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Book Recommendation System using Machine Learning

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ABSTRACT: In today's digital age, the sheer volume of available books poses a significant challenge for readers in identifying books that align with their preferences and interests. Users are often inundated with an extensive array of options, making it difficult to discover books according to their tastes. The traditional method of searching books through physical bookstores is a hectic and time-consuming task which might not even adequately cater to individual tastes. This problem is solved by book recommendation system. The system uses collaborative filtering method to recommend books to the users according to their past habits and ratings. It uses cosine similarity algorithm to find the similarity score between two books to recommend readers their next read.

KEYWORDS: Digital age; volume of available books; book recommendation system; collaborative filtering; ratings; cosine similarity; similarity scores

I. INTRODUCTION

With exponentially growing volume of information on the internet and around the world, users often face the difficulty of choosing among various choices of content. Recommendations systems come in handy for simplifying this process by filtering only the appropriate content based on user preferences, from a huge stack of data. This makes it easier for users to navigate through only their desired content or products. Thus, recommendation systems play a crucial role in decision making, enhancing user experience and satisfaction while also driving businesses to new heights.

The digitalization of libraries and the growth of online bookstores have led to readers' confusion when choosing their next read. Digital libraries are loved by readers for their facility of quick document retrieval, but it is a daunting task for a reader to decide which book is to be read next from a huge volume of books. Traditional methods of personally recommending a book or browsing through physical libraries might not yield satisfying results. A Book Recommendation System plays a vital role in this case by providing book recommendations based on user activity, habits, reviews and likes. This project uses collaborative filtering method which makes use of past user purchases, or in this case, past user ratings, and similar decisions taken by others to recommend a book.

The main purpose of book recommendation system is to enhance the reader's experience. By leveraging machine learning algorithms and user data, a reader receives tailored recommendations according to their choices and preferences. This saves lot of users' time and effort, which would have otherwise been spent on hunting through extensive libraries and bookstores. It would also facilitate users' to discover new authors, genres and topics which fits the users' interest, furthermore building the user engagement.

II. LITERATURE SURVEY

There has been a significant growth in the field of machine learning and recommender systems in the past few years. Various approaches can be used to provide specific recommendations to a user. Some of such most widely used methods are Collaborative Filtering and Content Based Filtering. Collaborative Filtering recommends content to a user based on their past habits, considering the chances that if a user agreed to an idea once in the past, other users might also agree to the same ideas in the future. Whereas, Content Based Filtering follows the content-based approach, meaning that it recommends a particular content to the user based on the content of the element in the user profile.

Hybrid recommendation systems are those which make use of features of both the above discussed methods to provide recommendations. The drawbacks of Collaborative Filtering and Content Based Filtering are reduced in Hybrid recommendation systems by optimizing these techniques by identifying more distinct features and integrating it in a hybrid way.

There are many book recommendation systems as of today, [1] proposed a book recommendation system which makes use of data mining techniques to recommend books to its users. The system uses various techniques like Collaborative, Content Based and Demographic methods. Thus, the system makes use of hybrid recommendation system to provide satisfying recommendations. [2][3] employs nearest neighbour algorithms, and matrix factorization for social voting, and the analysis revealed that the affiliation factor significantly enhances accuracy. [4] proposes a data model using the PageRank-based user ranking approach, and a user rank-based item similarities/differentials computing approach for userrank calculations. It is concluded that the userrank-based approaches improve recommendations of the typical Adjusted Cosine and Slope One item-based CF approaches. [5] shows how recommender systems help E-commerce sites increase sales. For this, six different sites which use more than one recommender systems are analyzed. [6] uses four different type of filtering techniques including demographic technique, content based filtering, collaborative filtering and hybrid method. [7] presented different recommendation methods and approaches. Also, common challenges and limitations in the recommendation systems are presented. [8] presents a new approach for recommending books to users by considering factors like content and quality of the book. It uses collaborative filtering and ratings of book to recommend book, also, associative model is used for stronger and more specific recommendations.

III. PROPOSED ALGORITHM

The proposed system uses cosine similarity algorithm for recommending books to the users. Cosine algorithm is one of the most popular algorithm which is used to calculate the cosine angle between two vectors. It is used to determine whether the two vectors are identical or not. It is mostly used in recommendation engines where it recommends content to the users based on the calculated cosine similarity between two vectors.

Cosine similarity is calculated as follows,

$$\text{Similarity}(A, B) = \cos(\theta) = A \cdot B / |A||B|$$

The steps for calculating the cosine similarity are as following:

Before calculating the cosine similarity between two vectors, the input data should be in proper format that is , it should be in the form of vectors such as user-items vectors which is used in recommendation system or any other numerical representation of object.

Step 1: Prepare the data in suitable format that is user-items matrix, where rows represent user and columns represent items and each cell contains interaction strength.

Step 2: Prepare the vector representation where each user and item represent vectors in high dimensional space and each dimension of vector represent characteristics of user/item.

Step 3: Compute the dot product of the two vectors. The dot product is calculated by multiplying elements of the vectors and then summing the results.

Step 4: Compute the magnitudes or length of vector. This is calculated by taking the square root of the sum of the squares of the elements of the vector

Step 5: Compute the cosine similarity of two vectors with the help of dot product and magnitudes.

Step 6: Display the similarity score which can be 1, 0 or -1 where values close to 1 represent high similarity, values close 0 represent low similarity and -1 indicates that both are dissimilar.

Step 7: Finally, display the top N recommendations to user with the help of recommendation user defined function and also display the information related to the item.

ARCHITECTURE:

Book recommendation system contains various components in its architecture, right from data collection, processing to creation of user profiles for ratings and recommendations. User profiles are created based on their past habits and ratings. The database for this user profiles and their book preferences and ratings are maintained, including book titles, authors and genres. The system utilizes collaborative filtering techniques to recommend books based on the user's past habits. The precise architecture for the system is discussed below, The architecture starts with organized acquisition of comprehensive data followed by thorough processing and cleansing of data to ensure data integrity. Simultaneously, the model undergoes evaluation according to collaborative filtering techniques that take past user habits and ratings as their

input that result into recommended books to the user. Once the user logs in to the system and provides information about their past recent read, the system seamlessly recommends a book to the user that fits his interests.

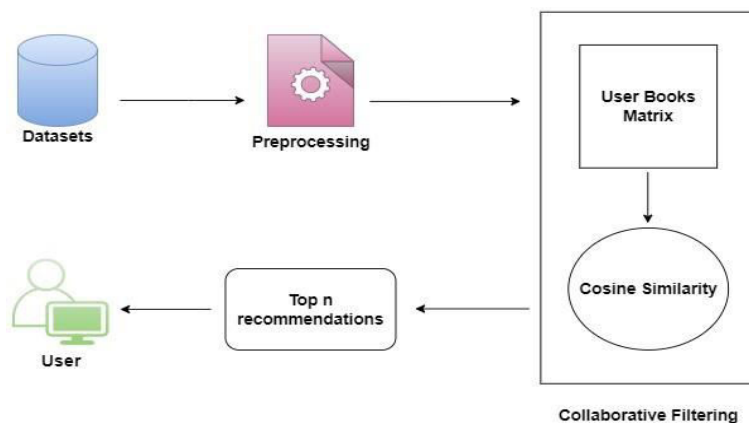


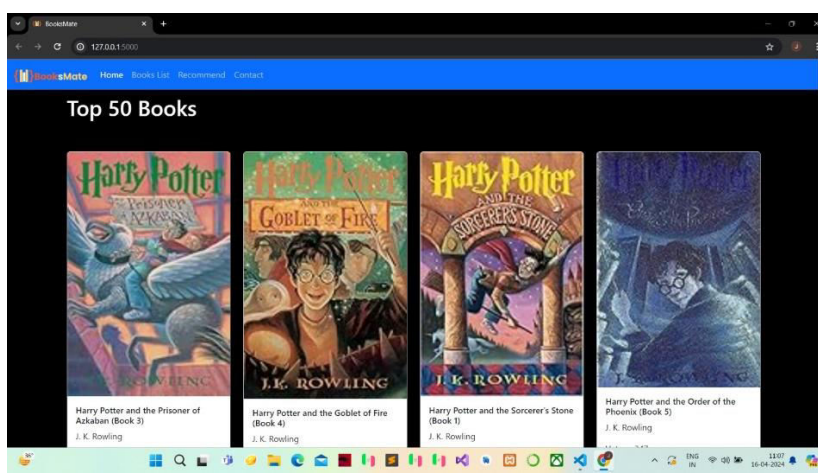
Fig: System Architecture

IV. RESULTS

The proposed system efficiently recommends books according to user preferences and ratings, showing significant improvement in the recommendation process as compared to the traditional techniques. This personalized recommendations not only ease the user effort of physically choosing a book to read, but also increase their interest in reading comparatively more amount of books. This also facilitates comparatively more user engagement and positive feedback. The system also enhances user experience by effectively recommending various authors, genres and topics which gives the user a new angle in the domain of book discovery. This enhanced user experience directly facilitates businesses to receive tangible benefits and also increased sales.

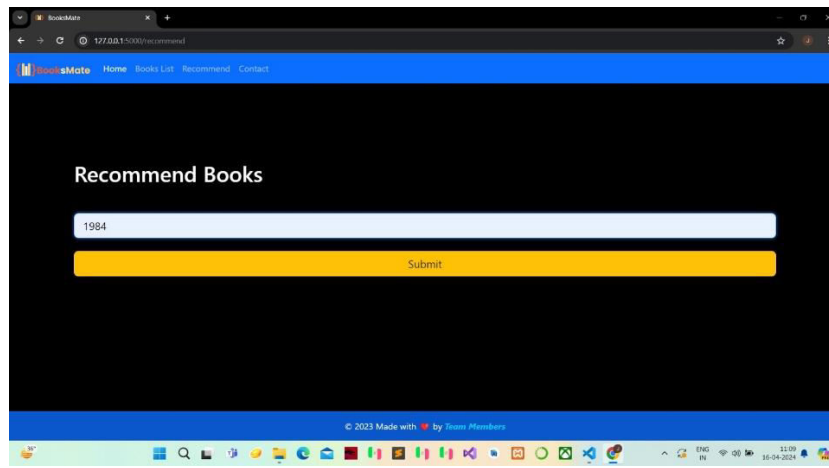
Overall, the results show the effectiveness of leveraging machine learning algorithms with user data to produce maximum user satisfaction and increased business value.

Step 1:



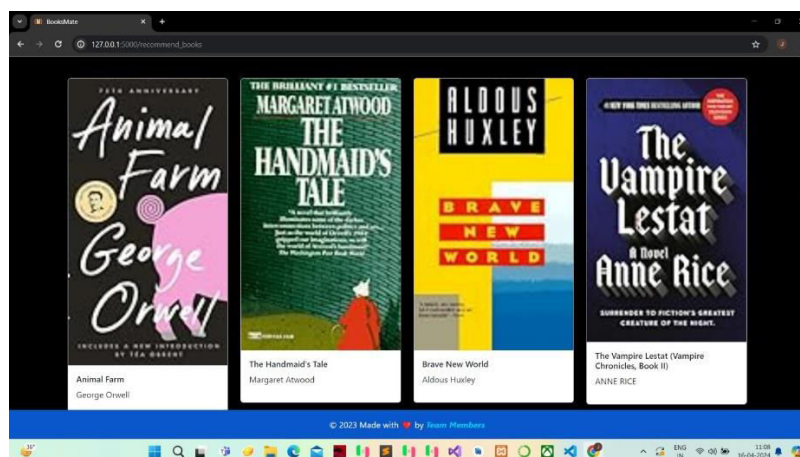
Top 50 popular books are shown on the home page of the system, from which users can choose from.

Step 2:



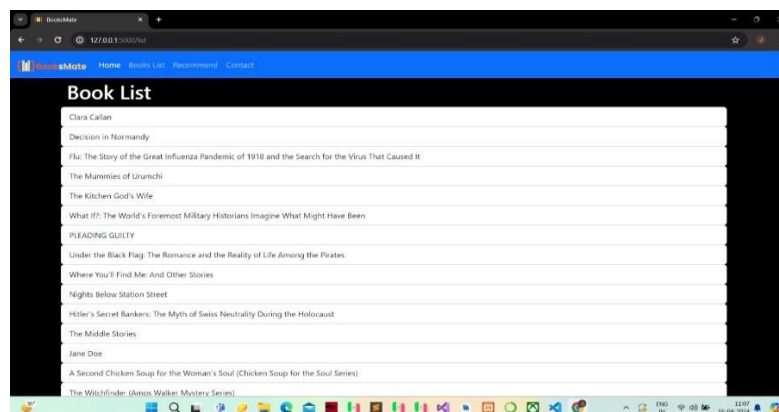
This page lets the user input the title of the last book they read, so as the system can recommend them their next read.

Step 3:



This page displays the recommended books for the user according to their input.

Step 4:



This page displays a book list from which users can choose their next read.

V. CONCLUSION AND FUTURE WORK

Implementing a book recommendation system offers transformative advantages, enhancing user engagement and satisfaction. The project targets to eventually minimize user efforts to find relevant and engaging reading options. The project employs machine learning algorithm cosine similarity to enhance the reading experience by providing personalized book suggestions. The system can easily be integrated into any existing system.

Future work may involve better and more advanced features for book recommendations such as combining collaborative filtering with content-based filtering to create a hybrid recommendation system. This type of system will use a popular approach to use a weighted combination of both the methods to improve recommendations.

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