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# BOOK RECOMMENDATION SYSTEM ON SOCIAL NETWORKS

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## ABSTRACT

*Nowadays, everyone relies on recommendations from other people for a variety of decisions, including what movie to watch, what products to buy, and what book to read. We solely utilise recommender systems for that. A recommender system is a type of filtering system that anticipates how a user would rate a product. By employing a prioritised list of anticipated item evaluations, recommender systems can make recommendations to consumers by sifting through a big library of data. The online book recommender system is a recommendation tool for readers. People read and take into consideration the book ratings and reviews that previous readers have left when choosing a book to read. Collaborative filtering and content-based filtering strategies are used in the hybrid recommender system in this paper. Data points are clustered by the author using collaborative techniques like clustering. For clustering, algorithms like K-means clustering and Gaussian mixture are employed. The silhouette score was utilised to determine the best algorithm for clustering. The features of a dataset are reduced using a matrix factorization technique, such as Truncated-SVD, which accepts a sparse matrix as input. The TFIDF vectorizer, which used statements as input and produced a matrix of vectors, was employed by the Content Based Filtering System. The RMSE (Root Mean Square Error) is used to determine the basic correctness by determining the absolute value's departure from the obtained value.*

***Keywords***: *Book Recommendation System, Matrix Factorization, Clustering, K-Means, Gaussian Mixture,Root Mean Square Error.*

## 1. INTRODUCTION

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Online ratings and reviews currently play a significant impact in the sales of books. Books were purchased by readers based on other people's reviews and ratings. The recommender system filters books based on other people's reviews and ratings. Hybrid recommender system is employed in this paper to strengthen our recommendations. Recommender systems employ a method called collaborative filtering. This method collects information from other users and filters it. Systems for collaborative filtering use a similarity index-based approach. The users' ratings of those goods, who have also evaluated the other item, establish how comparable the two items are. The similarity of user ratings for a specific item serves as a proxy for user similarity. Content-based filtering makes use of item descriptions

The Good-Reads website allows users to get the necessary dataset for our model's training and testing. For the purpose of reducing the number of features, a sparse matrix from the dataset is employed in a matrix factorization approach like Truncated-SVD. A recommendation system is constructed using clustering on the condensed dataset. Our recommendation system is built using clustering, a collaborative filtering process in which data points are organised into clusters. For clustering the users in this work, we used two techniques: K-means and Gaussian mixture. Based on the silhouette score, the superior model is chosen and put to use for clustering. The effectiveness of the grouping is measured using the silhouette score or silho

Positive number indicates flawless clustering, whereas negative value indicates insufficient clustering. The mean rating before and after clustering are compared, and the difference is calculated. The difference between the obtained values and the absolute values is measured using the Root Mean Square Error. The basic accuracy is determined using that RMSE number.

## 2. LITERATURE SURVEY

### Collaborative Filtering with Jaccard Similarity to build a recommendation system

A work titled "Online Book Recommendation System using Collaborative Filtering (With Jaccard Similarity)" was proposed by Avi Rana and K. Deeba, et al. in 2019 [1]. Because scalability, sparsity, and cold start are three common problems with CF, the author of this research employed CF with Jaccard similarity to obtain more accurate suggestions. Therefore, they used CF with Jaccard Similarity to get over these challenges. JS is based on a pair of

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books index, which is a ratio of the average users' ratings of both books divided by the total users' ratings of each book separately. It is strongly advised to read books having a high JS index.

**Building a Recommendation System using Keras Deep learning Framework**

A paper titled "Online Book Recommendation System" was proposed by G. Naveen Kishore, et al. in 2019 [2]. The website "good books-10k dataset" provided the ten thousand distinct books that made up the dataset used in this study. Book_id, user_id, and rating are features. In order to develop neural network embedding, the author of this paper used the Keras deep learning framework model.

**Using Quick sort Algorithm approach to design a system**

A work titled "An Improved Online Book Recommender System using Collaborative Filtering Algorithm" was proposed by Uko E. Okon et al. (2018) [3]. Using a rapid sort algorithm, cooperative filtering, and object-oriented analysis and design methodology (OOADM), the authors created and built a recommendation model. This system has a 90–95% accuracy rate.

**Using UV Decomposition and KNN for building system**

A article titled "Book Recommendation System" was proposed by Jinny Cho et al. (2016) [4]. The author of this study employs two approaches: collaborative filtering (CF) and content-based (CB). They employed the UV-Decomposition and K Nearest Neighbours (KNN) algorithms. They got a result that was 85% accurate.

**Recommending books through CB and CF approaches**

Sushma Rjpurkar, et.al. (2015) [5] proposed a paper “Book Recommendation System”. In this paper, the author used Associative Rule Mining to find association and correlation relationships among a dataset of items. They used CB and CF approaches to build a system.

## 3. EXISTING SYSTEM

The engines that are now in use use traditional algorithms for suggestions. The system provides suggestions from a source using the user's information and the features connected to the products in a content-based recommendation engine. Suggestions are generated by

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collaborative recommendation algorithms based on the ratings provided by a group of users. It searches for peer users who have ratings histories similar to the one of the present user and produces recommendations for them. The system needs extra information on the context of item consumption, such as time, mood, and behavioural factors, in a context-based recommendation engine. When contrasted to what could be done without this additional source of information, these data may be used to improve the advice.

## 4. PROPOSED SYSTEM

By creating a model with the K- Means Algorithm over a Gaussian Mixture and comparing the results with Silhouette scores, the Collaborative Filtering System is created. Dataset was gathered from the Good Reads website, where three datasets—Books Dataset, Ratings Dataset, and Users Dataset—are available. Datasets were preprocessed in Section 3.2 to make them eligible for creating the recommendation system. The features of the dataset are reduced using truncated-SVD. A content-based filtering system is created in Section 3.3, and one of its inputs is a book description. Data splitting is carried out in Section 3.4, where training dataset and testing dataset are separated in an 80:20 ratio.

## 5. MODULES DIVISION

The various modules in our proposed system and what each module contributes in achieving our goal.

### 5.1 Data Acquisition

Finding and acquiring all relevant datasets or data sources is the aim of this stage. Since data are frequently gathered from numerous internet sources like databases and files, the major goal of this step is to identify the different sources of available data. The quantity and calibre of the data in the gathered dataset will dictate how effective the model is. The Goodreads website is where the Books dataset is gathered.

### 5.2 Data Pre-Processing

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- This stage's objective is to examine and comprehend the nature of the data that was gathered in the previous step as well as to determine the data's quality. We will search for and eliminate any null values in this stage because they could reduce efficiency.
- This stage also includes locating duplicates in the dataset and eliminating them.
- pivoting after merging the tables to produce the Users X Books Dataframe
- In the aforementioned we join datasets using the merge function, the 'on' keyword, and pivot tables to produce a data frame called Users X Books.

### 5.3 Feature Extraction

- After pre-processing the acquired data, the next step is to reduce the features i.e. Dimensionality reduction. The reduced features should be able to give high efficiency. We used Matrix Factorization technique such as Truncated SVD which takes sparse matrix as input for reduction of features.
- In scikit-learn python library, sklearn.decomposition.TruncatedSVD module is used for carrying out Truncated SVD. In the fig 3.9 we can see in the screenshot that we are reducing the dimension so that complexity of the model decreases

## 6. CONCLUSION

In this research, we have suggested books to a user using a model trained using the collaborative filtering technique known as K-Means Clustering. We also analysed other models created using various methodologies, determined the best model, and explained why it was selected. We used the Goodreads website's books dataset, which has data on more than 3000 books. Truncated SVD is used to build the models utilising the decreased feature set. The author created a model that provides a high Silhouette score based on those characteristics. The suggested model in this research is beneficial to book readers. The technology we created can also offer recommendations to brand-new users.

The System can be modified appropriately in the future, if that becomes necessary. The primary aspects that can be done in the future are mobile app development and launch, service improvement and service addition, system security, data security, and reliability. We can also buy a book right now if the API for the payment and shopping gateway is added. Only a few

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categories are available in the current system; therefore, we can expand the site by adding more categories than are already available. Additionally, we can provide an admin side with features like user management and book management.

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