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# Intelligent Book Recommendation System Using KNN Algorithm

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**ABSTRACT:** Book Recommendation System is the application where the user is recommended with similar books as of his interest. Digital world of today has lot and lot of information. The huge set of information will not provide what user wants very quickly, Book recommendation is one such concept that help user to find the similar interest books. Machine learning has provided the recommendation techniques that applied to the dataset will give the results according to needs. This research provides the study of different book recommendation techniques and has implemented one of the techniques to recommend books.

**KEYWORDS:** Recommendation System, Machine Learning, KNN (K-Nearest Neighbors) algorithm.

## I. INTRODUCTION

The work carried out is to show the different techniques that the book recommendation can use and how it can be implemented applying the collaborative filtering technique using KNN machine learning algorithm. An intelligent algorithm forms the recommendation system, which can be used to recommend to the other users. In the digital world there are lots of e-books available what cause overhead to the users. This book recommendation system will help user to get books of their choice in fast and easy way.

Book Recommendation system is basically to help the users to choose books from large set of books available in the electronic information. Users have large set of information for the book, selecting the small and only the required part that suits the user, needs book recommendation system. Book recommendation system is one of the recommendation systems where user searches for one book and gets suggestion for the similar books. User will know what other books available of the same kind, which will help users to get the book he is looking for without searching or he may get more interesting books in the recommendation provided.

Different techniques that can be used for the Book recommendation system are collaborative filtering recommendation system, content based recommendation system and Hybrid recommendation system. Content based recommendation is based on the users' information like if the user has downloaded the book, its genre and its rating are considered and accordingly the recommendations are made once user gives the name of the book next time. In Collaborative filtering technique, data of other users with similar interest can be used along with the data of the user history, consider two users if one user like the book similar to the other user, other user history helps the user to get interested book. Hybrid recommendation system is the combination of content based recommendation and collaborative filtering recommendation systems.

KNN (K-Nearest Neighbors) algorithm is the technique that is used for recommendation of books in this paper, where the users of the same interest are clustered with the help of the book name and its ratings. KNN algorithm predicts the output based on the average rating of the books based on top nearest neighbors. Implementation of this is done using the python language and the machine learning KNN algorithm. KNN algorithm used to implement the collaborative filtering recommendation system.

## II. RELATED WORK

Different Recommendation approach and techniques [1] the main purpose of this paper is to spot the research trend in Recommendation System which will help the current and future Recommendation System researchers to assess and set their research roadmap. Movie recommendation system [2] aims at helping movie enthusiasts by suggesting what movie to watch without having to go through the long process of choosing from a large set of movies which involves going through thousands and millions of records that is time consuming and confusing. KNN algorithm is implemented. The objective of movie recommender [3] is to provide accurate movie recommendations to users. Usually the basic recommender systems consider one of the following factors for generating recommendations; the preference of user (content based filtering) or the preference of similar users (collaborative filtering). The sentiment analysis technique is implemented [4] to optimize the preliminary list and get the final recommendation list. Further on the basis of the hybrid recommendation framework, this paper fully focuses on the efficiency of the recommender system. Layered evaluation framework to fit the interaction components of a recommender system is discussed in [5], it focus on a system that is based on a large dataset in order to see how it may have an influence on the performance of the recommendation approach.

The research paper [7] present in the dataset are segregated into ‘k’ clusters using the PLSA (Probabilistic Latent Semantic Analysis) algorithm. Different topic is accredited to every of the cluster implicitly then consistent with the word distributions of papers their probability of getting it into a specific cluster is found out. Implementing a new recommendation algorithm as Android application with additional functions is illustrated in paper [8]. By combining with existing web services such as Google Movie Show times and Open APIs, our system can recommend movies playing in cinemas currently and show the detailed information of movies. A book recommendation system is proposed in paper [9] which uses data mining techniques and algorithms for recommending books. The proposed recommender system will give its users the power to look at and search books also as novels which can be wont to prolong conclusions about the stream of a user and therefore the genre of the books liked by that user. In paper [10] different approaches like Collaborative Filtering system; Content based system, Hybrid systems are mentioned to compare the limitation of each technique in proper manner to provide proper future recommendations. In paper [11], inputs consist of database of customers and database of books and output denotes the book recommendations. This paper presents a replacement approach for recommending books to the buyers. The proposed system combines the various features of content filtering, collaborative filtering and association rule mining to supply efficient and effective recommendations to users. This paper [12] proposes a recommender system which provides recommendation based on the information given by the users. Recommendation is done by using analysis of user’s psychological profile, their movie watching history and movie scores from other websites.

## III. THE PROPOSED SYSTEM

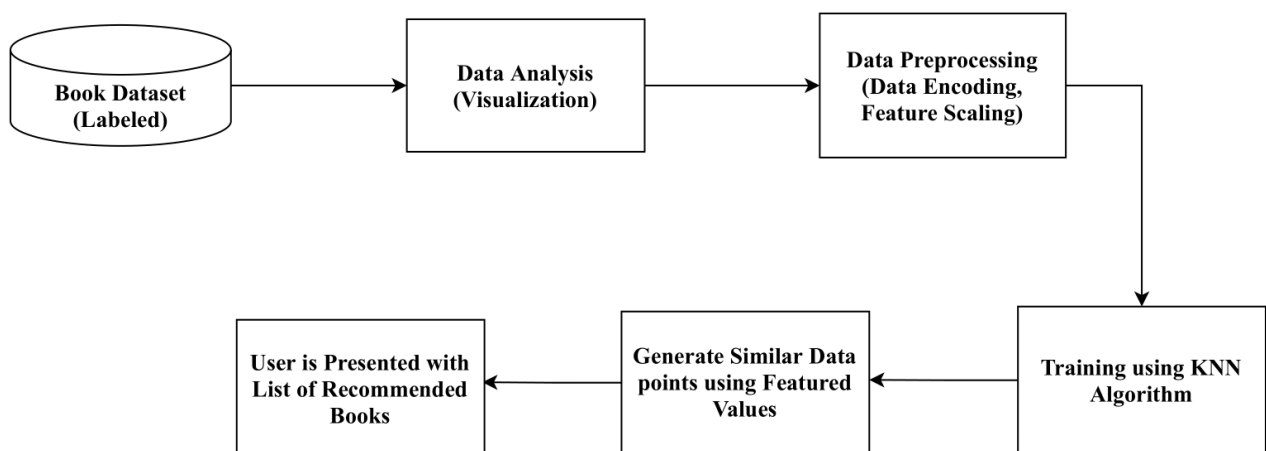


Figure 1: Block Diagram of the Proposed System

Figure 1 illustrates various steps involved in the methodology adapted for intelligent book recommendation system.

Proposed system is the intelligent Recommendation system which is capable to suggest books based on the ratings, count of ratings. It uses machine learning algorithms and techniques to recommend books. The algorithm uses various aspects which are known as features of dataset. Algorithm performs computations on these features to produce outcome. Machine learning algorithms mainly classifies learning into supervised and unsupervised learning. Supervised learning performs its learning on the labeled dataset and unsupervised learning performs learning on unlabeled dataset. Proposed systems are built on supervised learning algorithms and KNN (K Nearest Neighbors) is most widely used algorithm. KNN algorithm works on the assumption which states similar things have common characteristics. It focuses on the concept that data points which are near and closer to each other have similar characteristics and it uses the idea of similarity which is in terms of distance, proximity and closeness. The closeness is measured using mathematical computations, one such method is calculating distance between two points on graph and calculating Euclidean distance is another and most popular method. By calculating the similarity between data points, the algorithms groups similar data points using feature values and recommends the similar data points or product to the user.

Book dataset is loaded into a data frame. Analysis is done on the data loaded into data frame such as calculating the sum of null values to check the presence of any null values. Rating values of books as book rating is the main feature for generating the similar books. The rating values are visualized using seaborn's bar plot with average rating and book title as the parameters to be visualized in the plot. Visualization of books and their ratings is done to give the broader view of books and their ratings present in the dataset.

Analysis on the dataset is done by performing various visualizations. Categorical data are converted into numerical data using dummy value encoding. All the numerical features are scaled down to similar scale using feature scaling that is minmax scalar. KNN algorithm is implemented on the transformed features with number of neighbors being set. The algorithm generates the list books that are similar to the given book title.

#### IV. TOOLS AND TECHNOLOGIES

Tools and technology used in proposed work is Python, Jupiter Notebook, Scikit-learn Pandas, Numpy, Seaborn and Matplotlib.

Machine learning is one of the most powerful tools used to observe and provide accurate results for large set of data and information. This technology of machine learning has played vital role in recommendation systems. Suitable programming languages has to be used to implement the algorithms, this is where python come in picture making it most accurate and suitable as it is flexible and stable and many libraries that help in developing the book recommendation system.

Python has a rich technology stack and has a different set of libraries for Machine learning.

- Scikit-learn is used for machine learning
- Seaborn is used for data visualization
- Pandas is used for general-purpose data analysis
- NumPy is used for scientific computing and data analysis

The Jupyter Notebook is an open-source web application that provides many features such as creating and sharing documents containing live code, data visualizations, and narrative text. Some of the main functionalities provided by it include data cleaning, data transformation, numerical simulation, statistical modeling, machine learning, and many more. It comes pre-bundled with anaconda installation.

Scikit-learn provide a wide selection of supervised and unsupervised learning algorithms in machine learning. Scikit Learn allows users to visualize graphs using the graphic library, which comes with a few options that will help in visualizing. It also used to splits the learned model which is super useful for its work to be understood.

Pandas is an open-source, high-level data manipulation tool developed by Wes McKinney. It is built on the Numpy package. It is a data analysis toolkit that can be imported using `import pandas as pd`. Pandas has different advantages, ranging from parsing multiple file-formats to converting an entire data table into a NumPy matrix array. This makes pandas a trusted ally in machine learning.

Numpy is the package for in python. Numpy is the python libraries that provide various derived objects, multidimensional array objects, shape manipulation, etc. Numpy is used when you are dealing with array of values, where the data need to be converted to standardized data. Matplot and seaborn are the packages that are used to plot and represent the data in visual form.

**V. RESULT**

The result sets of this system describe about the results which are derived after the work is tested. The result set are as follows:

*1. Average Rating of Top Ten Books*

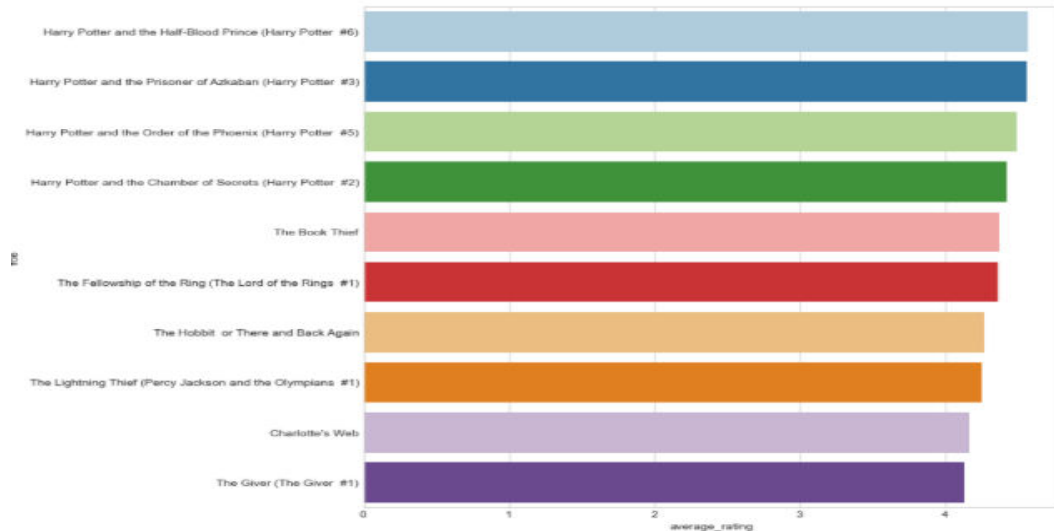


Figure 2: Bar Graph Representing Top Books

Figure2 illustrates graph plotted for the average rating and the book title of books. Average rating is on the x axis and book title is on the y axis. The graph shows the rating given out of 5 for all books. Different color shows different books.

*2. Top Ten Authors with Maximum Books*

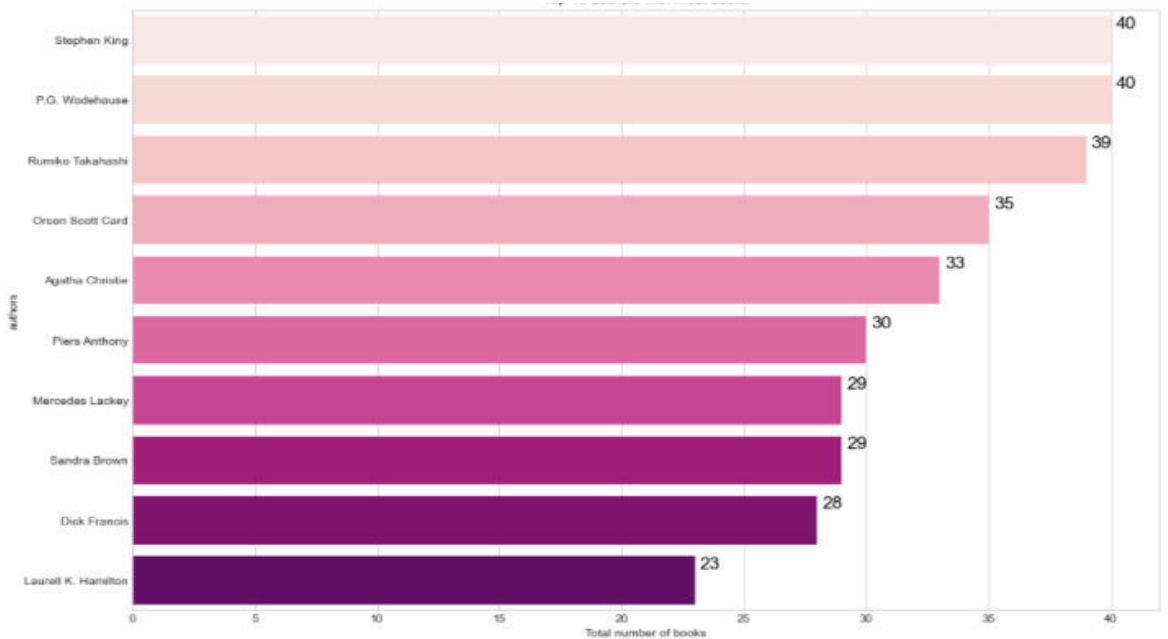


Figure 3: Bar Graph Representing Authors with Maximum Books

Figure 3 provides visualization of top ten authors with maximum number of books. It illustrates that maximum number of books of authors.

### 3. Average Rating Distribution

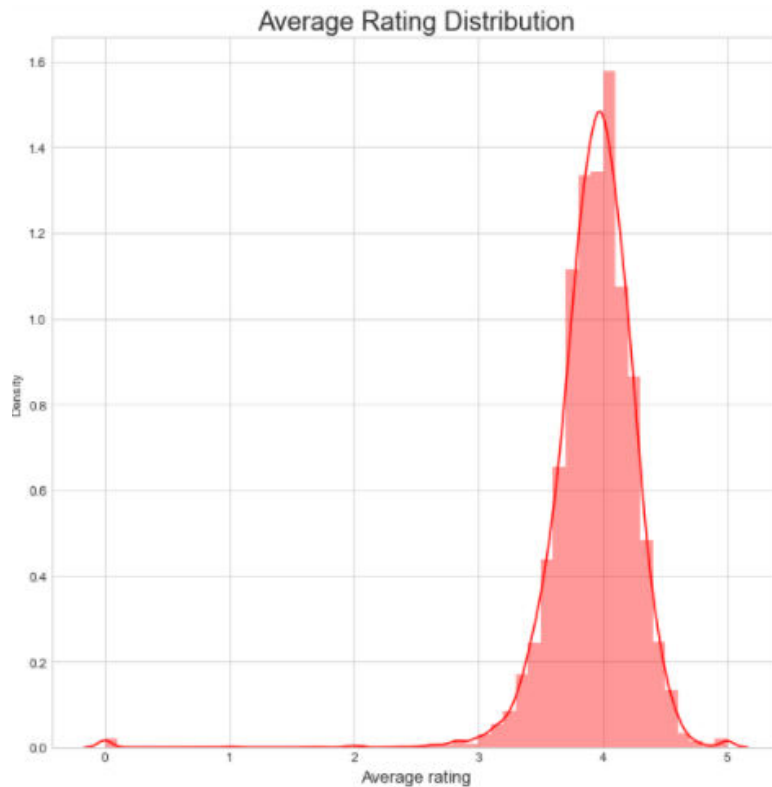


Figure 4: Distribution Graph Showing Relation between Average Ratings of Books

The Figure 4 shows the distribution plot or the histogram for the average rating of the books when all books are considered. Most of the ratings represent between the scale of 3 and 5.

### 4. Books Recommended

```
Bookname = Recommender('Harry Potter and the Half-Blood Prince (Harry Potter #6)')
Bookname

['Harry Potter and the Half-Blood Prince (Harry Potter #6)',
 'Harry Potter and the Order of the Phoenix (Harry Potter #5)',
 'The Fellowship of the Ring (The Lord of the Rings #1)',
 'Harry Potter and the Chamber of Secrets (Harry Potter #2)',
 'Harry Potter and the Prisoner of Azkaban (Harry Potter #3)',
 'The Lightning Thief (Percy Jackson and the Olympians #1)']
```

Figure 5: List of Books Recommended

Figure 5 shows the output, providing list of books recommended. It is the output for the proposed system after it has been implemented. Given input as the title of book it gives list of similar books.

## VI. CONCLUSION

Book Recommendation suggests books of user's choice. The goal of the book recommendation system is to help the user get the similar book of interest; this is achieved by applying one of the most popular technique collaborative



filtering and KNN algorithm. The dataset is collected, analyzed using various visualizations, data is processed and algorithm is applied to predict the books. KNN algorithm intelligently recommends the books when trained on the ratings in the dataset. Then user is predicted with list of similar books.

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