

BOOK RECOMMENDATION SYSTEM

**A Project report submitted in partial fulfillment of the requirements for the award of
the degree of**

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IN

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PROJECT DESCRIPTION

Recommendation systems are used in hundreds of different services everywhere from online shopping to music to movies. For instance, the online retailer Amazon had a heavy hand in developing collaborative filtering algorithms that recommend items to users. we analyzed three systems that predict how users will rate specific books.

Our system that we created makes these predictions based on data gathered from the Amazon Book Reviews dataset, Book crossing dataset, Google Books API, and Good Reads API. To accurately predict users' reactions to books, we've integrated several strategies in the field of recommendation systems.

The technique used by recommender systems is Collaborative filtering. This technique filters information by collecting data from other users. Collaborative filtering systems apply the similarity index-based technique. The ratings of those items by the users who have rated both items determine the similarity of the items.

The similarity of users is determined by the similarity of the ratings given by the users to an item. Content-based filtering uses the description of the items and gives recommendations which are similar to the description of the items. With these two filtering systems, books are recommended not only based on the user's behavior but also with the content of the books.

So, our recommendation system recommends books to the new users also. In this recommender system, books are recommended based on collaborative filtering technique and similar books are shown using content-based filtering

PROBLEM STATEMENT

- **Lack of personalized recommendations:**

Many users struggle to find books that match their interests and reading habits. This can lead to frustration and a less enjoyable reading experience.

- **Limited visibility of new and lesser-known titles:**

Many new and lesser-known books struggle to gain visibility and traction in the market. This can lead to lower sales and a less diverse reading experience for users.

- **Difficulty in discovering new books:**

With millions of books available, users can struggle to find new and relevant books that match their interests and reading habits. This can lead to a lack of variety in their reading habits and a less enjoyable reading experience.

AIMS & OBJECTIVES

The **aim** of a book recommendation system is to suggest books to users based on their interests and past reading behavior. The system is designed to help users discover new books that they may not have otherwise found, and to provide personalized recommendations that are tailored to their individual preferences.

The **objectives** of a book recommendation system can vary depending on the specific use case and the target audience, but some common objectives include:

- 1. Increasing user engagement:**

By providing personalized recommendations, the system can encourage users to spend more time on the platform or website, which can lead to increased user engagement and retention.

- 2. Improving user satisfaction:**

By suggesting books that users are likely to enjoy, the system can help improve user satisfaction and loyalty.

- 3. Increasing sales and revenue:**

For book retailers, the recommendation system can help drive sales by suggesting relevant books to users, which can lead to increased revenue.

- 4. Providing a competitive edge:**

In a crowded marketplace, a book recommendation system can provide a competitive edge by offering a more personalized and user-friendly experience for customers.

- 5. Providing insights into user behavior:**

By analyzing user behavior and preferences, the system can provide valuable insights that can be used to improve the platform or website, or to develop new products or services.

SCOPE OF THE PROJECT

The scope of a book recommendation system is quite broad and can be applied to various domains, including e-commerce, online bookstores, libraries, and book clubs.

- 1.** In an e-commerce context, a book recommendation system can be used to increase sales and customer satisfaction by suggesting books that are tailored to the customer's preferences and interests. For example, an online bookstore may use a book recommendation system to suggest books based on a customer's browsing history, search queries, and purchase history.
- 2.** In a library context, a book recommendation system can be used to help users discover new books that they may be interested in. For example, a library may use a book recommendation system to suggest books based on a user's borrowing history, ratings, and preferences.
- 3.** In a book club context, a book recommendation system can be used to facilitate discussions and suggest books that the group members are likely to enjoy. For example, a book club may use a book recommendation system to suggest books based on the group members' reading history, ratings, and preferences.

APPLICATIONS

Book recommendation systems have various applications in different domains. Here are some of the common applications of book recommendation systems:

- 1. E-commerce:**

Online bookstores like Amazon use book recommendation systems to provide personalized book recommendations to their customers based on their purchase history, browsing behavior, and other related factors.

- 2. Libraries:**

Public libraries and academic institutions use book recommendation systems to suggest books to their users based on their reading history and preferences.

- 3. Social networking:**

Social networking platforms like Goodreads use book recommendation systems to suggest books to their users based on their reading history and preferences. Users can also connect with other readers and join book clubs to discuss books and get recommendations.

- 4. Education:**

Book recommendation systems can be used in education to suggest books to students based on their reading level and interests. Teachers can also use book recommendation systems to recommend books to students as part of their coursework.

- 5. Research:**

Book recommendation systems can be used in research to suggest relevant books and research papers based on the research topic and other related factors.

DETAILS ABOUT THE STAKEHOLDERS

The stakeholders in a book recommendation system can vary depending on the specific application and context of the system. Here are some of the potential stakeholders and their roles in a book recommendation system:

- 1. Users:**

The users are the primary stakeholders in a book recommendation system. They are the individuals who are looking for book recommendations based on their interests and preferences. Users provide feedback to the system in the form of ratings, reviews, and purchase history, which the system uses to provide more accurate recommendations.

- 2. Book retailers:**

Book retailers such as Amazon, Barnes & Noble, and other online bookstores are stakeholders in book recommendation systems. They use these systems to provide personalized book recommendations to their customers, increase sales, and improve customer engagement.

- 3. Publishers:**

Publishers are also stakeholders in book recommendation systems as they can use these systems to promote their books to potential readers and increase sales.

- 4. Libraries:**

Libraries use book recommendation systems to provide personalized book recommendations to their users, increase engagement, and improve the overall user experience.

5. Book clubs:

Book clubs are groups of individuals who read and discuss books together. Book recommendation systems can be used by book clubs to suggest books to their members and facilitate discussions.

6. Researchers:

Researchers in the field of machine learning, artificial intelligence, and data mining are stakeholders in book recommendation systems. They use these systems as a platform to develop and test new algorithms and techniques.

A BRIEF SURVEY ON THE EXISTING TECHNIQUES IN THE AREA

Book recommendation systems have been an active area of research for several years, and there are various techniques that have been developed to improve the accuracy and effectiveness of these systems. Here is a brief survey on some of the existing techniques in the area of book recommendation systems:

1. Collaborative filtering:

Collaborative filtering is a popular technique used in book recommendation systems. It works by analyzing the behavior of users and finding similarities between users based on their ratings and preferences. This technique can be divided into two types: user-based and item-based collaborative filtering.

2. Content-based filtering:

Content-based filtering is another popular technique used in book recommendation systems. It works by analyzing the content of the books and recommending similar books based on the user's reading history and preferences.

3. Hybrid filtering:

Hybrid filtering is a combination of collaborative filtering and content-based filtering techniques. It works by analyzing both the user's behavior and the content of the books to provide personalized recommendations.

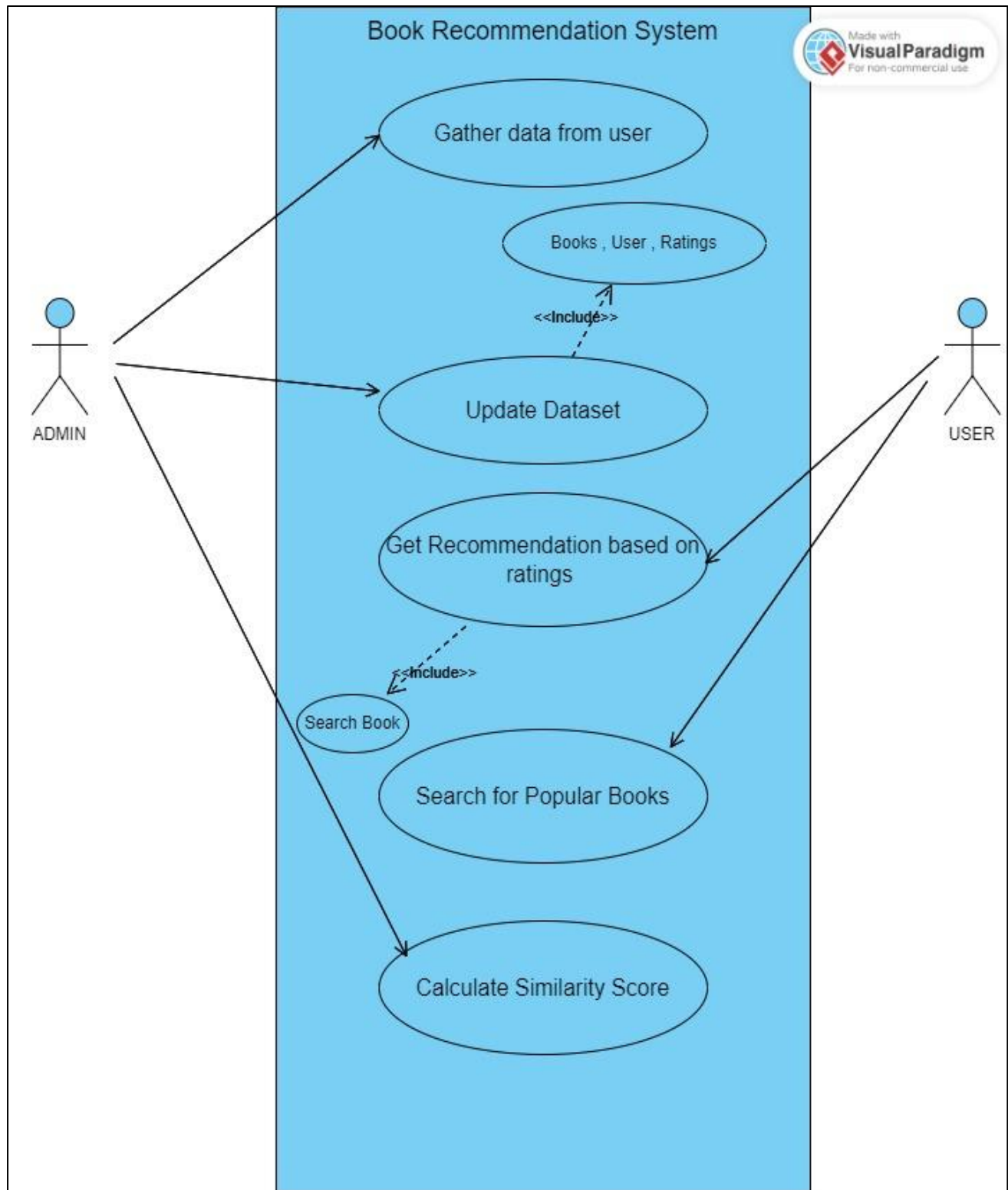
4. Matrix factorization:

Matrix factorization is a popular technique used in collaborative filtering-based book recommendation systems. It works by decomposing the rating matrix into two smaller matrices and then using these matrices to make predictions.

5. Deep learning:

Deep learning is a relatively new technique used in book recommendation systems. It works by using neural networks to analyze the user's behavior and recommend books based on their preferences.

USE-CASE DIAGRAM



API DOCUMENTATION

Brief introduction about Python and its installation instructions:

Python is a popular high-level programming language that is widely used for web development, data analysis, artificial intelligence, scientific computing, and many other applications. It is known for its simple syntax, ease of learning, and vast collection of libraries and frameworks.

Python can be installed on various operating systems, including Windows, macOS, and Linux. Here are the general steps to install Python on a Windows computer:

1. Visit the official Python website at python.org.
2. Click on the "Downloads" link and select the appropriate version of Python for the operating system. For example, in Windows 10, we should download the latest version of Python 3.X.
3. Run the installer and follow the prompts to install Python.
4. During the installation, we will be prompted to add Python to the system PATH. We should be sure to select this option for easily access Python from the command line.
5. Once the installation is complete, open a command prompt and type "python" to verify that Python is installed correctly. We should see the Python interpreter start up and display its version information.

Packages required for the project:

1. Pandas:

Pandas is an open-source library that is made mainly for working with relational or labeled data both easily and intuitively. It provides various data structures and operations for manipulating numerical data and time series. This library is built on top of the NumPy library. Pandas is fast and it has high performance & productivity for users.

2. NumPy:

NumPy is a Python library that provides support for large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays. It is widely used for numerical computation, data analysis, and scientific computing.

3. Sklearn:

Sklearn is a popular machine learning library in Python that provides a set of tools for building and using predictive models. It is built on top of NumPy, SciPy, and Matplotlib, and provides a wide variety of algorithms and techniques for tasks such as classification, regression, clustering, dimensionality reduction, and more.

4. Flask:

Used for web development.

```
import numpy as np
import pandas as pd
```

Python

```
from sklearn.metrics.pairwise import cosine_similarity
```

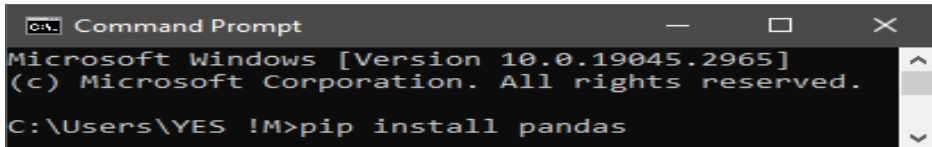
Python

Brief introduction about the installation of the packages:

1. Pandas :

To install pandas in Python, you can use pip, which is a package manager for Python. Here are the steps to install pandas:

- Open your command prompt (Windows) or terminal (Mac/Linux).
- Type pip install pandas and press Enter.
- Wait for the installation to complete.



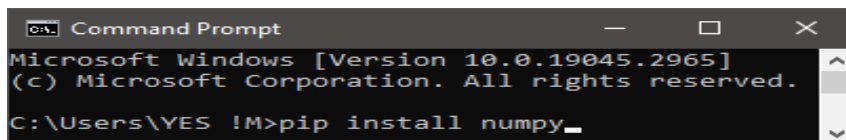
```
Microsoft Windows [Version 10.0.19045.2965]
(c) Microsoft Corporation. All rights reserved.

C:\Users\YES !M>pip install pandas
```

2. NumPy:

To install NumPy in Python, you can use pip, which is a package manager for Python. Here are the steps to install NumPy:

- Open your command prompt (Windows) or terminal (Mac/Linux).
- Type pip install numpy and press Enter.
- Wait for the installation to complete.



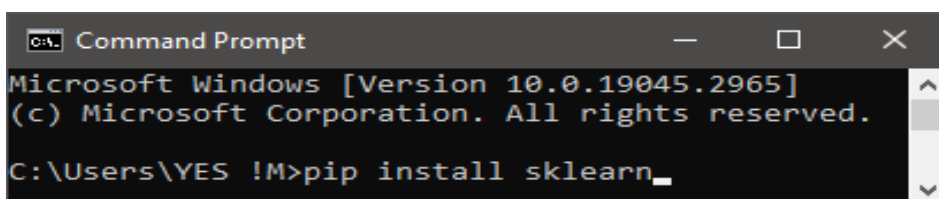
```
Microsoft Windows [Version 10.0.19045.2965]
(c) Microsoft Corporation. All rights reserved.

C:\Users\YES !M>pip install numpy_
```

3. Sklearn:

To install scikit-learn (sklearn) library in Python, you can use pip, which is a package manager for Python. Here are the steps to install scikit-learn:

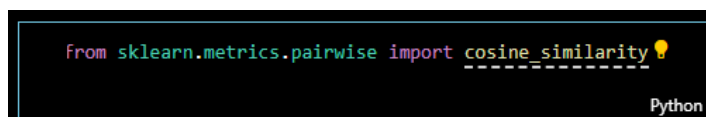
- Open your command prompt (Windows) or terminal (Mac/Linux).
- Type pip install scikit-learn and press Enter.
- Wait for the installation to complete.



```
Microsoft Windows [Version 10.0.19045.2965]
(c) Microsoft Corporation. All rights reserved.

C:\Users\YES !M>pip install sklearn_
```

The cosine similarity metric is part of the Sklearn library in Python, so you don't need to install it separately. However, you will need to import it into your Python code before you can use it.



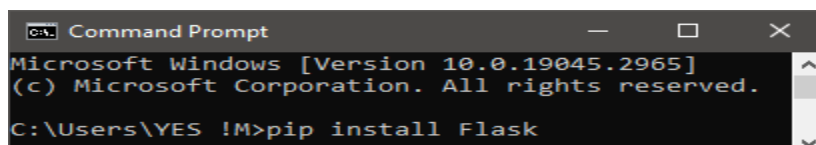
```
from sklearn.metrics.pairwise import cosine_similarity
```

4. Flask

To install Flask library in Python, you can use pip, which is a package manager for Python.

Here are the steps to install Flask:

- a) Open your command prompt (Windows) or terminal (Mac/Linux).
- b) Type pip install Flask and press Enter.
- c) Wait for the installation to complete.



```
Command Prompt
Microsoft Windows [Version 10.0.19045.2965]
(c) Microsoft Corporation. All rights reserved.
C:\Users\YES !M>pip install Flask
```

Data collection and Data preparation

1. Data Collection

Before building any machine learning model, it is vital to understand what the data is, and what are we trying to achieve.

Data exploration reveals the hidden trends and insights and data preprocessing makes the data ready for use by ML algorithms.

To proceed with the problem dealing first we will load our dataset that is given to us in a .csv file into a data frame.

2. Data Summary:

We are using Book-Crossing dataset to train and test our recommendation system. Book-Crossings is a book ratings dataset compiled by Cai-Nicolas Ziegler. It contains 1.1 million ratings of 270,000 books by 90,000 users. The ratings are on a scale from 1 to 10. The Book-Crossing dataset comprises 3 files.

a) Users:

This .csv file contains the users. Note that user IDs (User-ID) have been anonymized and map to integers. Demographic data is provided (Location, Age) if available. Otherwise, these fields contain NULL values.

b) Books:

Books are identified by their respective ISBN. Invalid ISBNs have already been removed from the dataset. Moreover, some content-based information is given (Book-Title, Book-Author, Year-Of-Publication, Publisher), obtained from Amazon Web Services. Note that in the case of several authors, only the first is provided. URLs linking to cover images are also given, appearing in three different flavors (Image-URL-S, Image-URL-M, Image-URL-L), i.e., small, medium, large. These URLs point to the Amazon website.

c) Ratings:

Contains the book rating information. Ratings (Book-Rating) are either explicit, expressed on a scale from 1–10 (higher values denoting higher appreciation), or implicit, expressed by 0.

CODE DOCUMENTATION

```
[1] import numpy as np
import pandas as pd
✓ 3.2s Python
```

```
[2] #Head is used to print the rows presents in the data frame
books = pd.read_csv('Books.csv')
books.head()
✓ 2.5s Python
```

... C:\Users\YES\MyAppData\Local\Temp\ipykernel_13016\2273988395.py:2: DtypeWarning: Columns (3) have mixed types. Specify dtype option on import or set 1
books = pd.read_csv('Books.csv')

	ISBN	Book-Title	Book-Author	Year-Of-Publication	Publisher	Image-URL-S	Image-URL-M
0	0195153448	Classical Mythology	Mark P. O. Morford	2002	Oxford University Press	http://images.amazon.com/images/P/0195153448.0...	http://images.amazon.com/images/P/0195153448.0...
1	0002005018	Clara Callan	Richard Bruce Wright	2001	HarperFlamingo Canada	http://images.amazon.com/images/P/0002005018.0...	http://images.amazon.com/images/P/0002005018.0...
2	0060973129	Decision in Normandy	Carlo D'Este	1991	HarperPerennial	http://images.amazon.com/images/P/0060973129.0...	http://images.amazon.com/images/P/0060973129.0...
3	0374157065	Flu: The Story of the Great Influenza Pandemic...	Gina Bari Kolata	1999	Farrar Straus Giroux	http://images.amazon.com/images/P/0374157065.0...	http://images.amazon.com/images/P/0374157065.0...
4	0393045218	The Mummies of Urumchi	E. J. W. Barber	1999	W. W. Norton & Company	http://images.amazon.com/images/P/0393045218.0...	http://images.amazon.com/images/P/0393045218.0...

```
[3] #Shape is used to print the total no. of entries present in data frame
print("No.of Books : ",books.shape)
print()
print("Attributes Having null values ")
print(books.isnull().sum())
print()
print("No. of Duplicated Books :",books.duplicated().sum())
✓ 0.9s Python
```

... No.of Books : (271360, 8)

Attributes Having null values

ISBN	0
Book-Title	0
Book-Author	2
Year-Of-Publication	0
Publisher	2
Image-URL-S	0
Image-URL-M	0
Image-URL-L	3

dtype: int64

No. of Duplicated Books : 0

```
[4] users = pd.read_csv('Users.csv')
users.head()
✓ 0.3s Python
```

	User-ID	Location	Age
0	1	nyc, new york, usa	NaN
1	2	stockton, california, usa	18.0
2	3	moscow, yukon territory, russia	NaN
3	4	porto, v.n.gaia, portugal	17.0
4	5	farnborough, hants, united kingdom	NaN

```
[5] print("No.of Users : ",users.shape)
print()
print("Attributes Having null values ")
print(users.isnull().sum())
print()
print("No. of Duplicated Users :",users.duplicated().sum())
✓ 0.2s Python
```

... No.of Users : (278858, 3)

Attributes Having null values

User-ID	0
Location	0
Age	110762

dtype: int64

No. of Duplicated Users : 0

```

ratings = pd.read_csv('Ratings.csv')
ratings.head()

```

[6] ✓ 0.8s Python

	User-ID	ISBN	Book-Rating
0	276725	034545104X	0
1	276726	0155061224	5
2	276727	0446520802	0
3	276729	052165615X	3
4	276729	0521795028	6

```

print("No.of Ratings : ",ratings.shape)
print()
print("Attributes Having null values ")
print(ratings.isnull().sum())
print()
print("No. of Duplicated Ratings :",ratings.duplicated().sum())

```

[7] ✓ 0.6s Python

No.of Ratings : (1149780, 3)

Attributes Having null values

User-ID 0
ISBN 0
Book-Rating 0
dtype: int64

No. of Duplicated Ratings : 0

Popularity based recommendation system

Based on Top 50 Books with highest average rating of 250

```

#inplace=True' if we want to commit the changes to the dataframe
ratings_with_bookname = ratings.merge(books,on='ISBN')
num_rating = ratings_with_bookname.groupby('Book-Title').count()['Book-Rating'].reset_index()
num_rating.rename(columns={'Book-Rating':'Num-Ratings'},inplace=True)
num_rating

```

[8] ✓ 2.4s Python

	Book-Title	Num-Ratings
0	A Light in the Storm: The Civil War Diary of ...	4
1	Always Have Popsicles	1
2	Apple Magic (The Collector's series)	1
3	Ask Lily (Young Women of Faith: Lily Series, ...	1
4	Beyond IBM: Leadership Marketing and Finance ...	1
...
241066	Ä?Ä?piraten.	2
241067	Ä?Ä?rger mit Produkt X. Roman.	4
241068	Ä?Ä?sterlich leben.	1
241069	Ä?Ä?stlich der Berge.	3
241070	Ä?Ä?thique en toc	2

241071 rows × 2 columns

```

avg_rating = ratings_with_bookname.groupby('Book-Title')['Book-Rating'].agg('mean').reset_index()
avg_rating.rename(columns={'Book-Rating':'Avg-Ratings'}, inplace=True)
avg_rating

```

[9] ✓ 0.8s Python

	Book-Title	Avg-Ratings
0	A Light in the Storm: The Civil War Diary of ...	2.250000
1	Always Have Popsicles	0.000000
2	Apple Magic (The Collector's series)	0.000000
3	Ask Lily (Young Women of Faith: Lily Series, ...	8.000000
4	Beyond IBM: Leadership Marketing and Finance ...	0.000000
...
241066	Ä?Ä?piraten.	0.000000
241067	Ä?Ä?rger mit Produkt X. Roman.	5.250000
241068	Ä?Ä?sterlich leben.	7.000000
241069	Ä?Ä?stlich der Berge.	2.666667
241070	Ä?Ä?thique en toc	4.000000

241071 rows × 2 columns

```
popular = num_rating.merge(avg_rating,on='Book-Title')
popular
```

✓ 0.3s Python

	Book-Title	Num-Ratings	Avg-Ratings
0	A Light in the Storm: The Civil War Diary of ...	4	2.250000
1	Always Have Popsicles	1	0.000000
2	Apple Magic (The Collector's series)	1	0.000000
3	Ask Lily (Young Women of Faith: Lily Series, ...	1	8.000000
4	Beyond IBM: Leadership Marketing and Finance ...	1	0.000000
...
241066	Ä?Ä?piraten.	2	0.000000
241067	Ä?Ä?rger mit Produkt X. Roman.	4	5.250000
241068	Ä?Ä?sterlich leben.	1	7.000000
241069	Ä?Ä?stlich der Berge.	3	2.666667
241070	Ä?Ä?thique en toc	2	4.000000

241071 rows x 3 columns

```
#Top 50 books having rating of more than 250
popular=popular[popular['Num-Ratings']>250].sort_values('Avg-Ratings',ascending=False).head(50)
popular=popular.merge(books,on='Book-Title').drop_duplicates('Book-Title')[['Book-Title','Book-Author','Year-Of-Publication','Image-URL-M','Num-Ratings','Avg-R']
popular
```

✓ 0.3s Python

	Book-Title	Book-Author	Year-Of-Publication	Image-URL-M	Num-Ratings	Avg-Ratings
0	Harry Potter and the Prisoner of Azkaban (Book 3)	J. K. Rowling	1999	http://images.amazon.com/images/P/0439136350.0...	428	5.852804
3	Harry Potter and the Goblet of Fire (Book 4)	J. K. Rowling	2000	http://images.amazon.com/images/P/0439139597.0...	387	5.824289
5	Harry Potter and the Sorcerer's Stone (Book 1)	J. K. Rowling	1998	http://images.amazon.com/images/P/0590353403.0...	278	5.737410
9	Harry Potter and the Order of the Phoenix (Boo...	J. K. Rowling	2003	http://images.amazon.com/images/P/043935806X.0...	347	5.501441
13	Harry Potter and the Chamber of Secrets (Book 2)	J. K. Rowling	2000	http://images.amazon.com/images/P/0439064872.0...	556	5.183453
16	The Hobbit : The Enchanting Prelude to The Lor...	J.R.R. TOLKIEN	1986	http://images.amazon.com/images/P/0345339681.0...	281	5.007117
17	The Fellowship of the Ring (The Lord of the Ri...	J.R.R. TOLKIEN	1986	http://images.amazon.com/images/P/0345339703.0...	368	4.948370
26	Harry Potter and the Sorcerer's Stone (Harry P...	J. K. Rowling	1999	http://images.amazon.com/images/P/059035342X.0...	575	4.895652
28	The Two Towers (The Lord of the Rings, Part 2)	J.R.R. TOLKIEN	1986	http://images.amazon.com/images/P/0345339711.0...	260	4.880769
39	To Kill a Mockingbird	Harper Lee	1988	http://images.amazon.com/images/P/0446310786.0...	510	4.700000
47	The Da Vinci Code	Dan Brown	2003	http://images.amazon.com/images/P/0385504209.0...	898	4.642539
53	The Five People You Meet in Heaven	Mitch Albom	2003	http://images.amazon.com/images/P/0786868716.0...	430	4.551163
55	The Catcher in the Rye	J.D. Salinger	1991	http://images.amazon.com/images/P/0316769487.0...	449	4.545657
62	The Lovely Bones: A Novel	Alice Sebold	2002	http://images.amazon.com/images/P/0316666343.0...	1295	4.468726
63	1984	George Orwell	1990	http://images.amazon.com/images/P/0451524934.0...	284	4.454225
72	Prodigal Summer: A Novel	Barbara Kingsolver	2001	http://images.amazon.com/images/P/0060959037.0...	253	4.450593

Collabrative Filtering

```
#x[x].index is boolean indexing which is used to filter data
x=ratings_with_bookname.groupby('User-ID').count()[['Book-Rating']>200
active_users = x[x].index
filtered_rating = ratings_with_bookname[ratings_with_bookname['User-ID'].isin(active_users)]
filtered_rating
```

✓ 0.7s Python

	User-ID	ISBN	Book-Rating	Book-Title	Book-Author	Year-Of-Publication	Publisher	Image-URL-S
2	6543	034545104X	0	Flesh Tones: A Novel	M. J. Rose	2002	Ballantine Books	http://images.amazon.com/images/P/034545104X.0... http://images.amazon.com/images/
5	23768	034545104X	0	Flesh Tones: A Novel	M. J. Rose	2002	Ballantine Books	http://images.amazon.com/images/P/034545104X.0... http://images.amazon.com/images/
7	28523	034545104X	0	Flesh Tones: A Novel	M. J. Rose	2002	Ballantine Books	http://images.amazon.com/images/P/034545104X.0... http://images.amazon.com/images/
15	77940	034545104X	0	Flesh Tones: A Novel	M. J. Rose	2002	Ballantine Books	http://images.amazon.com/images/P/034545104X.0... http://images.amazon.com/images/
16	81977	034545104X	0	Flesh Tones: A Novel	M. J. Rose	2002	Ballantine Books	http://images.amazon.com/images/P/034545104X.0... http://images.amazon.com/images/
...
1030883	275970	1880837927	0	The Theology of the Hammer	Millard Fuller	1994	Smyth & Helwys Publishing	http://images.amazon.com/images/P/1880837927.0... http://images.amazon.com/images/

```

y = filtered_rating.groupby('Book-Title').count()['Book-Rating']>=50
famous_books = y[y].index
final_ratings = filtered_rating[filtered_rating['Book-Title'].isin(famous_books)]
pt = final_ratings.pivot_table(index='Book-Title',columns='User-ID',values='Book-Rating')
pt.fillna(0,inplace=True)
pt

```

[35] ✓ 0.0s Python

	User-ID	254	2276	2766	2977	3363	4017	4385	6251	6323	6543	...	271705	273979	274004	274061	274301	274308	275970	277427	277639	278418
Book-Title																						
1984	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1st to Die: A Novel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2nd Chance	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4 Blondes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A Bend in the Road	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
...
Year of Wonders	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
You Belong To Me	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zen and the Art of Motorcycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

```

from sklearn.metrics.pairwise import cosine_similarity

```

[36] ✓ 0.0s Python

```

similarity_scores = cosine_similarity(pt)
print(similarity_scores)
print(similarity_scores.shape)

```

[37] ✓ 0.0s Python

```

[[1. 0.10255025 0.01220856 ... 0.12110367 0.07347567 0.04316046]
 [0.10255025 1. 0.2364573 ... 0.07446129 0.16773875 0.14263397]
 [0.01220856 0.2364573 1. ... 0.04558758 0.04938579 0.10796119]
 ...
 [0.12110367 0.07446129 0.04558758 ... 1. 0.07085128 0.0196177 ]
 [0.07347567 0.16773875 0.04938579 ... 0.07085128 1. 0.10602962]
 [0.04316046 0.14263397 0.10796119 ... 0.0196177 0.10602962 1. ]]]
(706, 706)

```

```

def recommend(book_name):
    # index fetch
    index = np.where(pt.index==book_name)[0][0]
    similar_items = sorted(list(enumerate(similarity_scores[index])),key=lambda x:x[1],reverse=True)[1:11]

    data = []
    for i in similar_items:
        item = []
        temp_df = books[books['Book-Title'] == pt.index[i][0]]
        item.extend(list(temp_df.drop_duplicates('Book-Title')['Book-Title'].values))
        item.extend(list(temp_df.drop_duplicates('Book-Title')['Book-Author'].values))
        item.extend(list(temp_df.drop_duplicates('Book-Title')['Image-URL-M'].values))

        data.append(item)

    return data

```

[38] ✓ 0.0s Python

```

recommend('A Bend in the Road')

```

[39] ✓ 0.5s Python

```

[['A Walk to Remember',
 'Nicholas Sparks',
 'http://images.amazon.com/images/P/0446608955.01.MZ777777.jpg'],
 ['The Last Time They Met : A Novel',
 'Anita Shreve',
 'http://images.amazon.com/images/P/0316781266.01.MZ777777.jpg'],
 ['Sea Glass: A Novel',
 'Anita Shreve',
 'http://images.amazon.com/images/P/0316089609.01.MZ777777.jpg'],
 ['Angels',
 'Marian Keyes',
 'http://images.amazon.com/images/P/0060080824.01.MZ777777.jpg'],
 ['Family Album',
 'Danielle Steel',
 'http://images.amazon.com/images/P/0448124344.01.MZ777777.jpg'],
 ['Cradle and All',
 'James Patterson',
 'http://images.amazon.com/images/P/0316690619.01.MZ777777.jpg'],
 ['Nights in Rodanthe',
 'Nicholas Sparks',
 'http://images.amazon.com/images/P/0446531332.01.MZ777777.jpg'],
 ['By the Light of the Moon',
 'DEAN KOONTZ',
 'http://images.amazon.com/images/P/0553582763.01.MZ777777.jpg'],
 ['The Rescue',
 'Nicholas Sparks',
 'http://images.amazon.com/images/P/0446610399.01.MZ777777.jpg'],

```

CODE CONVENTIONS

The coding conventions used for the project are as follows:

1. Variable names should be in lowercase and words should be separated by an underscore.
2. Constants should be in uppercase and words should be separated by an underscore.
3. Function names should be in lowercase and words should be separated by an underscore.
4. Indentation should be done using four spaces.
5. Comments should be used to explain the purpose of the code.

CITATIONS

1. https://youtu.be/1YoD0fg3_EM
2. <https://www.kaggle.com/datasets/arashnic/book-recommendation-dataset>
3. <https://thecleverprogrammer.com/2021/01/17/book-recommendation-system/>
4. <https://www.analyticsvidhya.com/blog/2021/06/build-book-recommendation-system-unsupervised-learning-project/>