# BOOK RECOMMENDATION SYSTEM

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ROLL NO: 1

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# INTRODUCTION

- A book recommender system is a tool that suggests books to users based on their interests and reading history.
- These systems can be used by libraries, bookstores, or online retailers to help users discover new books that they might enjoy.

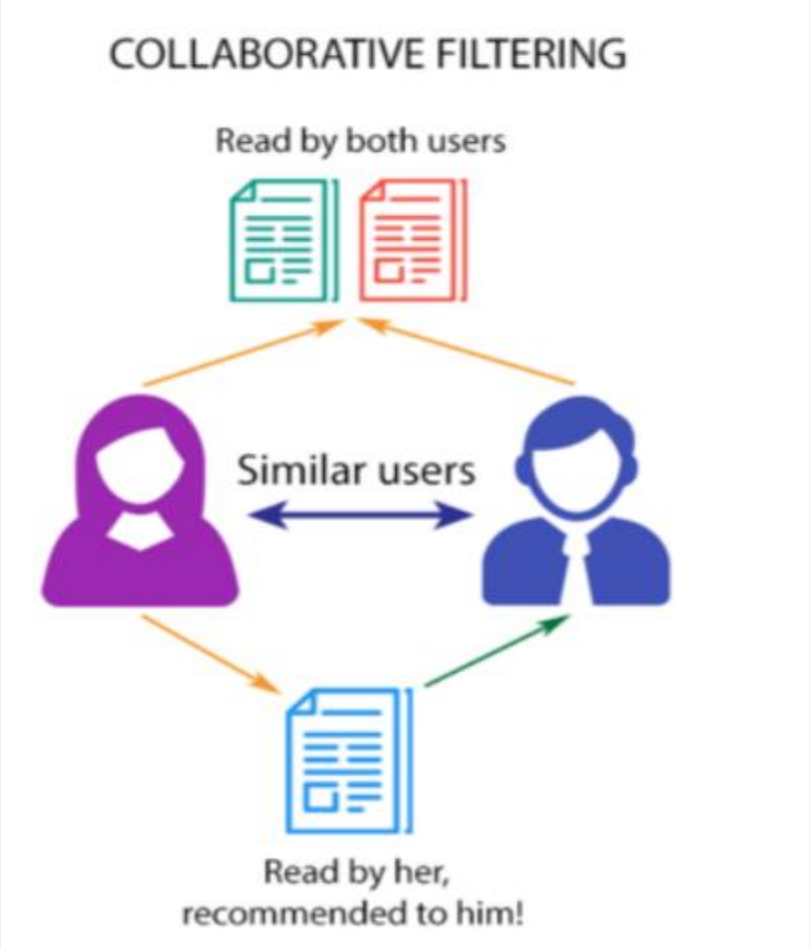
# APPROACH

## 1) Popularity Based Book Recommendation

- Recommend books with highest number of ratings.
- Target new customers with most popular books.
- It can be implemented using, Content based filtering & Collaborative filtering.

## 2) **Collaborative filtering**

Collaborative filtering is a recommendation technique that relies on user-item interaction data (e.g., ratings) to recommend items. It identifies patterns or relationships between users and items to make predictions.



# DATASET

The dataset is downloaded from the kaggle website it comprises of:

- Books – first are about books which contain all the information related to books like an author, title, publication year, etc.
- Users – The second file contains registered user’s information like user id, location.
- ratings – Ratings contain information like which user has given how much rating to which book.

# METHODOLOGY

1. Data Collection
2. Data Preprocessing
3. Exploratory Data Analysis (EDA)
4. Building Recommendation Approaches
    - Popularity-Based Recommendation
    - Collaborative Filtering
5. Model Evaluation

# DATA PREPROCESSING

1.Check for Missing Values
2.Filter Irrelevant Data
3.Data Merging
4.Data Type Consistency
5.Apply Filters

# Popularity-Based Recommendation

1. Aggregate ratings data to calculate the number of ratings or average rating for each item.
2. Sort items based on the chosen popularity metric (e.g., number of ratings or average rating).
3. Apply a threshold to filter items with insufficient ratings (optional).
4. Select the top N items based on the ranking.
5. Display the most popular items as recommendations.

# Popularity-Based Recommendation

1. Average Rating:

$$R_{avg} = \frac{\sum R}{N}$$

2. Count of Ratings:

$$C_{count} = N$$

3. Final Recommendation List:

$$\text{Rank}_i = \text{Sort}(R_{avg}, \text{Descending})$$

# Collaborative-Based Recommendation System

- **Types:**
- **User-based Collaborative Filtering**: Recommends items by finding users with similar preferences.
- **Item-based Collaborative Filtering**: Recommends items based on the similarity of items.

**1. User-Item Matrix**

Let $R$ be a matrix where:

- Rows represent users ($u$)
- Columns represent items ($i$)
- $R[u, i]$ is the rating given by user $u$ to item $i$.

**2. Cosine Similarity**

For user-based filtering, the similarity between two users $u$ and $v$:

$$\text{Sim}(u, v) = \frac{\sum_{i \in I} R[u, i] \cdot R[v, i]}{\sqrt{\sum_{i \in I} R[u, i]^2} \cdot \sqrt{\sum_{i \in I} R[v, i]^2}}$$

Where $I$ is the set of common items rated by both users.

### 3. Prediction Formula (User-Based)

The predicted rating for user $u$ on item $i$:

$$\hat{R}[u,i] = \bar{R}[u] + \frac{\sum_{v \in U} \text{Sim}(u,v) \cdot (R[v,i] - \bar{R}[v])}{\sum_{v \in U} |\text{Sim}(u,v)|}$$

Where:

- $\bar{R}[u]$: Average rating of user $u$
- $U$: Set of similar users who have rated item $i$

### 4. Prediction Formula (Item-Based)

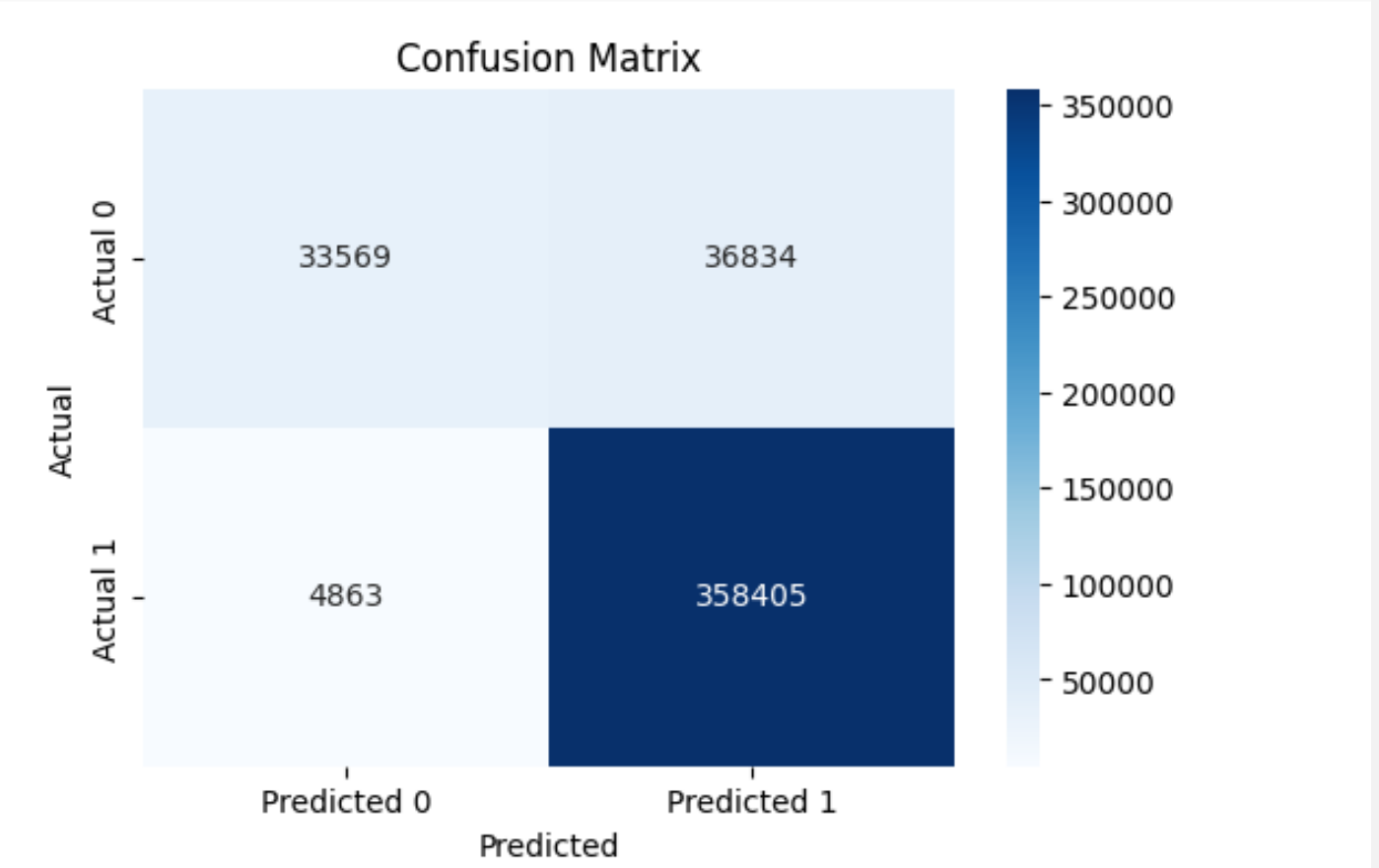
The predicted rating for user $u$ on item $i$:

$$\hat{R}[u,i] = \frac{\sum_{j \in I} \text{Sim}(i,j) \cdot R[u,j]}{\sum_{j \in I} |\text{Sim}(i,j)|}$$

Where $I$ is the set of items rated by user $u$.

# RESULTS AND EVALUATION

```
Enter the User-ID to check: 98391
User 98391 is in the range with at least 50 ratings.
Recommendations for this user:
{'The Da Vinci Code', '2nd Chance', 'The Lovely Bones: A Novel', 'Life of Pi', 'When the Wind Blows'}
```




```
Accuracy: 0.90
Precision: 0.91
Recall: 0.99
F1 Score: 0.95
```

# ADVANTAGES

- Personalized Recommendations
- Time saving
- Exposure to New Authors and Genres.
- Better Customer Experience
- Diverse Author Recommendations

# DISADVANTAGES

- Bias in Recommendations
- Overwhelming Number of Recommendations
- Data Privacy Concerns

# APPLICATIONS

- Online Bookstores & Retailers
- E-Book platforms.
- Social Media & Book Communities
- Educational Platforms
- Book Clubs & Reading Groups

# THANK YOU