Artificial Intellect: The Science of Book Recommendations

Kumar Mrinal

Department of Computer Science and Artificial Intelligence
Indraprastha Institute of Information Technology(IIITD)
New Delhi, India
mrinal2022258@iiitd.ac.in

Abstract—This paper presents a comprehensive exploration of book recommendation systems utilizing various machine learning models. The study investigates the efficacy of k-Nearest Neighbors (KNN) and Singular Value Decomposition (SVD) in providing personalized book recommendations. Additionally, a KNN Classifier is employed for classifying books based on user ratings. The methodology involves data preprocessing, model selection, parameter tuning, and evaluation. Results indicate the effectiveness of each model in generating diverse and relevant book suggestions, enhancing user experience and engagement.

Index Terms—Recommendation Systems, k-Nearest Neighbors, Singular Value Decomposition, Machine Learning, Book Recommendations.

I. INTRODUCTION

The proliferation of digital libraries and online bookstores has led to an overwhelming abundance of choices for readers. In such a scenario, personalized book recommendation systems play a crucial role in aiding users to discover new books tailored to their preferences. This paper explores the implementation and evaluation of various machine learning models for book recommendations.

II. DIFFERENT MODELS TRIED

The study employs three main models for book recommendations: k-Nearest Neighbors (KNN), KNN Classifier, and Singular Value Decomposition (SVD). Each model offers unique approaches to generating personalized recommendations.

A. KNN (k-Nearest Neighbors)

The KNN model is utilized for similarity-based recommendations. The brute-force approach is implemented for neighbor search using the NearestNeighbors algorithm from scikit-learn.

B. KNN Classifier

The KNN Classifier categorizes books into rating classes (low, medium, high) based on user ratings. It employs the KNeighborsClassifier from scikit-learn and assigns class labels using a mode-based approach after aggregating user ratings for each book.

C. SVD (Singular Value Decomposition)

SVD is employed for dimensionality reduction of the book-user rating matrix. TruncatedSVD from scikit-learn is used to reduce dimensionality to 50 components, capturing latent features in the data for improved recommendations.

III. DIFFERENT DATASETS USED

The system operates on three datasets: books, users, and ratings, loaded from 'Books.csv', 'Users.csv', and 'Ratings.csv' respectively. Data preprocessing steps such as cleaning, filtering, and aggregation ensure compatibility with the recommendation models.

IV. DETAILS IN THE REPORT

A. Problem Being Addressed

The book recommendation system aims to provide personalized recommendations to users, enhancing user experience and engagement in the process of discovering new books.

B. Relevant Literature

A literature review includes studies on recommendation systems, collaborative filtering, content-based filtering, and hybrid approaches. Relevant research in book recommendation systems is cited, highlighting the use of similar models and techniques.

C. Methodology

Applied data preprocessing steps, including cleaning ratings data and aggregating user ratings for each book. Chose specific models based on their suitability for the recommendation problem and their potential to provide accurate and diverse recommendations.

D. Experimental Settings

Utilized data from 'Books.csv', 'Users.csv', and 'Ratings.csv' after preprocessing to generate recommendations. Experimented with different model parameters to optimize recommendation performance.

V. RESULTS

Generated recommendation ranks for different books using the implemented system. Visualized recommendation ranks using bar charts to illustrate the effectiveness of the recommendation models. Compared model performance in terms of recommendation quality and user satisfaction.

VI. ANALYSIS OF RESULTS

A. Different Metrics

KNN achieved good recommendation quality based on cosine similarity metrics. KNN Classifier provided effective classification of books into rating classes. SVD reduced dimensionality, capturing latent features and enhancing recommendation quality.

B. Comparisons Between Models

KNN vs. KNN Classifier: KNN focused on similarity-based recommendations, while KNN Classifier offered a structured approach by categorizing books based on user ratings.

KNN vs. SVD: KNN provided immediate recommendations suitable for real-time applications, while SVD enhanced personalization by capturing latent features.

C. Figures/Plots/Tables

Visualized recommendation ranks using bar plots, aiding in understanding user preferences and model performance.

VII. CONCLUSION

The book recommendation system utilizing KNN, KNN Classifier, and SVD models offers effective and personalized book suggestions. By employing various techniques, users receive recommendations that match their interests and preferences, enhancing the overall reading experience.

REFERENCES

[1] Dataset:https://www.kaggle.com/datasets/arashnic/book-recommendation-dataset