In [ ]:

```
import pandas as pd
import numpy as np
from scipy.sparse import csr_matrix
from sklearn.neighbors import NearestNeighbors
import matplotlib.pyplot as plt
import seaborn as sns
```

In [ ]:

```
from google.colab import files
uploaded = files.upload()
```

Choose Files No file chosen

Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

```
Saving movies.csv to movies.csv
```

In [ ]:

```
from google.colab import files
uploaded = files.upload()
```

Choose Files No file chosen

Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

```
Saving ratings.xlsx to ratings.xlsx
```

In [ ]:

```
movies = pd.read_csv("movies.csv")
ratings = pd.read_excel("ratings.xlsx")
```

In [ ]:

```
movies.head()
```

Out[8]:

	movieId	title	genres
0	1	Toy Story (1995)	Adventure|Animation|Children|Comedy|Fantasy
1	2	Jumanji (1995)	Adventure|Children|Fantasy
2	3	Grumpier Old Men (1995)	Comedy|Romance
3	4	Waiting to Exhale (1995)	Comedy|Drama|Romance
4	5	Father of the Bride Part II (1995)	Comedy

In [ ]:

```
ratings.head()
```

Out[9]:

```
   userId  movieId  rating  timestamp
0       1        1     4.0  964982703
1       1        3     4.0  964981247
2       1        6     4.0  964982224
3       1       47     5.0  964983815
4       1       50     5.0  964982931
```

In [ ]:

```
final_dataset = ratings.pivot(index='movieId',columns='userId',values='rating')
final_dataset.head()
```

Out[12]:

```
 userId    1    2    3    4    5    6    7    8    9   10  ...  601  602  603  604  60
movieId
      1  4.0  NaN  NaN  NaN  4.0  NaN  4.5  NaN  NaN  NaN  ...  4.0  NaN  4.0  3.0  4
      2  NaN  NaN  NaN  NaN  NaN  4.0  NaN  4.0  NaN  NaN  ...  NaN  4.0  NaN  5.0  3
      3  4.0  NaN  NaN  NaN  NaN  5.0  NaN  NaN  NaN  NaN  ...  NaN  NaN  NaN  NaN  Na
      4  NaN  NaN  NaN  NaN  NaN  3.0  NaN  NaN  NaN  NaN  ...  NaN  NaN  NaN  NaN  Na
      5  NaN  NaN  NaN  NaN  NaN  5.0  NaN  NaN  NaN  NaN  ...  NaN  NaN  NaN  3.0  Na
```

5 rows × 610 columns

In [ ]:

```
final_dataset.fillna(0,inplace=True)
final_dataset.head()
```

Out[13]:

```
 userId    1    2    3    4    5    6    7    8    9   10  ...  601  602  603  604  605  606  607  60
movieId
      1  4.0  0.0  0.0  0.0  4.0  0.0  4.5  0.0  0.0  0.0  ...  4.0  0.0  4.0  3.0  4.0  2.5  4.0  2
      2  0.0  0.0  0.0  0.0  0.0  4.0  0.0  4.0  0.0  0.0  ...  0.0  4.0  0.0  5.0  3.5  0.0  0.0  2
      3  4.0  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  0.0  0.0  0.0  2
      4  0.0  0.0  0.0  0.0  0.0  3.0  0.0  0.0  0.0  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  5.0  0.0  0.0  0.0  0.0  ...  0.0  0.0  0.0  3.0  0.0  0.0  0.0  0
```

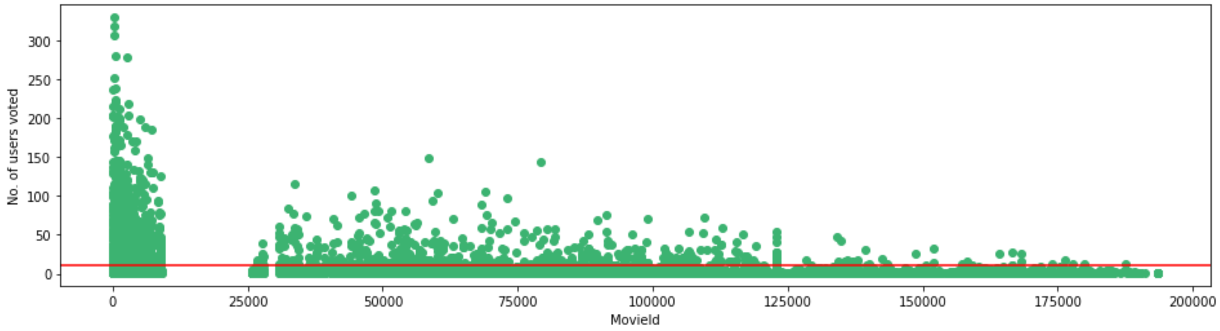
5 rows × 610 columns

In [ ]:

```
no_user_voted = ratings.groupby('movieId')['rating'].agg('count')
no_movies_voted = ratings.groupby('userId')['rating'].agg('count')
```

In [ ]:

```
f,ax = plt.subplots(1,1,figsize=(16,4))
# ratings['rating'].plot(kind='hist')
plt.scatter(no_user_voted.index,no_user_voted,color='mediumseagreen')
plt.axhline(y=10,color='r')
plt.xlabel('MovieId')
plt.ylabel('No. of users voted')
plt.show()
```

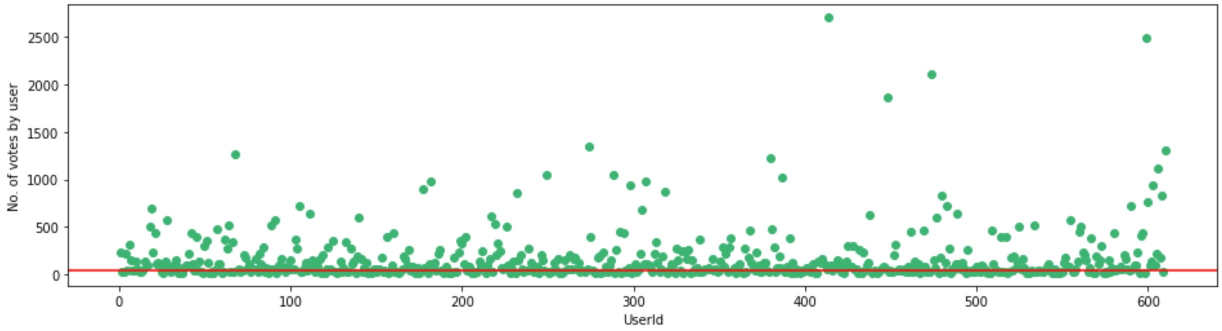


In [ ]:

```
final_dataset = final_dataset.loc[no_user_voted[no_user_voted > 10].index,:]
```

In [ ]:

```
f,ax = plt.subplots(1,1,figsize=(16,4))
plt.scatter(no_movies_voted.index,no_movies_voted,color='mediumseagreen')
plt.axhline(y=50,color='r')
plt.xlabel('UserId')
plt.ylabel('No. of votes by user')
plt.show()
```



In [ ]:
```
final_dataset=final_dataset.loc[:,no_movies_voted[no_movies_voted > 50].index]
final_dataset
```

Out[18]:

userId	1	4	6	7	10	11	15	16	17	18	...	600	601	602	603	604	605	606	60
movieId																			
1	4.0	0.0	0.0	4.5	0.0	0.0	2.5	0.0	4.5	3.5	...	2.5	4.0	0.0	4.0	3.0	4.0	2.5	4
2	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	...	4.0	0.0	4.0	0.0	5.0	3.5	0.0	0
3	4.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
5	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	2.5	0.0	0.0	0.0	3.0	0.0	0.0	0
6	4.0	0.0	4.0	0.0	0.0	5.0	0.0	0.0	0.0	4.0	...	0.0	0.0	3.0	4.0	3.0	0.0	0.0	0
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
174055	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	0.0	0.0	0
176371	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	0.0	0.0	0
177765	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0
179819	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
187593	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0

2121 rows × 378 columns

In [ ]:
```
sample = np.array([[0,0,3,0,0],[4,0,0,0,2],[0,0,0,0,1]])
sparsity = 1.0 - ( np.count_nonzero(sample) / float(sample.size) )
print(sparsity)
```

```
0.7333333333333334
```

In [ ]:
```
csr_sample = csr_matrix(sample)
print(csr_sample)
```

```
  (0, 2)	3
  (1, 0)	4
  (1, 4)	2
  (2, 4)	1
```

In [ ]:
```
csr_data = csr_matrix(final_dataset.values)
final_dataset.reset_index(inplace=True)
```

In [ ]:
```
knn = NearestNeighbors(metric='cosine', algorithm='brute', n_neighbors=20, n_jobs
knn.fit(csr_data)
```

Out[22]:
```
NearestNeighbors(algorithm='brute', metric='cosine', n_jobs=-1, n_neighbors=20)
```

In [ ]:
```
def get_movie_recommendation(movie_name):
    n_movies_to_reccomend = 10
    movie_list = movies[movies['title'].str.contains(movie_name)]
    if len(movie_list):
        movie_idx= movie_list.iloc[0]['movieId']
        movie_idx = final_dataset[final_dataset['movieId'] == movie_idx].index[0
        distances , indices = knn.kneighbors(csr_data[movie_idx],n_neighbors=n_mo
        rec_movie_indices = sorted(list(zip(indices.squeeze().tolist(),distances.
        recommend_frame = []
        for val in rec_movie_indices:
            movie_idx = final_dataset.iloc[val[0]]['movieId']
            idx = movies[movies['movieId'] == movie_idx].index
            recommend_frame.append({'Title':movies.iloc[idx]['title'].values[0],'
        df = pd.DataFrame(recommend_frame,index=range(1,n_movies_to_reccomend+1))
        return df
    else:
        return "No movies found. Please check your input"
```

In [ ]:
```
get_movie_recommendation('Iron Man')
```

Out[24]:

	Title	Distance
1	Up (2009)	0.368857
2	Guardians of the Galaxy (2014)	0.368758
3	Watchmen (2009)	0.368558
4	Star Trek (2009)	0.366029
5	Batman Begins (2005)	0.362759
6	Avatar (2009)	0.310893
7	Iron Man 2 (2010)	0.307492
8	WALL·E (2008)	0.298138
9	Dark Knight, The (2008)	0.285835
10	Avengers, The (2012)	0.285319

In [ ]:

```
get_movie_recommendation('Memento')
```

Out[25]:

	Title	Distance
1	American Beauty (1999)	0.389346
2	American History X (1998)	0.388615
3	Pulp Fiction (1994)	0.386235
4	Lord of the Rings: The Return of the King, The...	0.371622
5	Kill Bill: Vol. 1 (2003)	0.350167
6	Lord of the Rings: The Two Towers, The (2002)	0.348358
7	Eternal Sunshine of the Spotless Mind (2004)	0.346196
8	Matrix, The (1999)	0.326215
9	Lord of the Rings: The Fellowship of the Ring,...	0.316777
10	Fight Club (1999)	0.272380