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Recommendation System: Techniques and Issues

Sushma Malik, Mamta Bansal

Abstract: ***In daily life user searched the many things over the internet on the basis of requirement with the help of search engines. Recommendation systems are widely used on the internet to help the user in discover the products or services that are best with their individual interest. RS effectively reduce the information overload by providing personalized suggestions to user when searching for items like movies, songs, or books etc. The main aim of RS is to help the users by providing the surface of information that relevant to them, fulfill their needs and their task. The paper provides an overview of RS and analyze the different approaches used for develop RS that include collaborative filtering, content-based filtering and hybrid approach of recommender system.***

Keywords: Recommender System (RS), Content Based (CB), Collaborative Filtering (CF), Cold start problem, Shilling Attack

I. INTRODUCTION

The volatile expansion in the amount of available binary information and the number of Internet visitors increase day by day have created a potential challenge of information overload. The goal of RS is to produce the meaningful recommendation to a user for items or products on the basis of their interest or preferences. Recommendation of books on Amazon, movies on Netflix or songs on Spotify is the real world example of RS. Recommender systems were designed to fulfill the gap between the information and analysis by filtering all the available information to provide the most useable information to the user [1]. On the basis of user profile, RS has ability to predict whether a user prefer an item or not. RS is useful to both service providers and users.

It minimize the transaction cost of searching and selecting items in an online shopping environment and also improve the decision making process of user [2]. RS can be referred as a system that having users, a user interfaces dataset and recommendation algorithms. In another way RS can be say that –for the user, to the user and by the user. This fact can be elaborated that the RS are design for the recommendations to the users and users can feed their preferences, ratings or requirements with the help of user interface and recommendations also displayed on the same platform. Dataset used for making the recommendations also taken from the users in the form of ratings. Some recommendation algorithm can be applied when the user requirements are collected [3]

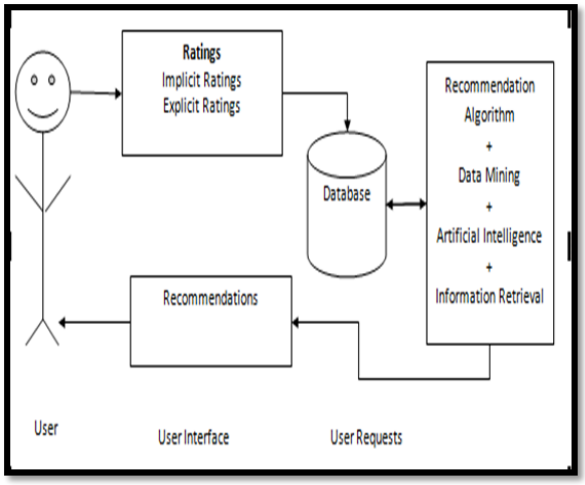

Fig. 1. Architecture of Recommendation system

Recommendation algorithms can be differentiates on the basis of knowledge sources that they use. There are three types of knowledge source which are used for classification of recommendation algorithms [5]:

- **Social Knowledge**: In this type, social relationship of user is used to describe the recommendation algorithms like tags ratings etc.
- **Individual Knowledge**: Individual data of user is used to classify the recommendation algorithms like demographics, behavior and interest.
- **Content Knowledge:** Features of items are used to differentiate the recommendation algorithms.

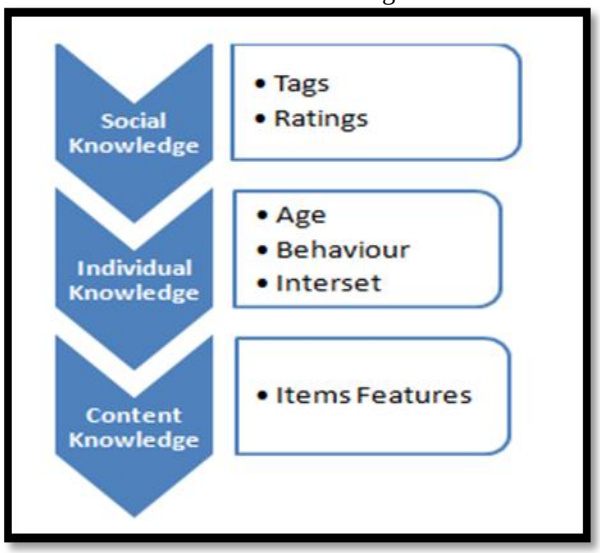

Fig.2. Knowledge source used for Recommendation Algorithm

Due to increase of binary data, users are faced the information overload problem.

RS using the data mining techniques and algorithms of prediction to predict the users interest on items and information among the large amount of existing items. RS predict the useful information regarding the product by using the past presences and interest of user and improve

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Sushma Malik, Research Scholar, Shobhit Deemed University, Meerut.

Dr. Mamta Bansal, Professor, School of Engg. & Tech. Dept. of CSE, Shobhit Deemed University, Meerut.

the quality of search items [6]. RS generate the list of recommendation in one of the given ways (Fig. 3):

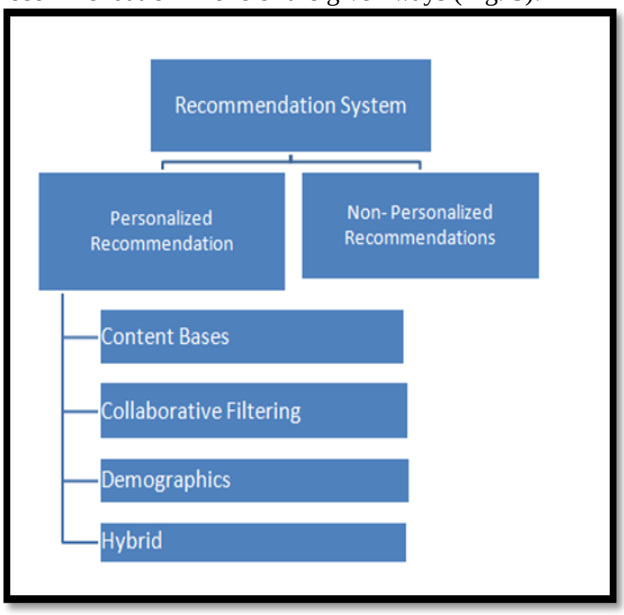

Fig. 3. Recommendation Techniques/Approaches

II. PERSONALIZED RECOMMENDATION

Personalized recommendation enables the online gathering and storing information of user, analyzing the present and past interactive behavior of user and on the basis of analysis, present the content to the user on his/her needs [7]. It can be classified into different types based on approach used for recommendation:

A. Content-Based Filtering

CB filtering recommendation technique is based o personal information of the user and item description. It depend on the user online history of items that he/she preferred in th past. This kind of technique does not need the profile of othe users because these users do not affect the recommendatio process [6] [8]. There are two types of users:

a) Implicit users and
b) Explicit users

Implicit users are those whose personal information automatically update as the user interact with the system on line and explicit kind of users using the feedback technique to convey their opinions by selecting a value [6].

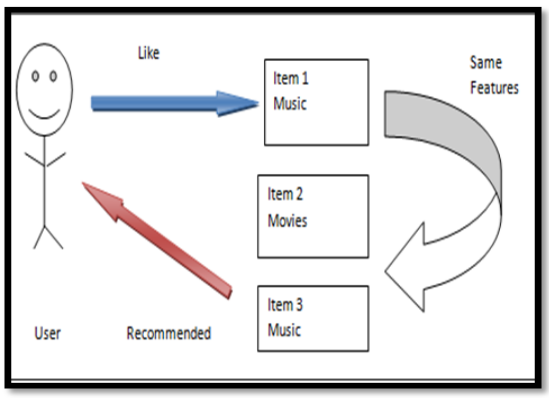

Fig. 4. Content Based Filtering

B. Collaborative-Filtering

CF technique is predicting the items for a particular user which based on the items rated by other users in the past. This technique basically filters information by using other users' recommendations [1] [8]. CF can use the user based approach or item based approach. In the user based approach, user plays an important role. Same taste users are kept in the same one group. In this approach, recommendations are given to user based on appraisal of items by other users of the same group [1].

Figure shows that user 1 and user 3have similar taste because the ratings given by users are similar. That's why item 3 is also recommended to the user 1.

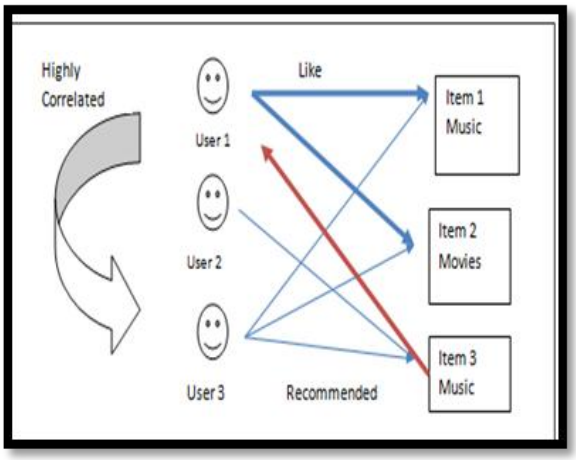

Fig. 5. User Based Collaborative Filtering

In the item based CF algorithm, the similarities between different items are calculated in the dataset. Once the most similar items are found, the recommendation is then computed by taking a weighted average of the target user's ratings on the similar items [1] [9].

Figure show that user 2 and user 3 rated the items 1 and 3 so it assumes that if the user rated item 1 then the item 3 is recommended to them.

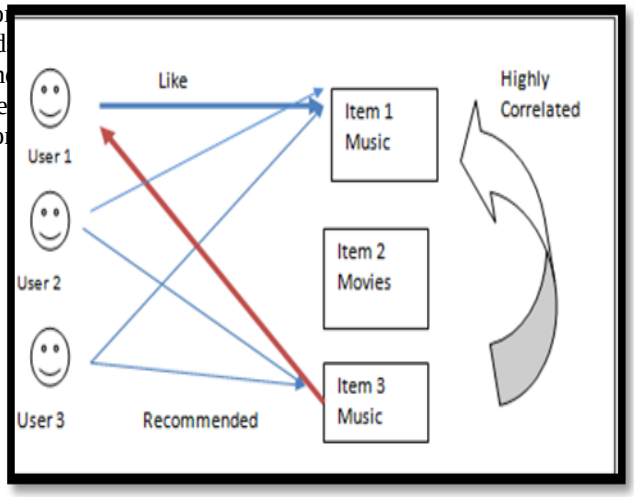

Fig.6. Item Based Collaborative Filtering

Demographic Filtering

Demographic recommendation approach design the demographic profile of the user using the demographic parameters like gender, age, knowledge of languages, status of employment, location etc. RS using this approach to recommend the items to the users according to the demographic similarities between the users [6] [8].

C. Hybrid approach

The hybrid filtering approach is a combination of more than one filtering approach but CF and CB filtering approaches are mostly used for that. It is basically introduced to overcome the problems of individual approaches [6] [8].

III. NON-PERSONALIZED RECOMMENDATION

In the non personalized RS, items are recommended to users on the basis of other users review on the items. Recommendations of items are independent of the users, so all users get the same recommendations [6].

IV. MAJOR ISSUES IN RECOMMENDATION SYSTEM

This section is including the various issues related to the RS like:

Fig.7. Issues in Recommendation System

Cold Start Problem: The cold star problem arises when the new products are added into the catalogue or new user enters into the system. So the main reason for it is too little rating data is available in the initial state of the RS because neither new user taste can be predicted before its purchase nor the new items can be rated [10][11][12].

Synonym: This problem arise when same item is represented with more different names or having similar meanings. At that time RS cannot easily identify that the term symbolize different item or the same item. For example RS will treat "movie" and "film" differently. The excessive usage of synonym terms decreases the performance of the RS [11].

Shilling Attacks: what happens if number of users and competitor giving the false ratings to some products either to increase its popularity or to decrease into the RS? Such kind of situation break the user trust as well decreases the quality and performance of the RS [11].

Privacy: For the better recommendation to the user, RS need the personal information of the user but it may lead to issues of user data privacy and security. Users are unwillingly filling the personal data into the RS that suffers from the data privacy issues. Some time user feed the wrong data into the RS for those reasons which affect the performance of the RS [11] [12].

Scalability: In many recommender techniques the problem of scalability arises when the number of users of items increases tremendously. Computation normally grows linearly with the number of users and items. Hence, the technique which takes limited number of dataset fails here. A techniques that can increase the dataset as per the requirement is needed in a recommender system for it to perform efficiently [12] [13].

Grey Sheep Problem: Grey Sheep problem occur with people who do not completely agree or disagree with a group of people. This is some weird customer whose choices are out of the line. A user for instance may like first season of some web series but dislike the other seasons. Recommendation to such customers is difficult because their likes or dislikes are not certain [13].

Diversity: Primary factor on which most of the recommender system works upon is that similar user is likely to have similar taste. Many of the recommender system allows us to connect with social media and suggests us the shows or products that are brought by our friends on the social media platform or the similar type of products we have viewed before. It is not always necessary that we want to view the same kind of items that we have viewed before. This makes the recommendations monotonous. Diversity is also important as say, a user has already brought TV set but now he does not want to buy that item again but many recommender systems will keep showing the user different TV sets because he had bought it once [13].

Data Sparsity: This problem arises because the users generally rate only a limited number of products. There are thousands of products available most of which are generally not used by the users and hence, they are not rated by the users. Moreover, there are also users who buys a product but do not rate them or gives feedback. For instance, take your own example how many times have you watched a movie on an online platform and rated it? Or how many times have you brought a product online and rated it? There are rarely people who rate every product they see or buy. This leads to sparse user item matrix, inability to locate successful neighbors, and hence generation of weaker recommendation [11] [13].

Table 1 shows the some popular sites which are currently using recommendation system for different areas [8]:

Table 1: Popular sites using recommender systems

Site	What is recommended
Facebook	Friends
Netflix	Movies/DVDs
Amazon	Books
Spotify	Songs
LinkedIn	Jobs
E-Commerce Sites	Items
MovieLens	Movies

V. CONCLUSION

Internet is a basic source of information now a day where large amount of data is stored. RS helps the user to find the required data from the web with less effort, less spending time with more accuracy. In this paper various recommendation techniques and their related issues are discussed. CB and CF are mostly used techniques but they have some individual problems like cold start problem, synonym etc. Hybrid technique is used to overcome these problems.

REFERENCES

1. P. Aggarwal, V. Tomar, A. Kathuria, "Comparing Content Based and Collaborative Filtering in Recommender Systems", International Journal of New Technology and Research (2017).
2. F.O. Isinkaye, Y.O. Folajimi, B.A. Ojokoh, "Recommendation systems: Principles, methods and Evaluation", Egyptian Informatics Journal (2015).
3. R. Sharma, S. Vinayak, R. Singh, "Guide Me: A Research Work Area Recommender System", I.J. Intelligent Systems and Applications (2016).
4. A. Felfernig and R. Burke, "Constraint-based recommender systems: technologies and research issues", ACM, New York(2008).
5. R. Burke, A. Felfernig, M. H. Göker, "Recommender Systems: An Overview", ResearchGate (2011).
6. Y.G. Patel, V. P. Patel, "A Survey on Various Techniques of Recommendation System in Web Mining", IJEDR (2015).
7. W. Chu, S. T. Park, "Personalized Recommendation on Dynamic Content Using Predictive Bilinear Models", International World Wide Web Conference Committee (IW3C2), ACM (2009).
8. P. B. Thorat, R. M. Goudar, S. Barve, " Survey on Collaborative Filtering, Content-based Filtering and Hybrid Recommendation System", International Journal of Computer Applications (2015).
9. B. Sarwar et al., "Item-based Collaborative Filtering Recommendation Algorithms", WWW10 (2001).
10. J. Lu, D. Wu, M. Mao, Wei Wang, G. Zhang, "Recommender System Application Developments: A Survey", Science Direct (2017).
11. S. Khusro, Z. Ali, I. Ullah, "Recommender Systems: Issues, Challenges, and Research Opportunities", ResearchGate(2016).
12. M. Kohar, C. Rana, "Survey Paper on Recommendation System", IJCSIT (2012).
13. M. Madhukar, "Challenges & Limitation in Recommender Systems", IJLTET (2014).

AUTHORS PROFILE

Sushma Malik working as Assistant Professor at Institute of Innovation in Technology and Management (IINTM), Affiliated to GGSIPU, New Delhi. She is sharing her rich knowledge and expertise in the field of academics for the past 10 years. She has a strong inclination towards both teaching and research. Her areas of interest include Data mining, E-commerce and software engineering. She has numerous research papers published in national as well as international journals. In addition, she has also published research papers in conferences and has attended several seminars.

Mamta Bansal has been in the field of Technical Education for the last 30 years. Mamta Bansal received her Ph.D. (Computer Engineering & Information Technology) in 2013 from Shobhit University, Meerut. Currently she is working as an Professor in Shobhit University, Meerut. Her research interest includes Data Mining, Web Mining, Crawler, Cloud Computing and Programming Languages. She has about 40 papers on her credit, which have been published in International, National Journals of repute and presented in various Conferences. She has guided many B.Tech., M.Tech., MCA, M.Phil. and Ph.D. students for their dissertation

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