Book Recommendation System

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Abstract:

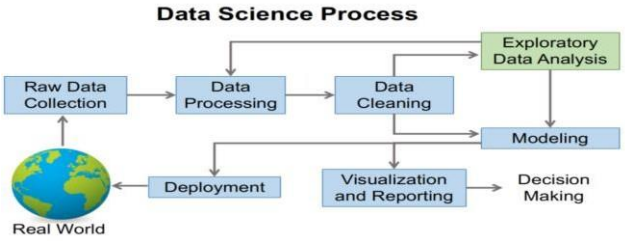
Recommendation systems is used for the purpose of suggesting items to purchase or to see. They direct users towards those items which can meet their needs through cutting down large database of Information. A various techniques have been introduced for recommending items i.e., content, collaborative and association mining techniques are used. This paper solves the problem of data sparsity problem by combining the collaborative-based filtering and association rule mining to achieve better performance. The results obtained are demonstrated and the proposed recommendation algorithms perform better and solve the challenges such as data sparsity and scalability.

Objective:

The main objective is to create a book recommendation system for users. Recommender systems are really critical in some industries as they can generate a huge amount of income when they are efficient or also be a way to stand out significantly from competitors.

Steps involve in this project

- loading the data into data frame
- cleaning the data
- extracting statistics from the dataset
- exploratory analysis and visualizations
- questions that can be asked from the dataset
- conclusion



1.Problem Statement

. During the last few decades, with the rise of YouTube, Amazon, Netflix, and many other such web services, recommender systems have taken more and more place in our lives. From e-commerce (suggest to buyer's articles that could interest them) to online advertisement (suggest to users the right contents, matching their preferences), recommender systems aretoday unavoidable in our daily online journeys.

In a very general way, recommender systems are algorithms aimed at suggesting relevant items to users (items being movies to watch, text to read, products to buy, or anything else

depending on industries).

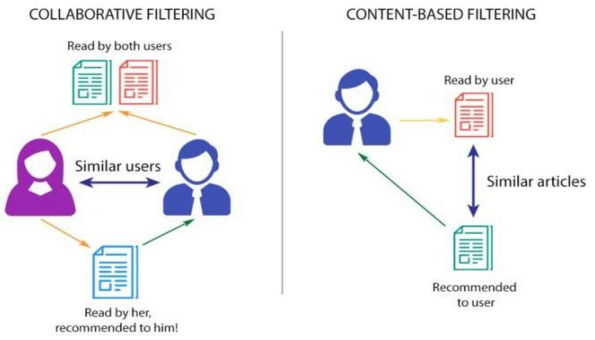
Recommender systems are really critical in some industries as they can generate a huge amount of income when they are efficient or also be a way to stand out significantly from

competitors. The main objective is to create a book recommendation system for users.

2. Introduction

We were provided the in-CSV format there are 3 data sets names books, users and ratings -

- Users: 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.
- 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 flavours (Image-URL-S, Image-URL-M, Image-URL-L), i.e., small, medium, large. These URLs point to the Amazon website.
- 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.



3. Data Cleanings and validations

In this step removing faulty data and filling in gaps. The task to be crucial and important thus validating by following steps

- Removing extraneous data
- Handing in missing values.
- Data shifting in respective columns
- Conforming data to a standardized pattern.
-

```
In [7]:
def missing_values(df):
    mis_val=df.isnull().sum()
    mis_val_percent=round(df.isnull().mean().mul(100),2)
    mz_table=pd.concat([mis_val,mis_val_percent],axis=1)
    mz_table=mz_table.rename(
    columns={df.index.name:'col_name',0:'Missing Values',1:'% of
    mz_table['Data_type']=df.dtypes
    mz_table=mz_table.sort_values('% of Total Values',ascending=F
    return mz_table.reset_index()
```

```
In [8]:
missing_values(users)
```

Out[8]:

	index	Missing Values	% of Total Values	Data_type
0	Age	110762	39.72	float64
1	User-ID	0	0.00	int64
2	Location	0	0.00	object

Out[59]:

	User-ID	Age	Country	ISBN	Book-Rating	Avg_Rating	Total_No_Of_Users_Rat
0	8	33.0	canada	0002005018	5	7.666667	
1	11676	28.0	nan	0002005018	8	7.666667	
2	67544	30.0	canada	0002005018	8	7.666667	
3	116866	32.0	other	0002005018	9	7.666667	
4	123629	33.0	canada	0002005018	9	7.666667	

```
In [60]:
missing_values(Final_Dataset)
```

Out[60]:

	index	Missing Values	% of Total Values	Data_type
0	User-ID	0	0.0	int64
1	Age	0	0.0	float64
2	Country	0	0.0	object
3	ISBN	0	0.0	object
4	Book-Rating	0	0.0	int64
5	Avg_Rating	0	0.0	float64
6	Total_No_Of_Users_Rated	0	0.0	int64
7	Book-Title	0	0.0	object
8	Book-Author	0	0.0	object
9	Year-Of-Publication	0	0.0	float64
10	Publisher	0	0.0	object

4. Transform data

```
#Books data
file_path = ('/content/drive/MyDrive/Copy of Books.csv')
books = pd.read_csv(file_path)
books.head()
```

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

-

```
[ ] ratings_explicit.head()
```

	User-ID	ISBN	Book-Rating	Avg_Rating	Total_No_Of_Users_Rated
1	276726	0155061224	5	5.000000	1
3	276729	052165615X	3	3.000000	1
4	276729	0521795028	6	6.000000	1
8	276744	038550120X	7	7.580247	81
16	276747	0060517794	9	8.000000	30

- **Merging All Dataset.**

```
[ ] Final_Dataset=users.copy()
    Final_Dataset=pd.merge(Final_Dataset,ratings_explicit,on='User-ID')
    Final_Dataset=pd.merge(Final_Dataset,books,on='ISBN')
```

```
[ ] Final_Dataset.head()
```

	User-ID	Age	Country	ISBN	Book-Rating	Avg_Rating	Total_No_Of_Users_Rated	B
0	8	33.0	canada	0002005018	5	7.666667	9	C
1	11676	28.0	nan	0002005018	8	7.666667	9	C
2	67544	30.0	canada	0002005018	8	7.666667	9	C
3	116866	32.0	other	0002005018	9	7.666667	9	C
4	123629	33.0	canada	0002005018	9	7.666667	9	C

	Boo
0	Harry Potter and the Goblet of Fire
1	Harry Potter and the Sorcerer's Stone (Harry Potter (Pap
2	Harry Potter and the Order of the Phoenix
3	To Kill a Moc
4	Harry Potter and the Prisoner of Azkaban
5	The Return of the King (The Lord of the Rings
6	Harry Potter and the Prisoner of Azkaban
7	Harry Potter and the Sorcerer's Stone
8	Harry Potter and the Chamber of Secrets
9	Harry Potter and the Chamber of Secrets
10	The Two Towers (The Lord of the Rings
11	Harry Potter and the Goblet of Fire
12	The Fellowship of the Ring (The Lord of the Rings
13	The Hobbit : The Enchanting Prelude to The Lord of tl
14	Ender's Game (Ender Wiggins Saga (Pap
15	Tuesdays with Morrie: An Old Man, a Young Man, and Life's Greates
16	Charlotte's Web (Trophy N
17	Dune (Remembering To
18	A Prayer for Owe
19	Fahrer

```
[ ] interactions_from_selected_users_df.head(10)
```

	User-ID	ISBN	Book-Rating	Avg_Rating	Total_No_Of_Use
0	2033	0030020786	7	7.000	
1	2033	0060248025	10	8.767	
2	2033	0060256664	10	8.333	
3	2033	0060256737	10	9.045	
4	2033	0060950536	10	9.400	
5	2033	0061020419	7	7.000	
6	2033	0061020427	6	6.000	
7	2033	0061056278	10	9.000	
8	2033	0061056286	8	7.667	
9	2033	0061056294	9	7.000	

```
[ ] import math
```

```
[ ] print(list(interactions_full_indexed_df.index.values))
```

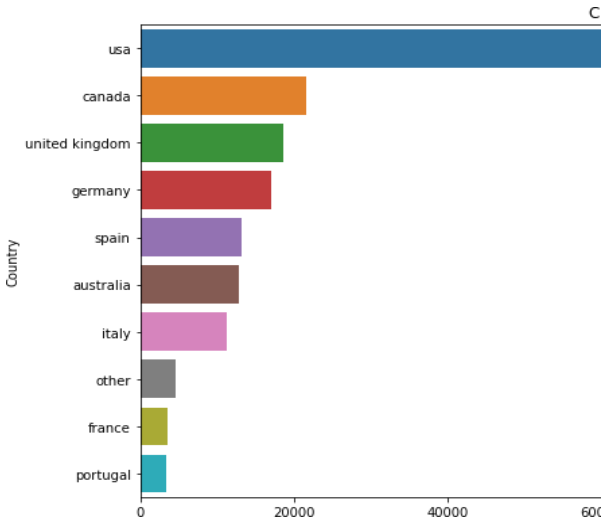
```
[171118, 23902, 23902, 23902, 23902, 166596, 23902, 109901, 189835, 1898
```

```
[ ] user=int(input("Enter User ID from above list for book recommen
    model_recommender.recommend_book(cf_recommender_model,user)
```

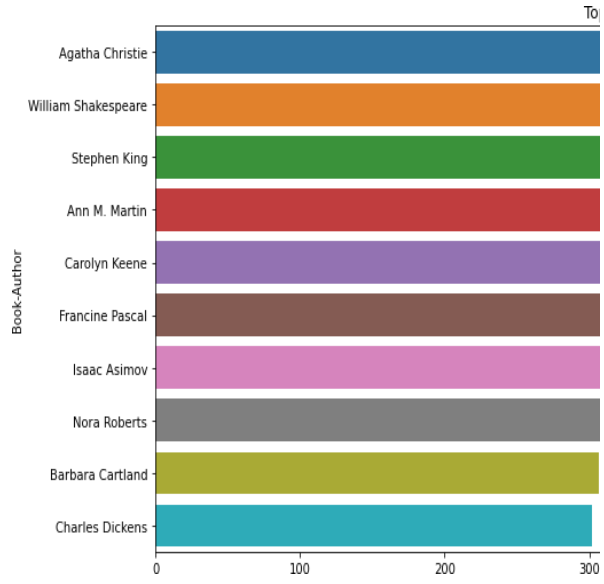
```
Enter User ID from above list for book recommendation  23902
Recommendation for User-ID =  23902
         ISBN                                          Book-Title  recStr
0  0446310786                                To Kill a Mockingbird
1  0156027321                                        Life of Pi
2  0312195516                The Red Tent (Bestselling Backlist)
3  0156628708                                        Mrs Dalloway
4  1573229725                                        Fingersmith
5  0060958022                          Five Quarters of the Orange
6  014029628X                               Girl in Hyacinth Blue
7  0140298479                     Bridget Jones: The Edge of Reason
8  038542017X  Like Water for Chocolate : A Novel in Monthly ...
9  0374129983                                The Corrections
```

5. Exploratory Analysis and Visualization

- Country wise Users who read books



. Top 10 Authors



11. **Popularity based recommendations**
12. **Popular in whole collection**
13. **Popular in given place**
14. **Books by same author, publisher of given book name**
15. **Popular books yearly**
16. **Recommendation using average weighted rating**
17. **Different Recommendation Model**
18. **User item collaborative filtering recommendation**
19. **Correlation based recommendation**
20. **Nearest neighbors-based recommendation**
21. **Content based recommendation**
22. **Challenges**
23. **Conclusion**
24. **Future Scope**

7. Programing Language:

We have used python programing Language and used below library for EDA

Numpy

Pandas

Seaborn

maths

matplotlib

warnings

6. Contributions:

1. **Introduction to data**
2. **Problem statement**
3. **Data Summary**
4. **Analysis of different datasets**
5. **Data Cleaning and pre processing**
6. **Understanding the data**
7. **correlation**
8. **Outlier treatment**
9. **Imputing missing values**
10. **Implanting algorithms**