

books-recommendation-system

January 1, 2024

```
[42]: #importing libraries
import os, sys
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
sns.set()
import warnings
warnings.filterwarnings('ignore')
```

```
[43]: #reading the files, importing the datasets
books = pd.read_csv('Books.csv')
users = pd.read_csv('Users.csv')
ratings = pd.read_csv('Ratings.csv')
```

```
[45]: #using head() function to view first 2 rows for the object based on position.
      ↪Just to test if we have right data.
books.head(2)
```

```
[45]:      ISBN      Book-Title      Book-Author      Year-Of-Publication  \
0  0195153448  Classical Mythology      Mark P. O. Morford      2002
1  0002005018      Clara Callan  Richard Bruce Wright      2001

      Publisher      Image-URL-S  \
0  Oxford University Press  http://images.amazon.com/images/P/0195153448.0...
1  HarperFlamingo Canada  http://images.amazon.com/images/P/0002005018.0...

      Image-URL-M  \
0  http://images.amazon.com/images/P/0195153448.0...
1  http://images.amazon.com/images/P/0002005018.0...

      Image-URL-L
0  http://images.amazon.com/images/P/0195153448.0...
1  http://images.amazon.com/images/P/0002005018.0...
```

```
[46]: users.head(2)
```

```
[46]:
```

	User-ID	Location	Age
0	1	nyc, new york, usa	NaN
1	2	stockton, california, usa	18.0

```
[47]: ratings.head(2)
```

```
[47]:
```

	User-ID	ISBN	Book-Rating
0	276725	034545104X	0
1	276726	0155061224	5

```
[48]: print(books.shape)
print("*****")
print(users.shape)
print("*****")
print(ratings.shape)
```

```
(271360, 8)
*****
(278858, 3)
*****
(1149780, 3)
```

```
[49]: # checking if there are any missing data in the datasets
print(books.isnull().sum())
print("*****")
print(users.isnull().sum())
print("*****")
print(ratings.isnull().sum())
```

```
ISBN          0
Book-Title    0
Book-Author   1
Year-Of-Publication  0
Publisher      2
Image-URL-S    0
Image-URL-M    0
Image-URL-L    3
dtype: int64
*****
User-ID        0
Location       0
Age          110762
dtype: int64
*****
User-ID        0
ISBN           0
Book-Rating    0
dtype: int64
```

```
[50]: # similarly checking if there are duplicate data in the datasets
print(books.duplicated().sum())
print("*****")
print(users.duplicated().sum())
print("*****")
print(ratings.duplicated().sum())
```

```
0
*****
0
*****
0
```

1 Popularity Based Recommendation System

```
[51]: # merging 2 tables
rating_with_name = ratings.merge(books, on='ISBN')
```

```
[52]: rating_with_name.head()
```

```
[52]:   User-ID      ISBN  Book-Rating      Book-Title Book-Author \
0    276725  034545104X           0  Flesh Tones: A Novel  M. J. Rose
1      2313  034545104X           5  Flesh Tones: A Novel  M. J. Rose
2      6543  034545104X           0  Flesh Tones: A Novel  M. J. Rose
3      8680  034545104X           5  Flesh Tones: A Novel  M. J. Rose
4     10314  034545104X           9  Flesh Tones: A Novel  M. J. Rose
```

```
   Year-Of-Publication      Publisher \
0                   2002  Ballantine Books
1                   2002  Ballantine Books
2                   2002  Ballantine Books
3                   2002  Ballantine Books
4                   2002  Ballantine Books
```

```
                                Image-URL-S \
0  http://images.amazon.com/images/P/034545104X.0...
1  http://images.amazon.com/images/P/034545104X.0...
2  http://images.amazon.com/images/P/034545104X.0...
3  http://images.amazon.com/images/P/034545104X.0...
4  http://images.amazon.com/images/P/034545104X.0...
```

```
                                Image-URL-M \
0  http://images.amazon.com/images/P/034545104X.0...
1  http://images.amazon.com/images/P/034545104X.0...
2  http://images.amazon.com/images/P/034545104X.0...
3  http://images.amazon.com/images/P/034545104X.0...
```

```
4 http://images.amazon.com/images/P/034545104X.0...
```

Image-URL-L

```
0 http://images.amazon.com/images/P/034545104X.0...
1 http://images.amazon.com/images/P/034545104X.0...
2 http://images.amazon.com/images/P/034545104X.0...
3 http://images.amazon.com/images/P/034545104X.0...
4 http://images.amazon.com/images/P/034545104X.0...
```

```
[53]: # checking the number of ratings in the dataframe by grouping as per book title
num_rating_df = rating_with_name.groupby('Book-Title').count()['Book-Rating'].
↳reset_index()
num_rating_df.rename(columns = {'Book-Rating' : 'Num_ratings'}, inplace=True)
num_rating_df
```

```
[53]:
```

	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	Ã?Ã?lpiraten.	2
241067	Ã?Ã?rger mit Produkt X. Roman.	4
241068	Ã?Ã?sterlich leben.	1
241069	Ã?Ã?stlich der Berge.	3
241070	Ã?Ã?thique en toc	2

[241071 rows x 2 columns]

```
[54]: # average rating of the book
avg_rating_df = rating_with_name.groupby('Book-Title').mean()['Book-Rating'].
↳reset_index()
avg_rating_df.rename(columns = {'Book-Rating' : 'Avg_ratings'}, inplace=True)
avg_rating_df
```

```
[54]:
```

	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	Ã?Ã?lpiraten.	0.000000
241067	Ã?Ã?rger mit Produkt X. Roman.	5.250000
241068	Ã?Ã?sterlich leben.	7.000000
241069	Ã?Ã?stlich der Berge.	2.666667

```
241070                Ã?Ã?thique en toc                4.000000
```

```
[241071 rows x 2 columns]
```

```
[55]: # creating one more variable
popular_df = num_rating_df.merge(avg_rating_df, on='Book-Title')
popular_df
```

```
[55]:
```

	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	Ã?Ã?lpiraten.	2
241067	Ã?Ã?rger mit Produkt X. Roman.	4
241068	Ã?Ã?sterlich leben.	1
241069	Ã?Ã?stlich der Berge.	3
241070	Ã?Ã?thique en toc	2

```

Avg_ratings
0      2.250000
1      0.000000
2      0.000000
3      8.000000
4      0.000000
...
241066  0.000000
241067  5.250000
241068  7.000000
241069  2.666667
241070  4.000000
```

```
[241071 rows x 3 columns]
```

```
[56]: popular_df = popular_df[popular_df['Num_ratings']>=250].
      ↪sort_values('Avg_ratings', ascending=False).head(50)
```

```
[57]: # top 50 books as per recommendation engine based on average ratings
popular_df
```

```
[57]:
```

	Book-Title	Num_ratings \
80434	Harry Potter and the Prisoner of Azkaban (Book 3)	428
80422	Harry Potter and the Goblet of Fire (Book 4)	387
80441	Harry Potter and the Sorcerer's Stone (Book 1)	278
80426	Harry Potter and the Order of the Phoenix (Boo...	347

80414	Harry Potter and the Chamber of Secrets (Book 2)	556
191612	The Hobbit : The Enchanting Prelude to The Lor...	281
187377	The Fellowship of the Ring (The Lord of the Ri...	368
80445	Harry Potter and the Sorcerer's Stone (Harry P...	575
211384	The Two Towers (The Lord of the Rings, Part 2)	260
219741	To Kill a Mockingbird	510
183573	The Da Vinci Code	898
187880	The Five People You Meet in Heaven	430
180556	The Catcher in the Rye	449
196326	The Lovely Bones: A Novel	1295
764	1984	284
144165	Prodigal Summer: A Novel	253
128670	Neverwhere	265
206502	The Secret Life of Bees	774
168719	Stupid White Men ...and Other Sorry Excuses fo...	283
223135	Tuesdays with Morrie: An Old Man, a Young Man,...	493
204387	The Red Tent (Bestselling Backlist)	723
191589	The Hitchhiker's Guide to the Galaxy	268
129379	Nickel and Dime: On (Not) Getting By in America	335
93381	Into the Wild	252
63867	Fahrenheit 451	409
74750	Girl with a Pearl Earring	526
136145	Outlander	283
233370	Where the Heart Is (Oprah's Book Club (Paperba...	585
156102	Seabiscuit: An American Legend	275
107962	Life of Pi	664
176845	The Bean Trees	389
2281	A Child Called \It\": One Child's Courage to S...	265
8434	ANGELA'S ASHES	279
76343	Good in Bed	490
64931	Fast Food Nation: The Dark Side of the All-Ame...	321
12700	American Gods	302
161645	Skippping Christmas	322
105777	Left Behind: A Novel of the Earth's Last Days ...	318
189551	The Golden Compass (His Dark Materials, Book 1)	336
181679	The Color Purple	314
160336	Silence of the Lambs	256
8752	About a Boy	262
158138	Seven Up (A Stephanie Plum Novel)	278
175097	The Alchemist: A Fable About Following Your Dream	266
80069	Hard Eight : A Stephanie Plum Novel (A Stephan...	269
170101	Suzanne's Diary for Nicholas	457
111073	Lord of the Flies	259
5664	A Prayer for Owen Meany	413
212070	The Vampire Lestat (Vampire Chronicles, Book II)	301
233851	White Oleander : A Novel (Oprah's Book Club)	356

	Avg_ratings
80434	5.852804
80422	5.824289
80441	5.737410
80426	5.501441
80414	5.183453
191612	5.007117
187377	4.948370
80445	4.895652
211384	4.880769
219741	4.700000
183573	4.642539
187880	4.551163
180556	4.545657
196326	4.468726
764	4.454225
144165	4.450593
128670	4.449057
206502	4.447028
168719	4.356890
223135	4.354970
204387	4.334716
191589	4.328358
129379	4.289552
93381	4.273810
63867	4.264059
74750	4.218631
136145	4.173145
233370	4.105983
156102	4.098182
107962	4.088855
176845	4.087404
2281	4.086792
8434	4.075269
76343	4.055102
64931	4.037383
12700	4.006623
161645	4.006211
105777	4.003145
189551	4.000000
181679	3.964968
160336	3.960938
8752	3.900763
158138	3.888489
175097	3.875940
80069	3.825279
170101	3.820569

```
111073      3.818533
5664        3.796610
212070      3.777409
233851      3.772472
```

```
[58]: books.columns
```

```
[58]: Index(['ISBN', 'Book-Title', 'Book-Author', 'Year-Of-Publication', 'Publisher',
          'Image-URL-S', 'Image-URL-M', 'Image-URL-L'],
          dtype='object')
```

```
[59]: # adding more details to the recommended books
popular_df = popular_df.merge(books, on='Book-Title').
    ↪ drop_duplicates('Book-Title')[['Book-Title',
    ↪      'Book-Author',
    ↪      'Year-Of-Publication', 'Publisher',
    ↪      'Avg_ratings',
    ↪      'Num_ratings', 'Image-URL-L']]
```

```
[60]: # top 50 books as per recommendation engine based on average ratings with more
    ↪ columns
popular_df
```

```
[60]:                                     Book-Title \
0    Harry Potter and the Prisoner of Azkaban (Book 3)
3          Harry Potter and the Goblet of Fire (Book 4)
5          Harry Potter and the Sorcerer's Stone (Book 1)
9    Harry Potter and the Order of the Phoenix (Boo...
13   Harry Potter and the Chamber of Secrets (Book 2)
16   The Hobbit : The Enchanting Prelude to The Lor...
17   The Fellowship of the Ring (The Lord of the Ri...
26   Harry Potter and the Sorcerer's Stone (Harry P...
28       The Two Towers (The Lord of the Rings, Part 2)
39                                   To Kill a Mockingbird
47                                   The Da Vinci Code
53                   The Five People You Meet in Heaven
55                   The Catcher in the Rye
62       The Lovely Bones: A Novel
63                                   1984
72       Prodigal Summer: A Novel
73                                   Nowhere
78                   The Secret Life of Bees
84   Stupid White Men ...and Other Sorry Excuses fo...
```


85 Tuesdays with Morrie: An Old Man, a Young Man,...
 88 The Red Tent (Bestselling Backlist)
 89 The Hitchhiker's Guide to the Galaxy
 98 Nickel and Dimed: On (Not) Getting By in America
 100 Into the Wild
 103 Fahrenheit 451
 116 Girl with a Pearl Earring
 117 Outlander
 123 Where the Heart Is (Oprah's Book Club (Paperba...
 124 Seabiscuit: An American Legend
 126 Life of Pi
 130 The Bean Trees
 133 A Child Called \It\": One Child's Courage to S...
 135 ANGELA'S ASHES
 137 Good in Bed
 139 Fast Food Nation: The Dark Side of the All-Ame...
 140 American Gods
 141 Skipping Christmas
 147 Left Behind: A Novel of the Earth's Last Days ...
 149 The Golden Compass (His Dark Materials, Book 1)
 157 The Color Purple
 163 Silence of the Lambs
 166 About a Boy
 173 Seven Up (A Stephanie Plum Novel)
 175 The Alchemist: A Fable About Following Your Dream
 177 Hard Eight : A Stephanie Plum Novel (A Stephan...
 182 Suzanne's Diary for Nicholas
 186 Lord of the Flies
 192 A Prayer for Owen Meany
 194 The Vampire Lestat (Vampire Chronicles, Book II)
 195 White Oleander : A Novel (Oprah's Book Club)

	Book-Author	Year-Of-Publication	\
0	J. K. Rowling	1999	
3	J. K. Rowling	2000	
5	J. K. Rowling	1998	
9	J. K. Rowling	2003	
13	J. K. Rowling	2000	
16	J.R.R. TOLKIEN	1986	
17	J.R.R. TOLKIEN	1986	
26	J. K. Rowling	1999	
28	J.R.R. TOLKIEN	1986	
39	Harper Lee	1988	
47	Dan Brown	2003	
53	Mitch Albom	2003	
55	J.D. Salinger	1991	
62	Alice Sebold	2002	

63	George Orwell	1990
72	Barbara Kingsolver	2001
73	Neil Gaiman	1998
78	Sue Monk Kidd	2003
84	Michael Moore	2002
85	MITCH ALBOM	1997
88	Anita Diamant	1998
89	Douglas Adams	1982
98	Barbara Ehrenreich	2002
100	Jon Krakauer	1997
103	Ray Bradbury	1994
116	Tracy Chevalier	2001
117	DIANA GABALDON	1996
123	Billie Letts	1998
124	LAURA HILLENBRAND	2002
126	Yann Martel	2002
130	Barbara Kingsolver	1989
133	Dave Pelzer	1995
135	Frank McCourt	1996
137	Jennifer Weiner	2002
139	Eric Schlosser	2002
140	Neil Gaiman	2002
141	JOHN GRISHAM	2001
147	Tim Lahaye	1996
149	PHILIP PULLMAN	2002
157	Alice Walker	1985
163	Thomas Harris	1991
166	Nick Hornby	1999
173	Janet Evanovich	2001
175	Paulo Coelho	1993
177	Janet Evanovich	2003
182	James Patterson	2001
186	William Gerald Golding	1959
192	John Irving	1990
194	ANNE RICE	1986
195	Janet Fitch	2000

	Publisher	Avg_ratings	Num_ratings \
0	Scholastic	5.852804	428
3	Scholastic	5.824289	387
5	Scholastic	5.737410	278
9	Scholastic	5.501441	347
13	Scholastic	5.183453	556
16	Del Rey	5.007117	281
17	Del Rey	4.948370	368
26	Arthur A. Levine Books	4.895652	575
28	Del Rey	4.880769	260

39	Little Brown & Company	4.700000	510
47	Doubleday	4.642539	898
53	Hyperion	4.551163	430
55	Little, Brown	4.545657	449
62	Little, Brown	4.468726	1295
63	Signet Book	4.454225	284
72	Perennial	4.450593	253
73	Avon	4.449057	265
78	Penguin Books	4.447028	774
84	Regan Books	4.356890	283
85	Doubleday	4.354970	493
88	Picador USA	4.334716	723
89	Pocket	4.328358	268
98	Owl Books	4.289552	335
100	Anchor	4.273810	252
103	Distribooks Inc	4.264059	409
116	Plume Books	4.218631	526
117	Dell	4.173145	283
123	Warner Books	4.105983	585
124	Ballantine Books	4.098182	275
126	Harcourt	4.088855	664
130	Perennial	4.087404	389
133	Health Communications	4.086792	265
135	Scribner	4.075269	279
137	Washington Square Press	4.055102	490
139	Perennial	4.037383	321
140	HarperTorch	4.006623	302
141	Doubleday	4.006211	322
147	Tyndale House Publishers	4.003145	318
149	Knopf Books for Young Readers	4.000000	336
157	Pocket Books	3.964968	314
163	St. Martin's Press	3.960938	256
166	Riverhead Books	3.900763	262
173	St. Martin's Press	3.888489	278
175	HarperSanFrancisco	3.875940	266
177	St. Martin's Paperbacks	3.825279	269
182	Little, Brown	3.820569	457
186	Perigee Trade	3.818533	259
192	Ballantine Books	3.796610	413
194	Ballantine Books	3.777409	301
195	Back Bay Books	3.772472	356

Image-URL-L

0	http://images.amazon.com/images/P/0439136350.0...
3	http://images.amazon.com/images/P/0439139597.0...
5	http://images.amazon.com/images/P/0590353403.0...
9	http://images.amazon.com/images/P/043935806X.0...

13 <http://images.amazon.com/images/P/0439064872.0...>
16 <http://images.amazon.com/images/P/0345339681.0...>
17 <http://images.amazon.com/images/P/0345339703.0...>
26 <http://images.amazon.com/images/P/059035342X.0...>
28 <http://images.amazon.com/images/P/0345339711.0...>
39 <http://images.amazon.com/images/P/0446310786.0...>
47 <http://images.amazon.com/images/P/0385504209.0...>
53 <http://images.amazon.com/images/P/0786868716.0...>
55 <http://images.amazon.com/images/P/0316769487.0...>
62 <http://images.amazon.com/images/P/0316666343.0...>
63 <http://images.amazon.com/images/P/0451524934.0...>
72 <http://images.amazon.com/images/P/0060959037.0...>
73 <http://images.amazon.com/images/P/0380789019.0...>
78 <http://images.amazon.com/images/P/0142001740.0...>
84 <http://images.amazon.com/images/P/0060392452.0...>
85 <http://images.amazon.com/images/P/0385484518.0...>
88 <http://images.amazon.com/images/P/0312195516.0...>
89 <http://images.amazon.com/images/P/0671461494.0...>
98 <http://images.amazon.com/images/P/0805063897.0...>
100 <http://images.amazon.com/images/P/0385486804.0...>
103 <http://images.amazon.com/images/P/3257208626.0...>
116 <http://images.amazon.com/images/P/0452282152.0...>
117 <http://images.amazon.com/images/P/0440222915.0...>
123 <http://images.amazon.com/images/P/0446672211.0...>
124 <http://images.amazon.com/images/P/0449005615.0...>
126 <http://images.amazon.com/images/P/0151008116.0...>
130 <http://images.amazon.com/images/P/0060915544.0...>
133 <http://images.amazon.com/images/P/1558743669.0...>
135 <http://images.amazon.com/images/P/0684874350.0...>
137 <http://images.amazon.com/images/P/0743418174.0...>
139 <http://images.amazon.com/images/P/0060938455.0...>
140 <http://images.amazon.com/images/P/0380789035.0...>
141 <http://images.amazon.com/images/P/0385505833.0...>
147 <http://images.amazon.com/images/P/0842329129.0...>
149 <http://images.amazon.com/images/P/037582345X.0...>
157 <http://images.amazon.com/images/P/0671617028.0...>
163 <http://images.amazon.com/images/P/0312924585.0...>
166 <http://images.amazon.com/images/P/1573227331.0...>
173 <http://images.amazon.com/images/P/0312265840.0...>
175 <http://images.amazon.com/images/P/0062502174.0...>
177 <http://images.amazon.com/images/P/0312983867.0...>
182 <http://images.amazon.com/images/P/0316969443.0...>
186 <http://images.amazon.com/images/P/0399501487.0...>
192 <http://images.amazon.com/images/P/0345361792.0...>
194 <http://images.amazon.com/images/P/0345313860.0...>
195 <http://images.amazon.com/images/P/0316284955.0...>

2 Collaborative Filtering Based Recommendation System

```
[61]: # getting the headers
rating_with_name.head(1)
```

```
[61]:   User-ID      ISBN  Book-Rating      Book-Title Book-Author \
0    276725  034545104X           0  Flesh Tones: A Novel  M. J. Rose

      Year-Of-Publication      Publisher \
0                2002  Ballantine Books

                                Image-URL-S \
0  http://images.amazon.com/images/P/034545104X.0...

                                Image-URL-M \
0  http://images.amazon.com/images/P/034545104X.0...

                                Image-URL-L
0  http://images.amazon.com/images/P/034545104X.0...
```

```
[62]: rating_with_name.shape
```

```
[62]: (1031136, 10)
```

```
[63]: # creating a variable x, user based ratings
x = rating_with_name.groupby('User-ID').count()['Book-Rating'] > 200
educated_users = x[x].index
```

```
[64]: educated_users
```

```
[64]: Int64Index([ 254,   2276,   2766,   2977,   3363,   4017,   4385,   6251,
                6323,   6543,
                ...,
                271705, 273979, 274004, 274061, 274301, 274308, 275970, 277427,
                277639, 278418],
                dtype='int64', name='User-ID', length=811)
```

```
[65]: filtered_rating = rating_with_name[rating_with_name['User-ID'].
      ↪isin(educated_users)]
```

```
[66]: filtered_rating.shape
```

```
[66]: (474007, 10)
```

```
[67]: filtered_rating.head()
```

```
[67]:      User-ID      ISBN  Book-Rating      Book-Title Book-Author \
2         6543  034545104X           0  Flesh Tones: A Novel  M. J. Rose
5         23768 034545104X           0  Flesh Tones: A Novel  M. J. Rose
7         28523 034545104X           0  Flesh Tones: A Novel  M. J. Rose
15        77940 034545104X           0  Flesh Tones: A Novel  M. J. Rose
16        81977 034545104X           0  Flesh Tones: A Novel  M. J. Rose
```

```
      Year-Of-Publication      Publisher \
2              2002  Ballantine Books
5              2002  Ballantine Books
7              2002  Ballantine Books
15             2002  Ballantine Books
16             2002  Ballantine Books
```

```
      Image-URL-S \
2  http://images.amazon.com/images/P/034545104X.0...
5  http://images.amazon.com/images/P/034545104X.0...
7  http://images.amazon.com/images/P/034545104X.0...
15 http://images.amazon.com/images/P/034545104X.0...
16 http://images.amazon.com/images/P/034545104X.0...
```

```
      Image-URL-M \
2  http://images.amazon.com/images/P/034545104X.0...
5  http://images.amazon.com/images/P/034545104X.0...
7  http://images.amazon.com/images/P/034545104X.0...
15 http://images.amazon.com/images/P/034545104X.0...
16 http://images.amazon.com/images/P/034545104X.0...
```

```
      Image-URL-L
2  http://images.amazon.com/images/P/034545104X.0...
5  http://images.amazon.com/images/P/034545104X.0...
7  http://images.amazon.com/images/P/034545104X.0...
15 http://images.amazon.com/images/P/034545104X.0...
16 http://images.amazon.com/images/P/034545104X.0...
```

```
[68]: # creating one more variable y, books based ratings
y = filtered_rating.groupby('Book-Title').count()['Book-Rating']>=50
famous_books = y[y].index
```

```
[69]: final_ratings = filtered_rating[filtered_rating['Book-Title'].
↳isin(famous_books)]
```

```
[70]: # top 50 books as per recommendation engine based on user ratings, with more
↳than 50 book ratings
final_ratings
```

[70]:

	User-ID	ISBN	Book-Rating	Book-Title \
63	278418	0446520802	0	The Notebook
65	3363	0446520802	0	The Notebook
66	7158	0446520802	10	The Notebook
69	11676	0446520802	10	The Notebook
74	23768	0446520802	6	The Notebook
...
1026724	266865	0531001725	10	The Catcher in the Rye
1027923	269566	0670809381	0	Echoes
1028777	271284	0440910927	0	The Rainmaker
1029070	271705	B0001PI0X4	0	Fahrenheit 451
1030868	275970	1586210661	9	Me Talk Pretty One Day

	Book-Author	Year-Of-Publication	Publisher \
63	Nicholas Sparks	1996	Warner Books
65	Nicholas Sparks	1996	Warner Books
66	Nicholas Sparks	1996	Warner Books
69	Nicholas Sparks	1996	Warner Books
74	Nicholas Sparks	1996	Warner Books
...
1026724	Jerome David Salinger	1973	Scholastic Library Pub
1027923	Maeve Binchy	1986	Penguin USA
1028777	John Grisham	1995	Island
1029070	Ray Bradbury	1993	Simon & Schuster
1030868	David Sedaris	2001	Time Warner Audio Major

	Image-URL-S \
63	http://images.amazon.com/images/P/0446520802.0...
65	http://images.amazon.com/images/P/0446520802.0...
66	http://images.amazon.com/images/P/0446520802.0...
69	http://images.amazon.com/images/P/0446520802.0...
74	http://images.amazon.com/images/P/0446520802.0...
...	...
1026724	http://images.amazon.com/images/P/0531001725.0...
1027923	http://images.amazon.com/images/P/0670809381.0...
1028777	http://images.amazon.com/images/P/0440910927.0...
1029070	http://images.amazon.com/images/P/B0001PI0X4.0...
1030868	http://images.amazon.com/images/P/1586210661.0...

	Image-URL-M \
63	http://images.amazon.com/images/P/0446520802.0...
65	http://images.amazon.com/images/P/0446520802.0...
66	http://images.amazon.com/images/P/0446520802.0...
69	http://images.amazon.com/images/P/0446520802.0...
74	http://images.amazon.com/images/P/0446520802.0...
...	...
1026724	http://images.amazon.com/images/P/0531001725.0...

```

1027923 http://images.amazon.com/images/P/0670809381.0...
1028777 http://images.amazon.com/images/P/0440910927.0...
1029070 http://images.amazon.com/images/P/B0001PI0X4.0...
1030868 http://images.amazon.com/images/P/1586210661.0...

```

```

                                     Image-URL-L
63      http://images.amazon.com/images/P/0446520802.0...
65      http://images.amazon.com/images/P/0446520802.0...
66      http://images.amazon.com/images/P/0446520802.0...
69      http://images.amazon.com/images/P/0446520802.0...
74      http://images.amazon.com/images/P/0446520802.0...
...
1026724 http://images.amazon.com/images/P/0531001725.0...
1027923 http://images.amazon.com/images/P/0670809381.0...
1028777 http://images.amazon.com/images/P/0440910927.0...
1029070 http://images.amazon.com/images/P/B0001PI0X4.0...
1030868 http://images.amazon.com/images/P/1586210661.0...

```

[58586 rows x 10 columns]

```

[71]: # using pivot table
pt = final_ratings.pivot_table(index='Book-Title', columns='User-ID',
    ↪values='Book-Rating')

```

[72]: pt

```

[72]: User-ID          254      2276      2766      \
Book-Title
1984              9.0      NaN      NaN
1st to Die: A Novel      NaN      NaN      NaN
2nd Chance              NaN     10.0      NaN
4 Blondes              NaN      NaN      NaN
A Bend in the Road        0.0      NaN      7.0
...
Year of Wonders          NaN      NaN      NaN
You Belong To Me          NaN      NaN      NaN
Zen and the Art of Motorcycle Maintenance: An I...      NaN      NaN      NaN
Zoya                    NaN      NaN      NaN
\0\" Is for Outlaw"      NaN      NaN      NaN

User-ID          2977      3363      4017      \
Book-Title
1984              NaN      NaN      NaN
1st to Die: A Novel      NaN      NaN      NaN
2nd Chance              NaN      NaN      NaN
4 Blondes              NaN      NaN      NaN
A Bend in the Road        NaN      NaN      NaN

```


...	
Year of Wonders	7.0	NaN	NaN
You Belong To Me	NaN	NaN	NaN
Zen and the Art of Motorcycle Maintenance: An I...	NaN	0.0	NaN
Zoya	NaN	NaN	NaN
\0\" Is for Outlaw"	NaN	NaN	NaN
User-ID	4385	6251	6323 \
Book-Title			
1984	NaN	NaN	NaN
1st to Die: A Novel	NaN	NaN	NaN
2nd Chance	NaN	NaN	NaN
4 Blondes	NaN	0.0	NaN
A Bend in the Road	NaN	NaN	NaN
...	
Year of Wonders	NaN	NaN	NaN
You Belong To Me	NaN	NaN	0.0
Zen and the Art of Motorcycle Maintenance: An I...	NaN	0.0	NaN
Zoya	NaN	NaN	NaN
\0\" Is for Outlaw"	NaN	NaN	NaN
User-ID	6543	...	271705 \
Book-Title		...	
1984	NaN	...	10.0
1st to Die: A Novel	9.0	...	NaN
2nd Chance	0.0	...	NaN
4 Blondes	NaN	...	NaN
A Bend in the Road	NaN	...	NaN
...	
Year of Wonders	0.0	...	NaN
You Belong To Me	NaN	...	NaN
Zen and the Art of Motorcycle Maintenance: An I...	NaN	...	NaN
Zoya	NaN	...	NaN
\0\" Is for Outlaw"	NaN	...	NaN
User-ID	273979	274004	274061 \
Book-Title			
1984	NaN	NaN	NaN
1st to Die: A Novel	NaN	NaN	NaN
2nd Chance	NaN	NaN	NaN
4 Blondes	NaN	NaN	NaN
A Bend in the Road	0.0	NaN	NaN
...	
Year of Wonders	9.0	NaN	NaN
You Belong To Me	NaN	NaN	NaN
Zen and the Art of Motorcycle Maintenance: An I...	NaN	NaN	NaN
Zoya	0.0	NaN	NaN

\0\" Is for Outlaw"	NaN	NaN	NaN
User-ID	274301	274308	275970 \
Book-Title			
1984	NaN	NaN	0.0
1st to Die: A Novel	NaN	NaN	NaN
2nd Chance	NaN	0.0	NaN
4 Blondes	NaN	NaN	NaN
A Bend in the Road	NaN	NaN	NaN
...	
Year of Wonders	NaN	NaN	0.0
You Belong To Me	NaN	NaN	NaN
Zen and the Art of Motorcycle Maintenance: An I...	NaN	NaN	0.0
Zoya	NaN	NaN	NaN
\0\" Is for Outlaw"	8.0	NaN	NaN
User-ID	277427	277639	278418
Book-Title			
1984	NaN	NaN	NaN
1st to Die: A Novel	NaN	NaN	NaN
2nd Chance	NaN	0.0	NaN
4 Blondes	NaN	NaN	NaN
A Bend in the Road	NaN	NaN	NaN
...	
Year of Wonders	NaN	NaN	NaN
You Belong To Me	NaN	NaN	NaN
Zen and the Art of Motorcycle Maintenance: An I...	NaN	NaN	NaN
Zoya	NaN	NaN	NaN
\0\" Is for Outlaw"	NaN	NaN	NaN

[706 rows x 810 columns]

```
[73]: # replacing null values with zero
pt.fillna(0, inplace=True)
```

```
[74]: pt
```

User-ID	254	2276	2766 \
Book-Title			
1984	9.0	0.0	0.0
1st to Die: A Novel	0.0	0.0	0.0
2nd Chance	0.0	10.0	0.0
4 Blondes	0.0	0.0	0.0
A Bend in the Road	0.0	0.0	7.0
...	
Year of Wonders	0.0	0.0	0.0
You Belong To Me	0.0	0.0	0.0

Zen and the Art of Motorcycle Maintenance: An I...	0.0	0.0	0.0
Zoya	0.0	0.0	0.0
\0\" Is for Outlaw"	0.0	0.0	0.0
User-ID	2977	3363	4017 \
Book-Title			
1984	0.0	0.0	0.0
1st to Die: A Novel	0.0	0.0	0.0
2nd Chance	0.0	0.0	0.0
4 Blondes	0.0	0.0	0.0
A Bend in the Road	0.0	0.0	0.0
...	
Year of Wonders	7.0	0.0	0.0
You Belong To Me	0.0	0.0	0.0
Zen and the Art of Motorcycle Maintenance: An I...	0.0	0.0	0.0
Zoya	0.0	0.0	0.0
\0\" Is for Outlaw"	0.0	0.0	0.0
User-ID	4385	6251	6323 \
Book-Title			
1984	0.0	0.0	0.0
1st to Die: A Novel	0.0	0.0	0.0
2nd Chance	0.0	0.0	0.0
4 Blondes	0.0	0.0	0.0
A Bend in the Road	0.0	0.0	0.0
...	
Year of Wonders	0.0	0.0	0.0
You Belong To Me	0.0	0.0	0.0
Zen and the Art of Motorcycle Maintenance: An I...	0.0	0.0	0.0
Zoya	0.0	0.0	0.0
\0\" Is for Outlaw"	0.0	0.0	0.0
User-ID	6543	...	271705 \
Book-Title		...	
1984	0.0	...	10.0
1st to Die: A Novel	9.0	...	0.0
2nd Chance	0.0	...	0.0
4 Blondes	0.0	...	0.0
A Bend in the Road	0.0	...	0.0
...	
Year of Wonders	0.0	...	0.0
You Belong To Me	0.0	...	0.0
Zen and the Art of Motorcycle Maintenance: An I...	0.0	...	0.0
Zoya	0.0	...	0.0
\0\" Is for Outlaw"	0.0	...	0.0
User-ID	273979	274004	274061 \

Book-Title			
1984	0.0	0.0	0.0
1st to Die: A Novel	0.0	0.0	0.0
2nd Chance	0.0	0.0	0.0
4 Blondes	0.0	0.0	0.0
A Bend in the Road	0.0	0.0	0.0
...
Year of Wonders	9.0	0.0	0.0
You Belong To Me	0.0	0.0	0.0
Zen and the Art of Motorcycle Maintenance: An I...	0.0	0.0	0.0
Zoya	0.0	0.0	0.0
\0\" Is for Outlaw"	0.0	0.0	0.0
User-ID	274301	274308	275970 \
Book-Title			
1984	0.0	0.0	0.0
1st to Die: A Novel	0.0	0.0	0.0
2nd Chance	0.0	0.0	0.0
4 Blondes	0.0	0.0	0.0
A Bend in the Road	0.0	0.0	0.0
...
Year of Wonders	0.0	0.0	0.0
You Belong To Me	0.0	0.0	0.0
Zen and the Art of Motorcycle Maintenance: An I...	0.0	0.0	0.0
Zoya	0.0	0.0	0.0
\0\" Is for Outlaw"	8.0	0.0	0.0
User-ID	277427	277639	278418
Book-Title			
1984	0.0	0.0	0.0
1st to Die: A Novel	0.0	0.0	0.0
2nd Chance	0.0	0.0	0.0
4 Blondes	0.0	0.0	0.0
A Bend in the Road	0.0	0.0	0.0
...
Year of Wonders	0.0	0.0	0.0
You Belong To Me	0.0	0.0	0.0
Zen and the Art of Motorcycle Maintenance: An I...	0.0	0.0	0.0
Zoya	0.0	0.0	0.0
\0\" Is for Outlaw"	0.0	0.0	0.0

[706 rows x 810 columns]

```
[75]: from sklearn.metrics.pairwise import cosine_similarity
```

```
[76]: #chances of user rating a book
similarity_scores = cosine_similarity(pt)
```

```
[77]: similarity_scores
```

```
[77]: array([[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.          ]])
```

```
[78]: similarity_scores.shape
```

```
[78]: (706, 706)
```

```
[79]: books.columns
```

```
[79]: Index(['ISBN', 'Book-Title', 'Book-Author', 'Year-Of-Publication', 'Publisher',
        'Image-URL-S', 'Image-URL-M', 'Image-URL-L'],
        dtype='object')
```

```
[80]: # creating recommendation system
def recommendation_system(book_name):
    # index fetch
    index = np.where(pt.index==book_name)[0][0]
    # using the similarity scores
    similar_items = sorted(list(enumerate(similarity_scores[index])), key = λ
    ↪ lambda x : x[1], reverse=True)[1:6]

    data = []
    for i in similar_items:
        item = []
        temp_df = books[books['Book-Title'] == pt.index[i[0]]]
        #pre processing
        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-L'].
        ↪ values))

        data.append(item)
```

```
return data
```

```
[81]: # checking the recommendation system
recommendation_system('Harry Potter and the Prisoner of Azkaban (Book 3)')
```

```
[81]: [['Harry Potter and the Goblet of Fire (Book 4)',
        'J. K. Rowling',
        'http://images.amazon.com/images/P/0439139597.01.LZZZZZZZ.jpg'],
        ['Harry Potter and the Chamber of Secrets (Book 2)',
        'J. K. Rowling',
        'http://images.amazon.com/images/P/0439064872.01.LZZZZZZZ.jpg'],
        ['Harry Potter and the Order of the Phoenix (Book 5)',
        'J. K. Rowling',
        'http://images.amazon.com/images/P/043935806X.01.LZZZZZZZ.jpg'],
        ["Harry Potter and the Sorcerer's Stone (Book 1)",
        'J. K. Rowling',
        'http://images.amazon.com/images/P/0590353403.01.LZZZZZZZ.jpg'],
        ["Harry Potter and the Sorcerer's Stone (Harry Potter (Paperback))",
        'J. K. Rowling',
        'http://images.amazon.com/images/P/059035342X.01.LZZZZZZZ.jpg']]
```

```
[82]: recommendation_system('Life of Pi')
```

```
[82]: [['Tell No One',
        'Harlan Coben',
        'http://images.amazon.com/images/P/0440236703.01.LZZZZZZZ.jpg'],
        ['The Lovely Bones: A Novel',
        'Alice Sebold',
        'http://images.amazon.com/images/P/0316666343.01.LZZZZZZZ.jpg'],
        ['Fried Green Tomatoes at the Whistle Stop Cafe',
        'Fannie Flagg',
        'http://images.amazon.com/images/P/0070212570.01.LZZZZZZZ.jpg'],
        ['Fall On Your Knees (Oprah #45)',
        'Ann-Marie MacDonald',
        'http://images.amazon.com/images/P/0743237188.01.LZZZZZZZ.jpg'],
        ['Balzac and the Little Chinese Seamstress : A Novel',
        'DAI SIJIE',
        'http://images.amazon.com/images/P/0385722206.01.LZZZZZZZ.jpg']]
```

```
[83]: recommendation_system('Year of Wonders')
```

```
[83]: [['The Eight',
        'Katherine Neville',
        'http://images.amazon.com/images/P/0345366239.01.LZZZZZZZ.jpg'],
        ['A Heartbreaking Work of Staggering Genius',
        'Dave Eggers',
```

```
'http://images.amazon.com/images/P/0375725784.01.LZZZZZZZ.jpg'],  
['Bridget Jones: The Edge of Reason',  
 'Helen Fielding',  
 'http://images.amazon.com/images/P/0140298479.01.LZZZZZZZ.jpg'],  
["Drowning Ruth (Oprah's Book Club)",  
 'CHRISTINA SCHWARZ',  
 'http://images.amazon.com/images/P/0345439104.01.LZZZZZZZ.jpg'],  
['Midwives: A Novel',  
 'Chris Bohjalian',  
 'http://images.amazon.com/images/P/0375706771.01.LZZZZZZZ.jpg']]
```

[]: