```
pip install numpy
```

```
Requirement already satisfied: numpy in /usr/local/lib/python3.10/dist-packages (1.23.5)
```

```
pip install scikit-surprise
```

```
Collecting scikit-surprise
  Downloading scikit-surprise-1.1.3.tar.gz (771 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 772.0/772.0 kB 8.9 MB/s eta 0:00:00
  Preparing metadata (setup.py) ... done
Requirement already satisfied: joblib>=1.0.0 in /usr/local/lib/python3.10/dist-packages (from scikit-surprise) (1.3.2)
Requirement already satisfied: numpy>=1.17.3 in /usr/local/lib/python3.10/dist-packages (from scikit-surprise) (1.23.5)
Requirement already satisfied: scipy>=1.3.2 in /usr/local/lib/python3.10/dist-packages (from scikit-surprise) (1.11.3)
Building wheels for collected packages: scikit-surprise
  Building wheel for scikit-surprise (setup.py) ... done
  Created wheel for scikit-surprise: filename=scikit_surprise-1.1.3-cp310-cp310-linux_x86_64.whl size=3163491 sha256=8f29a00699ba40a3b24
  Stored in directory: /root/.cache/pip/wheels/a5/ca/a8/4e28def53797fdc4363ca4af740db15a9c2f1595ebc51fb445
Successfully built scikit-surprise
Installing collected packages: scikit-surprise
Successfully installed scikit-surprise-1.1.3
```

+ Code + Text

```
import numpy as np
import pandas as pd
import datetime
from sklearn import preprocessing
from sklearn.datasets import make_blobs
from sklearn.preprocessing import StandardScaler
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.metrics.pairwise import cosine_similarity
import re
from scipy.sparse import csr_matrix
import scipy as sp
```

```
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.graph_objs as go
from plotly.offline import init_notebook_mode, plot, iplot
%matplotlib inline
```

```
from surprise import Reader
from surprise import Dataset
from surprise import KNNWithMeans
from surprise import KNNBasic
from surprise.model_selection import cross_validate
from surprise.model_selection import GridSearchCV
from surprise import SVD
from surprise import SVDpp
from surprise import NMF
from surprise import SlopeOne
from surprise import CoClustering
import heapq

from sklearn.metrics import mean_squared_error
from sklearn.metrics import mean_absolute_error
from time import time
```

```
import warnings
warnings.filterwarnings("ignore")

import pickle
```

```
from google.colab import drive
```

```
drive.mount('/content/drive', force_remount=True)
```

```
Mounted at /content/drive
```

```
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

```
import pandas as pd
```

```
train = pd.read_csv('/content/drive/MyDrive/train.csv')
test_df = pd.read_csv('/content/drive/MyDrive/test.csv')
df_movies = pd.read_csv('/content/drive/MyDrive/movies.csv')
df_imdb = pd.read_csv('/content/drive/MyDrive/imdb_data.csv')
df_gtags = pd.read_csv('/content/drive/MyDrive/genome_tags.csv')
df_scores = pd.read_csv('/content/drive/MyDrive/genome_scores.csv')
df_tags = pd.read_csv('/content/drive/MyDrive/tags.csv')
df_links = pd.read_csv('/content/drive/MyDrive/links.csv')
```

```
df_imdb.info()
df_imdb.head(2)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 27278 entries, 0 to 27277
Data columns (total 6 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   movieId        27278 non-null  int64
 1   title_cast     17210 non-null  object
 2   director       17404 non-null  object
 3   runtime        15189 non-null  float64
 4   budget         7906 non-null   object
 5   plot_keywords  16200 non-null  object
dtypes: float64(1), int64(1), object(4)
memory usage: 1.2+ MB
```

	movieId	title_cast	director	runtime	budget	plot_keywords
0	1	Tom Hanks|Tim Allen|Don Rickles|Jim Varney|Wal...	John Lasseter	81.0	$30,000,000	toy|rivalry|cowboy|cgi animation
1	2	Robin Williams|Jonathan Hyde|Kirsten Dunst|Bra...	Jonathan Hensleigh	104.0	$65,000,000	board game|adventurer|fight|game

```
df_movies.info()
df_movies.head()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 62423 entries, 0 to 62422
Data columns (total 3 columns):
 #   Column   Non-Null Count  Dtype
---  ------   --------------  -----
 0   movieId  62423 non-null  int64
 1   title    62423 non-null  object
 2   genres   62423 non-null  object
dtypes: int64(1), object(2)
memory usage: 1.4+ MB
```

	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

```
df_gtags.info()
df_gtags.head()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1128 entries, 0 to 1127
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   tagId   1128 non-null   int64
 1   tag     1128 non-null   object
dtypes: int64(1), object(1)
memory usage: 17.8+ KB
```

	tagId	tag
0	1	007
1	2	007 (series)
2	3	18th century
3	4	1920s
4	5	1930s

```
df_scores.info()
df_scores.head(2)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 15584448 entries, 0 to 15584447
Data columns (total 3 columns):
 #   Column     Dtype
---  ------     -----
 0   movieId    int64
 1   tagId      int64
 2   relevance  float64
dtypes: float64(1), int64(2)
memory usage: 356.7 MB
```

	movieId	tagId	relevance
0	1	1	0.02875
1	1	2	0.02375

```
df_tags.info()
df_tags.head()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1093360 entries, 0 to 1093359
Data columns (total 4 columns):
 #   Column     Non-Null Count    Dtype
---  ------     --------------    -----
 0   userId     1093360 non-null  int64
 1   movieId    1093360 non-null  int64
 2   tag        1093344 non-null  object
 3   timestamp  1093360 non-null  int64
dtypes: int64(3), object(1)
memory usage: 33.4+ MB
```

	userId	movieId	tag	timestamp
0	3	260	classic	1439472355
1	3	260	sci-fi	1439472256
2	4	1732	dark comedy	1573943598
3	4	1732	great dialogue	1573943604
4	4	7569	so bad it's good	1573943455

```
df_links.info()
df_links.head()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 62423 entries, 0 to 62422
Data columns (total 3 columns):
 #   Column   Non-Null Count  Dtype
---  ------   --------------  -----
 0   movieId  62423 non-null  int64
 1   imdbId   62423 non-null  int64
 2   tmdbId   62316 non-null  float64
dtypes: float64(1), int64(2)
memory usage: 1.4 MB
```

	movieId	imdbId	tmdbId
0	1	114709	862.0
1	2	113497	8844.0
2	3	113228	15602.0
3	4	114885	31357.0
4	5	113041	11862.0

```
train.head()
```

	userId	movieId	rating	timestamp
0	5163	57669	4.0	1518349992
1	106343	5	4.5	1206238739
2	146790	5459	5.0	1076215539
3	106362	32296	2.0	1423042565
4	9041	366	3.0	833375837

```
train.isnull().sum()
```

```
userId       0
movieId      0
rating       0
timestamp    0
dtype: int64
```

```
duplicate_bool = train.duplicated(['userId', 'movieId', 'rating'])

print("Number of duplicate records:", sum(duplicate_bool))
```

```
Number of duplicate records: 0
```

```
df_train = train
df_train.head(2)
```

	userId	movieId	rating	timestamp
0	5163	57669	4.0	1518349992
1	106343	5	4.5	1206238739

```
combined_df = df_train.merge(df_movies, on='movieId')

combined_df.head()
```

	userId	movieId	rating	timestamp	title	genres
0	5163	57669	4.0	1518349992	In Bruges (2008)	Comedy|Crime|Drama|Thriller
1	87388	57669	3.5	1237455297	In Bruges (2008)	Comedy|Crime|Drama|Thriller
2	137050	57669	4.0	1425631854	In Bruges (2008)	Comedy|Crime|Drama|Thriller
3	120490	57669	4.5	1408228517	In Bruges (2008)	Comedy|Crime|Drama|Thriller
4	50616	57669	4.5	1446941640	In Bruges (2008)	Comedy|Crime|Drama|Thriller

```
combined_df2 = df_train.merge(df_imdb, on="movieId")
combined_df2.head()
```

	userId	movieId	rating	timestamp	title_cast	director	runtime	budget	plot_keywords
0	5163	57669	4.0	1518349992	Elizabeth Berrington|Rudy Blomme|Olivier Bonjo...	Martin McDonagh	107.0	$15,000,000	dwarf|bruges|irish|hitman
1	87388	57669	3.5	1237455297	Elizabeth Berrington|Rudy Blomme|Olivier Bonjo...	Martin McDonagh	107.0	$15,000,000	dwarf|bruges|irish|hitman
2	137050	57669	4.0	1425631854	Elizabeth Berrington|Rudy Blomme|Olivier Bonjo...	Martin McDonagh	107.0	$15,000,000	dwarf|bruges|irish|hitman
					Elizabeth Berrington|Rudy Blomme|Olivier	Martin			

```
combined_df3 = combined_df.merge(df_imdb, on="movieId" )
combined_df3.head()
```

	userId	movieId	rating	timestamp	title	genres	title_cast	director	runtime	budget	plot_keyw
0	5163	57669	4.0	1518349992	In Bruges (2008)	Comedy|Crime|Drama|Thriller	Elizabeth Berrington|Rudy Blomme|Olivier Bonjo...	Martin McDonagh	107.0	$15,000,000	dwarf|bruges|irish|h
1	87388	57669	3.5	1237455297	In Bruges (2008)	Comedy|Crime|Drama|Thriller	Elizabeth Berrington|Rudy Blomme|Olivier Bonjo...	Martin McDonagh	107.0	$15,000,000	dwarf|bruges|irish|h
2	137050	57669	4.0	1425631854	In Bruges (2008)	Comedy|Crime|Drama|Thriller	Elizabeth Berrington|Rudy Blomme|Olivier Bonjo	Martin McDonagh	107.0	$15,000,000	dwarf|bruges|irish|h

```
combined_df3.isnull().sum()
```

```
userId                0
movieId               0
rating                0
timestamp             0
title                 0
genres                0
title_cast      2604407
director        2602688
runtime         2653058
budget          3152276
plot_keywords   2610043
dtype: int64
```

```
combined_df3['plot_keywords'].tail(100)
```

```
9632931                                          NaN
9632932    sex|male frontal nudity|prostitution|perversity
9632933                                  color in title
9632934                                          NaN
9632935        murder|serial killer|peeping|female nudity
                                ...
9633026                                          NaN
9633027      janitor|income|housing problem|social problem
9633028                                          NaN
9633029                    soldier|italy|partisan|fascist
9633030            genius|artist|greek american|direction
Name: plot_keywords, Length: 100, dtype: object
```

```
train['rating'].unique()
```

```
array([4. , 4.5, 5. , 2. , 3. , 1. , 3.5, 2.5, 0.5, 1.5])
```

```
train['rating'].describe()
```

```
count    1.000004e+07
mean     3.533395e+00
std      1.061124e+00
min      5.000000e-01
25%      3.000000e+00
50%      3.500000e+00
75%      4.000000e+00
```

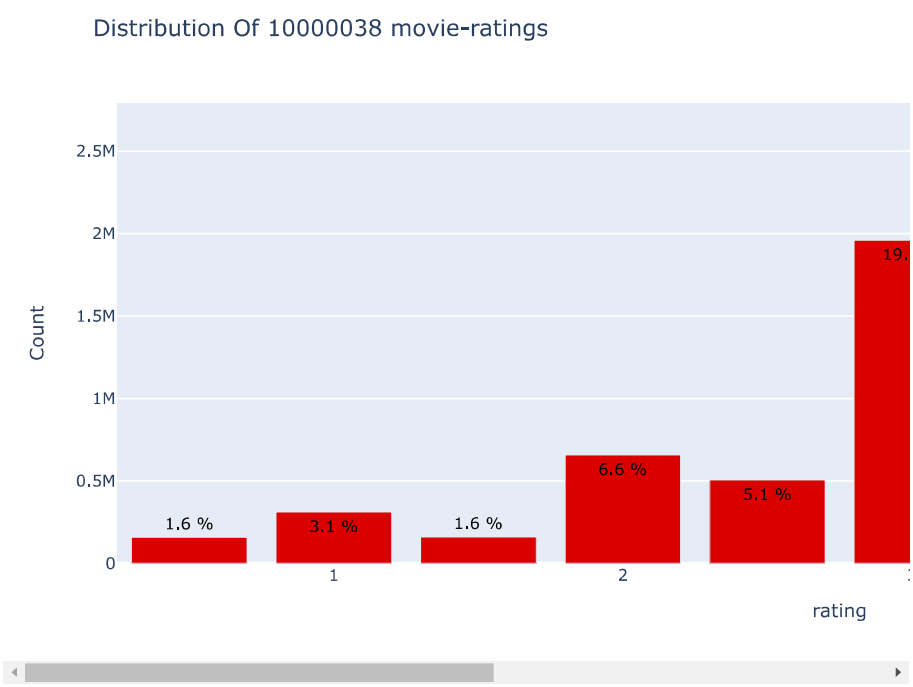
```
max      5.000000e+00
Name: rating, dtype: float64
```

```
rating_per_user = df_train.groupby('userId')['rating'].count().reset_index().sort_values('rating', ascending = False)
rating_per_user.head()
```

	userId	rating
72314	72315	12952
80973	80974	3680
137292	137293	3588
33843	33844	3208
20054	20055	3050

```
import plotly.graph_objects as go
```

```
data = combined_df['rating'].value_counts().sort_index(ascending=False)

trace = go.Bar(x=data.index,
               text=['{:.1f} %'.format(val) for val in (data.values / combined_df.shape[0] * 100)],
               textposition='auto',
               textfont=dict(color='#000000'),
               y=data.values,
               marker=dict(color='#db0000'))
layout = dict(title='Distribution Of {} movie-ratings'.format(combined_df.shape[0]),
              xaxis=dict(title='rating'),
              yaxis=dict(title='Count'))
fig = go.Figure(data=[trace], layout=layout)
iplot(fig)
```




```
ranked_movies = combined_df3.groupby('title')['rating'].mean().sort_values(ascending = False)
ranked_movies.head()
```

```
title
Wrestling for Jesus: The Tale of T-Money (2011)    5.0
The... Beautiful Country (1977)                    5.0
Only Daughter (2013)                               5.0
Vasermil (2007)                                    5.0
Day the Universe Changed, The (1985)               5.0
Name: rating, dtype: float64
```

```
combined_df3.rename(columns={'rating_x': 'rating', 'rating_y': 'numRatings'}, inplace=True)
num_ratings = pd.DataFrame(combined_df3.groupby('movieId').count()['rating']).reset_index()
combined_df3 = pd.merge(left=combined_df3, right=num_ratings, on='movieId')
combined_df3.rename(columns={'rating_x': 'rating', 'rating_y': 'numRatings'}, inplace=True)
```

```
combined_df3['budget'] = combined_df3['budget'].astype(str)

combined_df3['budget'] = combined_df3['budget'].str.replace(',', '')

combined_df3['budget'] = combined_df3['budget'].str.replace('[$£]', '', regex=True)

combined_df3['budget'] = pd.to_numeric(combined_df3['budget'], errors='coerce')
```

```
combined_df3['budget'] = combined_df3['budget'].fillna(0)
```

```
combined_df3['release_year'] = combined_df3.title.str.extract('(\(\d\d\d\d\))', expand=False)

combined_df3['release_year'] = combined_df3.release_year.str.extract('(\d\d\d\d)', expand=False)

combined_df3.head(2)
```

	userId	movieId	rating	timestamp	title	genres	title_cast
0	5163	57669	4.0	1518349992	In Bruges (2008)	Comedy|Crime|Drama|Thriller	Elizabeth Berrington|Rudy Blomme|Olivier Bonjo...
1	87388	57669	3.5	1237455297	In Bruges (2008)	Comedy|Crime|Drama|Thriller	Elizabeth Berrington|Rudy Blomme|Olivier Bonjo...

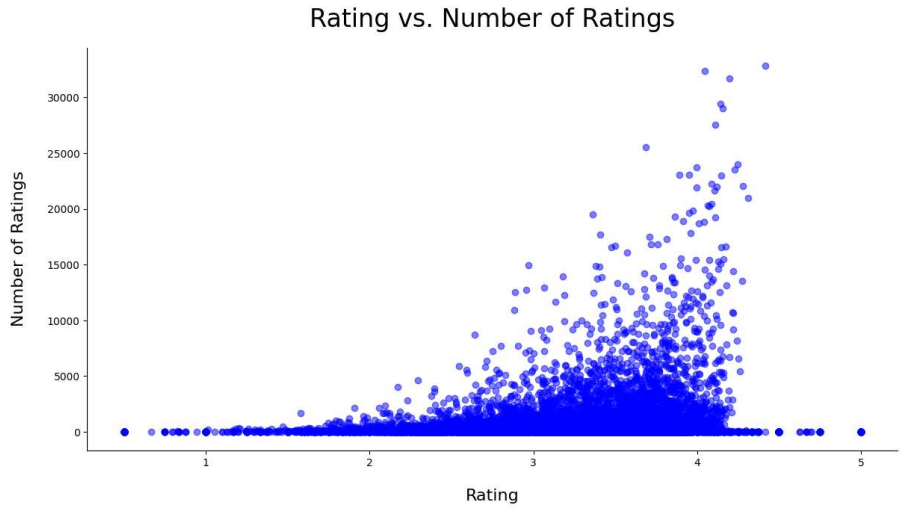
```
data_1= combined_df3.drop_duplicates('movieId')

data_1.head(2)
```

	userId	movieId	rating	timestamp	title	genres	title_ca
0	5163	57669	4.0	1518349992	In Bruges (2008)	Comedy|Crime|Drama|Thriller	Elizab Berrington|Ru Blomme|Oliv Bonj
4253	106343	5	4.5	1206238739	Father of the Bride Part II (1995)	Comedy	Ste Martin|Dia Keaton|Mar Short|Kimber

```
import matplotlib.pyplot as plt
```

```
ratings_df = pd.DataFrame()

ratings_df['Mean_Rating'] = combined_df3.groupby('title')['rating'].mean().values

ratings_df['Num_Ratings'] = combined_df3.groupby('title')['rating'].count().values

fig, ax = plt.subplots(figsize=(14, 7))
ax.spines['top'].set_visible(False)
ax.spines['right'].set_visible(False)
ax.set_title('Rating vs. Number of Ratings', fontsize=24, pad=20)
ax.set_xlabel('Rating', fontsize=16, labelpad=20)
ax.set_ylabel('Number of Ratings', fontsize=16, labelpad=20)

plt.scatter(ratings_df['Mean_Rating'], ratings_df['Num_Ratings'], alpha=0.5, color='blue')
```

```
<matplotlib.collections.PathCollection at 0x7bbb35227820>
```




```
list_list =list(df_movies['genres'].str.split('|'))
genres_list = []
for i in list_list:
    for j in i:
        genres_list.append(j)
print(genres_list[0:11])
print(len(genres_list))
```

```
['Adventure', 'Animation', 'Children', 'Comedy', 'Fantasy', 'Adventure', 'Children', 'Fantasy', 'Comedy', 'Romance', 'Comedy']
112307
```

```
genres_list = pd.DataFrame(genres_list)
genres_list.rename(columns ={0:'genres'},inplace = True)
genres_list.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 112307 entries, 0 to 112306
Data columns (total 1 columns):
 #   Column  Non-Null Count   Dtype
---  ------  --------------   -----
 0   genres  112307 non-null  object
dtypes: object(1)
memory usage: 877.5+ KB
```

```
genres_counted = pd.DataFrame(genres_list['genres'].value_counts())
```

```
genres_counted.reset_index(inplace = True)
genres_counted.rename(columns = {'index':'genres','genres': 'count'}, inplace = True)
genres_counted.head()
```

	genres	count
0	Drama	25606
1	Comedy	16870
2	Thriller	8654
3	Romance	7719
4	Action	7348

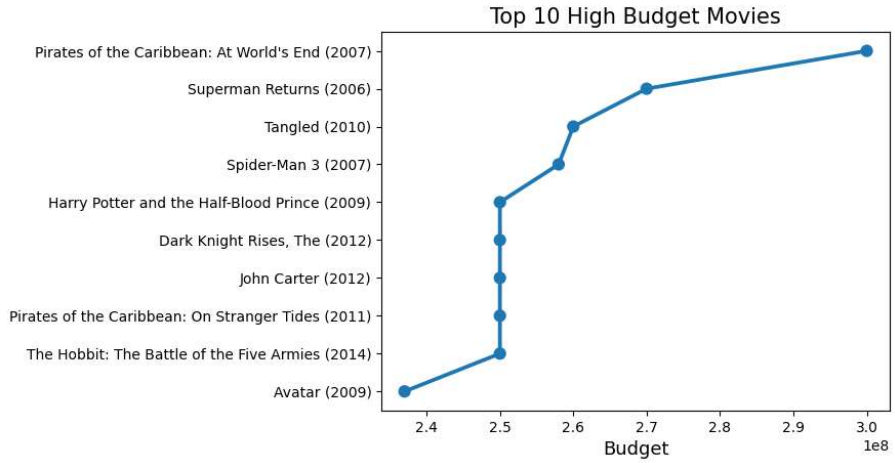
```
genome_df = pd.merge(df_scores, df_gtags, how = 'left', on = 'tagId')
genome_df.head()
```

	movieId	tagId	relevance	tag
0	1	1	0.02875	007
1	1	2	0.02375	007 (series)
2	1	3	0.06250	18th century
3	1	4	0.07575	1920s
4	1	5	0.14075	1930s

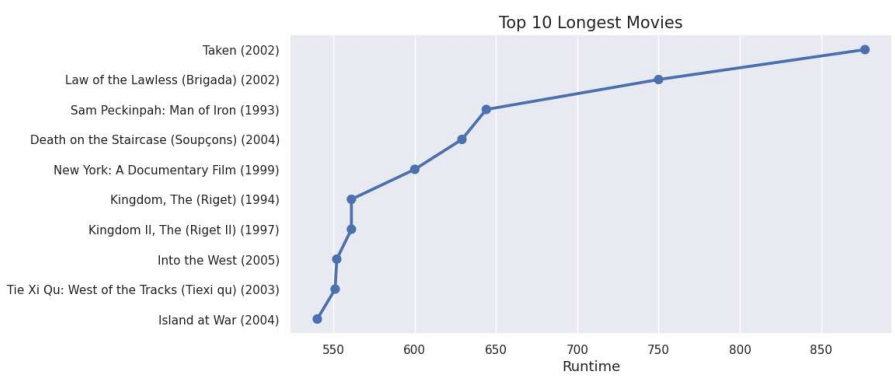
```
df_genre_tag = genome_df.merge(df_movies, on = 'movieId', how = 'outer')
df_genre_tag.head(2)
```

	movieId	tagId	relevance	tag	title	genres
0	1	1.0	0.02875	007	Toy Story (1995)	Adventure|Animation|Children|Comedy|Fantasy

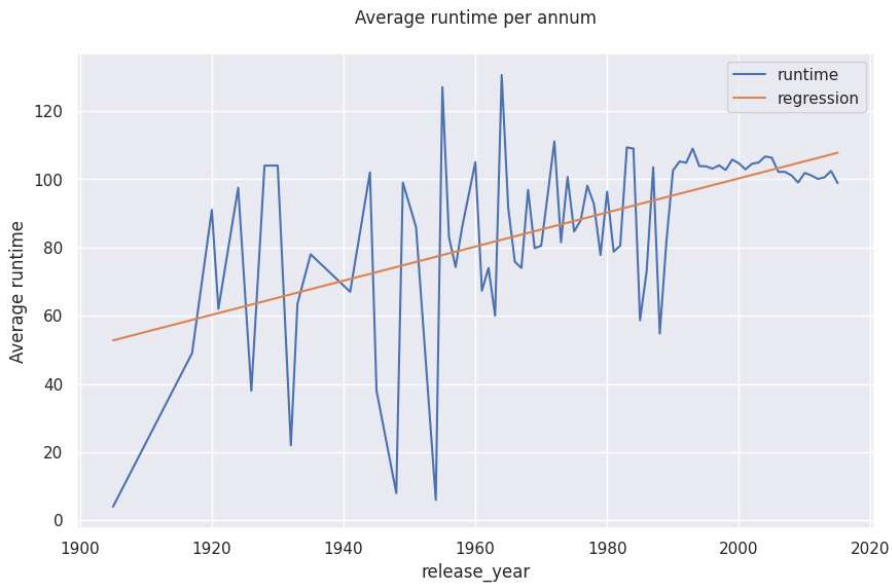
```
import seaborn as sns
import matplotlib.pyplot as plt


info = pd.DataFrame(data_1['budget'].sort_values(ascending = False))
info['title'] = data_1['title']
data = list(map(str,(info['title'])))

x = list(data[:10])
y = list(info['budget'][:10])

ax = sns.pointplot(x=y,y=x)
sns.set(rc={'figure.figsize':(10,5)})
ax.set_title("Top 10 High Budget Movies",fontsize = 15)
ax.set_xlabel("Budget",fontsize = 13)
sns.set_style("darkgrid")
```



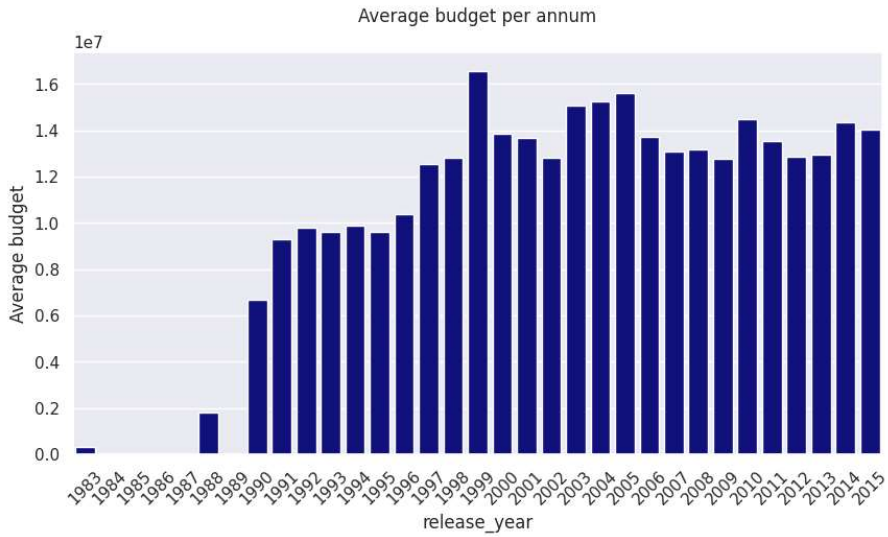

```
#top 10 Movies With Longest runtime
info = pd.DataFrame(data_1['runtime'].sort_values(ascending = False))
info['title'] = data_1['title']
data = list(map(str,(info['title'])))

x = list(data[:10])
y = list(info['runtime'][:10])

ax = sns.pointplot(x=y,y=x)
sns.set(rc={'figure.figsize':(10,5)})
ax.set_title("Top 10 Longest Movies",fontsize = 15)
ax.set_xlabel("Runtime",fontsize = 13)
sns.set_style("darkgrid")
```



```
from sklearn.linear_model import LinearRegression

# create a dataframe with runtime data
runtime_data = pd.DataFrame(data_1.dropna().groupby('release_year').mean()['runtime']).dropna()
runtime_data.index = runtime_data.index.astype('int')
runtime_data = runtime_data[runtime_data['runtime']>1].copy()

lrm = LinearRegression()
runtime_data = runtime_data.reset_index()
lrm.fit(runtime_data.release_year.values.reshape(-1,1),runtime_data.runtime.values.reshape(-1,1))

runtime_data['regression'] = lrm.predict(runtime_data.release_year.values.reshape(-1,1))

runtime_data = runtime_data.set_index('release_year')
runtime_data.plot(figsize=(10,6))
plt.title("Average runtime per annum\n")
plt.ylabel("Average runtime")
plt.show()
```




```
# create a dataframe with budget data
budget_data = pd.DataFrame(data_1.dropna().groupby('release_year').mean()['budget']).dropna()
budget_data.index = budget_data.index.astype('int')
runtime_data = budget_data[budget_data['budget']>1].copy()

budget_data = budget_data.reset_index()
budget_data = budget_data.drop('budget',1).merge(pd.DataFrame(budget_data[budget_data['release_year']>1982]), on ='release_year')

plt.figure(figsize=(10,5))
sns.barplot(x='release_year',y='budget',data=budget_data, color='darkblue')
plt.title("Average budget per annum\n")
plt.ylabel("Average budget")
plt.xticks(rotation=45)
plt.show()
```




```
def plot_correlation_map( df ):

    """
    This function gives a correlation map
    using all the features from merged data.

    Input : dataframe column
    datatype : dataframe (integer)

    output : Figure (bar plot)

    """
    # Plotting using the features

    corr = df.corr()
    _ , ax = plt.subplots( figsize =( 12 , 10 ) )
    cmap = sns.diverging_palette( 240 , 10 , as_cmap = True )
    _ = sns.heatmap(corr,cmap = cmap,square=True, cbar_kws={ 'shrink' : .9 }, ax=ax, annot = True, annot_kws = { 'fontsize' : 12 })
```

```
movies = df_movies
```

```
df_1 = df_imdb[['movieId','title_cast','director', 'plot_keywords']]
df_1 = df_1.merge(movies[['movieId', 'genres', 'title']], on='movieId', how='inner')
df_1.head(2)
```

	movieId	title_cast	director	plot_keywords	
0	1	Tom Hanks|Tim Allen|Don Rickles|Jim	John Lasseter	toy|rivalry|cowboy|cgi animation	Adventure|Animation|Children

```
# Convert data types to strings for string handling
df_1['title_cast'] = df_1.title_cast.astype(str)
df_1['plot_keywords'] = df_1.plot_keywords.astype(str)
df_1['genres'] = df_1.genres.astype(str)
df_1['director'] = df_1.director.astype(str)

df_1['director'] = df_1['director'].apply(lambda x: "".join(x.lower() for x in x.split()))
df_1['title_cast'] = df_1['title_cast'].apply(lambda x: "".join(x.lower() for x in x.split()))

df_1['title_cast'] = df_1['title_cast'].map(lambda x: x.split('|'))

df_1['plot_keywords'] = df_1['plot_keywords'].map(lambda x: x.split('|'))
df_1['plot_keywords'] = df_1['plot_keywords'].apply(lambda x: " ".join(x))

df_1['genres'] = df_1['genres'].map(lambda x: x.lower().split('|'))
df_1['genres'] = df_1['genres'].apply(lambda x: " ".join(x))

df_1.head()
```

	movieId	title_cast	director	plot_keywords	genres	title
0	1	[tomhanks, timallen, donrickles, jimvarney, wa...	johnlasseter	toy rivalry cowboy cgi animation	adventure animation children comedy fantasy	Toy Story (1995)
1	2	[robinwilliams, jonathanhyde, kirstendunst, br...	jonathanhensleigh	board game adventurer fight game	adventure children fantasy	Jumanji (1995)
2	3	[waltermatthau, jacklemmon, sophialoren, ann-m...	markstevenjohnson	boat lake neighbor rivalry	comedy romance	Grumpier Old Men (1995)

```
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.metrics.pairwise import cosine_similarity

from surprise.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler

from surprise.model_selection import GridSearchCV


df_1['liststring'] = df_1['title_cast'].apply(lambda x: ','.join(map(str, x)))

df_1['liststring'] = df_1['liststring'].replace(',',' ', regex=True)

df_features = df_1[['liststring','director','plot_keywords','genres']]

df_1['combined_features'] = df_features['liststring'] +' '+ df_features['director'] +' '+ df_features['plot_keywords'] +' '+ df_features['ge

cv =CountVectorizer()
cv_matrix = cv.fit_transform(df_1['combined_features'])

#now we obtain the cosine similarity matrix from the cv matrix
sim_score = cosine_similarity(cv_matrix,cv_matrix)

df_1.set_index('title', inplace = True)
indices = pd.Series(df_1.index)


print(sim_score)
```

```
[[1.         0.10910895 0.07715167 ... 0.03026138 0.         0.07881104]
 [0.10910895 1.         0.         ... 0.06163336 0.         0.08025724]
 [0.07715167 0.         1.         ... 0.         0.         0.        ]
 ...
 [0.03026138 0.06163336 0.         ... 1.         0.         0.03338903]
 [0.         0.         0.         ... 0.         1.         0.        ]
 [0.07881104 0.08025724 0.         ... 0.03338903 0.         1.        ]]
```

```
#Method to get recommenations
def recommendations(title,n,sim_score = sim_score):
    '''
    This method returns movies which are similar.

    Input:
        title: name of the movie to be compared
        n: number(quantity) of movies to be returned
        sim_core: similarity score
    Output:
        recommend movies
    '''

    recommended_movies = []

    idx = indices[indices == title].index[0]

    score_series = pd.Series(sim_score[idx]).sort_values(ascending = False)

    top_n_indexes = list(score_series.iloc[1:n+1].index)

    for i in top_n_indexes:
        recommended_movies.append(list(df_1.index)[i])

    return recommended_movies
```

```
recommendations('Innocence (2014)',10)
```

```
['King Kong (1933)',
 'Zu: Warriors from the Magic Mountain (Xin shu shan jian ke) (1983)',
 'Island of Dr. Moreau, The (1977)',
 'The Man in the Orange Jacket (2014)',
 'She (1965)',
 'Printed Rainbow (2006)',
 'MirrorMask (2005)',
 'Seventh Son (2014)',
 'The Prophecy: Forsaken (2005)',
 'The Damned (2014)']
```

```
# Load reader and data in Surprise dataframe
df_train = train.copy()
reader = Reader(rating_scale = (0.5, 5))
data = Dataset.load_from_df(df_train[['userId', 'movieId', 'rating']], reader)
```

```
trainset, testset = train_test_split(data, test_size=0.1)
```

```
# Base algorithm
algo = SVD()
algo.fit(trainset)
```

```
<surprise.prediction_algorithms.matrix_factorization.SVD at 0x7bbaab87b850>
```

```
# Using the 10% testset to make predictions
predictions = algo.test(testset)
predictions

test = pd.DataFrame(predictions)
```

```
test.head()
```

	uid	iid	r_ui	est	details
0	159395	1805	3.0	3.111852	{'was_impossible': False}
1	69693	1073	5.0	4.111816	{'was_impossible': False}
2	130284	58	5.0	4.672666	{'was_impossible': False}
3	28776	115617	3.5	4.432589	{'was_impossible': False}
4	91928	2005	4.0	3.878586	{'was_impossible': False}

```
ratings_predictions=[algo.predict(row.userId, row.movieId) for _,row in test_df.iterrows()]
ratings_predictions
```

```
[Prediction(uid=1, iid=2011, r_ui=None, est=3.089682575557945, details={'was_impossible': False}),
 Prediction(uid=1, iid=4144, r_ui=None, est=4.355548758994347, details={'was_impossible': False}),
 Prediction(uid=1, iid=5767, r_ui=None, est=3.388721437663148, details={'was_impossible': False}),
 Prediction(uid=1, iid=6711, r_ui=None, est=4.045082530843054, details={'was_impossible': False}),
 Prediction(uid=1, iid=7318, r_ui=None, est=3.304385002219601, details={'was_impossible': False}),
 Prediction(uid=1, iid=8405, r_ui=None, est=3.829216369124501, details={'was_impossible': False}),
 Prediction(uid=1, iid=8786, r_ui=None, est=4.103997105862923, details={'was_impossible': False}),
 Prediction(uid=2, iid=150, r_ui=None, est=3.36055650859955, details={'was_impossible': False}),
 Prediction(uid=2, iid=356, r_ui=None, est=3.8287895224630173, details={'was_impossible': False}),
 Prediction(uid=2, iid=497, r_ui=None, est=3.5860429036321473, details={'was_impossible': False}),
 Prediction(uid=2, iid=588, r_ui=None, est=2.9954014502446555, details={'was_impossible': False}),
 Prediction(uid=2, iid=653, r_ui=None, est=2.7775703941963164, details={'was_impossible': False}),
 Prediction(uid=2, iid=1080, r_ui=None, est=3.72282289167322, details={'was_impossible': False}),
 Prediction(uid=2, iid=1196, r_ui=None, est=4.151333622495135, details={'was_impossible': False}),
 Prediction(uid=2, iid=1198, r_ui=None, est=3.8844104048352817, details={'was_impossible': False}),
 Prediction(uid=2, iid=1201, r_ui=None, est=3.734370812119143, details={'was_impossible': False}),
 Prediction(uid=2, iid=1299, r_ui=None, est=3.725000945624323, details={'was_impossible': False}),
 Prediction(uid=2, iid=1485, r_ui=None, est=3.0983154188176645, details={'was_impossible': False}),
 Prediction(uid=2, iid=1580, r_ui=None, est=3.3495877860026075, details={'was_impossible': False}),
 Prediction(uid=2, iid=1693, r_ui=None, est=3.424765466285744, details={'was_impossible': False}),
 Prediction(uid=2, iid=2028, r_ui=None, est=3.783642541766892, details={'was_impossible': False}),
 Prediction(uid=2, iid=2083, r_ui=None, est=3.4284168998178832, details={'was_impossible': False}),
 Prediction(uid=2, iid=2617, r_ui=None, est=3.222914235004545, details={'was_impossible': False}),
 Prediction(uid=2, iid=2640, r_ui=None, est=2.873882496371321, details={'was_impossible': False}),
 Prediction(uid=2, iid=2918, r_ui=None, est=3.4591620497081688, details={'was_impossible': False}),
 Prediction(uid=2, iid=3098, r_ui=None, est=3.5269226971035037, details={'was_impossible': False}),
 Prediction(uid=2, iid=3114, r_ui=None, est=3.7935675421553112, details={'was_impossible': False}),
 Prediction(uid=2, iid=3510, r_ui=None, est=3.1704218373046817, details={'was_impossible': False}),
 Prediction(uid=2, iid=3994, r_ui=None, est=3.446227584515542, details={'was_impossible': False}),
 Prediction(uid=2, iid=4103, r_ui=None, est=3.490434053735088, details={'was_impossible': False}),
 Prediction(uid=2, iid=4963, r_ui=None, est=3.798058340243462, details={'was_impossible': False}),
 Prediction(uid=2, iid=5103, r_ui=None, est=3.249295675021867, details={'was_impossible': False}),
 Prediction(uid=2, iid=5955, r_ui=None, est=3.1747738672035086, details={'was_impossible': False}),
 Prediction(uid=2, iid=6156, r_ui=None, est=3.2732434048529453, details={'was_impossible': False}),
 Prediction(uid=2, iid=6287, r_ui=None, est=2.6953974583035842, details={'was_impossible': False}),
 Prediction(uid=2, iid=6311, r_ui=None, est=3.2880956187030113, details={'was_impossible': False}),
 Prediction(uid=2, iid=6753, r_ui=None, est=3.8977500628372943, details={'was_impossible': False}),
 Prediction(uid=2, iid=7075, r_ui=None, est=3.541716938895851, details={'was_impossible': False}),
 Prediction(uid=2, iid=7153, r_ui=None, est=4.292634701735269, details={'was_impossible': False}),
 Prediction(uid=2, iid=7386, r_ui=None, est=2.8984350243104435, details={'was_impossible': False}),
 Prediction(uid=2, iid=8961, r_ui=None, est=4.09514144523768, details={'was_impossible': False}),
 Prediction(uid=2, iid=30848, r_ui=None, est=3.573433025745973, details={'was_impossible': False}),
 Prediction(uid=2, iid=33493, r_ui=None, est=3.425454940170666, details={'was_impossible': False}),
 Prediction(uid=2, iid=34162, r_ui=None, est=3.0766612685365513, details={'was_impossible': False}),
 Prediction(uid=2, iid=40815, r_ui=None, est=4.3640767041009925, details={'was_impossible': False}),
 Prediction(uid=3, iid=1, r_ui=None, est=3.674853224139493, details={'was_impossible': False}),
 Prediction(uid=3, iid=260, r_ui=None, est=3.9565367756170136, details={'was_impossible': False}),
 Prediction(uid=3, iid=858, r_ui=None, est=4.297984087620668, details={'was_impossible': False}),
 Prediction(uid=3, iid=1198, r_ui=None, est=3.913629067615077, details={'was_impossible': False}),
 Prediction(uid=3, iid=1201, r_ui=None, est=4.407113945359762, details={'was_impossible': False}),
 Prediction(uid=3, iid=1214, r_ui=None, est=4.108003576174463, details={'was_impossible': False}),
 Prediction(uid=3, iid=1217, r_ui=None, est=4.546934276338445, details={'was_impossible': False}),
 Prediction(uid=3, iid=1221, r_ui=None, est=4.288314065898787, details={'was_impossible': False}),
 Prediction(uid=3, iid=1222, r_ui=None, est=4.2909841121006265, details={'was_impossible': False}),
 Prediction(uid=3, iid=1676, r_ui=None, est=3.520943048708721, details={'was_impossible': False}),
 Prediction(uid=3, iid=1909, r_ui=None, est=3.6259947315613967, details={'was_impossible': False}),
 Prediction(uid=3, iid=1960, r_ui=None, est=4.033286756793813, details={'was_impossible': False}),
 Prediction(uid=3, iid=3471, r_ui=None, est=3.771072662959557, details={'was_impossible': False}),
```

```
df_pred=pd.DataFrame(ratings_predictions)
df_pred
```

	uid	iid	r_ui	est	details
0	1	2011	None	3.089683	{'was_impossible': False}
1	1	4144	None	4.355549	{'was_impossible': False}
2	1	5767	None	3.388721	{'was_impossible': False}