Import Necessary Libraries

In [43]:
```
import pandas as pd
import numpy as np
from sklearn.metrics import pairwise_distances
```

Import Data

In [44]:
```
book_data = pd.read_csv('book.csv')
book_data
```

Out[44]:

	Unnamed: 0	User.ID	Book.Title	Book.Rating
0	1	276726	Classical Mythology	5
1	2	276729	Clara Callan	3
2	3	276729	Decision in Normandy	6
3	4	276736	Flu: The Story of the Great Influenza Pandemic...	8
4	5	276737	The Mummies of Urumchi	6
...	...	...	...	...
9995	9996	162121	American Fried: Adventures of a Happy Eater.	7
9996	9997	162121	Cannibal In Manhattan	9
9997	9998	162121	How to Flirt: A Practical Guide	7
9998	9999	162121	Twilight	8
9999	10000	162129	Kids Say the Dandiest Things	6

10000 rows × 4 columns

Data Understanding

```
Initial Analysis
```

In [11]:
```
book_data.shape
```

Out[11]:
```
(10000, 4)
```

In [12]:
```
book_data.isna().sum()
```

Out[12]:
```
Unnamed: 0    0
User.ID       0
Book.Title    0
Book.Rating   0
dtype: int64
```

In [13]:
```
book12=book_data.iloc[:,1:]
book12
```

Out[13]:

	User.ID	Book.Title	Book.Rating
0	276726	Classical Mythology	5
1	276729	Clara Callan	3
2	276729	Decision in Normandy	6
3	276736	Flu: The Story of the Great Influenza Pandemic...	8
4	276737	The Mummies of Urumchi	6
...	...	...	...
9995	162121	American Fried: Adventures of a Happy Eater.	7
9996	162121	Cannibal In Manhattan	9
9997	162121	How to Flirt: A Practical Guide	7
9998	162121	Twilight	8
9999	162129	Kids Say the Dandiest Things	6

10000 rows × 3 columns

In [14]:
```
(book12['User.ID'].nunique())
```

Out[14]:
```
2182
```

In [15]:
```
len(book12['Book.Title'].unique())
```

Out[15]:
```
9659
```

In [16]:
```
book12.sort_values(['User.ID'])
```

Out[16]:

	User.ID	Book.Title	Book.Rating
2401	8	Wings	5
2400	8	The Western way: A practical guide to the West...	5
2399	8	Ancient Celtic Romances	5
2402	8	Truckers	5
2405	8	The Art Of Celtia	7
...	...	...	...
2395	278854	La crónica del Perú (Crónicas de América)	7
2398	278854	Celtic Mythology (Library of the World's Myths...	8
2393	278854	A corrente de Trewis Scott	7
2394	278854	As valkirias	7
2397	278854	A Treasury of Irish Myth, Legend, and Folklore	6

10000 rows × 3 columns

Data Preparation

In [28]:
```
book_recom=pd.pivot_table(data=book_data,values='Book.Rating',index='User.ID',columns='Book.Title').reset_index(drop=True)
book_recom
```

Out[28]:

Book.Title	Jason, Madison &amp	Stories:Merril;1985;McClelland &amp	Other &amp	Repairing PC Drives &amp	48	'O Au No Keia: Voices from Hawai'I Māoli and Transgender Communities	...AND THE HORSE HE RODE ON: THE PEOPLE'S ... KENNETH STARR	E1-E1-00: A Novel of the Millennium	1,401 More Things That P*Ss Me Off	10 Commandments Of Dating	100 Great Fantasy Short, Short Stories	...	Zora Hurston and the Chinaberry Tree (Reading Rainbow Book)	'Even Monkeys Fall from Trees and Other Japanese Proverbs	'I Won't Learn from You!: Stories and Thoughts on Creative Maladjustment	'More More More, Said the Baby	'Ol' Is for Outlaw
0	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
1	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
2	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
3	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
4	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2177	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
2178	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
2179	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
2180	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
2181	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN

2182 rows × 9659 columns

In [29]:
```
#Replacing the index values by unique User IDs
book_recom.index=book12['User.ID'].unique()
book_recom
```

Out[21]:

Book.Title	Jason, Madison &amp	Stories:Merril;1985;McClelland &amp	Other &amp	Repairing PC Drives &amp	48	'O Au No Keia: Voices from Hawai'I Māoli and Transgender Communities	...AND THE HORSE HE RODE ON: THE PEOPLE'S ... KENNETH STARR	E1-E1-00: A Novel of the Millennium	1,401 More Things That P*Ss Me Off	10 Commandments Of Dating	100 Great Fantasy Short, Short Stories	...	Zora Hurston and the Chinaberry Tree (Reading Rainbow Book)	'Even Monkeys Fall from Trees and Other Japanese Proverbs	'I Won't Learn from You!: Stories and Thoughts on Creative Maladjustment	'More More More, Said the Baby	'Ol' Is for Outlaw
276726	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
276729	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
276736	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
276737	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
276744	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
162107	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
162109	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
162113	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
162121	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN
162129	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN

2182 rows × 9659 columns

In [30]:
```
book_recom.fillna(0,inplace=True)
book_recom
```

Out[21]:

Book.Title	Jason, Madison &amp	Stories:Merril;1985;McClelland &amp	Other &amp	Repairing PC Drives &amp	48	'O Au No Keia: Voices from Hawai'I Māoli and Transgender Communities	...AND THE HORSE HE RODE ON: THE PEOPLE'S ... KENNETH STARR	E1-E1-00: A Novel of the Millennium	1,401 More Things That P*Ss Me Off	10 Commandments Of Dating	100 Great Fantasy Short, Short Stories	...	Zora Hurston and the Chinaberry Tree (Reading Rainbow Book)	'Even Monkeys Fall from Trees and Other Japanese Proverbs	'I Won't Learn from You!: Stories and Thoughts on Creative Maladjustment	'More More More, Said the Baby	'Ol' Is for Outlaw
276726	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
276729	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
276736	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
276737	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
276744	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
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
162107	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
162109	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
162113	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
162121	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
162129	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

2182 rows × 9659 columns

In [20]:
```
book_recom.shape
```

Out[20]:
```
(2182, 9659)
```

Model Building and Finding out the similar user for Recommendations..

In [26]:
```
#calculating cosine similarity
user_sim1=pairwise_distances(book_recom.values,metric='cosine')
user_sim
```

Out[26]:
```
array([[1., 0., 0., ..., 0., 0., 0.],
       [0., 1., 0., ..., 0., 0., 0.],
       [0., 0., 1., ..., 0., 0., 0.],
       ...,
       [0., 0., 0., ..., 1., 0., 0.],
       [0., 0., 0., ..., 0., 1., 0.],
       [0., 0., 0., ..., 0., 0., 1.]])
```

In [27]:
```
user_sim2=pd.DataFrame(user_sim) #storing results in dataframe format
user_sim2
```

Out[27]:

	0	1	2	3	4	5	6	7	8	9	...	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181
0	1.0	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
1	0.0	1.0	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	1.0	0.0	0.0	0.0
2	0.0	0.0	1.0	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
3	0.0	0.0	0.0	1.0	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	0.0	0.0	0.0	0.0	1.0	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
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2177	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	1.0	0.0	0.0	0.0	0.0
2178	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	1.0	0.0	0.0	0.0
2179	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	1.0	0.0	0.0
2180	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	1.0	0.0
2181	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	1.0

2182 rows × 2182 columns

In [28]:
```
#enter the index and columns name to user ids
user_sim2.index=book12['User.ID'].unique()
user_sim2.columns=book12['User.ID'].unique()
user_sim2
```

Out[28]:

	276726	276729	276736	276737	276744	276745	276747	276748	276751	276754	...	162065	162091	162092	162095	162103	162107	162109	162113	162121	162129
276726	1.0	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
276729	0.0	1.0	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
276736	0.0	0.0	1.0	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
276737	0.0	0.0	0.0	1.0	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
276744	0.0	0.0	0.0	0.0	1.0	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
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
162107	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	1.0	0.0	0.0	0.0	0.0
162109	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	1.0	0.0	0.0	0.0
162113	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	1.0	0.0	0.0
162121	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	1.0	0.0
162129	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	1.0

2182 rows × 2182 columns

In [32]:
```
## Nullifying diagonal values
np.fill_diagonal(user_sim_0)
user_sim2
```

Out[32]:

	276726	276729	276736	276737	276744	276745	276747	276748	276751	276754	...	162065	162091	162092	162095	162103	162107	162109	162113	162121	162129
276726	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
276729	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
276736	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
276737	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
276744	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
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
162107	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
162109	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
162113	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
162121	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
162129	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

2182 rows × 2182 columns

In [33]:
```
#Most Similar Users
user_sim2.idxmax(axis=1)
```

Out[33]:
```
276726    276726
276729    276729
276736    276736
276737    276737
276744    276744
           ...
162107    162107
162109    162109
162113    162113
162121    162121
162129    162129
Length: 2182, dtype: int64
```

In [34]:
```
book12[(book2['User.ID']==162107)|(book2['User.ID']==276726)]
```

Out[34]:

	User.ID	Book.Title	Book.Rating
0	276726	Classical Mythology	5
9087	162107	What's Bred in the Bone	7

In [35]:
```
# extract the books which user10 276729 & 276726 have watched
book2[(book2['User.ID']==276729) | (book2['User.ID']==276726)]
```

Out[35]:

	User.ID	Book.Title	Book.Rating
0	276726	Classical Mythology	5
1	276729	Clara Callan	3
2	276729	Decision in Normandy	6

In [36]:
```
user_1=book2[(book2['User.ID']==276729)]
user_2=book2[(book2['User.ID']==276726)]
```

In [37]:
```
user_1['Book.Title']
```

Out[38]:
```
1                Clara Callan
2    Decision in Normandy
Name: Book.Title, dtype: object
```

In [39]:
```
user_2['Book.Title']
```

Out[39]:
```
0    Classical Mythology
Name: Book.Title, dtype: object
```

In [40]:
```
pd.merge(user_1,user_2,on='Book.Title',how='outer')
```

Out[40]:

	User.ID_x	Book.Title	Book.Rating_x	User.ID_y	Book.Rating_y
0	276729.0	Clara Callan	3.0	NaN	NaN
1	276729.0	Decision in Normandy	6.0	NaN	NaN
2	NaN	Classical Mythology	NaN	276726.0	5.0