Movie Recommender System

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DSC 680 - T302

16 MARCH 2021

In [1]:

```
import psycopg2
import pandas as pd

# set parameters
params = {
    "host" : "localhost",
    "database" : "DSC_680",
    "user" : "bretyoung"
}

# Connect to your postgres DB
def connection(params):
    conn = None
    try:
        print("Connecting to PostgreSQL...")
        conn = psycopg2.connect(**params)
    except (Exception, psycopg2.DatabaseError) as error:
        print(error)
        sys.exit(1)
    print("Successful connection established.")
    return conn

def sql_to_df(conn, selection, column_names):
    # Open a cursor to perform database operations
    cur = conn.cursor()

    # Execute a query
    cur.execute(selection)

    # Retrieve query results
    records = cur.fetchall()

    # close connection
    cur.close()

    # convert query to dataframe
    df = pd.DataFrame(records, columns = column_names)
    return df
```

In [2]:

```
# select rating information from PostgreSQL
column_names = ("userid", "title", "rating")

selection = "SELECT userid, m.title, rating FROM ratings r, movies m WHERE r.
# selecting movies made in 2000's due to memory issues with full dataset, 22 

conn = connection(params)

# ratings dataframe
df_ratings = sql_to_df(conn, selection, column_names)
```

```
Connecting to PostgreSQL...
Successful connection established.
```

In [3]:

```
df_ratings.head()
```

Out[3]:

	userid	title	rating
0	232564	Boondock Saints, The (2000)	5.0
1	232569	Erin Brockovich (2000)	4.0
2	232570	Gladiator (2000)	3.5
3	232570	Crouching Tiger, Hidden Dragon (Wo hu cang lon...	5.0
4	232570	Snatch (2000)	4.0

In [4]:

```
df_ratings.describe(include = 'all')
```

Out[4]:

	userid	title	rating
count	5.943045e+06	5943045	5.943045e+06
unique	NaN	10406	NaN
top	NaN	Lord of the Rings: The Fellowship of the Ring,...	NaN
freq	NaN	46888	NaN
mean	1.232278e+05	NaN	3.498708e+00
std	7.153748e+04	NaN	1.047263e+00
min	1.000000e+00	NaN	5.000000e-01
25%	6.060000e+04	NaN	3.000000e+00
50%	1.230070e+05	NaN	3.500000e+00
75%	1.854300e+05	NaN	4.000000e+00
max	2.477530e+05	NaN	5.000000e+00

In [5]:

```
len(df_ratings.userid.unique())
```

Out[5]:

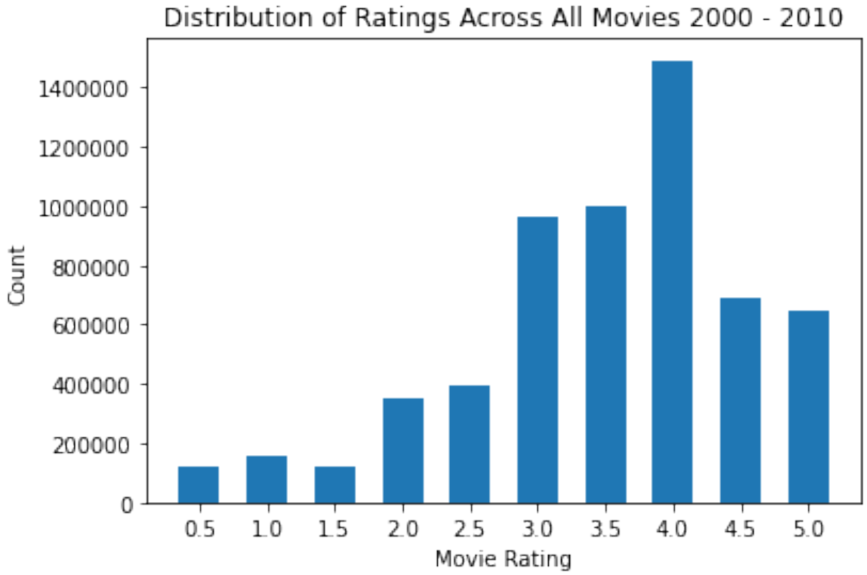
```
153548
```

In [6]:

```
# remove any duplicate entries
df_ratings = df_ratings.drop_duplicates()
```

In [7]:

```
# View distribution of ratings
import matplotlib.pyplot as plt

rating_count = df_ratings['rating'].value_counts() # return count for each un
rating_count = pd.DataFrame(rating_count).reset_index()
rating_count.columns = ['rating', 'count'] # rename columns after reseting th

fig, ax = plt.subplots()

ax.bar(rating_count['rating'], height = rating_count['count'], width = 0.3)
ax.ticklabel_format(useOffset = False, style = 'plain', axis = 'y')

plt.title('Distribution of Ratings Across All Movies 2000 - 2010')
plt.xticks(rating_count['rating'])
plt.xlabel('Movie Rating')
plt.ylabel('Count')

plt.show()
```



In [8]:

```
# transpose movie title to columns and set value to rating for each user
user_df = df_ratings.groupby(['userid','title'])['rating'].max().unstack()
```

In [9]:

```
# fill NaN with 0 indicating that the user has not rated the movie
user_df.fillna(0, inplace = True)
```

In [10]:

```
user_df.head()
```

Out[10]:

title	#1 Cheerleader Camp (2010)	$5 a Day (2008)	$9.99 (2008)	'Hellboy': The Seeds of Creation (2004)	'R Xmas (2001)	'Salem's Lot (2004)	'Twas the Night (2001)	(500) Days of Summer (2009)	(Untitled) (2009)
userid									
1	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	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

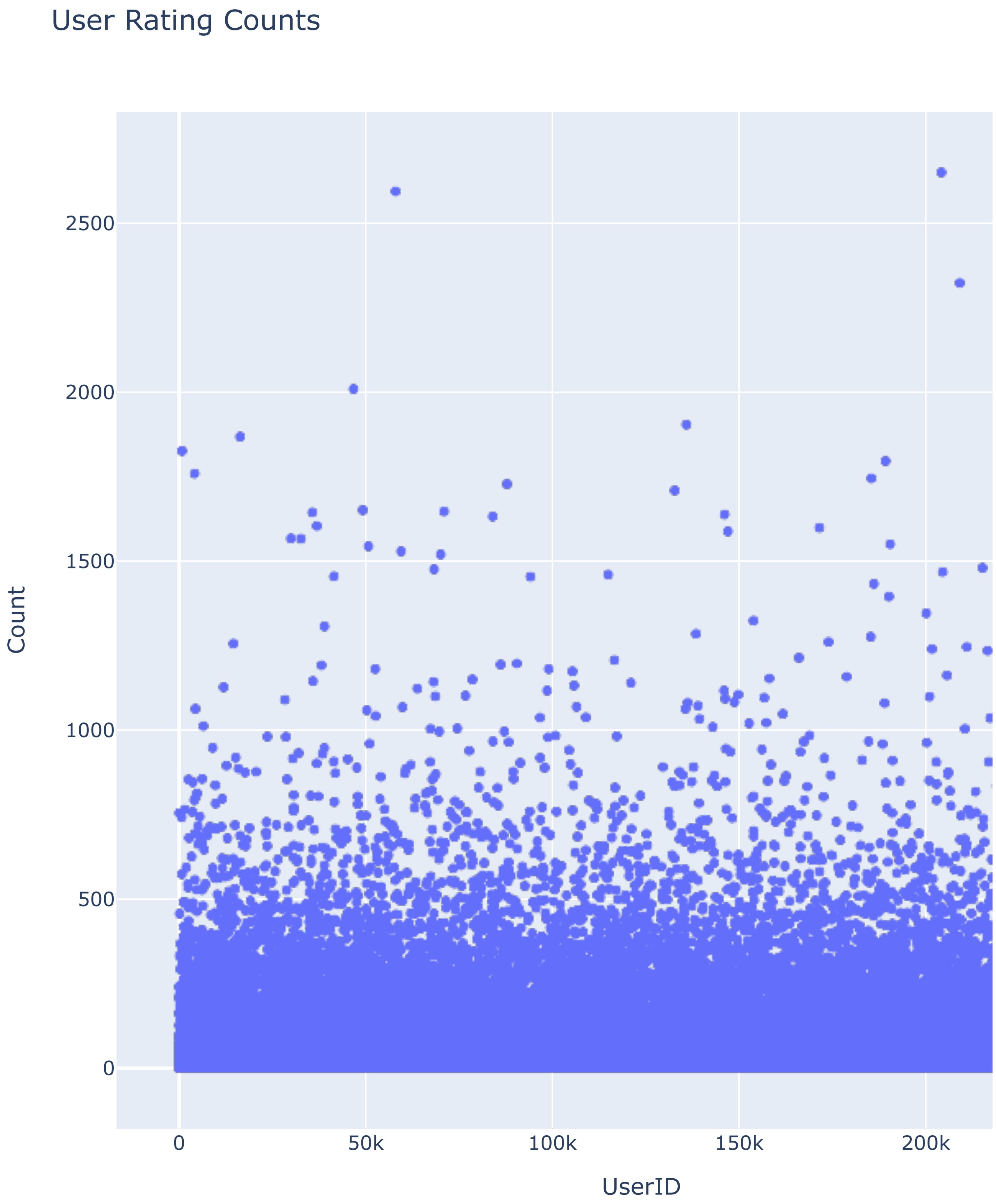
5 rows × 10406 columns

In [11]:

```
# number of ratings conducted by a user
user_rating_count = df_ratings.groupby('userid')['rating'].agg('count')

# number of ratings a movie has received
movie_rating_count = df_ratings.groupby('title')['rating'].agg('count')
```

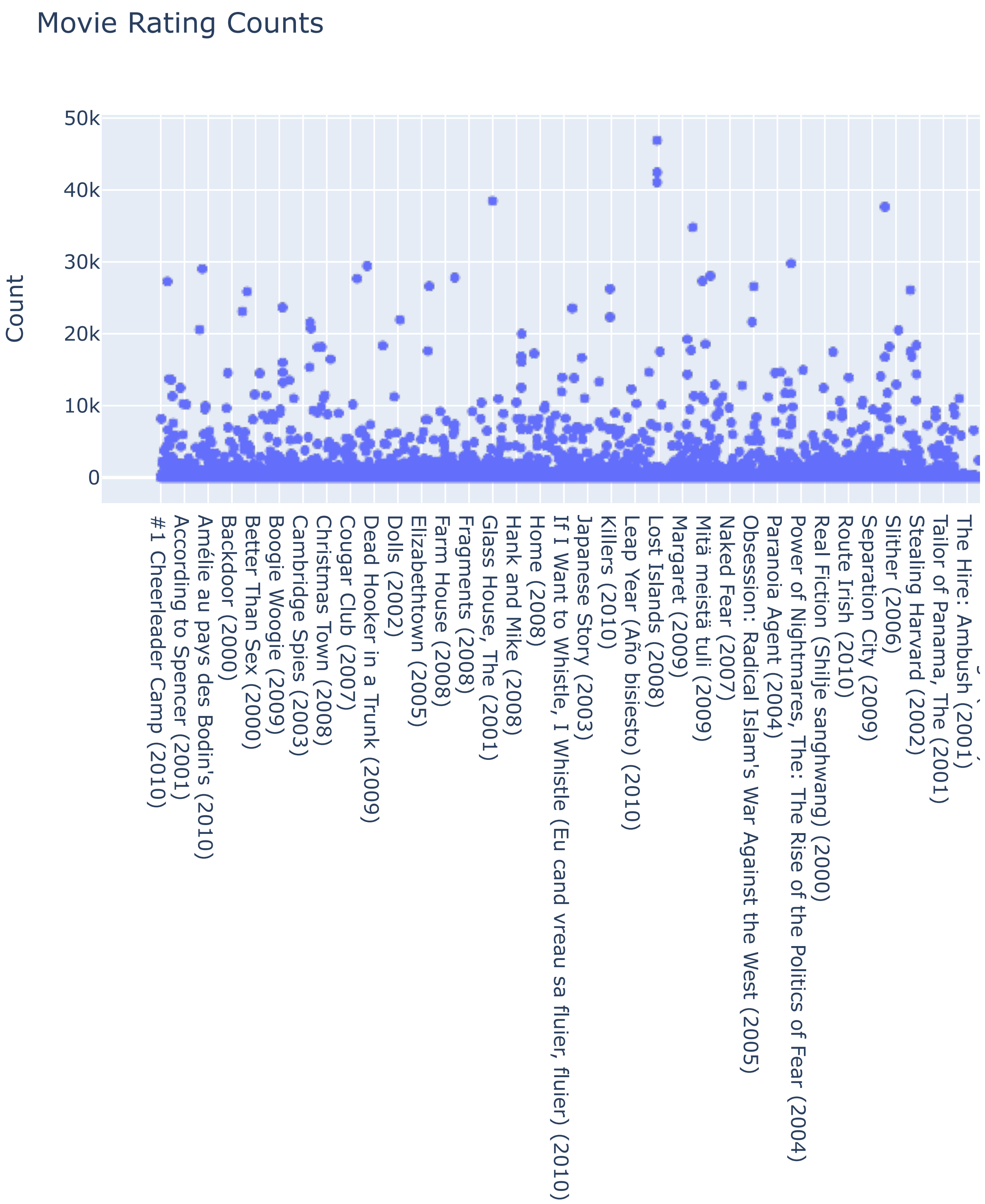
In [12]:

```
# Plot user rating counts
import plotly.express as px

fig = px.scatter(x = user_rating_count.index, y = user_rating_count, width =

fig.show()

fig.write_html("user_counts.html")
```


User Rating Counts
Count
2500
2000
1500
1000
500
0
UserID
0
50k
100k
150k
200k

In [13]:

```
# Plot movie rating counts

fig2 = px.scatter(x = movie_rating_count.index, y = movie_rating_count, width

fig2.show()

fig2.write_html("movie_counts.html")
```


Movie Rating Counts
Count
50k
40k
30k
20k
10k
0
#1 Cheerleader Camp (2010)
According to Spencer (2001)
Amélie au pays des Bodin's (2010)
Backdoor (2000)
Better Than Sex (2000)
Boogie Woogie (2009)
Cambridge Spies (2003)
Christmas Town (2008)
Cougar Club (2007)
Dead Hooker in a Trunk (2009)
Dolls (2002)
Elizabethtown (2005)
Farm House (2008)
Fragments (2008)
Glass House, The (2001)
Hank and Mike (2008)
Home (2008)
If I Want to Whistle, I Whistle (Eu cand vreau sa fluier, fluier) (2010)
Japanese Story (2003)
Killers (2010)
Leap Year (Año bisiesto) (2010)
Lost Islands (2008)
Margaret (2009)
Mitä meistä tuli (2009)
Naked Fear (2007)
Obsession: Radical Islam's War Against the West (2005)
Paranoia Agent (2004)
Power of Nightmares, The: The Rise of the Politics of Fear (2004)
Real Fiction (Shilje sanghwang) (2000)
Route Irish (2010)
Separation City (2009)
Slither (2006)
Stealing Harvard (2002)
Tailor of Panama, The (2001)
The Hire: Ambush (2001)

In [14]:

```
# clear memory
import gc

del user_rating_count
del movie_rating_count
del df_ratings
gc.collect()
```

Out[14]:

```
291
```

In [17]:

```
df = user_df.values.T

df.shape
```

Out[17]:

```
(10406, 153548)
```

In [18]:

```
# reduce dimensionality of data using ingular value decomposition
from sklearn.decomposition import TruncatedSVD

SVD = TruncatedSVD(n_components = 20, random_state = 0)
matrix = SVD.fit_transform(df)

matrix.shape
```

Out[18]:

```
(10406, 20)
```

In [19]:

```
# Get correlation coefficients
import numpy as np
corr = np.corrcoef(matrix)
```

In [21]:

```
movie_title = user_df.columns

movie_list = list(movie_title)

movie = "Minority Report (2002)"

# find the index for the movie
movie_index = movie_list.index(movie)
```

In [35]:

```
corr_movie_index  = corr[movie_index]
corr_list = list(movie_title[(corr_movie_index > 0.8) & (corr_movie_index < 1

print(corr_list[:11])
```

```
['A.I. Artificial Intelligence (2001)', 'Beautiful Mind, A (2001)', 'Bourne Id
entity, The (2002)', 'Catch Me If You Can (2002)', 'Italian Job, The (2003)',
'K-PAX (2001)', 'Last Samurai, The (2003)', 'Matrix Reloaded, The (2003)', 'Ma
trix Revolutions, The (2003)', "Ocean's Eleven (2001)", 'Pirates of the Caribb
ean: The Curse of the Black Pearl (2003)']
```

In [44]:

```
# Reduce features for sparse data
from scipy.sparse import csr_matrix

csr = csr_matrix(df)
```

In [53]:

```
from sklearn.neighbors import NearestNeighbors
from sklearn.model_selection import GridSearchCV

acc = []


# Create knn model
knn = NearestNeighbors(n_neighbors = 25, n_jobs = -1)
knn.fit(csr)
```

Out[53]:

```
NearestNeighbors(n_jobs=-1, n_neighbors=25)
```

In [74]:

```
def get_movie_recommendation(movie_name):
    n_movies_to_reccomend = 10

    movie_idx = movie_list.index(movie)

    distances , indices = knn.kneighbors(csr[movie_idx], n_neighbors = n_movi

    # Create list of movies to recommend
    movies = []

    for i in indices:
        for j in i:
            movies.append(movie_list[j])
    return movies
```

In [75]:

```
get_movie_recommendation(movie)
```

```
Out[75]: ['Minority Report (2002)',
          'Spider-Man (2002)',
          'Matrix Reloaded, The (2003)',
          'Star Wars: Episode II - Attack of the Clones (2002)',
          'Signs (2002)',
          'X2: X-Men United (2003)',
          'Matrix Revolutions, The (2003)',
          'Spider-Man 2 (2004)',
          'Men in Black II (a.k.a. MIIB) (a.k.a. MIB 2) (2002)',
          'I, Robot (2004)',
          'Star Wars: Episode III - Revenge of the Sith (2005)']
```

```
In [ ]:
```