Nearest Neighbor item based Collaborative Filtering

COLLABORATIVE FILTERING

Read by both users

Similar users

Read by her, recommended to him!

CONTENT-BASED FILTERING

Read by user

Similar articles

Recommended to user
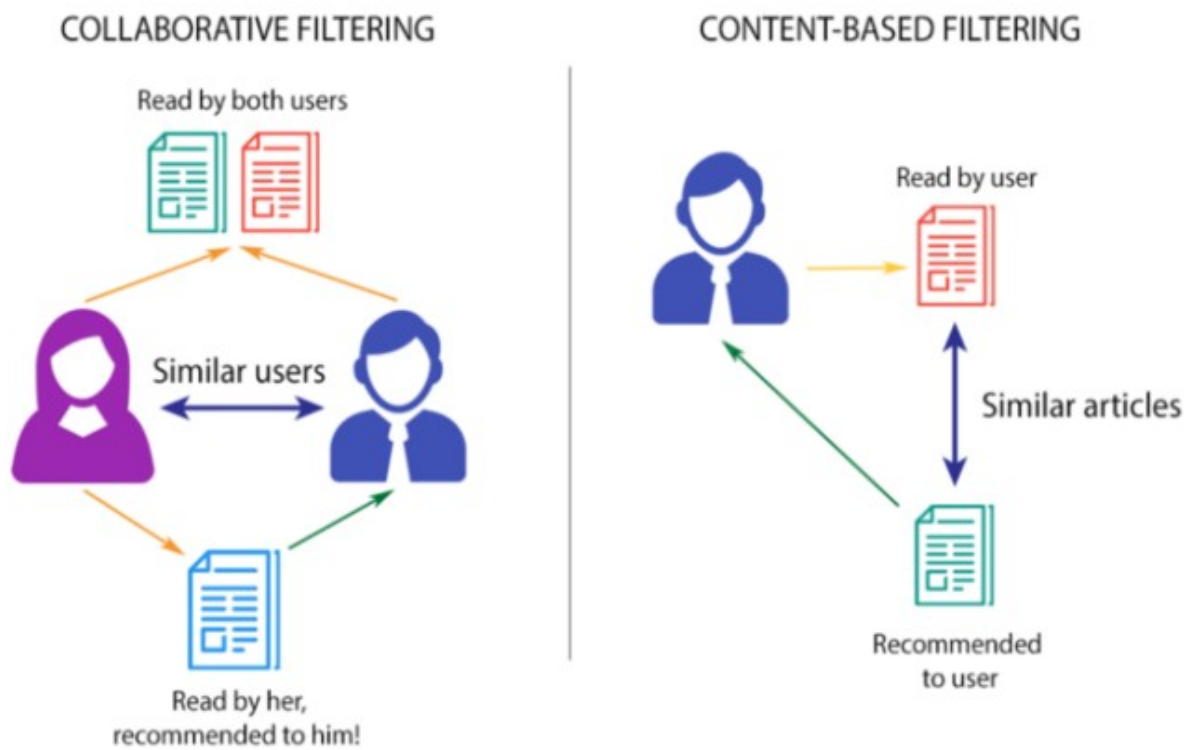
An Overview of Recommendation Systems

Source: https://towardsdatascience.com

```python
import pandas as pd
import numpy as np
pd.set_option('display.max_columns', None)

movies_df =
pd.read_csv('movies.csv',usecols=['movieId','title'],dtype={'movieId':
'int32', 'title': 'str'})
rating_df=pd.read_csv('ratings.csv',usecols=['userId', 'movieId',
'rating'],  dtype={'userId': 'int32', 'movieId': 'int32', 'rating':
'float32'})

movies_df.head()

    movieId                                       title
0         1                         Toy Story (1995)
1         2                           Jumanji (1995)
2         3                   Grumpier Old Men (1995)
3         4                  Waiting to Exhale (1995)
4         5    Father of the Bride Part II (1995)
```

```python
rating_df.head()
```

```
   userId  movieId  rating
0       1        1     4.0
1       1        3     4.0
2       1        6     4.0
3       1       47     5.0
4       1       50     5.0
```

```python
df = pd.merge(rating_df,movies_df,on='movieId')
df.head()
```

```
   userId  movieId  rating                         title
0       1        1     4.0               Toy Story (1995)
1       1        3     4.0         Grumpier Old Men (1995)
2       1        6     4.0                     Heat (1995)
3       1       47     5.0      Seven (a.k.a. Se7en) (1995)
4       1       50     5.0       Usual Suspects, The (1995)
```

```python
combine_movie_rating = df.dropna(axis = 0, subset = ['title'])
movie_ratingCount = (combine_movie_rating.
        groupby(by = ['title'])['rating'].
        count().
        reset_index().
        rename(columns = {'rating': 'totalRatingCount'})
        [['title', 'totalRatingCount']]
    )
movie_ratingCount.head()
```

```
                                 title  totalRatingCount
0                          '71 (2014)                 1
1   'Hellboy': The Seeds of Creation (2004)            1
2                   'Round Midnight (1986)             2
3                      'Salem's Lot (2004)             1
4                'Til There Was You (1997)             2
```

```python
rating_with_totalRatingCount =
combine_movie_rating.merge(movie_ratingCount)
rating_with_totalRatingCount.head()
```

```
   userId  movieId  rating                         title
totalRatingCount
0       1        1     4.0               Toy Story (1995)
215
1       1        3     4.0         Grumpier Old Men (1995)
52
2       1        6     4.0                     Heat (1995)
102
3       1       47     5.0      Seven (a.k.a. Se7en) (1995)
203
```

```
4       1       50      5.0    Usual Suspects, The (1995)
204

popularity_threshold = 50
rating_popular_movie=
rating_with_totalRatingCount.query('totalRatingCount >=
@popularity_threshold')
rating_popular_movie.head()
```

```
   userId  movieId  rating                            title
totalRatingCount
0       1        1     4.0                    Toy Story (1995)
215
1       1        3     4.0               Grumpier Old Men (1995)
52
2       1        6     4.0                         Heat (1995)
102
3       1       47     5.0   Seven (a.k.a. Se7en) (1995)
203
4       1       50     5.0    Usual Suspects, The (1995)
204
```

```
rating_popular_movie.shape
```

```
(41362, 5)
```

First lets create a Pivot matrix

```
movie_features_df=rating_popular_movie.pivot_table(index='title',colum
ns='userId',values='rating').fillna(0)
movie_features_df.head()
# Create a spreadsheet-style pivot table as a DataFrame.
```

```
userId                          1     2     3     4     5     6     7
8     \
title

10 Things I Hate About You (1999)  0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
12 Angry Men (1957)                0.0   0.0   0.0   5.0   0.0   0.0   0.0
0.0
2001: A Space Odyssey (1968)       0.0   0.0   0.0   0.0   0.0   0.0   4.0
0.0
28 Days Later (2002)               0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
300 (2007)                         0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0

userId                          9    10    11    12    13    14    15
16    \
title
```

title								
10 Things I Hate About You (1999)	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0
300 (2007)	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0

userId	17	18	19	20	21	22	23	24 \
title								
10 Things I Hate About You (1999)	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	5.0	0.0	0.0	0.0	0.0	3.0	0.0
2001: A Space Odyssey (1968)	0.0	4.0	3.0	0.0	0.0	0.0	4.0	0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0
300 (2007)	0.0	3.5	0.0	0.0	3.5	0.0	0.0	4.0

userId	25	26	27	28	29	30	31	32 \
title								
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001: A Space Odyssey (1968)	0.0	0.0	2.0	3.0	5.0	0.0	0.0	0.0
28 Days Later (2002)	0.0	0.0	0.0	3.0	4.5	0.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	4.5	0.0	0.0	0.0	0.0

userId	33	34	35	36	37	38	39	40 \
title								
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	0.0	2.0
0.0							
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0							
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0							

userId	41	42	43	44	45	46	47
48 \							
title							
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0							
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	2.5
0.0							
2001: A Space Odyssey (1968)	2.0	5.0	0.0	0.0	4.0	0.0	0.0
0.0							
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0							
300 (2007)	2.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0							

userId	49	50	51	52	54	55	56
57 \							
title							
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0							
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0							
2001: A Space Odyssey (1968)	0.0	4.5	5.0	0.0	0.0	0.0	0.0
5.0							
28 Days Later (2002)	0.0	0.0	5.0	0.0	0.0	0.0	0.0
0.0							
300 (2007)	0.0	0.0	5.0	5.0	0.0	0.0	0.0
0.0							

userId	58	59	60	61	62	63	64
65 \							
title							
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0							
12 Angry Men (1957)	0.0	0.0	3.0	0.0	5.0	4.0	5.0
0.0							
2001: A Space Odyssey (1968)	0.0	5.0	0.0	0.0	0.0	3.5	1.0
0.0							
28 Days Later (2002)	0.0	0.0	0.0	4.0	0.0	4.0	4.5
0.0							
300 (2007)	0.0	0.0	0.0	0.0	4.5	0.0	0.0

```
0.0

userId                             66   67   68   69   70   71   72
73   \
title

10 Things I Hate About You (1999)  0.0  0.0  4.5  0.0  0.0  0.0  0.0
0.0
12 Angry Men (1957)                4.5  0.0  0.0  0.0  0.0  0.0  0.0
0.0
2001: A Space Odyssey (1968)       0.0  0.0  1.5  5.0  0.0  0.0  0.0
4.0
28 Days Later (2002)               0.0  0.0  4.5  0.0  0.0  0.0  0.0
0.0
300 (2007)                         0.0  0.0  4.0  0.0  0.0  0.0  0.0
0.0

userId                             74   75   76   77   78   79   80
81   \
title

10 Things I Hate About You (1999)  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0
12 Angry Men (1957)                0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0
2001: A Space Odyssey (1968)       0.0  3.5  0.0  0.0  0.0  0.0  0.0
0.0
28 Days Later (2002)               0.0  0.0  0.0  0.0  0.0  0.0  4.0
0.0
300 (2007)                         0.0  0.0  3.0  0.0  0.0  0.0  4.5
0.0

userId                             82   83   84   85   86   87   88
89   \
title

10 Things I Hate About You (1999)  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0
12 Angry Men (1957)                0.0  0.0  4.0  0.0  0.0  0.0  0.0
0.0
2001: A Space Odyssey (1968)       0.0  5.0  0.0  0.0  0.0  0.0  0.0
0.0
28 Days Later (2002)               0.0  3.5  0.0  0.0  0.0  0.0  4.5
0.0
300 (2007)                         0.0  1.5  0.0  0.0  1.5  0.0  0.0
0.0

userId                             90   91   92   93   94   95   96
97   \
title
```

title							
10 Things I Hate About You (1999)	0.0	0.0	5.0	0.0	0.0	0.0	0.0 0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
2001: A Space Odyssey (1968)	0.0	3.5	0.0	0.0	0.0	5.0	0.0 0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	4.5	0.0 0.0
300 (2007)	0.0	0.0	4.5	0.0	0.0	0.0	0.0 0.0

userId	98	99	100	101	102	103	104 105 \
title							
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	5.0 0.0
12 Angry Men (1957)	0.0	0.0	4.0	0.0	0.0	0.0	0.0 4.5
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	4.0	0.0 4.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 4.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 4.5

userId	106	107	108	109	110	111	112 113 \
title							
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	4.0	0.0 0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	4.0	0.0 0.0

userId	114	115	116	117	118	119	120 121 \
title							
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0

title								
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0

userId	122	123	124	125	126	127	128	129 \
title								
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28 Days Later (2002)	5.0	0.0	0.0	3.5	0.0	0.0	0.0	3.5
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

userId	130	131	132	133	134	135	136	137 \
title								
10 Things I Hate About You (1999)	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	5.0	0.0	4.5
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

userId	138	139	140	141	142	143	144	145 \
title								
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001: A Space Odyssey (1968)	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	2.5	0.0	0.0	0.0	

```
0.0

userId                                146   147   148   149   150   151   152
153  \
title

10 Things I Hate About You (1999)     0.0   0.0   0.0   0.0   0.0   0.0   0.0
1.0
12 Angry Men (1957)                   0.0   0.0   0.0   0.0   0.0   0.0   5.0
0.0
2001: A Space Odyssey (1968)          0.0   0.0   0.0   2.0   0.0   0.0   0.0
0.0
28 Days Later (2002)                  0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
300 (2007)                            3.0   0.0   0.0   0.0   0.0   0.0   0.0
0.5

userId                                154   155   156   157   158   159   160
161  \
title

10 Things I Hate About You (1999)     0.0   0.0   0.0   0.0   3.5   0.0   0.0
0.0
12 Angry Men (1957)                   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
2001: A Space Odyssey (1968)          0.0   0.0   4.5   0.0   0.0   0.0   5.0
0.0
28 Days Later (2002)                  0.0   0.0   0.0   0.0   4.0   0.0   0.0
0.0
300 (2007)                            0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0

userId                                162   163   164   165   166   167   168
169  \
title

10 Things I Hate About You (1999)     0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
12 Angry Men (1957)                   0.0   0.0   0.0   0.0   0.0   0.0   5.0
0.0
2001: A Space Odyssey (1968)          0.0   0.0   0.0   0.0   0.0   1.0   0.0
0.0
28 Days Later (2002)                  0.0   0.0   0.0   0.0   4.5   0.0   0.0
0.0
300 (2007)                            0.0   0.0   0.0   0.0   4.0   0.0   0.0
0.0

userId                                170   171   172   173   174   176   177
178  \
title
```

	0.0	0.0	0.0	0.0	0.0	0.0	4.5
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	4.5
0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	4.5
0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	0.0	1.5
0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.5
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	2.0
0.0

userId	179	180	181	182	183	184	185
186 \
title
10 Things I Hate About You (1999)	0.0	0.0	0.0	4.0	0.0	0.0	0.0
0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	5.0	0.0	0.0	0.0
5.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0

userId	187	188	189	190	191	192	193
194 \
title
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0
12 Angry Men (1957)	4.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0
2001: A Space Odyssey (1968)	4.0	0.0	0.0	0.0	0.0	0.0	5.0
0.0
28 Days Later (2002)	4.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0
300 (2007)	2.5	0.0	0.0	0.0	0.0	0.0	0.0
0.0

userId	195	196	197	198	199	200	201
202 \
title
10 Things I Hate About You (1999)	0.0	0.0	0.0	1.0	0.0	5.0	0.0
0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.0

title							
2001: A Space Odyssey (1968)	0.0	0.0	4.0	4.0	0.0	0.0	0.0 5.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	5.0	0.0 0.0

userId	203	204	205	206	207	208	209 210 \
title							
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0

userId	211	212	213	214	215	216	217 218 \
title							
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
12 Angry Men (1957)	0.0	0.0	4.0	0.0	4.0	0.0	0.0 0.0
2001: A Space Odyssey (1968)	0.0	4.0	0.0	0.0	0.0	0.0	0.0 0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
300 (2007)	0.0	3.5	3.5	0.0	0.0	0.0	0.0 0.0

userId	219	220	221	222	223	224	225 226 \
title							
10 Things I Hate About You (1999)	2.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
12 Angry Men (1957)	0.0	0.0	4.5	0.0	0.0	0.0	0.0 0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 4.0
300 (2007)	4.0	4.5	0.0	0.0	3.0	0.0	0.0

```
0.0

userId                          227  228  229  230  231  232  233
234  \
title

10 Things I Hate About You (1999)  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0
12 Angry Men (1957)                0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0
2001: A Space Odyssey (1968)       0.0  0.0  0.0  0.0  0.0  0.0  3.5
0.0
28 Days Later (2002)               0.0  0.0  0.0  4.0  0.0  0.0  0.0
0.0
300 (2007)                         0.0  0.0  0.0  3.5  0.0  5.0  0.0
0.0

userId                          235  236  237  238  239  240  241
242  \
title

10 Things I Hate About You (1999)  0.0  5.0  0.0  0.0  0.0  0.0  0.0
0.0
12 Angry Men (1957)                0.0  0.0  4.0  0.0  0.0  0.0  0.0
0.0
2001: A Space Odyssey (1968)       0.0  0.0  0.0  0.0  4.0  0.0  0.0
0.0
28 Days Later (2002)               0.0  0.0  0.0  0.0  5.0  0.0  0.0
0.0
300 (2007)                         0.0  0.0  0.0  0.0  4.0  0.0  0.0
0.0

userId                          243  244  245  246  247  248  249
250  \
title

10 Things I Hate About You (1999)  0.0  0.0  0.0  0.0  0.0  0.0  3.5
0.0
12 Angry Men (1957)                0.0  0.0  0.0  0.0  0.0  0.0  5.0
0.0
2001: A Space Odyssey (1968)       0.0  0.0  0.0  0.0  0.0  0.0  4.5
0.0
28 Days Later (2002)               0.0  0.0  0.0  0.0  0.0  0.0  4.0
0.0
300 (2007)                         0.0  0.0  0.0  0.0  5.0  0.0  5.0
0.0

userId                          251  252  253  254  255  256  257
258  \
title
```

title								
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

userId	259	260	261	262	263	264	265	266 \
title								
10 Things I Hate About You (1999)	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
28 Days Later (2002)	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

userId	267	268	269	270	271	272	273	274 \
title								
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5
2001: A Space Odyssey (1968)	4.0	0.0	0.0	0.0	4.0	0.0	0.0	2.5
28 Days Later (2002)	0.0	0.0	0.0	0.0	2.5	0.0	0.0	3.5
300 (2007)	0.0	0.0	0.0	0.0	0.0	3.5	0.0	4.0

userId	275	276	277	278	279	280	281	282 \
title								
10 Things I Hate About You (1999)	4.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5

title	283	284	285	286	287	288	289	290
2001: A Space Odyssey (1968)	1.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	3.5	4.5	3.5

userId title	283	284	285	286	287	288	289	290	\

title	283	284	285	286	287	288	289	290
10 Things I Hate About You (1999)	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	5.0	0.0	5.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

userId title	291	292	293	294	295	296	297	298	\

title	291	292	293	294	295	296	297	298
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5
12 Angry Men (1957)	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0

userId title	299	300	301	302	303	304	305	306	\

title	299	300	301	302	303	304	305	306
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	5.0	2.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	3.0	

0.0

userId	307	308	309	310	311	312	313	314 \
title								
10 Things I Hate About You (1999)	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.5	5.0	0.0	0.0	0.0	0.0	0.0
2001: A Space Odyssey (1968)	3.5	0.0	0.0	0.0	0.0	5.0	3.0	5.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300 (2007)	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

userId	315	316	317	318	319	320	321	322 \
title								
10 Things I Hate About You (1999)	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	4.0	0.0	0.0	0.0	4.0
2001: A Space Odyssey (1968)	3.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0
28 Days Later (2002)	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0

userId	323	324	325	326	327	328	329	330 \
title								
10 Things I Hate About You (1999)	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0
2001: A Space Odyssey (1968)	0.0	0.0	5.0	0.0	0.0	4.0	0.0	1.5
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

userId	331	332	333	334	335	336	337	338 \
title								

title							
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
12 Angry Men (1957)	0.0	4.0	0.0	0.0	0.0	0.0	0.0 5.0
2001: A Space Odyssey (1968)	0.0	0.0	2.0	0.0	0.0	0.0	0.0 0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0

userId	339	340	341	342	343	344	345 346 \
title							
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
12 Angry Men (1957)	4.0	0.0	0.0	0.0	4.5	0.0	5.0 0.0
2001: A Space Odyssey (1968)	5.0	0.0	0.0	0.0	0.0	0.0	4.0 0.0
28 Days Later (2002)	4.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0

userId	347	348	349	350	351	352	353 354 \
title							
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 4.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	4.0	0.0 3.5
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	5.0	0.0 0.0
300 (2007)	0.0	0.0	0.0	0.0	4.0	4.0	0.0 3.5

userId	355	356	357	358	359	360	361 362 \
title							
10 Things I Hate About You (1999)	0.0	4.0	0.0	4.0	0.0	0.0	0.0 0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0

title							
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5.0							
28 Days Later (2002)	0.0	0.0	4.5	0.0	0.0	0.0	0.0
0.0							
300 (2007)	0.0	3.0	0.0	0.0	0.0	0.0	3.5
0.0							

userId	363	364	365	366	367	368	369
370 \							
title							

10 Things I Hate About You (1999)	0.0	0.0	4.0	0.0	0.0	0.0	0.0
3.5							
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0							
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	3.0	0.0
0.0							
28 Days Later (2002)	0.0	0.0	2.0	0.0	0.0	0.0	0.0
0.0							
300 (2007)	0.0	0.0	3.5	0.0	0.0	0.0	0.0
0.0							

userId	371	372	373	374	375	376	377
378 \							
title							

10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0							
12 Angry Men (1957)	0.0	4.0	0.0	0.0	0.0	0.0	5.0
0.0							
2001: A Space Odyssey (1968)	5.0	2.0	0.0	0.0	0.0	0.0	5.0
0.0							
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0							
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	3.5
0.0							

userId	379	380	381	382	383	384	385
386 \							
title							

10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0							
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0							
2001: A Space Odyssey (1968)	0.0	4.0	0.0	0.0	0.0	3.0	4.0
0.0							
28 Days Later (2002)	0.0	3.0	0.0	0.0	0.0	0.0	0.0
0.0							
300 (2007)	0.0	4.0	3.5	0.0	0.0	0.0	0.0

```
0.0

userId                             387    388    389    390    391    392    393
394  \
title

10 Things I Hate About You (1999)  0.0    0.0    0.0    0.0    0.0    0.0    0.0
0.0
12 Angry Men (1957)                0.0    1.0    0.0    0.0    0.0    0.0    0.0
0.0
2001: A Space Odyssey (1968)       5.0    0.0    0.0    0.0    5.0    0.0    0.0
0.0
28 Days Later (2002)               4.0    0.0    0.0    0.0    0.0    0.0    0.0
0.0
300 (2007)                         3.5    0.0    0.0    0.0    0.0    0.0    0.0
0.0

userId                             395    396    397    398    399    400    401
402  \
title

10 Things I Hate About You (1999)  0.0    0.0    0.0    0.0    0.0    0.0    0.0
0.0
12 Angry Men (1957)                0.0    0.0    0.0    0.0    0.0    0.0    0.0
0.0
2001: A Space Odyssey (1968)       0.0    0.0    0.0    0.0    0.0    0.0    0.0
0.0
28 Days Later (2002)               0.0    0.0    0.0    0.0    0.0    0.0    0.0
0.0
300 (2007)                         0.0    0.0    0.0    0.0    0.0    0.0    0.0
0.0

userId                             403    404    405    406    407    408    409
410  \
title

10 Things I Hate About You (1999)  0.0    0.0    0.0    0.0    0.0    0.0    0.0
0.0
12 Angry Men (1957)                0.0    0.0    0.0    0.0    0.0    0.0    0.0
0.0
2001: A Space Odyssey (1968)       0.0    0.0    0.0    0.0    0.0    0.0    0.0
0.0
28 Days Later (2002)               0.0    0.0    0.0    0.0    0.0    0.0    0.0
0.0
300 (2007)                         0.0    0.0    0.0    0.0    0.0    4.0    0.0
0.0

userId                             411    412    413    414    415    416    417
418  \
title
```

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10 Things I Hate About You (1999)    0.0    0.0    0.0    4.0    0.0    0.0    0.0
0.0
12 Angry Men (1957)                  0.0    0.0    0.0    0.0    4.5    0.0    0.0
0.0
2001: A Space Odyssey (1968)         0.0    5.0    0.0    5.0    0.0    0.0    0.0
0.0
28 Days Later (2002)                 0.0    0.0    0.0    4.0    0.0    0.0    0.0
0.0
300 (2007)                           0.0    0.0    5.0    4.0    0.0    0.0    0.0
0.0

userId                               419    420    421    422    423    424    425
426  \
title

10 Things I Hate About You (1999)    0.0    0.0    0.0    0.0    0.0    0.0    0.0
0.0
12 Angry Men (1957)                  0.0    4.0    4.5    0.0    0.0    0.0    0.0
0.0
2001: A Space Odyssey (1968)         0.0    4.0    0.0    0.0    0.0    0.0    0.0
0.0
28 Days Later (2002)                 3.5    0.0    0.0    0.0    0.0    0.0    0.0
0.0
300 (2007)                           0.0    3.5    0.0    0.0    0.0    0.0    0.0
0.0

userId                               427    428    429    430    431    432    433
434  \
title

10 Things I Hate About You (1999)    0.0    0.0    0.0    0.0    0.0    3.5    0.0
0.0
12 Angry Men (1957)                  0.0    0.0    0.0    0.0    0.0    0.0    0.0
0.0
2001: A Space Odyssey (1968)         0.0    0.0    0.0    0.0    0.0    0.0    0.0
4.5
28 Days Later (2002)                 0.0    3.5    0.0    0.0    0.0    0.0    0.0
4.5
300 (2007)                           0.0    0.0    0.0    0.0    0.0    4.0    0.0
3.5

userId                               435    436    437    438    439    440    441
443  \
title

10 Things I Hate About You (1999)    0.0    0.0    0.0    0.0    0.0    0.0    0.0
0.0
12 Angry Men (1957)                  0.0    0.0    0.0    0.0    0.0    0.0    0.0
0.0
```

title								
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0
300 (2007)	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0

userId	444	445	446	447	448	449	450	451 \
title								
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0

userId	452	453	454	455	456	457	458	459 \
title								
10 Things I Hate About You (1999)	0.0	5.0	0.0	0.0	0.0	4.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001: A Space Odyssey (1968)	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

userId	460	461	462	463	464	465	466	467 \
title								
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001: A Space Odyssey (1968)	0.0	0.0	2.0	0.0	0.0	5.0	0.0	0.0
28 Days Later (2002)	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

```
0.0

userId                            468  469  470  471  472  473  474
475  \
title

10 Things I Hate About You (1999)  0.0  0.0  0.0  0.0  0.0  0.0  2.5
0.0
12 Angry Men (1957)                0.0  0.0  0.0  0.0  0.0  0.0  4.0
0.0
2001: A Space Odyssey (1968)       0.0  5.0  0.0  0.0  0.0  0.0  4.0
0.0
28 Days Later (2002)               0.0  0.0  0.0  0.0  0.0  0.0  4.5
0.0
300 (2007)                         0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0

userId                            476  477  478  479  480  481  482
483  \
title

10 Things I Hate About You (1999)  0.0  0.0  0.0  0.0  2.5  0.0  0.0
2.5
12 Angry Men (1957)                0.0  4.0  0.0  0.0  5.0  0.0  0.0
5.0
2001: A Space Odyssey (1968)       0.0  4.5  0.0  0.0  0.0  0.0  0.0
0.0
28 Days Later (2002)               0.0  4.0  0.0  0.0  4.0  0.0  0.0
0.0
300 (2007)                         0.0  4.5  0.0  0.0  4.0  0.0  0.0
4.0

userId                            484  485  486  487  488  489  490
491  \
title

10 Things I Hate About You (1999)  4.0  0.0  0.0  0.0  0.0  4.5  0.0
0.0
12 Angry Men (1957)                0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0
2001: A Space Odyssey (1968)       0.0  0.0  0.0  0.0  0.0  4.0  0.0
0.0
28 Days Later (2002)               0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0
300 (2007)                         3.0  0.0  0.0  0.0  0.0  4.0  0.0
0.0

userId                            492  493  494  495  496  497  498
499  \
title
```

title								
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

userId	500	501	502	503	504	505	506	507 \
title								
10 Things I Hate About You (1999)	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0
300 (2007)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

userId	508	509	510	511	512	513	514	515 \
title								
10 Things I Hate About You (1999)	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001: A Space Odyssey (1968)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28 Days Later (2002)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300 (2007)	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0

userId	516	517	518	519	520	521	522	523 \
title								
10 Things I Hate About You (1999)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 Angry Men (1957)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

```
2001: A Space Odyssey (1968)        0.0   0.0   0.0   0.0   3.0   0.0   0.0
0.0
28 Days Later (2002)                0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
300 (2007)                          0.0   0.0   0.0   0.0   0.0   0.0   1.0
0.0

userId                              524   525   526   527   528   529   530
531  \
title

10 Things I Hate About You (1999)   0.0   4.0   0.0   0.0   0.0   0.0   0.0
0.0
12 Angry Men (1957)                 0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
2001: A Space Odyssey (1968)        4.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
28 Days Later (2002)                0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
300 (2007)                          0.0   3.5   0.0   0.0   0.0   0.0   0.0
0.0

userId                              532   533   534   535   536   537   538
539  \
title

10 Things I Hate About You (1999)   0.0   0.0   0.0   0.0   0.0   0.0   3.5
0.0
12 Angry Men (1957)                 0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
2001: A Space Odyssey (1968)        0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
28 Days Later (2002)                0.0   3.5   0.0   0.0   0.0   0.0   0.0
0.0
300 (2007)                          0.0   0.0   4.0   0.0   0.0   0.0   0.0
0.0

userId                              540   541   542   543   544   545   546
547  \
title

10 Things I Hate About You (1999)   0.0   0.0   3.5   0.0   0.0   0.0   0.0
0.0
12 Angry Men (1957)                 0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
2001: A Space Odyssey (1968)        0.0   0.0   4.0   0.0   0.0   0.0   0.0
0.0
28 Days Later (2002)                0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
300 (2007)                          0.0   0.0   0.0   0.0   0.0   0.0   0.0
```

```
0.0

userId                                548   549   550   551   552   553   554
555  \
title

10 Things I Hate About You (1999)     0.0   0.0   0.0   0.0   0.0   0.0   0.0
3.0
12 Angry Men (1957)                   0.0   0.0   0.0   0.0   3.5   0.0   0.0
0.0
2001: A Space Odyssey (1968)          0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
28 Days Later (2002)                  0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
300 (2007)                            0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0

userId                                556   557   558   559   560   561   562
563  \
title

10 Things I Hate About You (1999)     0.0   0.0   0.0   0.0   0.0   0.0   0.0
3.5
12 Angry Men (1957)                   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
2001: A Space Odyssey (1968)          0.0   0.0   0.0   0.0   0.0   4.0   0.0
0.0
28 Days Later (2002)                  0.0   0.0   0.0   0.0   0.0   4.0   4.5
0.0
300 (2007)                            0.0   0.0   0.0   0.0   3.5   3.5   0.0
0.0

userId                                564   565   566   567   568   569   570
571  \
title

10 Things I Hate About You (1999)     3.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
12 Angry Men (1957)                   0.0   0.0   0.0   4.5   0.0   0.0   0.0
0.0
2001: A Space Odyssey (1968)          0.0   0.0   0.0   1.0   0.0   0.0   0.0
0.0
28 Days Later (2002)                  0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
300 (2007)                            0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0

userId                                572   573   574   575   577   578   579
580  \
title
```

```
10 Things I Hate About You (1999)  0.0  0.0  0.0  2.0  0.0  0.0  0.0
0.0
12 Angry Men (1957)                0.0  0.0  0.0  0.0  4.0  0.0  0.0
0.5
2001: A Space Odyssey (1968)       5.0  0.0  0.0  0.0  3.0  0.0  0.0
3.5
28 Days Later (2002)               0.0  4.5  0.0  0.0  0.0  0.0  0.0
4.5
300 (2007)                         0.0  4.5  0.0  0.0  0.0  0.0  0.0
5.0

userId                             581  582  583  584  585  586  587
588  \
title

10 Things I Hate About You (1999)  0.0  0.0  5.0  0.0  0.0  0.0  0.0
0.0
12 Angry Men (1957)                0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0
2001: A Space Odyssey (1968)       0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0
28 Days Later (2002)               0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0
300 (2007)                         0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0

userId                             589  590  591  592  593  594  595
596  \
title

10 Things I Hate About You (1999)  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0
12 Angry Men (1957)                0.0  5.0  0.0  0.0  0.0  0.0  0.0
0.0
2001: A Space Odyssey (1968)       0.0  5.0  0.0  0.0  0.0  0.0  0.0
4.0
28 Days Later (2002)               0.0  0.0  0.0  0.0  0.0  0.0  0.0
4.0
300 (2007)                         0.0  3.5  0.0  0.0  0.0  0.0  0.0
0.0

userId                             597  598  599  600  601  602  603
604  \
title

10 Things I Hate About You (1999)  3.0  0.0  3.0  3.0  0.0  0.0  3.0
0.0
12 Angry Men (1957)                0.0  0.0  0.0  0.0  5.0  0.0  0.0
0.0
```

```
2001: A Space Odyssey (1968)          0.0  0.0  5.0  4.0  0.0  0.0  5.0
0.0
28 Days Later (2002)                  0.0  0.0  3.0  3.0  0.0  0.0  0.0
0.0
300 (2007)                            0.0  0.0  3.0  0.0  0.0  0.0  0.0
0.0

userId                                605  606  607  608  609  610
title
10 Things I Hate About You (1999)     5.0  0.0  0.0  0.0  0.0  0.0
12 Angry Men (1957)                   0.0  0.0  0.0  0.0  0.0  0.0
2001: A Space Odyssey (1968)          0.0  5.0  0.0  3.0  0.0  4.5
28 Days Later (2002)                  0.0  0.0  0.0  3.5  0.0  5.0
300 (2007)                            3.0  0.0  0.0  5.0  0.0  4.0
```

```python
from scipy.sparse import csr_matrix
from sklearn.neighbors import NearestNeighbors
movie_features_df_matrix = csr_matrix(movie_features_df.values)

model_knn = NearestNeighbors()
model_knn.fit(movie_features_df_matrix)
```

```
NearestNeighbors()
```

```python
movie_features_df.shape
```

```
(450, 606)
```

```python
query_index = 0
print(query_index)
distances, indices =
model_knn.kneighbors(movie_features_df.iloc[query_index,:].values.reshape(1, -1))
movie_features_df.index
```

```
0

Index(['10 Things I Hate About You (1999)', '12 Angry Men (1957)',
       '2001: A Space Odyssey (1968)', '28 Days Later (2002)', '300
(2007)',
       '40-Year-Old Virgin, The (2005)', 'A.I. Artificial Intelligence
(2001)',
       'Abyss, The (1989)', 'Ace Ventura: Pet Detective (1994)',
       'Ace Ventura: When Nature Calls (1995)',
       ...
       'Willy Wonka & the Chocolate Factory (1971)',
       'Wizard of Oz, The (1939)', 'Wolf of Wall Street, The (2013)',
       'X-Men (2000)', 'X-Men: The Last Stand (2006)',
       'X2: X-Men United (2003)', 'You've Got Mail (1998)',
       'Young Frankenstein (1974)', 'Zombieland (2009)', 'Zoolander
```

```
(2001)'],
      dtype='object', name='title', length=450)

for i in range(0, len(distances.flatten())):
    if i == 0:
        print('Recommendations for {0}:\
n'.format(movie_features_df.index[query_index]))
    else:
        print('{0}: {1}, with distance of {2}:'.format(i,
movie_features_df.index[indices.flatten()[i]],
        distances.flatten()[i]))

Recommendations for 10 Things I Hate About You (1999):

1: Wild Wild West (1999), with distance of 26.893308639526367:
2: Wedding Singer, The (1998), with distance of 27.98213768005371:
3: What Women Want (2000), with distance of 28.1069393157959:
4: Hook (1991), with distance of 28.900691986083984:

corrMatrix = rating_df.corr()
print (corrMatrix)

          userId    movieId     rating
userId   1.000000   0.006773 -0.049348
movieId  0.006773   1.000000 -0.004061
rating  -0.049348  -0.004061  1.000000

import pandas as pd
import matplotlib as plt
import seaborn as sn
import numpy as np

sn.heatmap(corrMatrix, annot=True)

<Axes: >
```