

A Review of Recommender System

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Abstract— Recommender system is the software that is used to predict the rating given by the individual. Recommender system is used in numerous applications like entertainment, services, E-commerce etc. The recommender system are mainly classified into four category namely Content based filtering system, collaborative filtering and the hybrid recommender system. This paper presents the survey of the different category of the recommender system in which pros and cons are discussed. Experiments are performed for choosing best method of eth recommender system that is accurate.

Key words: Recommender system, social network, Content-based Filtering Systems; Collaborative filtering, Hybrid Recommender Systems

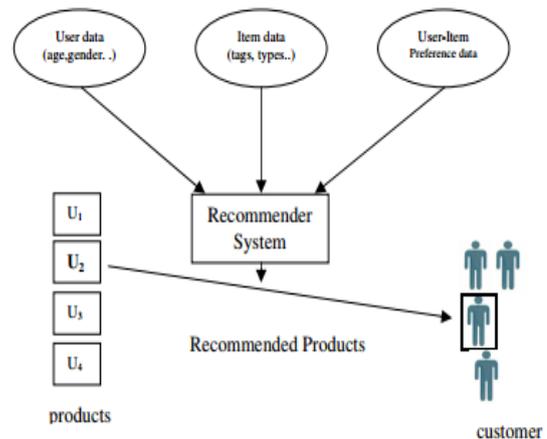


Fig. 1: Recommendation Process [4]

I. INTRODUCTION

Data mining is the growing as an extensive research field for the extraction of the useful information from the data base. The data mining is the process of extracting the information from the large amount of the data. Due to this technology of collecting and storing the data has made it easier for the organization to accumulate large amount of data. This help in exploring and analyzing useful information from the large set of data .With increase in the technology the applications of the database have also increased which in turn increases the dimension and the complexity of the data. The process of data mining is completed in various steps firstly the data is acquired, then the data is prepared for the mining process with the help of the data mining algorithm and finally the results are obtained and the analysis are made .[13]

As the use of internet technologies is increasing day by day, users are mainly facing the problem of the information overload. Collection of large amount of the data is quite time consuming task as it not easy for an individual to choose from the limited number of available alternate. So for this purpose the recommender systems are designed. The recommender systems are basically the tool for collecting and providing the information about the activities and the interest of the other people or group of people. These are considered as the data filtration system that is used for the prediction. This is employed for various real time applications like for recommendation of the product for online shopping, for recommending movie at Movielens. This is beneficial for both the customer and the merchant.[4]

II. APPLICATIONS OF RECOMMENDER SYSTEMS

Recommendation systems are used for numerous applications. Some of the applications of the recommender systems have been described below:

- **Entertainment** – Recommendation system are widely used for the recommendation for movies, music and IPTV
- **Content** – other use of the recommender system can be used for the personalized newspaper. it is also used for the recommendation for documents , for web page recommendation ,email filters etc.
- **E-commerce**–In this field the E-commerce, recommendation system plays an important role. it can be used for recommender the products like book, Cameras, PCs etc by the consumers.
- **Services** – One of the applications of the recommender system is to do recommendations of the travel services, for recommending of house to rent etc[18]

III. CLASSIFICATION OF THE RECOMMENDER SYSTEM

Recommender system is categorized on the basis of the information that it uses for the recommended items. The recommender systems are classified as:

- Content-based Filtering Systems.
- Collaborative Filtering System
- Hybrid Recommender Systems:

A. Content-Based Filtering Systems

This type of recommender system uses the data about the thing and its active user. In such system the recommendation process begins by collecting the information about the required items. It is basically an information retrieval and information filtration process .It is advantageous as it does not require data of any other user. [24].

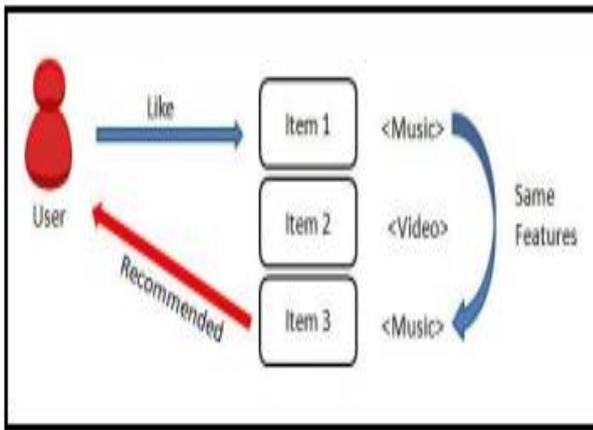


Fig. 2: Content based filtering system. [6]

1) *Advantages of the Content Based Filtering System*

- 1) In content based recommender systems the active user can make its own profile with the help of the exclusive rating.
- 2) These systems provide transparency by explaining the working of the recommender system to the user.
- 3) Content based recommenders system are capable of recommending even those items that are not placed by any user ,there by helping the new user.[21]

2) *Limitation of the Content Based Filtering System*

- 1) In content based filtering it is difficult to generate the attribute for some of the items.
- 2) This method suffers from the problem of the over specialization that arise due to advocating same type of item.
- 3) In content based filtering it is difficult to predict that whether the recommendation is correct or not .it is harder to acquire the feedback from the user as the items are not ranked

B. *Collaborative Filtering System*

In these type of recommender approaches the information about the past users. On the basis of the feedback obtained the recommendation is made. This technique is used for various E-Commerce applications. it gathers the list of information from the group of user and on the basis of the rating the recommendation are made. The main advantage of this system is that it does not rely upon the content that is analysed by the machine and can make accurate recommendations.[24]

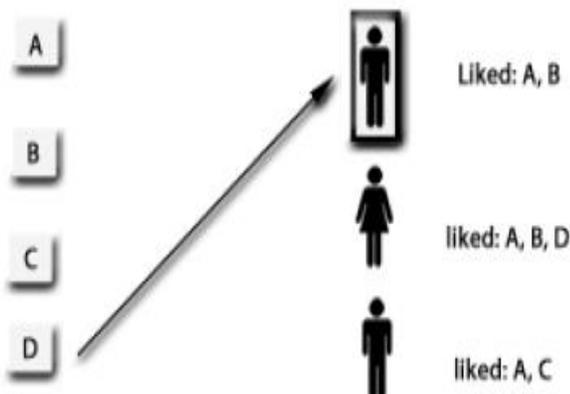


Fig. 3: Collaborative Filtering System. [4]

This is further divided into two sections:

- 1) User based Collaborative filtering approach.
 - 2) Item based Collaborative filtering approach.
- 1) *Advantage of Collaborative Filtering System*
- 1) This technique is consider to be quite useful as with the help of the memory based collaborative technique the recommendation system can be easily implemented.
 - 2) With the help of this technique the new data can be easily inserted in the incremental way.[21]
 - 3) The prediction performance of the system is improved by using Model based collaborative filtering technique.

2) *Limitation of the Collaborative Filtering System*

- 1) Collaborative filtering systems requires lot amount of the data from making exact recommendations from the existing data of user.
- 2) Its computational power is more as it make recommendation for the large amount of data .So it requires huge amount of power for computing recommendation.[21]

– **Hybrid Recommender Systems**

These types of the recommender system are designed to overcome the limitation of the other approaches. It combines two or more than two techniques so that the new system that is designed is better than the previous one. The limitation of the individual technique is removed. The hybridization is done in many ways like Weighted, Switching, and Feature combination Cascade etc.

IV. CLASSIFICATION OF HYBRID RECOMMENDATION SYSTEMS

The systems in which the two or more recommendation techniques are combined in order to increase the performance of the system are termed as the hybrid recommenders system. In this the drawbacks of the individual technique is removed. Various methods that are used for performing the hybridization are divided in the seven classes. These seven classes have been described below:

- 1) **Weighted** : A weighted hybrid recommender system in which the recommended item is computed form the all available recommendation technique that are present in the system. This data is combined statically using additive formulas. [30]
- 2) **Switching**: In this typer of recommender system the recommnder techniqe is chosse according to the current situation . it will instanly switch to the other recommnder technique according to the situation . The major advantage of this system is that these systems are sensitive to the merits and demerits of the constituent recommender . if the switchng cateria is not determined this switching hybrid can increrse the complexity in the recommnedation process.[30]
- 3) **Mixed**: In this type of system various recommendation processes can be combined. This based on the combining and presenting the multiple rates list into single rated list. This mixed hybrid system can avoid the new item starting problem . This will used the contend based and the collaborative based technique if recommended system . The recommendation of the two

techniques are combined together for the final representation [30]

- 4) **Feature Combination:** In this process of the recommendation the feature of the one technique are combined with the other technique. In this way the data is modified is used that will help in the working of the actual recommender system. This feature combination hybrid helps the system to combine of data without depending on it's exclusively. This will also help in reduction of the sensitivity of the system to the number of user those have done rating[30] .
- 5) **Cascade:** In this for each recommendation the recommender assign some priority to the recommender. The recommender that is having low priority will act as the tie breakers role over higher priority. These systems usually don't allow the employment of the second recommender having low priority. The cascade's second step is only applicable for that item that requires additional discrimination. In this the ratings given to the high priority recommender can be refined [30].
- 6) **Feature Augmentation:** This is method is similar to the feature combination hybrid . This system is more elastic than the feature combimnetaion method [30]
- 7) **Meta-level:** This method is the two recommendation techniques are combined by using model that is generated by one as the input of the other. It is different from the feature method as in the feature based method a learned model is generated and in meta level hybrid the model that is presented will become the input .This main advantage of using this meta –level method is that the model is a compressed representation of a user's based on its interest. Also the collaborative method is used that will operate on the information that is more easily represented than on raw rating data[30]

V. RELATED WORK

This section represents the work done in the field of recommender system. Recommender systems are used in many applications. Some of the papers describing types of recommender system and its various uses have been discussed below:

Tejal Arekar et al [1] present the survey of recommender systems. It is used to predict the rating of the item that a individual will give. Two basic approaches of the recommender system that are content based approach and the collaborative filtering is also described

Mukta kohar et al [2] Presents survey on the techniques of recommender system as various approaches and algorithms of the recommender systems have been proposed. In this main limitations and the issue of the recommender system have been discussed. User bases approach, item based approach , hybrid approaches are the main techniques of the recommender system.

RVVSV Prasad et al [3] present the merits and demerits of the existing recommender systems. The trustiness and the accuracy of eth recommender system is described. The main types of recommender systems that are Content-based Filtering Systems, Collaborative Filtering System, Demographic Filtering Systems and Hybrid Recommender Systems are studied. The recommender system is used for the E-commerce applications.

Thi Thuan et al [4] present the enhancement made in Collaborative Filtering System used in the recommender systems. Various limitation of the collaborative filtering algorithm is studied and new method is proposed. A comparison is made between the user-based collaborative filtering and the row-sampling approximating singular value decomposition. From the results obtained it is concluded that the proposed method is better than the traditional.

P. N. Vijaya Kumar [5] presents a survey on the types of recommender systems. As recommender systems are the tool that provides suggestion for the things that is to be use by the user. In this Collaborative filtering (CF), Content-based filtering, Hybrid recommender system techniques and there a use for different e-commerce websites is studied. Various merits and demerits of the techniques have been discussed.

Joonseok Lee et al [6] present the study of various collaborative filtering techniques in order to get the best filtering the technique for recommender systems. Various experiments have been performed and it is concluded that the algorithm that has ability to control the number of user, number of items and is able to improve the performance is considered to be best filtering algorithm.

Lalita Sharma et al [7] present the various challenges faced by using various technique of recommender system. Collaborative filtering, content based and hybrid recommendations are the three main categories of the recommender system. The recommendation is the process that is used is various applications. The quality of the recommendation can be improved by proposing various approaches that can remove the limitation of the traditional techniques.

VI. CONCLUSION AND FUTURE SCOPE

Recommender systems are basically designed for removing the problem of the data overload as the e-commerce is increasing rapidly. A good recommender system should be able to provide accurate and useful recommendations from time to time in the recommendation list. In this paper various techniques of the recommender system have been discussed from the results obtained it was concluded that these techniques have memory computational complexity that results increase of the processing time and data latency. Though various hybrid methods have been proposed earlier but still the results obtained were not desired. So in future the further work can be done in enhancing the efficiency of the hybrid technique of the recommender system. In order to increase the accuracy of the recommender system further enhancements are done.

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