  
Solapur India<sup>2</sup>

**ABSTRACT:** Traditional recommendation systems do not consider social information about the user while recommending the items to him. In real life we always seek help from our friends, colleagues, relatives for the purchase of new item or watching movie or choosing anything from the available various options. We also check the reviews of the object before buying it. Hence here, we are actually using social information in our recommendation system. In our proposed system, we are going to consider both social trust information and item ratings for recommendation. With the use of social trust we are going to predict the rating a consumer will give to the product, movie or restaurant and also item recommendation. This will help us to enhance the performance. We are going to implement hybrid approach here.

**KEYWORDS:** Recommendation system, Collaborative Filtering, Trust based recommendation system,

## I. INTRODUCTION

Due to the event of net and e-commerce systems, heap of knowledge is accessible on net these days. Thus, recommendation systems that use data filtering technology are developed to produce helpful information. normally on-line recommender is utilized for e-commerce applications or client tailored websites. In general, there exist 2 basic varieties of recommendation techniques, specifically content primarily based filtering and cooperative filtering. Content-based filtering strategies examine things previously favoured by the particular user, collaborative filtering computes recommendations supported the knowledge concerning similar things or users.

### Content-Based Recommendation

Content-Based recommender systems make recommendation according to the item features and user interests. Usually, personalized profiles are made by the system with the help of feedback by the user, describing the kind of items a person would like. In order to determine what items to recommend, user information is collected and compared with features of the items to examine.

### Collaborative Filtering

Collaborative Filtering (CF) is the method of evaluating information using the opinion of other people [1]. Typically, predictions regarding user interests are made by gathering taste information from other similar users. Thereby it is assumed that those individuals who agreed in the past tend to agree again in the future. Usually, CF systems have to process copious amounts of data like humongous datasets from e-commerce and web applications. Within the last decade CF has been improved continually and finally became one of the most prominent personalization techniques in the field of recommendation systems [2].

As we are going to use collaborative filtering for our model, we have understood how the components in this architecture work as follows.

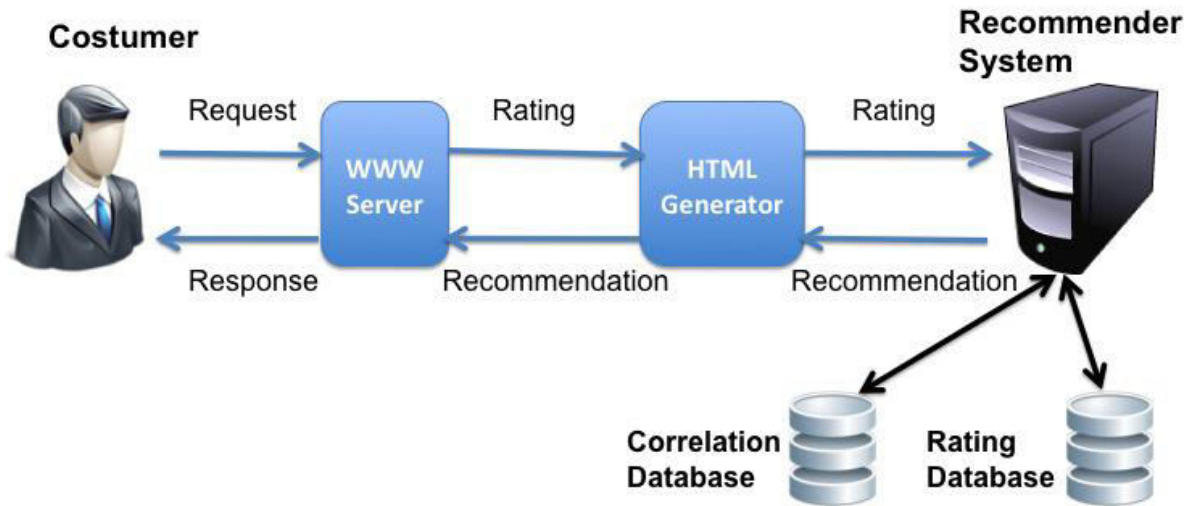


Figure 1: Collaborative Recommender System Architecture [2]

Figure 2.1 presents the interaction of a user with an online collaborative recommender system through a web interface. In order to suggest products to a user, web server and recommender need to communicate with each other. Usually, the web server application forwards user feedback to the recommender, and receives personalized recommendations in return. User ratings and item correlations are both stored on the recommender platform to ensure realtime results. [2] Collaborative filtering basically can be classified into two major types such as neighbourhood methods and latent factor models.

### Neighbourhood method

In neighbourhood methods we compute the relationships between items or alternatively, between users. The item oriented approach evaluates a user's preference for an item based on ratings of "neighbouring" items by the same user. When a product gets same ratings as another product by the same user, then it is referred to as the neighbour of the product. In the user-oriented approach we identify like-minded users who can complement each other's ratings. [5]

### Latent factor models

Latent factor models are a substitute methodology that explains the ratings by identifying both users and items. Ratings for a product are deeply influenced by set of factors specific to the product. We might think of some of these factors, to estimate the impact on its rating. The goal is to derive such latent factors using mathematical techniques. For this, decomposition of the rating matrix into the product of user feature matrix and item feature matrix is done.

### Hybrid Recommender Systems

In order to achieve better recommendation results, generally developers can combined both techniques to build Hybrid Recommender system. This approach is used to inherit advantages and eliminate disadvantages. In general, hybrid recommenders are systems that combine multiple recommendation techniques together to achieve a synergy between them. [8]

### Trust based Recommender Systems

To improve the ability to make accurate recommendations, in these systems they propose a new way to choose the recommendation partners. Trustworthiness of the partner is considered. A recommendation partner may have similar ratings to a target user but they may not be a reliable predictor for a given item or set of items. For example, when we are looking for car recommendations we will often turn to our friends, on the basis that we have similar comfort, budget preferences overall. Though, one of our friends may not be reliable when it comes to recommend a particular type of car. The difference here is that user similarity alone is not ideal. Recommendation partners must have similar likings and should be reliable in making appropriate recommendations.



## II. RELATED WORK

We can derive a following conclusion from our literature survey. For recommendation system there are various models and methods implemented. Recommending an item and predicting the rating for the user are two pole apart recommendation tasks. They differ in the following aspects. First, the main objective is different. Item recommendation targets to give top-N list of interesting items to buy, and thus does not care about the possible ratings users may give to the items purchased. On the other side, rating prediction aims to predict the possible rating the user may give as closely as possible. Also, ranking directly based on predicted ratings will end in defective ranking performance. Second, the training process of item recommendation is necessary to consider both positive and negative samples, while rating predictions function only on positive samples, i.e., observed data [6], [7].

In social rating networks, a user can label, add other users as trusted friends and thus form a social network. Trust is not symmetric; for example, user x1 trusts x2 but x2 does not specify user x1 as trustworthy.

Reducing data sparsity, cold start problem & degradation of recommendation system is our main aim. Current trust-based models emphasise quite a lot on the utility of user trust but tend to overlook the impact of item ratings themselves. And existing trust unaware models only consider the item ratings or for recommendation of an item they consider the item similarity or an active user similarity. If we consider only trust or only previous item ratings it will reduce predictive accuracy as sparsity increases in the user rating matrices or user-user trust matrices. In social trust network, users are strongly correlated with their outgoing trusted neighbors (i.e., trustees) whereas they have a weakly positive correlation with their trust-alike neighbors (e.g., friends). So we decide to add implicit as well as explicit items ratings and also both user trusts to our recommendation model.

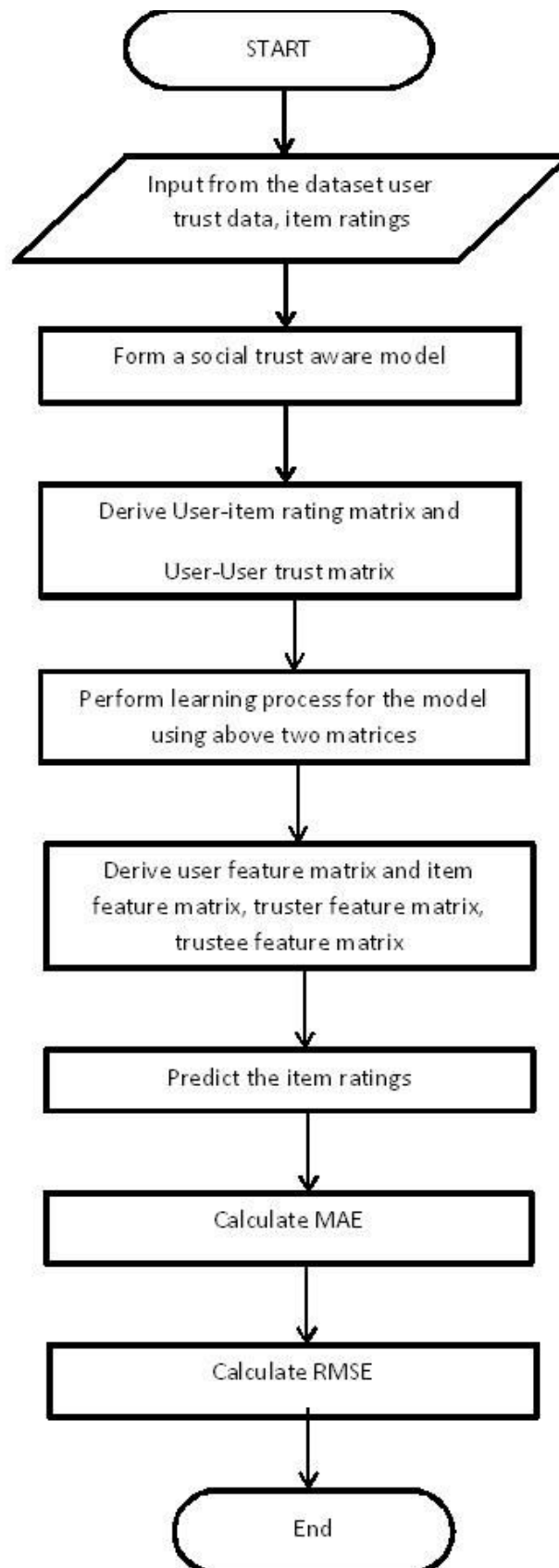
## III. METHODOLOGY

The working and flow of the proposed system is as follows.

**Proposed System :** The dataset we are using for our system is open dataset which will contain the user trust data in the form of tuple (user-id (truster), user-id (trustee), trust-value) and item ratings in the form of tuple (user-id, item-id, rating-value). Such example datasets are Epinions, FilmTrust, Flixter and Ciao. These are open datasets available for the research purpose. We will use matrix factorisation technique here.

The given flowchart (Figure 2) shows the process of our proposed system. The explanation for the flowchart that is how our system will work is given below.







We will form a social aware model first. The dataset will be input to our model. Then we will derive the User –item rating data and User-User trust data in the matrix format from the training dataset. We will perform the learning process for our model using these two matrices. Using matrix factorisation method we will derive user feature matrix, item feature matrix, truster feature matrix and trustee feature matrix.

Using the combined information from these feature matrices we can predict user rating for an unknown item. This prediction is done using implicit as well as explicit trust and item ratings.

Then we will perform performance analysis for our model. We calculate MAE and RMSE metrics for the model.

#### IV. HARDWARE AND SOFTWARE USED

##### Hardware:

System : Intel CORE i5,32 bit/64 bit.  
Hard Disk : 500 GB.  
RAM : 4GB.  
Monitor : Minimum 15 inch Colour.  
Input Devices : Keyboard, Mouse.

##### Software:

Operating System: Windows 10.  
Language : ASP.net core(2.3 version).  
Database : MS SQL 8  
IDE : Microsoft Visual Studio 2017.

#### V. CONCLUSION

In this paper, we planned a unique trust-based matrix resolution model that incorporated each item rating and trust data. Our analysis of trust in real-world information sets indicated that trust data and ratings are complementary. Each one of them is important for a lot of correct recommendations. Our methodology takes into account every explicit and implicit impact of ratings and of trust data when predicting ratings. We measure the performance of the proposed model with MAE (Mean Absolute Error), RMSE (Root Mean Square Error). In this model we try to improve the data sparsity and cold start problems. Adding trust information to our model will resolve cold start users rating predictions.

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