In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score,roc_auc_score,confusion_matrix


%matplotlib inline
```

In [2]:
```
movies_data = pd.read_csv("movies.dat",sep="::",header=None,names=["MovieID","Ti
users_data = pd.read_csv("users.dat",sep="::",header=None,names=["UserID","Gende
ratings_data = pd.read_csv("ratings.dat",sep="::",header=None,names=["UserID","M
```

```
C:\Users\raada\Anaconda3\lib\site-packages\ipykernel_launcher.py:1: ParserWarni
ng: Falling back to the 'python' engine because the 'c' engine does not support
regex separators (separators > 1 char and different from '\s+' are interpreted
as regex); you can avoid this warning by specifying engine='python'.
  """Entry point for launching an IPython kernel.
C:\Users\raada\Anaconda3\lib\site-packages\ipykernel_launcher.py:2: ParserWarni
ng: Falling back to the 'python' engine because the 'c' engine does not support
regex separators (separators > 1 char and different from '\s+' are interpreted
as regex); you can avoid this warning by specifying engine='python'.

C:\Users\raada\Anaconda3\lib\site-packages\ipykernel_launcher.py:3: ParserWarni
ng: Falling back to the 'python' engine because the 'c' engine does not support
regex separators (separators > 1 char and different from '\s+' are interpreted
as regex); you can avoid this warning by specifying engine='python'.
  This is separate from the ipykernel package so we can avoid doing imports unt
il
```

In [3]:
```
data = pd.merge(users_data,ratings_data,on=["UserID"])
```

In [4]:
```
data.head()
```

Out[4]:

	UserID	Gender	Age	Occupation	Zip-code	MovieID	Rating	Timestamp
0	1	F	1	10	48067	1193	5	978300760
1	1	F	1	10	48067	661	3	978302109
2	1	F	1	10	48067	914	3	978301968
3	1	F	1	10	48067	3408	4	978300275
4	1	F	1	10	48067	2355	5	978824291

In [5]:
```
master_data = pd.merge(movies_data,data,on=["MovieID"],how="inner")
```

In [6]:
```
master_data.head()
```

Out[6]:

	MovieID	Title	Genres	UserID	Gender	Age	Occupation	Zip-code	Ratir
0	1	Toy Story (1995)	Animation|Children's|Comedy	1	F	1	10	48067	
1	1	Toy Story (1995)	Animation|Children's|Comedy	6	F	50	9	55117	
2	1	Toy Story (1995)	Animation|Children's|Comedy	8	M	25	12	11413	
3	1	Toy Story (1995)	Animation|Children's|Comedy	9	M	25	17	61614	
4	1	Toy Story (1995)	Animation|Children's|Comedy	10	F	35	1	95370	

In [7]:
```
master_data.drop(["Genres","Zip-code","Timestamp"],axis=1,inplace=True)
```

In [8]:
```
master_data.head()
```

Out[8]:

	MovieID	Title	UserID	Gender	Age	Occupation	Rating
0	1	Toy Story (1995)	1	F	1	10	5
1	1	Toy Story (1995)	6	F	50	9	4
2	1	Toy Story (1995)	8	M	25	12	4
3	1	Toy Story (1995)	9	M	25	17	5
4	1	Toy Story (1995)	10	F	35	1	5

In [9]:
```
master_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1000209 entries, 0 to 1000208
Data columns (total 7 columns):
MovieID       1000209 non-null int64
Title         1000209 non-null object
UserID        1000209 non-null int64
Gender        1000209 non-null object
Age           1000209 non-null int64
Occupation    1000209 non-null int64
Rating        1000209 non-null int64
dtypes: int64(5), object(2)
memory usage: 61.0+ MB
```

In [10]:
```
master_data.to_csv("master_data.csv",index=False)
```

Import New DataSet

In [11]:
```
movie_lens = pd.read_csv("master_data.csv")
```

Check first 5 rows of dataset

In [12]:
```
movie_lens.head()
```

Out[12]:

	MovieID	Title	UserID	Gender	Age	Occupation	Rating
0	1	Toy Story (1995)	1	F	1	10	5
1	1	Toy Story (1995)	6	F	50	9	4
2	1	Toy Story (1995)	8	M	25	12	4
3	1	Toy Story (1995)	9	M	25	17	5
4	1	Toy Story (1995)	10	F	35	1	5

Check more info about dataset

In [13]:
```
movie_lens.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000209 entries, 0 to 1000208
Data columns (total 7 columns):
MovieID       1000209 non-null int64
Title         1000209 non-null object
UserID        1000209 non-null int64
Gender        1000209 non-null object
Age           1000209 non-null int64
Occupation    1000209 non-null int64
Rating        1000209 non-null int64
dtypes: int64(5), object(2)
memory usage: 53.4+ MB
```

Check mean, median, mode about dataset columns

In [14]:
```
movie_lens.describe()
```

Out[14]:

	MovieID	UserID	Age	Occupation	Rating
count	1.000209e+06	1.000209e+06	1.000209e+06	1.000209e+06	1.000209e+06
mean	1.865540e+03	3.024512e+03	2.973831e+01	8.036138e+00	3.581564e+00
std	1.096041e+03	1.728413e+03	1.175198e+01	6.531336e+00	1.117102e+00
min	1.000000e+00	1.000000e+00	1.000000e+00	0.000000e+00	1.000000e+00
25%	1.030000e+03	1.506000e+03	2.500000e+01	2.000000e+00	3.000000e+00
50%	1.835000e+03	3.070000e+03	2.500000e+01	7.000000e+00	4.000000e+00
75%	2.770000e+03	4.476000e+03	3.500000e+01	1.400000e+01	4.000000e+00
max	3.952000e+03	6.040000e+03	5.600000e+01	2.000000e+01	5.000000e+00

Check data have null values or not

In [15]:
```
movie_lens.isna().any()
```

Out[15]:
```
MovieID       False
Title         False
UserID        False
Gender        False
Age           False
Occupation    False
Rating        False
dtype: bool
```

In [16]:
```
movie_lens.loc[:,movie_lens.isna().any()]
```

Out[16]:

0
1
2
3
4
...
1000204
1000205
1000206
1000207
1000208

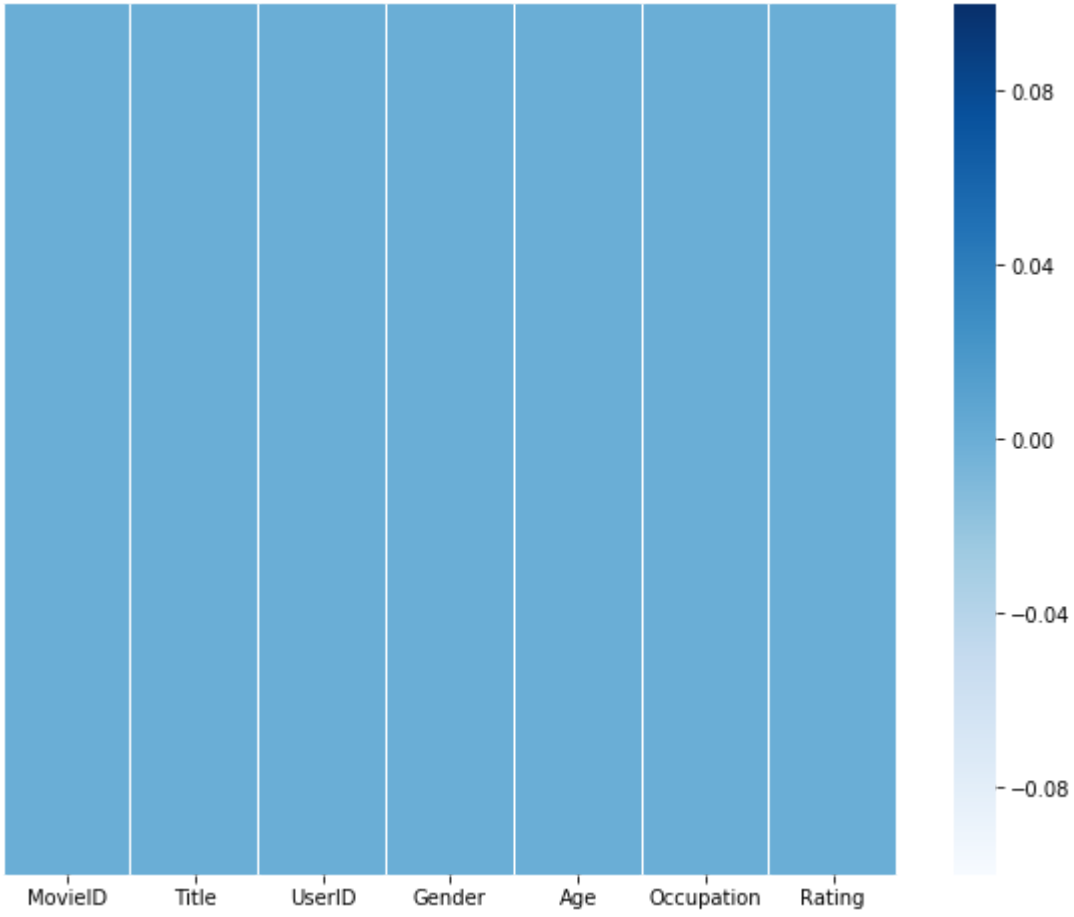
1000209 rows × 0 columns

In [17]:
```
movie_lens.isnull().sum()
```

Out[17]:
```
MovieID       0
Title         0
UserID        0
Gender        0
Age           0
Occupation    0
Rating        0
dtype: int64
```

In [18]:
```
plt.figure(figsize=(10,8))
sns.heatmap(movie_lens.isnull(),yticklabels=False,cbar="False",cmap="Blues")
```

Out[18]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x1ed335f3b88>
```



User Age Distibution

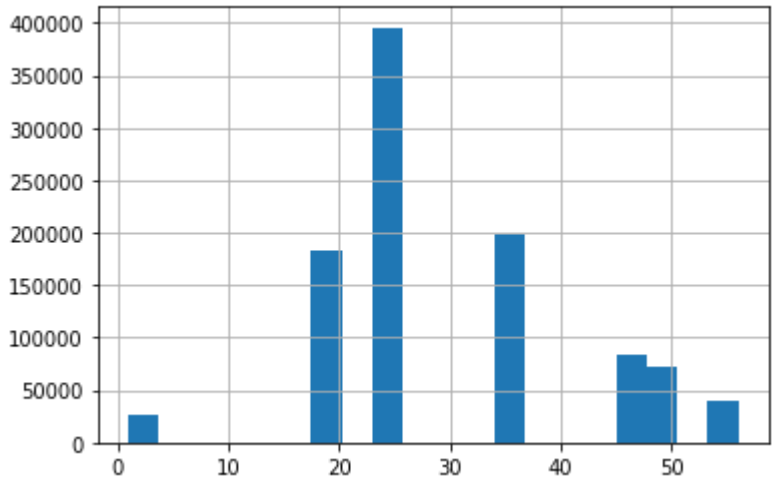
In [19]:
```
age_group = movie_lens.groupby("Age").size()
```

In [20]:
```
age_group
```

Out[20]:
```
Age
1      27211
18    183536
25    395556
35    199003
45     83633
50     72490
56     38780
dtype: int64
```

In [21]:
```
movie_lens["Age"].hist(bins=20)
```

Out[21]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x1ed33668d88>
```



In [22]:
```
movie_lens.head()
```

Out[22]:

	MovieID	Title	UserID	Gender	Age	Occupation	Rating
0	1	Toy Story (1995)	1	F	1	10	5
1	1	Toy Story (1995)	6	F	50	9	4
2	1	Toy Story (1995)	8	M	25	12	4
3	1	Toy Story (1995)	9	M	25	17	5
4	1	Toy Story (1995)	10	F	35	1	5

User rating of the movie "Toy Story"

In [23]:
```
toy_story = movie_lens[movie_lens["MovieID"]==1]
```

In [24]:
```
toy_story
```

Out[24]:

	MovieID	Title	UserID	Gender	Age	Occupation	Rating
0	1	Toy Story (1995)	1	F	1	10	5
1	1	Toy Story (1995)	6	F	50	9	4
2	1	Toy Story (1995)	8	M	25	12	4
3	1	Toy Story (1995)	9	M	25	17	5
4	1	Toy Story (1995)	10	F	35	1	5
...	...	...	...	...	...	...	...
2072	1	Toy Story (1995)	6022	M	25	17	5
2073	1	Toy Story (1995)	6025	F	25	1	5
2074	1	Toy Story (1995)	6032	M	45	7	4
2075	1	Toy Story (1995)	6035	F	25	1	4
2076	1	Toy Story (1995)	6040	M	25	6	3

2077 rows × 7 columns

In [25]:
```
toy_story_total_rating = toy_story.groupby("Rating").size()
```

In [26]:
```
toy_story_total_rating
```

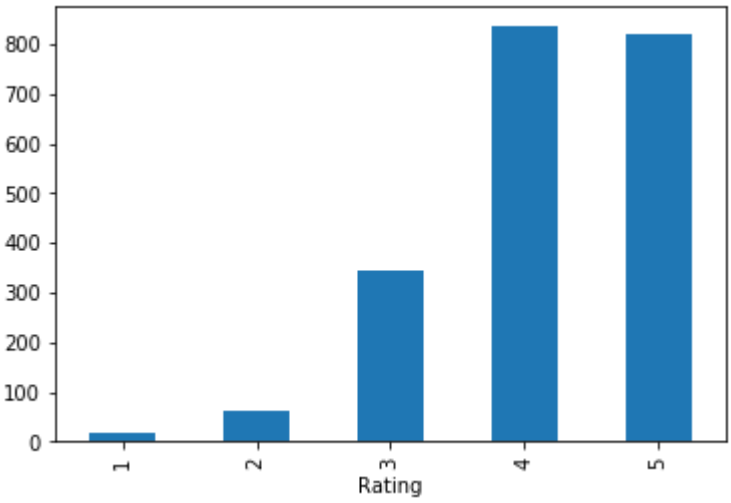
Out[26]:
```
Rating
1     16
2     61
3    345
4    835
5    820
dtype: int64
```

In [27]:
```
toy_story_total_rating.agg({"Rating":"mean"})
```

Out[27]:
```
Rating    415.4
dtype: float64
```

In [28]:
```
toy_story_total_rating.plot(kind="bar")
```

Out[28]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x1ed336a3a88>
```



This Graph Shows Movie "ToyStory" Has Got Maximum 4 Stars And After That 5 Stars Rating....

In [ ]:
```
```

Top 25 movies by viewership rating

In [29]:
```
viewership_rating = movie_lens.groupby(["MovieID"], as_index=False)
```

In [30]:
```
average_movie_ratings = viewership_rating.agg({"Rating":"mean"})
```

In [31]:
```
top_25_movies = average_movie_ratings.sort_values("Rating",ascending=False).head
```

In [32]:
```
top_25_movies
```

Out[32]:

	MovieID	Rating
926	989	5.000000
3635	3881	5.000000
1652	1830	5.000000
3152	3382	5.000000
744	787	5.000000
3054	3280	5.000000
3367	3607	5.000000
3010	3233	5.000000
2955	3172	5.000000
3414	3656	5.000000
3021	3245	4.800000
51	53	4.750000
2309	2503	4.666667
2698	2905	4.608696
1839	2019	4.560510
309	318	4.554558
802	858	4.524966
708	745	4.520548
49	50	4.517106
513	527	4.510417
1066	1148	4.507937
2117	2309	4.500000
1626	1795	4.500000
2287	2480	4.500000
425	439	4.500000

In [33]:
```
top_25_movie = pd.merge(top_25_movies, movies_data, how='left', left_on=['MovieI
```

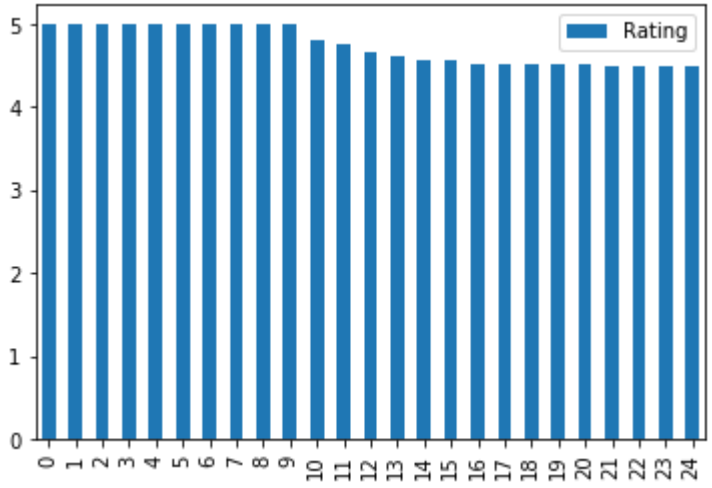
In [34]:
```
top_25_movie
```

Out[34]:

	MovieID	Rating	Title	Genres
0	989	5.000000	Schlafes Bruder (Brother of Sleep) (1995)	Drama
1	3881	5.000000	Bittersweet Motel (2000)	Documentary
2	1830	5.000000	Follow the Bitch (1998)	Comedy
3	3382	5.000000	Song of Freedom (1936)	Drama
4	787	5.000000	Gate of Heavenly Peace, The (1995)	Documentary
5	3280	5.000000	Baby, The (1973)	Horror
6	3607	5.000000	One Little Indian (1973)	Comedy|Drama|Western
7	3233	5.000000	Smashing Time (1967)	Comedy
8	3172	5.000000	Ulysses (Ulisse) (1954)	Adventure
9	3656	5.000000	Lured (1947)	Crime
10	3245	4.800000	I Am Cuba (Soy Cuba/Ya Kuba) (1964)	Drama
11	53	4.750000	Lamerica (1994)	Drama
12	2503	4.666667	Apple, The (Sib) (1998)	Drama
13	2905	4.608696	Sanjuro (1962)	Action|Adventure
14	2019	4.560510	Seven Samurai (The Magnificent Seven) (Shichin...	Action|Drama
15	318	4.554558	Shawshank Redemption, The (1994)	Drama
16	858	4.524966	Godfather, The (1972)	Action|Crime|Drama
17	745	4.520548	Close Shave, A (1995)	Animation|Comedy|Thriller
18	50	4.517106	Usual Suspects, The (1995)	Crime|Thriller
19	527	4.510417	Schindler's List (1993)	Drama|War
20	1148	4.507937	Wrong Trousers, The (1993)	Animation|Comedy
21	2309	4.500000	Inheritors, The (Die Siebtelbauern) (1998)	Drama
22	1795	4.500000	Callejón de los milagros, El (1995)	Drama
23	2480	4.500000	Dry Cleaning (Nettoyage à sec) (1997)	Drama
24	439	4.500000	Dangerous Game (1993)	Drama

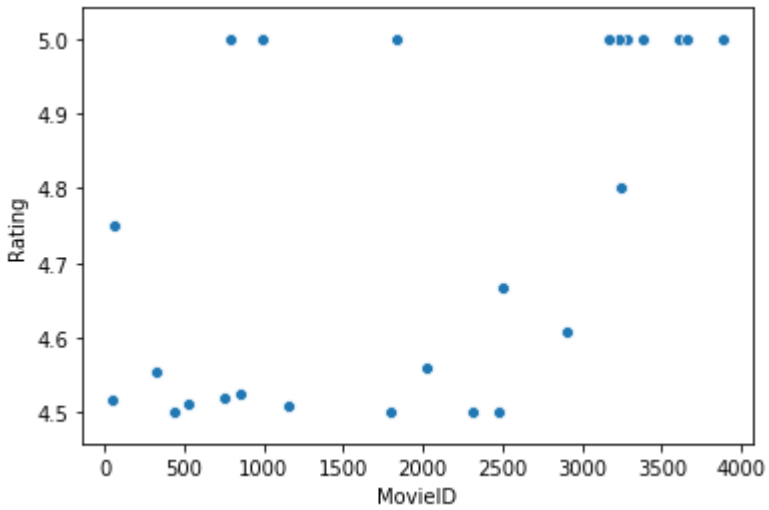
In [35]:
```
plt.figure()
top_25_movie["Rating"].plot(kind="bar",stacked=True,legend=True)
```

Out[35]: <matplotlib.axes._subplots.AxesSubplot at 0x1ed336dbb08>



In [36]:
```
sns.scatterplot(x="MovieID",y="Rating",data=top_25_movie)
```

Out[36]: <matplotlib.axes._subplots.AxesSubplot at 0x1ed3371e988>



Find the ratings for all the movies reviewed by for a particular user of user id = 2696

In [37]:
```
#movie_lens.head(3)
```

In [38]:
```
user_id_2696 = movie_lens[movie_lens["UserID"]==1]
```

In [39]:
```
## total rating given by user id = 2696
len(user_id_2696)
```

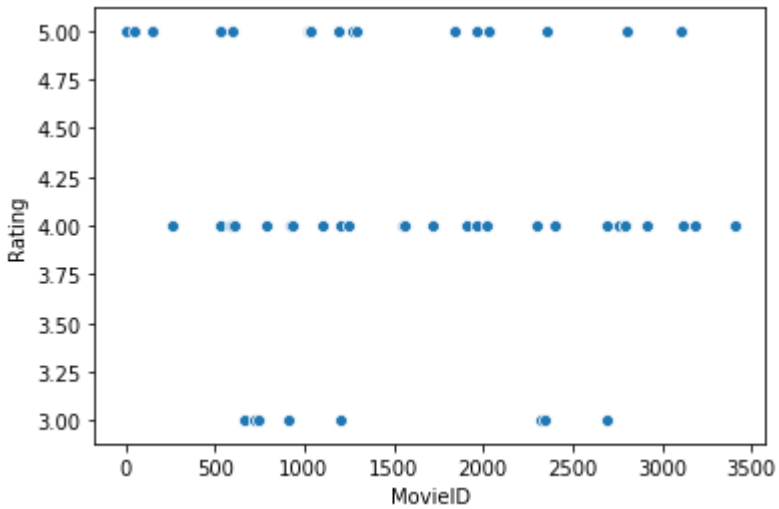
Out[39]: 53

In [40]:
```
user_id_2696.head(10)
```

Out[40]:

	MovieID	Title	UserID	Gender	Age	Occupation	Rating
0	1	Toy Story (1995)	1	F	1	10	5
22893	48	Pocahontas (1995)	1	F	1	10	5
41541	150	Apollo 13 (1995)	1	F	1	10	5
67447	260	Star Wars: Episode IV - A New Hope (1977)	1	F	1	10	4
141660	527	Schindler's List (1993)	1	F	1	10	5
144754	531	Secret Garden, The (1993)	1	F	1	10	4
158459	588	Aladdin (1992)	1	F	1	10	4
167921	594	Snow White and the Seven Dwarfs (1937)	1	F	1	10	4
168684	595	Beauty and the Beast (1991)	1	F	1	10	5
172011	608	Fargo (1996)	1	F	1	10	4

In [41]:
```
sns.scatterplot(x="MovieID",y="Rating",data=user_id_2696)
plt.show()
```



In [ ]:

Feature Engineering

In [42]:
```
val = movies_data.Genres.str.split("|")
```

In [43]:
```
fin_col = []
for v in fin_col:
    for i in v:
        if i not in fin_col:
            fin_col.append(i)

fin_col.append("Gender")
fin_col.append("Age")
fin_col.append("Rating")

df = pd.DataFrame(columns=fin_col)
```

In [44]:
```
result = movie_lens.merge(movies_data,on=["MovieID"],how="left")[["Genres","Ratii
```

In [45]:

```
val = movies_data.Genres.str.split("|")

res_col = []
for v in val:
    for i in v:
        if i not in res_col:
            res_col.append(i)

res_col.append("Gender")
res_col.append("Age")
res_col.append("Rating")

df = pd.DataFrame(columns=res_col)

res = movie_lens.merge(movies_data, on = ['MovieID'], how="left")[["Genres","Rat

for index, row in res.head(20000).iterrows():
    tmp = row.Genres.split("|")

    for i in tmp:
       # print(i)
        df.loc[index,i] = 1
        df.loc[index,"Gender"] = res.loc[index,"Gender"]
        df.loc[index,"Age"] = res.loc[index,"Age"]
        df.loc[index,"Rating"] = res.loc[index,"Rating"]

#         var = res.loc[index, "Rating"]
#         if var == 1:
#             df.loc[index,"Rating"] = "one"
#         elif var == 2:
#             df.loc[index,"Rating"] = "two"
#         elif var == 3:
#             df.loc[index,"Rating"] = "three"
#         elif var == 4:
#             df.loc[index,"Rating"] = "four"
#         else:
#             df.loc[index,"Rating"] = "five"

    df.loc[index,df.columns[~df.columns.isin(tmp+["Gender","Rating","Age"])]] = 0

df.head()


#df.loc[i,"Animation"] = 1

#df
```

Out[45]:

Comedy	Adventure	Fantasy	Romance	Drama	Action	Crime	Thriller	...	Sci-Fi	Documentary
1	0	0	0	0	0	0	0	...	0	0
1	0	0	0	0	0	0	0	...	0	0
1	0	0	0	0	0	0	0	...	0	0

Comedy	Adventure	Fantasy	Romance	Drama	Action	Crime	Thriller	...	Sci-Fi	Documentary
1	0	0	0	0	0	0	0	...	0	0
1	0	0	0	0	0	0	0	...	0	0

In [51]:
```
df.columns
```

Out[51]:
```
Index(['Animation', 'Children's', 'Comedy', 'Adventure', 'Fantasy', 'Romance',
       'Drama', 'Action', 'Crime', 'Thriller', 'Horror', 'Sci-Fi',
       'Documentary', 'War', 'Musical', 'Mystery', 'Film-Noir', 'Western',
       'Gender', 'Age', 'Rating'],
      dtype='object')
```

In [52]:
```
from sklearn.preprocessing import LabelEncoder
```

In [53]:
```
X = df[df.columns[~df.columns.isin(["Rating"])]]
y = df.Rating
```

In [54]:
```
X_train,X_test,y_train,y_test = train_test_split(X,y,random_state=0)
```

In [60]:
```
number = LabelEncoder()
X_train.Gender = number.fit_transform(X_train["Gender"].astype("str"))
```

In [64]:
```
X_test.Gender = number.fit_transform(X_test["Gender"].astype("str"))
```

In [69]:
```
y_train = number.fit_transform(y_train.astype("int"))
y_test = number.fit_transform(y_test.astype("int"))
```

In [71]:
```
y_train.dtype
```

Out[71]:
```
dtype('int64')
```

In [ ]:

In [ ]:

In [74]:
```
lin_model = LogisticRegression(max_iter=400).fit(X_train,y_train)
```

```
C:\Users\raada\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:43
2: FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
solver to silence this warning.
  FutureWarning)
C:\Users\raada\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:46
9: FutureWarning: Default multi_class will be changed to 'auto' in 0.22. Specif
y the multi_class option to silence this warning.
  "this warning.", FutureWarning)
```

In [75]:
```
y_pred = lin_model.predict(X_test)
```

In [77]:
```
print(accuracy_score(y_test,y_pred))
```

```
0.3994
```

In [ ]:

In [ ]: