

# Book Recommendation System through Content Based and Collaborative Filtering Method

Ms. Praveena Mathew<sup>1</sup>, Ms. Bincy Kuriakose<sup>2</sup>, Mr. Vinayak Hegde<sup>3</sup>

*Department of Computer Science*

*Amrita Vishwa Vidyapeetham Mysuru Campus*

*Mysuru, Karnataka, India*

veenapravi.mathew@gmail.com, bincykarikkattu@gmail.com, vinayakhgde92@gmail.com

**Abstract**—The online recommendation system has become a trend. Now a days rather than going out and buying items for themselves, reason being, online recommendation provides an easier and quicker way to buy items and transactions are also quick when it is done online. Recommended systems are powerful new technology and it helps users to find items which they want to buy. A recommendation system is broadly used to recommend products to the end users that are most appropriate. Online book selling websites now-a-days is competing with each other by considering many attributes. A recommendation system is one of the strongest tools to increase profits and retaining buyer. The existing systems lead to extraction of irrelevant information and lead to lack of user satisfaction. This paper presents Book Recommendation System (BRS) based on combined features of content based filtering (CBF), collaborative filtering (CF) and association rule mining to produce efficient and effective recommendation. For this we are proposing a hybrid algorithm in which we combine two or more algorithms, so it helps the recommendation system to recommend the book based on the buyer's interest.

**Keywords**—Book recommendation system, association rule, content based filtering, collaborative filtering.

## I. INTRODUCTION

The goal of data mining is to analyze process and extract knowledge from data in the context of large databases by using different data mining methods and techniques. A large number of data are available in the Information industry, all these data are no use until unless converted into meaningful or useful information. So, it is necessary for analyze this large amount of data and extract useful information from it. It allows users to utilize data from many different dimensions. Recommendation systems are the subordinate class of information filtering system which helps to recommend a particular item to the user. Recommendation applied in a variety of applications like movies, music, news, books and products, etc...In general recommendation systems produce a list of recommendations in different ways - through various technologies like content-based filtering and collaborative filtering. In the case of collaborative filtering approach, build the model from various aspects like users past behavior, which includes items purchased by the user previously as well as the rating given by the users for a particular item. This approach helps to predict the interesting item that the user may have.

Content based filtering works based on the description or content of a particular item.

## II. RELATED WORK

Atisha Sachan and Vineet Richariya are given a “Survey on Recommender System based on Collaborative Technique” that helps to discover the information of user's interest. In this paper they recommend the books using four types of filtering technique, which includes demographic technique, content based filtering, collaborative filtering and hybrid method. [1]

Prem Melville and Vikas Sindhwani are introducing a paper on “Recommender System” in that defines different recommendation methods and approaches. They also tried to define the common challenges and limitations in the recommendation system. [2]

Anand Shanker Tewari, Abhay Kumar, Asim Gopal Barman proposed a paper on “Recommendation System Based on Combine Features of Content Based Filtering, Collaborative Filtering and Association Rule Mining”. For the better recommendation of books to the user they have used Content Recommendation and Collaborative Filtering Based Recommendation System. Also association rule is used for the proper recommendation. They mainly focused on the quality of the books. [3]

Chhavi rana and Sanjay kumar Jain proposed a paper on “Building a Book Recommender system using time based content filtering”. In this paper they mentioned that, recommendation systems are new generation tool for helping the people in navigating information through internet and retrieving information according to their preferences. The approach they have used is content based approach with new dimension called temporal dimension. With the help of a counter each time the item get update with passage of time. Also providing a diverse of recommendation to the user. [4]

Shun-Hong Sie and Jian-Hua Yeh proposed a paper on Recommendation called “Library Book Recommendations Based on Latent Topic Aggregation”. They proved that library provide more personalized services such as customized web

interface and reading suggestions. They have used the method as Collaborative filtering to make circulation logs. It contains their borrow history as well as favourite reading. Another technique that they have used is Latent Dirichlet Allocation to find the topics of the books. The drawback is sometimes reading history not effective for efficient recommendation, which may leads lot of time to identify the needs of the customer. [5]

Pranav Bhure, Navinkumar Adhe proposed another system for book recommendation called “Book Recommendation System Using Opinion Mining Technique”. The main intension of this work was creating and deploying a book recommendation system to the user by collecting the feedback and comments. This will be analysed by opinion mining techniques. Based on the given review of the user categorize the books and final top ten are displayed to the user as recommended. The algorithm they used is commtrust and normalization. Normalization contains the ranking of books, based on the weights assigned to them. [6]

Lakshmi v, dr. M.C. Padma proposed a paper on “Hybrid Book Recommender System for an E-Commerce Application”. The main two technologies they have used is content recommendation and collaborative filtering recommendation system. For content recommendation Web Usages Mining is used. This stores the user’s behaviour on the internet and processes that data and also provides overview of the books. In the case of collaborative filtering recommendation system, based on the opinion of the users toward the books.[7]

Mark Claypool, Anuja Gokhale, Tim Miranda, Pavel Murnikov, Dmitry Netes and Matthew Sartin proposed sytem called “Combining Content –Based and Collaborative Filters in an online newspaper”. The content based filtering method helps them to combine the opinion of humans to make personalized and accurate prediction. This was a unique approach to combing both content based and collaborative filtering. They have implemented a collaborative test bed called p-tango for filtering, which provide a personalised online newspaper to the users. [8]

Abhilasha Sase, Kritika Varun, Sanyukta Rathod, Prof. Deepali Patil made a paper called “A Proposed Book Recommender System”. The main intentions of this work were search and view the books and novels as per the user’s requirements. The main techniques are Engine collaborative, content based and demographic. For content based technique Locality Sensitive Hashing method is used. [9]

Badrul Sarwar, George Karypis, Joseph Konstan, and John Riedl are introducing a paper on “Item-Based Collaborative Filtering Recommendation Algorithms”. In this paper they analyze different item-based recommendation generation algorithms and also they look into different techniques for computing item-item similarities like item-item Correlation vs.

cosine similarities between item vectors etc...then they finally evaluate the results and compare them to the basic k-nearest neighbor approach.[10]

Omkar S. Revankar, Dr.Mrs. Y.V.Haribhakta are proposed a paper regarding “Survey on Collaborative Filtering Technique in Recommendation System” in this paper they predict a user’s preferred items by using the user’s known history data and then recommends items to the user. Using content based filtering and collaborative filtering technique.[11]

M.s Pooja Malhotra, Ms.Sushama Rajpurkar and Ms.Darshana Bhatt are proposed a paper on “Book Recommendation System” in this paper they represent a new approach for recommending books to the buyers by considered many parameters like content of the book and quality of the book. They considered collaborative filtering and ratings of the other buyers. Providing stronger recommendations it also uses associative model. [12]

Lalita Sharma , Anju Gera are proposed a system for recommendation called “A Survey of Recommendation System Research Challenges” in this paper they explain the various challenges regarding the techniques that are used for generating the recommendation. The main recommendation techniques they have proposed are Collaborative Filtering, Content based filtering and Hybrid Recommendations. [13]

Nirav M. Khetra, Shruti B.Yagnik are proposed a paper on “A Collaborative Approach for Web Personalized Recommendation System” in this paper a user is represented by a user typicality vector which can indicate the users preference on each kind of items and it selects neighbours of users by measuring users similarity.[14]

Prem Melville ,Raymond J, Mooney and Ramadass Nagarajan are proposed a paper called” Content-Boosted Collaborative Filtering for Improved Recommendations” this paper uses another type of approaches that uses a content-based predictor to enhance existing user data, and provide personalized suggestions through collaborative filtering. This content-boosted collaborative filtering, they first create a pseudo user-ratings vector for every user in the database. From the database books will be recommended to the users. [15]

### III. METHODOLOGY

#### A. Content based filtering

Content-based filtering system selects and determines items based on the correlation and relationship between the content of the items in the dataset. In our case, paper describes the content of the book and purchased history of a particular book by the user. It uses a series of characteristics from the book in order to recommend additional books with similar content. Content of the book will be provided as an overview for the user. So that user can easily find out the book they

want to use or buy. Content based recommendation system filter the entire set of books from the dataset based on the content of the book, where buyer is interested to buy. Recommendation system uses content based filtering for doing the separation and filtering of books from other books which is having similar kind of content. Also, this helps to discover the content of purchased history from the browsing data. This leads to result in a good recommendation of books to the user based on their interest.

### *B. Collaborative filtering*

Content based filtering approach cannot helps to find out the content quality of the book. We can overcome this problem by using collaborative filtering. This approach builds the model for book recommendation based on various aspects like, opinion in the form of rating given by other users for a particular book and user's past behavior towards the system, which includes books read by the user previously. Item based collaborative recommendation algorithm looks in to the set of items, the target user have already rated and computes how much similar they are to the target item  $i$  and then selects  $k$ -most similar items  $\{i_1, i_2, \dots, i_k\}$  to the set of items the target user has rated, the recommendation is then computed by taking the weighted average of the target user's rating on these similar items [3]. Users will assign rating for books, the system make uses of information from all users to recommend previously unseen items that a user might like to buy. Collaborative filtering approach helps to predict and recommend the interesting books according to user requirements.

### *C. Key word based filtering*

In the case of keyword based filtering, recommend the books to the user based on the keywords provided by the user as per their requirements. According to the keywords, the system will recommend the appropriate books to the user from the dataset.

### *D. Equivalence class Clustering and bottom up Lattice Traversal (ECLAT)*

Eclat algorithm takes an important role in finding the frequent item sets in an efficient way. It finds the elements from bottom like depth first search and provide relevant recommendation. Compare to other algorithm like apriori, eclat is very effective and time saving because ECLAT algorithm scans the database only once for the entire datasets. There is no need to scan the database again and again, which leads for inefficiency and time consuming.

Proposed system helps to increase the accuracy, scalability and also provide efficient book recommendation to the user. To achieving these features through the proposed algorithm and methodology, first we need to identify whole books available in the dataset by scanning the dataset .From

the scanned dataset perform data pre-processing, which includes the extraction of data that are needed for mining. From the extracted data perform filtering of transactions here we categorize the books based on category and subcategories. For example if we consider the book category as computer science, which contain various subcategory like programming languages(c, c++, java etc...) and different subjects (operating system, data mining, software engineering etc...). Each subcategories have different kind of books written by different authors. From the identified book perform content based filtering and collaborative filtering which leads to the final recommendation of the book to the users.

Steps involved in the algorithm,

#### *Step 1: Scan the Books Dataset*

In this step scan the entire storage server and simultaneously perform the data cleaning, which include removing the irrelevant data and keeping the relevant data for mining.

#### *Step 2: Data Preprocessing*

According to our application, it includes the extraction of data that are needed for mining, which means extraction of only book categories and subcategories.

#### *Step 3: Filtering Transactions*

For filtering the transactions categorize the book based on category and subcategories.

#### *Step 4: Perform Content based Filtering*

In this step we need to perform content based filtering of books according to user preferences. for example, User1 clicked on book B1, Assume that we have some related books B2, B3 and B4 in the dataset. Assume B2 is of different type, but B3 and B4 is of same type of book B1. Now we check the content of the books B3 and B4, if the contents match with book B1, then the system will recommend books B3 and B4 for the user. If user clicks on book B1, then the user will get books B3 and B4 as the recommended.

#### *Step 5: Perform Collaborative Filtering*

Here we consider the quality of the book content. In our example, recommending the books B3 and B4. This will perform based on the registered user's opinions and rating.

#### *Step 6: Final Recommendations*

In the final recommendation, the order of the book is consider based on the book which holds highest rating compare to remaining books and arrange in descending order.

TABLE.1 BOOKS RELATED ATTRIBUTES

SL.No	Attribute Name	Description
1	Book Id	Id of the particular book
2	Book Name	Name of the book
3	Category Id and Name	Id and Name of book category
4	Subcategory Id and Name	Id and Name of book subcategory
5	Book Rating	Rating of the book given by the registered user.
6	Book price	The cost of the book

TABLE.2 MEMBER RELATED ATTRIBUTES

SL.No	Attribute Name	Description
1	Member id	Id of registered user
2	Member name	Name of registered user
3	Password	Password of registered user
4	Email	Mail id of registered user
5	Phone number	Phone number of registered user

#### IV.EXPERIMENTAL RESULTS

Our proposed system mainly contain three members,

- Admin
- Members/registered user
- Guest

##### Admin

Admin have the overall control of the system including the modules specifying bellow,

- *Login*: Admin can get login to the application by entering user id and password provided to admin.
- *Manage book categories and subcategories*: Admin

can manage the categories and subcategories of books available in the system.

- *Manage customer transactions*: Admin can manage the entire transaction of customer like view order details and feedbacks etc..
- *View rating of book*: Admin can view and manage the rating of books given by the member.
- *Change password*: Admin can change the password if require.
- *View feedback*: Admin can view and manage the feedback of members and improve the system performance according to the feedback.

##### Members/registered user

Member can have the following functionalities and facilities,

- *Login*: Members can get login to the application by inputting the user id and password that is given during registration time.
- *Place the order*: Member can place the order of books according to their requirements.
- *Place rating for book*: Here the member can place the rating for the books according to their experience and preferences.
- *Post feedback*: Can post the feedback about the system provided service, which consider as a measure for improving the system service efficiency in future.
- *Profile update*: Can able to update member's profile according to their requirements. Also can change the password if require.

##### Guest

Guest can have the following facilities,

- *Browse the books*: Here the guest can browse the books available in the system.
- *Registration*: guest can register into the system. Then the guest will be the part of the system, as member.
- *View FAQs*: Can view and post the queries to the admin.
- *Add books into the cart*: Can able to add books into the cart. After registering can buy the books from the cart.

In proposed work, the recommendation algorithm is implemented in web based recommendation application. The figures 1 represent the home page of the system and figure 2 represent the book related data like categories and subcategories.

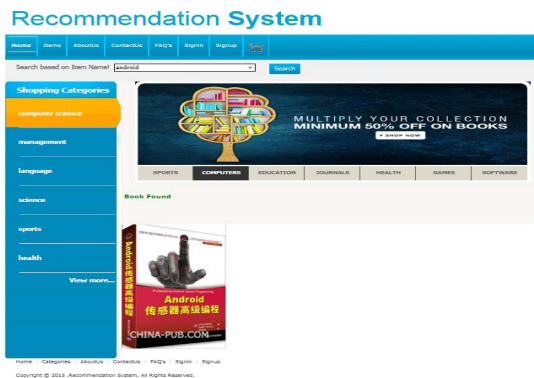


Figure 1: Recommendation Home Page

The registered user can access all the facilities available in the system except the admin functions. The guest can register from the home page. Also both registered user as well as guest can browse and view the categories and subcategories of books available in the system. The system will recommend the books according to their requirements.

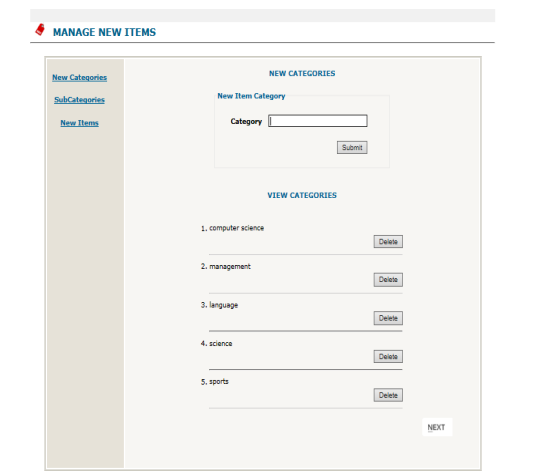


Figure 2: Managing categories and sub categories by admin

Here admin can add new book to category or sub category

## V. FINDINGS AND OBSERVATION

The main objectives of Book Recommendation System includes, The extraction of useful information from the transaction dataset and produces efficient and effective book recommendations to the buyer based on content based filtering. Also find the quality of the book's content through collaborative filtering. It includes the user's opinion and rating (feedback) towards the books given by the user. This helps to provide relevant information to the buyers using web usage

mining. The basic finding that we achieved through this proposed work is to recommend the books based on the buyer's interest and increase the productivity and credibility.

## VI.IMPLEMENTING ISSUES

The major problem faced during the implementation, developing a new website application for book selling and implementing the appropriate recommendation module based on the user's interest. Also, coordinating and implementing both content based filtering and collaborative filtering together. Other than, trust towards the users. Like whether the feedback and rating given by the users are believable or not. Another issue related to our work is after implementing, the system can only used by the educated people and people who have the knowledge and ability to work with the computer as well as internet.

## VII.CONCLUSION

Recommendation system is widely used from the last decades. Book recommendation system is recommending books to the buyers that suits according to their interest and stores recommendations in the buyer's web profile. This system will store the details of the books which users have bought earlier and find the category of book from users buying history. It using content based filtering and collaborative filtering and find out the list of books based on content and ratings. The system actually evaluate the quality of the recommending books dependent on the rating given by the existing users also use association rule mining algorithm to finds interesting association and relationship among large data set of books and provide an efficient recommendation for the book. This system may helpful for lots of people as well as students who need the best books available from the database for both general and academic purpose.

## VIII.FUTURE WORK

Along with the recommendation we can find many other important challenges in the field of book recommendation system, like payment of books through online, customer order tracking, confirmation of order and the replacement or cancellations of order. These features can be incorporate for better recommendation in the future work of book recommendation.

## VIII.REFERENCES

- [1] Atisha Sachan and Vineet Richariya," Survey on Recommender System based on Collaborative Technique", Department of Computer Science And Engineering,international journal of innovations in engineering and technology(IJIET), ISSN:2319-1058,vol.2, issue 2, pp1-7, april 2013.
- [2] Prem Melville and Vikas Sindhwani," Recommender System ", IBM T.J. Watson Research Center, Yorktown Heights, pp1-18.
- [3] Anand Shanker Tewari, Abhay Kumar, Asim Gopal Barman," Book Recommendation System Based On Combine Features Of Content

- Based Filtering And Association Rule Mining", IEEE International Advance Computing Conference (IACC), ISSN: 47992572, pp 502 14th august 2014.
- [4] Chhavi rana, sanjay kumar jain, "Building a Book Recommender system using time based content Filtering", University Institute of Engineering and Technology, ISSN: 2224-2872, Issue 2, Volume 11, 6 February 2012.
- [5] Shun-Hong Sie and Jian-Hua Yeh, "Library Book Recommendations Based on Latent Topic Aggregation", International Publishing Switzerland, pp. 411–416, 2014.
- [6] Pranav Bhure, Navinkumar Adhe, "Book Recommendation System Using Opinion Mining Technique", International Journal of Research in Engineering and Technology (IJRET), eISSN: 2319-1163, ISSN: 2321-7308, Volume: 04, Issue: 1, pp 333, Jan-2015
- [7] Lakshmi v, dr. M.C. Padma "Hybrid Book Recommender System for an E-Commerce Application", International Journal of Computer Science and Information Technology Research, ISSN 2348-1196, Vol. 3, Issue 2, pp: (921-924), Month: April - June 2015.
- [8] Mark Claypool, Anuja Gokhale, Tim Miranda, Pavel Murnikov, Dmitry Netes and Matthew Sartin, "Combining Content -Based and Collaborative Filters in an online newspaper", ACM SIGIR Workshop on Recommended Systems-implementation and Evaluation, Berkeley CA, USA, 1999 in August 19.
- [9] Abhilasha Sase, Kritika Varun, Sanyukta Rathod, Prof. Deepali Patil "A Proposed Book Recommender System", International Journal of Advanced Research in Computer and Communication Engineering, ISSN (Online) 2278-1021, Vol. 4, Issue 2, pp: (481-483), February 2015.
- [10] Badrul Sarwar, George Karypis, Joseph Konstan, and John Riedl, "Item-Based Collaborative Filtering Recommendation Algorithms", Department of Computer Science and Engineering University of Minnesota, Minneapolis, MN 55455 ACM Hong Kong, pp: (285- 295), May 5, 2001.
- [11] Omkar S. Revankar, Dr. Mrs. Y.V. Haribhakta, "Survey On Collaborative Filtering Technique In Recommendation System", IJAIE, ISSN 2319 – 4847, Volume 4, Issue 3, March 2015.
- [12] Ms. Sushama Rajpurkar, Ms. Darshana Bhatt And Ms. Pooja Malhotra, "Book Recommendation System", International Journal For Innovative Research In Science And Technology, ISSN: 314-316, vol 1, issue 11, 1 May 2015.
- [13] Sharma, Lalita And Anju Gera, "A Survey Of Recommendation System: Research Challenges", International Journal Of Engineering Trend And Technology (IJETT), vol 5, iss 4, may 2013, pp. 1989- 1992.
- [14] Nirav M. Khetra, Shruti B. Yagnik, "A Collaborative Approach For Web Personalized Recommendation System", International Journal Of Engineering Development And Research (IJEDR), vol 2, issue 4, dec 2014.
- [15] Prem Melville, Raymond J. Mooney and Ramadass Nagarajan, "Content-Boosted Collaborative Filtering for Improved Recommendations", AAAI/IAAI, 28 July 2002, ISSN 187-192..