Loading data

In [1]:
```
import pandas as pd

movies = r"C:\Users\SujitSonar\Desktop\SimpliLearn\Python\Assessment\Data science with Python 1\movies.dat"
ratings=r"C:\Users\SujitSonar\Desktop\SimpliLearn\Python\Assessment\Data science with Python 1\ratings.dat"
users = r"C:\Users\SujitSonar\Desktop\SimpliLearn\Python\Assessment\Data science with Python 1\users.dat"
```

In [2]:
```
df_movies = pd.read_csv(movies,delimiter='::', header=None, names=['MovieID','Title','Genres'])
df_ratings = pd.read_csv(ratings,delimiter='::', header=None, names=['UserID','MovieID','Rating','Timestamp'])
df_users = pd.read_csv(users,delimiter='::', header=None, names=['UserID','Gender','Age','Occupation','Zip-code'])
```

```
C:\Users\SujitSonar\Anaconda3\lib\site-packages\ipykernel_launcher.py:1: ParserWarning: 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\SujitSonar\Anaconda3\lib\site-packages\ipykernel_launcher.py:2: ParserWarning: 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\SujitSonar\Anaconda3\lib\site-packages\ipykernel_launcher.py:3: ParserWarning: 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 until
```

In [3]:
```
df_movies.head()
```

Out[3]:

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

In [4]:
```
df_movies.shape
```

Out[4]:
```
(3883, 3)
```

In [5]:
```
df_movies.isnull().sum()
```

Out[5]:
```
MovieID    0
Title      0
Genres     0
dtype: int64
```

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

Out[6]:

	UserID	MovieID	Rating	Timestamp
0	1	1193	5	978300760
1	1	661	3	978302109
2	1	914	3	978301968
3	1	3408	4	978300275
4	1	2355	5	978824291

In [7]:
```
df_ratings.shape
```

Out[7]:
```
(1000209, 4)
```

In [8]:
```
df_ratings.isnull().sum()
```

Out[8]:
```
UserID       0
MovieID      0
Rating       0
Timestamp    0
dtype: int64
```

In [9]:
```
df_ratings.sort_values('MovieID', inplace=True)
```

In [10]:
```
df_ratings.head()
```

Out[10]:

	UserID	MovieID	Rating	Timestamp
427702	2599	1	4	973796689
1966	18	1	4	978154768
683688	4089	1	5	965428947
596207	3626	1	4	966594018
465902	2873	1	5	972784317

In [11]:
```
df_users.head()
```

Out[11]:

	UserID	Gender	Age	Occupation	Zip-code
0	1	F	1	10	48067
1	2	M	56	16	70072
2	3	M	25	15	55117
3	4	M	45	7	02460
4	5	M	25	20	55455

In [12]:
```
df_users.shape
```

Out[12]:
```
(6040, 5)
```

In [13]:
```
df_users.isnull().sum()
```

Out[13]:
```
UserID        0
Gender        0
Age           0
Occupation    0
Zip-code      0
dtype: int64
```

Merging datasets to create master dataset

In [14]:
```
# Merging movies and ratings

df_movies_ratings = pd.merge(df_ratings,df_movies, how='left', left_on=
'MovieID',right_on='MovieID')
```

In [15]:
```
df_movies_ratings.head()
```

Out[15]:

	UserID	MovieID	Rating	Timestamp	Title	Genres
0	2599	1	4	973796689	Toy Story (1995)	Animation|Children's|Comedy
1	18	1	4	978154768	Toy Story (1995)	Animation|Children's|Comedy
2	4089	1	5	965428947	Toy Story (1995)	Animation|Children's|Comedy
3	3626	1	4	966594018	Toy Story (1995)	Animation|Children's|Comedy
4	2873	1	5	972784317	Toy Story (1995)	Animation|Children's|Comedy

In [16]:
```
df_movies_ratings.isnull().sum()
```

Out[16]:
```
UserID        0
MovieID       0
Rating        0
Timestamp     0
Title         0
Genres        0
dtype: int64
```

In [17]:
```
# Merging movies_ratings and users

df_movies_ratings_users = pd.merge(df_movies_ratings,df_users, how='left',left_on='UserID', right_on='UserID')
```

In [18]:
```
df_movies_ratings_users.head()
```

Out[18]:

	UserID	MovieID	Rating	Timestamp	Title	Genres	Gender	Age	Occ
0	2599	1	4	973796689	Toy Story (1995)	Animation|Children's|Comedy	M	25	
1	18	1	4	978154768	Toy Story (1995)	Animation|Children's|Comedy	F	18	
2	4089	1	5	965428947	Toy Story (1995)	Animation|Children's|Comedy	M	25	
3	3626	1	4	966594018	Toy Story (1995)	Animation|Children's|Comedy	M	25	
4	2873	1	5	972784317	Toy Story (1995)	Animation|Children's|Comedy	F	18	

In [19]:
```
df_movies_ratings_users.isnull().sum()
```

Out[19]:
```
UserID        0
MovieID       0
Rating        0
Timestamp     0
Title         0
Genres        0
Gender        0
Age           0
Occupation    0
Zip-code      0
dtype: int64
```

In [20]:
```
# sorting the data
df_movies_ratings_users.sort_values(['UserID','MovieID'],ascending=[True,True], inplace=True)
```

In [21]:
```
df_movies_ratings_users.head()
```

Out[21]:

	UserID	MovieID	Rating	Timestamp	Title	Genres
1949	1	1	5	978824268	Toy Story (1995)	Animation|Children's|Comedy
23186	1	48	5	978824351	Pocahontas (1995)	Animation|Children's|Musical|Romance
41924	1	150	5	978301777	Apollo 13 (1995)	Drama
68619	1	260	4	978300760	Star Wars: Episode IV - A New Hope (1977)	Action|Adventure|Fantasy|Sci-Fi
141694	1	527	5	978824195	Schindler's List (1993)	Drama|War

In [22]:
```
df_movies_ratings_users.describe(include='all')
```

Out[22]:

	UserID	MovieID	Rating	Timestamp	Title	Genres	Gender
count	1.000209e+06	1.000209e+06	1.000209e+06	1.000209e+06	1000209	1000209	1000209
unique	NaN	NaN	NaN	NaN	3706	301	2
top	NaN	NaN	NaN	NaN	American Beauty (1999)	Comedy	M
freq	NaN	NaN	NaN	NaN	3428	116883	753769
mean	3.024512e+03	1.865540e+03	3.581564e+00	9.722437e+08	NaN	NaN	NaN
std	1.728413e+03	1.096041e+03	1.117102e+00	1.215256e+07	NaN	NaN	NaN
min	1.000000e+00	1.000000e+00	1.000000e+00	9.567039e+08	NaN	NaN	NaN
25%	1.506000e+03	1.030000e+03	3.000000e+00	9.653026e+08	NaN	NaN	NaN
50%	3.070000e+03	1.835000e+03	4.000000e+00	9.730180e+08	NaN	NaN	NaN
75%	4.476000e+03	2.770000e+03	4.000000e+00	9.752209e+08	NaN	NaN	NaN
max	6.040000e+03	3.952000e+03	5.000000e+00	1.046455e+09	NaN	NaN	NaN

In [23]:
```
df_movies_ratings_users['Gender'].unique()
```

Out[23]:
```
array(['F', 'M'], dtype=object)
```

In [24]:
```
sorted(df_movies_ratings_users['Age'].unique())
```

Out[24]:
```
[1, 18, 25, 35, 45, 50, 56]
```

In [25]:
```
# creating age group table

value = [1, 18, 25, 35, 45, 50, 56]
description =["Under 18","18-24","25-34","35-44","45-49","50-55","56+"]
data = list(zip(value,description))
df_age = pd.DataFrame(data, columns=['Age','Age_Group'])
df_age
```

Out[25]:

	Age	Age_Group
0	1	Under 18
1	18	18-24
2	25	25-34
3	35	35-44
4	45	45-49
5	50	50-55
6	56	56+

In [26]:
```
sorted(df_movies_ratings_users['Occupation'].unique())
```

Out[26]:
```
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 1
9, 20]
```

In [27]:
```
# creating Occupation  group table

occupation_value = [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 1
5, 16, 17, 18, 19, 20]
occupation_desc =['other or not specified',
'academic/educator',
'artist',
'clerical/admin',
'college/grad student',
'customer service',
'doctor/health care',
'executive/managerial',
'farmer',
'homemaker',
'K-12 student',
'lawyer',
'programmer',
'retired',
' sales/marketing',
'scientist',
' self-employed',
'technician/engineer',
'tradesman/craftsman',
'unemployed',
'writer'
]

data1 = list(zip(occupation_value,occupation_desc))

df_occupation_desc = pd.DataFrame(data1, columns=['Occupation','Occupat
ion_Desc'])

df_occupation_desc
```

Out[27]:

	Occupation	Occupation_Desc
0	0	other or not specified
1	1	academic/educator
2	2	artist
3	3	clerical/admin
4	4	college/grad student
5	5	customer service
6	6	doctor/health care
7	7	executive/managerial
8	8	farmer
9	9	homemaker
10	10	K-12 student
11	11	lawyer
12	12	programmer
13	13	retired
14	14	sales/marketing
15	15	scientist
16	16	self-employed
17	17	technician/engineer
18	18	tradesman/craftsman
19	19	unemployed
20	20	writer

In [28]:
```
df_movies_ratings_users = pd.merge(df_movies_ratings_users,df_age, how='left', left_on ='Age', right_on='Age')
```

In [29]:
```
df_movies_ratings_users.head()
```

Out[29]:

	UserID	MovieID	Rating	Timestamp	Title	Genres	Gend
0	1	1	5	978824268	Toy Story (1995)	Animation|Children's|Comedy	
1	1	48	5	978824351	Pocahontas (1995)	Animation|Children's|Musical|Romance	
2	1	150	5	978301777	Apollo 13 (1995)	Drama	
3	1	260	4	978300760	Star Wars: Episode IV - A New Hope (1977)	Action|Adventure|Fantasy|Sci-Fi	
4	1	527	5	978824195	Schindler's List (1993)	Drama|War	

In [30]:
```
df_movies_ratings_users= pd.merge(df_movies_ratings_users,df_occupation_desc,how='left',left_on='Occupation', right_on='Occupation')
```

In [31]:
```
df_movies_ratings_users.head()
```

Out[31]:

	UserID	MovieID	Rating	Timestamp	Title	Genres	Gend
0	1	1	5	978824268	Toy Story (1995)	Animation|Children's|Comedy	
1	1	48	5	978824351	Pocahontas (1995)	Animation|Children's|Musical|Romance	
2	1	150	5	978301777	Apollo 13 (1995)	Drama	
3	1	260	4	978300760	Star Wars: Episode IV - A New Hope (1977)	Action|Adventure|Fantasy|Sci-Fi	
4	1	527	5	978824195	Schindler's List (1993)	Drama|War	

In [32]:
```
df1=df_movies_ratings_users[['MovieID','Title']].drop_duplicates()
#df1=df_movies_ratings_users[['MovieID','Title']]
```

In [33]:
```
df1.shape
```

Out[33]:
```
(3706, 2)
```

In [34]:
```
df1.sort_values('MovieID').head()
```

Out[34]:

	MovieID	Title
0	1	Toy Story (1995)
800	2	Jumanji (1995)
3369	3	Grumpier Old Men (1995)
555	4	Waiting to Exhale (1995)
3371	5	Father of the Bride Part II (1995)

Q1:Create a new dataset [Master_Data] with the following columns MovieID Title UserID Age Gender Occupation Rating. (Hint: (i) Merge two tables at a time. (ii) Merge the tables using two primary keys MovieID & UserId)

In [35]:
```
df_Master_Data = df_movies_ratings_users[['MovieID','Title','Genres','UserID','Age','Age_Group','Gender','Occupation','Occupation_Desc','Rating']]
```

In [36]:
```
df_Master_Data.head()
```

Out[36]:

	MovieID	Title	Genres	UserID	Age	Age_Group	Gender
0	1	Toy Story (1995)	Animation|Children's|Comedy	1	1	Under 18	F
1	48	Pocahontas (1995)	Animation|Children's|Musical|Romance	1	1	Under 18	F
2	150	Apollo 13 (1995)	Drama	1	1	Under 18	F
3	260	Star Wars: Episode IV - A New Hope (1977)	Action|Adventure|Fantasy|Sci-Fi	1	1	Under 18	F
4	527	Schindler's List (1993)	Drama|War	1	1	Under 18	F

In [37]:
```
df_Master_Data['Movie_Year']= df_Master_Data['Title'].str.extract
(r"\(([0-9]+)\)", expand=False)
```

```
C:\Users\SujitSonar\Anaconda3\lib\site-packages\ipykernel_launcher.p
y:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: http://pandas.pydata.org/pandas
-docs/stable/indexing.html#indexing-view-versus-copy
  """Entry point for launching an IPython kernel.
```

In [38]:
```
df_Master_Data.shape
```

Out[38]:
```
(1000209, 11)
```

In [39]:
```
df_Master_Data.head()
```

Out[39]:

	MovieID	Title	Genres	UserID	Age	Age_Group	Gender
0	1	Toy Story (1995)	Animation|Children's|Comedy	1	1	Under 18	F
1	48	Pocahontas (1995)	Animation|Children's|Musical|Romance	1	1	Under 18	F
2	150	Apollo 13 (1995)	Drama	1	1	Under 18	F
3	260	Star Wars: Episode IV - A New Hope (1977)	Action|Adventure|Fantasy|Sci-Fi	1	1	Under 18	F
4	527	Schindler's List (1993)	Drama|War	1	1	Under 18	F

In [40]:
```
#convert the string values to numeric
df_Master_Data['Movie_Year'] = pd.to_datetime(df_Master_Data['Movie_Yea
r'], format='%Y')
```

```
C:\Users\SujitSonar\Anaconda3\lib\site-packages\ipykernel_launcher.p
y:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: http://pandas.pydata.org/pandas
-docs/stable/indexing.html#indexing-view-versus-copy
```

In [41]:
```
df_Master_Data.head()
```

Out[41]:

	MovieID	Title	Genres	UserID	Age	Age_Group	Gender
0	1	Toy Story (1995)	Animation|Children's|Comedy	1	1	Under 18	F
1	48	Pocahontas (1995)	Animation|Children's|Musical|Romance	1	1	Under 18	F
2	150	Apollo 13 (1995)	Drama	1	1	Under 18	F
3	260	Star Wars: Episode IV - A New Hope (1977)	Action|Adventure|Fantasy|Sci-Fi	1	1	Under 18	F
4	527	Schindler's List (1993)	Drama|War	1	1	Under 18	F

In [42]:
```
df_Master_Data.describe(include='object')
```

Out[42]:

	Title	Genres	Age_Group	Gender	Occupation_Desc
count	1000209	1000209	1000209	1000209	1000209
unique	3706	301	7	2	21
top	American Beauty (1999)	Comedy	25-34	M	college/grad student
freq	3428	116883	395556	753769	131032

In [43]:
```
df_Master_Data['Rating'].describe()
```

Out[43]:
```
count    1.000209e+06
mean     3.581564e+00
std      1.117102e+00
min      1.000000e+00
25%      3.000000e+00
50%      4.000000e+00
75%      4.000000e+00
max      5.000000e+00
Name: Rating, dtype: float64
```

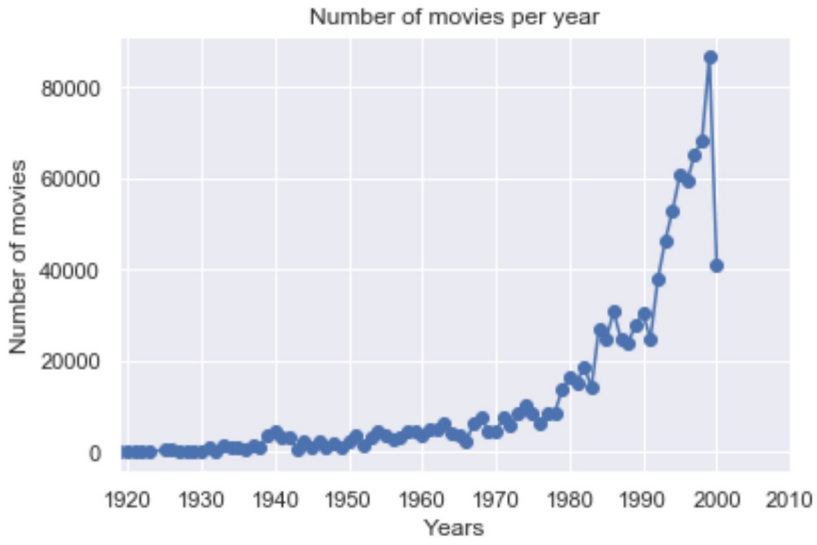
Q2. Explore the datasets using visual representations (graphs or tables), also include your comments on the following:

```
User Age Distribution
User rating of the movie “Toy Story”
Top 25 movies by viewership rating
Find the ratings for all the movies reviewed by for a particular user of u
ser id = 2696
```

In [44]:
```
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
sns.set()
```

In [45]:
```
#Number of Movies by year
movie_year = pd.DataFrame(df_Master_Data['Title'].groupby(df_Master_Dat
a['Movie_Year']).count())

movie_year.reset_index(inplace=True)

X=movie_year['Movie_Year']
Y=movie_year['Title']

plt.plot_date(X,Y,'bo-')
plt.grid(True)
plt.rcParams["figure.figsize"] = (15,5)
plt.title('Number of movies per year')
plt.xlabel('Years')
plt.ylabel('Number of movies')
plt.xlim('1919-01-01','2010-01-01')
plt.show()
```

```
C:\Users\SujitSonar\Anaconda3\lib\site-packages\pandas\plotting\_conv
erter.py:129: FutureWarning: Using an implicitly registered datetime
converter for a matplotlib plotting method. The converter was registe
red by pandas on import. Future versions of pandas will require you t
o explicitly register matplotlib converters.

To register the converters:
        >>> from pandas.plotting import register_matplotlib_converter
s
        >>> register_matplotlib_converters()
  warnings.warn(msg, FutureWarning)
```



In [46]:
```
print(movie_year.sort_values('Title', ascending=False).head())
print(movie_year.sort_values('Movie_Year', ascending=False).head(2))
```

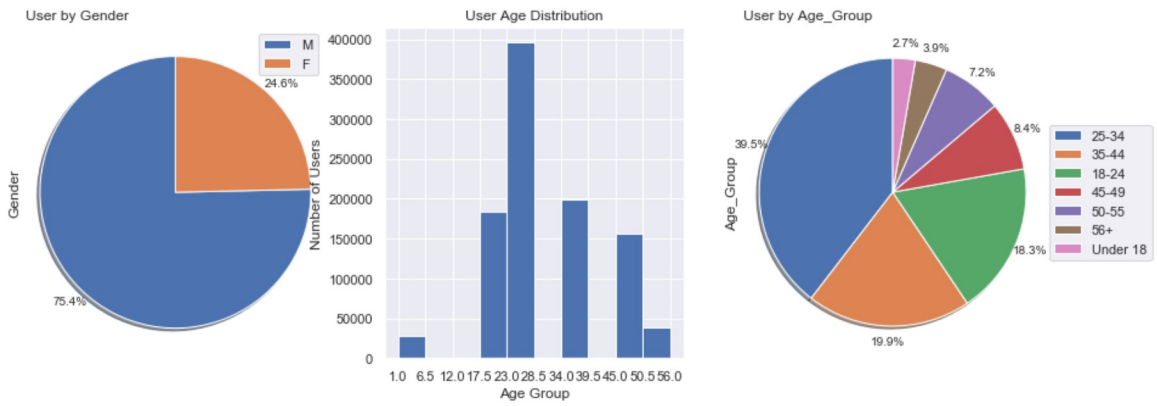
```
    Movie_Year  Title
79 1999-01-01  86833
78 1998-01-01  68226
77 1997-01-01  65402
75 1995-01-01  60754
76 1996-01-01  59382
    Movie_Year  Title
80 2000-01-01  41000
79 1999-01-01  86833
```

Observations:

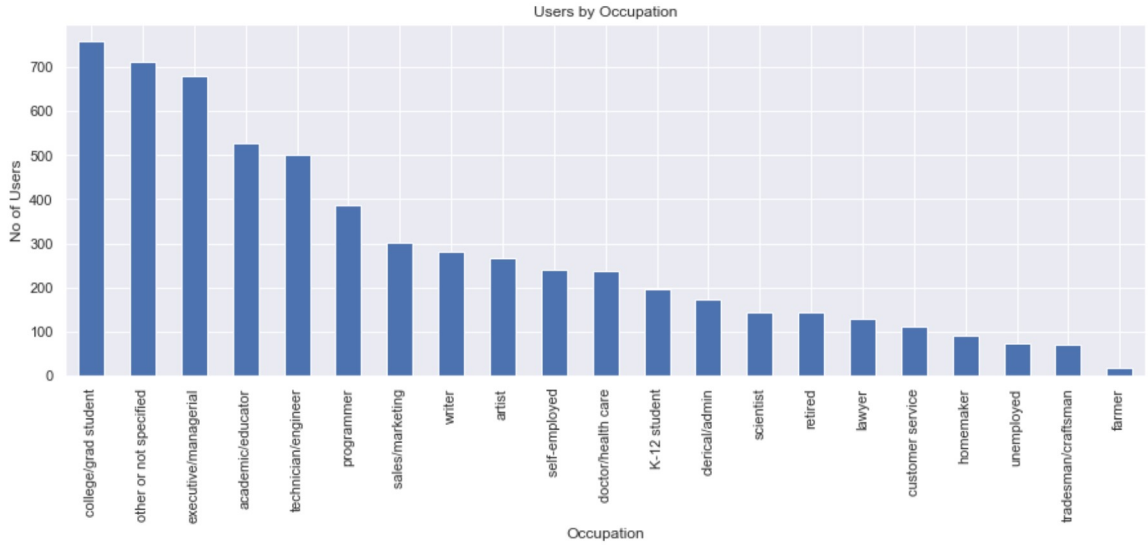
* In this dataset we see that highest number of movies were produced in 1999 - 86833 movies
*The decades between 1980 to 2000 we saw highest year or year increase in number of movies produced
* we see a sudden fall in the number of movies produced in 2000, from 86833 movies in 1999 to 41000, this is perhaps we do not have the full data for 2000 or may be need more analysis

User Demography

In [47]:
```
plt.subplot(1, 3, 1)
(df_Master_Data['Gender'].value_counts()).plot(kind='pie',
                          figsize =(15,5),
                          autopct='%1.1f%%',
                          startangle=90,
                          shadow=True,
                         labels=None,
                         pctdistance=1.12)

plt.title('User by Gender',loc='left')

plt.axis('equal')
plt.legend(labels=(df_Master_Data['Gender'].value_counts()).index, loc=
'upper right')

plt.subplot(1, 3, 2)
count, bin_edges = np.histogram(df_Master_Data['Age'])

df_Master_Data['Age'].plot(kind='hist', figsize=(15, 5), xticks=bin_edg
es)

plt.title('User Age Distribution') # add a title to the histogram
plt.ylabel('Number of Users') # add y-label
plt.xlabel('Age Group') # add x-label

plt.subplot(1, 3, 3)
(df_Master_Data['Age_Group'].value_counts()).plot(kind='pie',
                          figsize =(15,5),
                          autopct='%1.1f%%',
                          startangle=90,
                          shadow=True,
                         labels=None,
                         pctdistance=1.12)

plt.title('User by Age_Group',loc='left')

plt.axis('equal')
plt.legend(labels=(df_Master_Data['Age_Group'].value_counts()).index, l
oc='center left', bbox_to_anchor=(1, 0.5))

plt.show()
```



In [48]:
```
df_occupation=df_Master_Data[['Occupation_Desc','UserID']].drop_duplicates()
df_occupation.groupby(['Occupation_Desc']).size().sort_values(ascending=False).plot(kind='bar')
plt.title('Users by Occupation')
plt.ylabel('No of Users')
plt.xlabel('Occupation')
plt.show()
```



In [49]:
```
#df_occupation['Occupation_Desc'].value_counts(normalize=True)
```

Observations:

* Given dataset user population is predominantly male users (75.4%)
* User Age Distribution:
    * Highest number of users fall under the age group of 25-34 years (39.5%
    * we do not have many users under 18 and above 56 years of age
* Majority of the users fall under below category
    * College/grad students
    * executive/managerial
    * academic/educator
    * technician/engineer

Most Watched Movies

In [50]:
```
### Checking number of users rating for each movie
title_ratings = df_Master_Data.groupby(['Title']).size()
title_ratings_df = pd.DataFrame(title_ratings)
title_ratings_df.reset_index(inplace=True)
title_ratings_df.rename(columns={0:'No_of_ratings'}, inplace=True)

print(title_ratings_df[title_ratings_df['No_of_ratings']<100].count())
print(title_ratings_df[title_ratings_df['No_of_ratings']>=100].count())
print(title_ratings_df.shape)
print(1687+2019)
```

```
Title           1687
No_of_ratings   1687
dtype: int64
Title           2019
No_of_ratings   2019
dtype: int64
(3706, 2)
3706
```

Observations:

* we see that around 1687 unique movies has less than 100 user rating
* only 2019 unique moves has >= 100 users rating the movie

In [51]:
```
# dropping the list of movies where we have less than 100 users rating the movie
title_ratings_df.sort_values('No_of_ratings').head()
```

Out[51]:

	Title	No_of_ratings
185	Another Man's Poison (1952)	1
2365	Night Tide (1961)	1
2951	Shadows (Cienie) (1988)	1
2121	McCullochs, The (1975)	1
179	Anna (1996)	1

In [52]:
```
df_Master_Data.shape
```

Out[52]: (1000209, 11)

In [53]:
```
#copy of df
df_100plus_Ratings_data = df_Master_Data.copy()

#groupby df
df_100plus_Ratings_data['No_of_rating']=df_100plus_Ratings_data.groupby
(['Title'])['Rating'].transform('count')

#filtering df
df_100plus_Ratings_data=df_100plus_Ratings_data.sort_values('No_of_rati
ng', ascending=False)
df_100plus_Ratings_data=df_100plus_Ratings_data[df_100plus_Ratings_data
['No_of_rating']>=100]
print(df_100plus_Ratings_data.shape)
df_100plus_Ratings_data.head()
```

```
(942225, 12)
```

Out[53]:

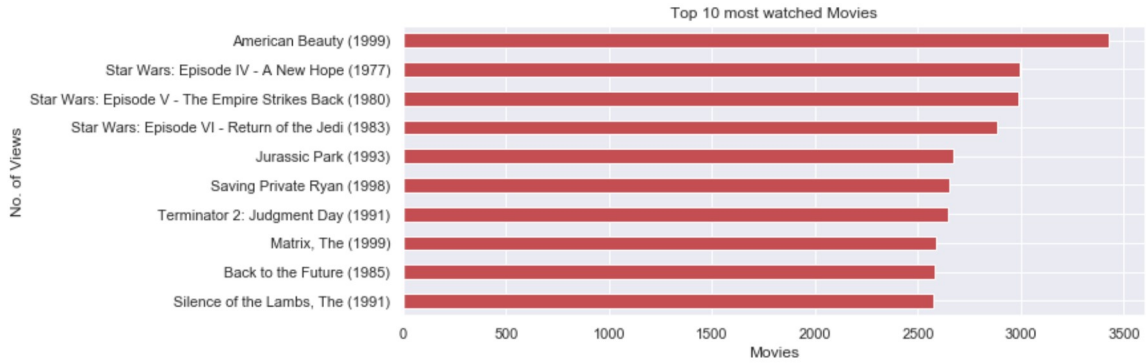
	MovieID	Title	Genres	UserID	Age	Age_Group	Gender	Occupation	Oc
801892	2858	American Beauty (1999)	Comedy|Drama	4803	25	25-34	F	16	
51856	2858	American Beauty (1999)	Comedy|Drama	341	56	56+	F	13	
779765	2858	American Beauty (1999)	Comedy|Drama	4656	25	25-34	M	17	tec
723200	2858	American Beauty (1999)	Comedy|Drama	4332	25	25-34	F	3	
302291	2858	American Beauty (1999)	Comedy|Drama	1794	25	25-34	M	11	

Observations:

* reduced the data from 1000209 rows to 942225 rows
* data contains movies that has atleast 100 users rating a movie

In [54]:
```
# TOP 10 most viwed movies
df_top10_movies=df_100plus_Ratings_data.groupby(['Title','Gender'])[['U
serID']].count().unstack().reset_index()
df_top10_movies.columns = df_top10_movies.columns.droplevel()
df_top10_movies.rename(columns={'':'Title'}, inplace=True)
df_top10_movies['Total_Viewers'] = df_top10_movies['F'] + df_top10_movi
es['M']
df_c=df_top10_movies[['Title','Total_Viewers']].sort_values('Total_View
ers', ascending=False).head(10).reset_index()
```

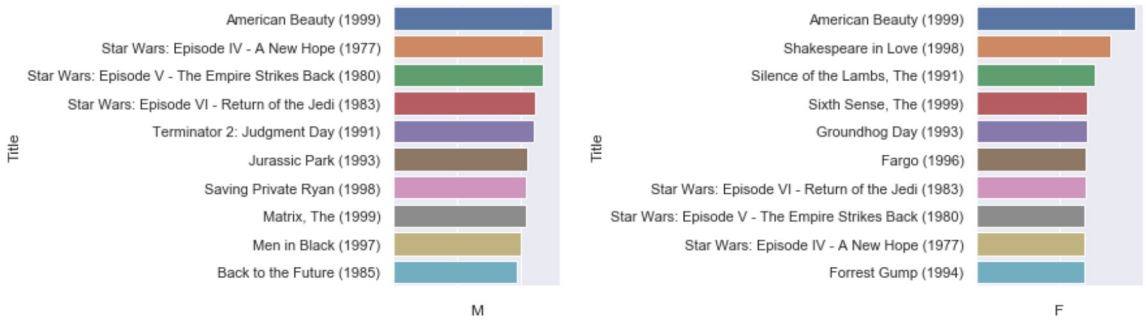
In [55]:
```
ax=df_c[['Title','Total_Viewers']].plot(kind='barh',x='Title', figsize=
(10,4), color='r')

ax.set_title('Top 10 most watched Movies')
ax.set_xlabel('Movies')
ax.set_ylabel ('No. of Views')
ax.legend().set_visible(False)
ax.invert_yaxis()

plt.show()
```



Observations:

* American beauty (1999) appears to be the most watched movie amongst male and female users

In [56]:
```
# Top 10 most viwed movies by Gender

fig, axs = plt.subplots(ncols=2, figsize=(10,5))

ax0=sns.barplot(y='Title',x='M',data = df_top10_movies[['Title','M']],
           order=df_top10_movies[['Title','M']].sort_values('M',ascendi
ng = False).head(10).Title,ax=axs[0])
ax0.set_xticklabels(ax0.get_xticklabels(), rotation=90, ha="right")


ax1=sns.barplot(y='Title',x='F',data = df_top10_movies[['Title','F']],
           order=df_top10_movies[['Title','F']].sort_values('F',ascendi
ng = False).head(10).Title,ax=axs[1])
ax1.set_xticklabels(ax1.get_xticklabels(), rotation=90, ha="right")

#fig.tight_layout()
plt.subplots_adjust(left=0.1,
                    bottom=0.3,
                    right=0.9,
                    top=0.9,
                    wspace=2.5,
                    hspace=0.4)
plt.show()
```



Observations:

* American beauty (1999) appears to be the most watched movie amongst male and female users
* top 10 most watched movies fall under action,sci-fi, Comedy, Drama and Romance

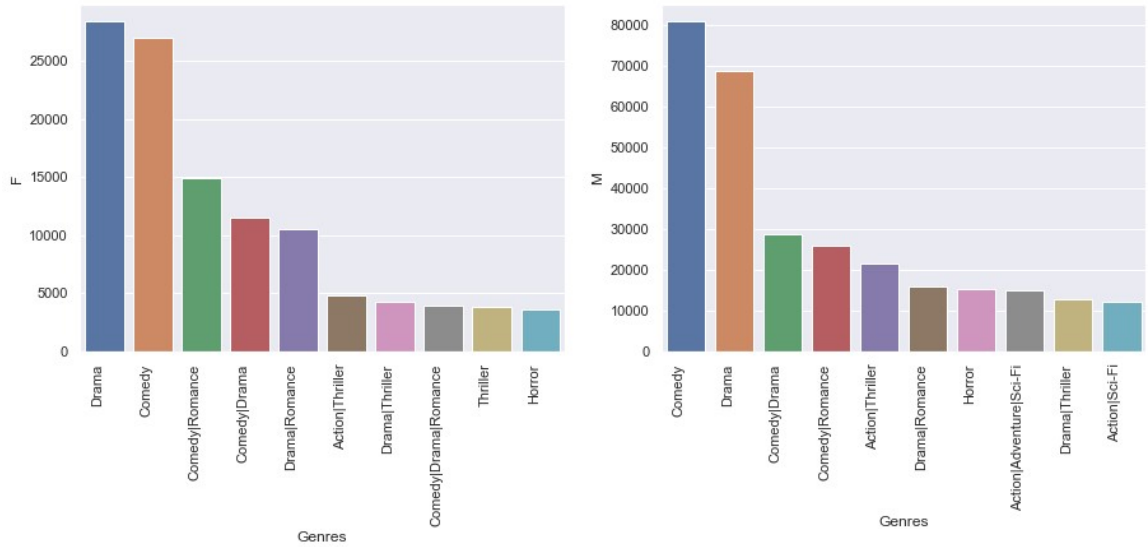
In [57]:
```
####################################
```

Genres

In [58]:
```
df_100plus_Ratings_data['Genres'].value_counts().head(10)
```

Out[58]:
```
Comedy                    107708
Drama                      97012
Comedy|Romance             40722
Comedy|Drama               40101
Drama|Romance              26491
Action|Thriller            26426
Horror                     18846
Action|Adventure|Sci-Fi    17705
Drama|Thriller             17132
Thriller                   15679
Name: Genres, dtype: int64
```

In [59]:
```
sns.set()
df_genres_by_gender_top10 =df_100plus_Ratings_data.groupby(['Genres','Gender'])['MovieID'].count().unstack().reset_index()
# among females
df_genres_by_Female_top10=df_genres_by_gender_top10[['Genres','F']].sort_values('F', ascending=False).head(10)
# among males
df_genres_by_Male_top10=df_genres_by_gender_top10[['Genres','M']].sort_values('M', ascending=False).head(10)

#Plotting
fig, axs = plt.subplots(ncols=2, figsize=(15,5))

ax0=sns.barplot(x='Genres',y='F',data = df_genres_by_Female_top10,
           order=df_genres_by_Female_top10.sort_values('F',ascending = False).Genres,ax=axs[0])
ax0.set_xticklabels(ax0.get_xticklabels(), rotation=90, ha="right")


ax1=sns.barplot(x='Genres',y='M',data = df_genres_by_Male_top10,
           order=df_genres_by_Male_top10.sort_values('M',ascending = False).Genres,ax=axs[1])
ax1.set_xticklabels(ax1.get_xticklabels(), rotation=90, ha="right")

plt.show()
```



Observations:

* Top 10 most viewed movies among Male viewers fall under Action and Sci-Fi, however if we look at the overall viewership,Comedy appears to be most popular amongst male viewers
* Top 10 most viewed movies among Female viewers fall under Comedy, Drama and Rommance genres

In [60]:
```
############################################################
```

Rating

In [61]:
```
print(df_100plus_Ratings_data.shape)
df_100plus_Ratings_data.head()
```

```
(942225, 12)
```

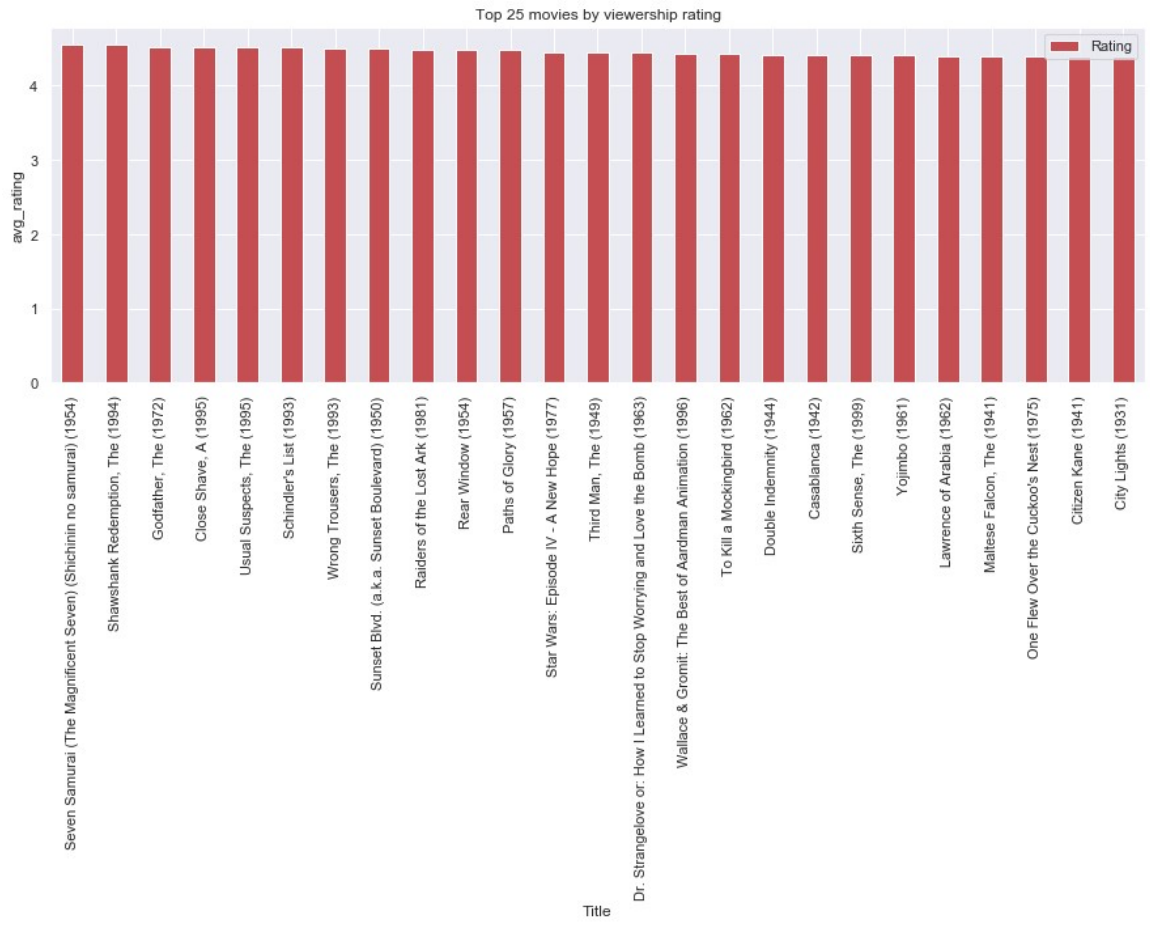
Out[61]:

	MovieID	Title	Genres	UserID	Age	Age_Group	Gender	Occupation	Oc
801892	2858	American Beauty (1999)	Comedy|Drama	4803	25	25-34	F	16	
51856	2858	American Beauty (1999)	Comedy|Drama	341	56	56+	F	13	
779765	2858	American Beauty (1999)	Comedy|Drama	4656	25	25-34	M	17	tec
723200	2858	American Beauty (1999)	Comedy|Drama	4332	25	25-34	F	3	
302291	2858	American Beauty (1999)	Comedy|Drama	1794	25	25-34	M	11	

In [62]:
```
# Top 10 Average movie rating by user

df_Top10_user_rating= df_100plus_Ratings_data.groupby(['Title'])[['Rati
ng']].mean().reset_index().sort_values('Rating', ascending=False).head
(10)
df_Top10_user_rating

df_gender_rating= df_100plus_Ratings_data.groupby(['Title','Gender
'])[['Rating']].mean().unstack().reset_index()
df_gender_rating.columns=df_gender_rating.columns.droplevel()
df_gender_rating.rename(columns={'':'Title'}, inplace=True)

# Top 10 Average movie rating by female user
df_female_rating = df_gender_rating[['Title','F']].sort_values('F', asc
ending=False).head(10)
df_female_rating

# Top 10 Average movie rating by male user
df_male_rating = df_gender_rating[['Title','M']].sort_values('M', ascen
ding=False).head(10)
df_male_rating

#Plotting
fig, axs = plt.subplots(ncols=3, figsize=(5,5))
ax0=sns.barplot(x='Rating',y='Title',data = df_Top10_user_rating,
            order=df_Top10_user_rating.sort_values('Rating',ascending =
False).Title,ax=axs[0])
ax0.set_xticklabels(ax0.get_xticklabels(), rotation=90, ha="right")
ax0.set_title('Overall User Rating')

ax1=sns.barplot(x='F',y='Title',data = df_female_rating,
            order=df_female_rating.sort_values('F',ascending = False).Ti
tle,ax=axs[1])
ax1.set_xticklabels(ax1.get_xticklabels(), rotation=90, ha="right")
ax1.set_title('Female User Rating')

ax2=sns.barplot(x='M',y='Title',data = df_male_rating,
            order=df_male_rating.sort_values('M',ascending = False).Titl
e,ax=axs[2])
ax2.set_xticklabels(ax1.get_xticklabels(), rotation=90, ha="right")
ax2.set_title('Male User Rating')

plt.subplots_adjust(left=0.2,
                    bottom=0.3,
                    right=2.5,
                    top=0.9,
                    wspace=5,
                    hspace=0.)


plt.show()
```

Top 25 movies by viewership rating

In [63]:
```
#Top 25 movies by viewership rating
top25_user_rating_movies=df_100plus_Ratings_data.groupby(['Title'])[['Rating']].mean().reset_index().sort_values('Rating', ascending=False).head(25)
top25_user_rating_movies.plot(kind='bar', x='Title', color='r')
plt.title('Top 25 movies by viewership rating')
plt.ylabel('avg_rating')
plt.show()
```

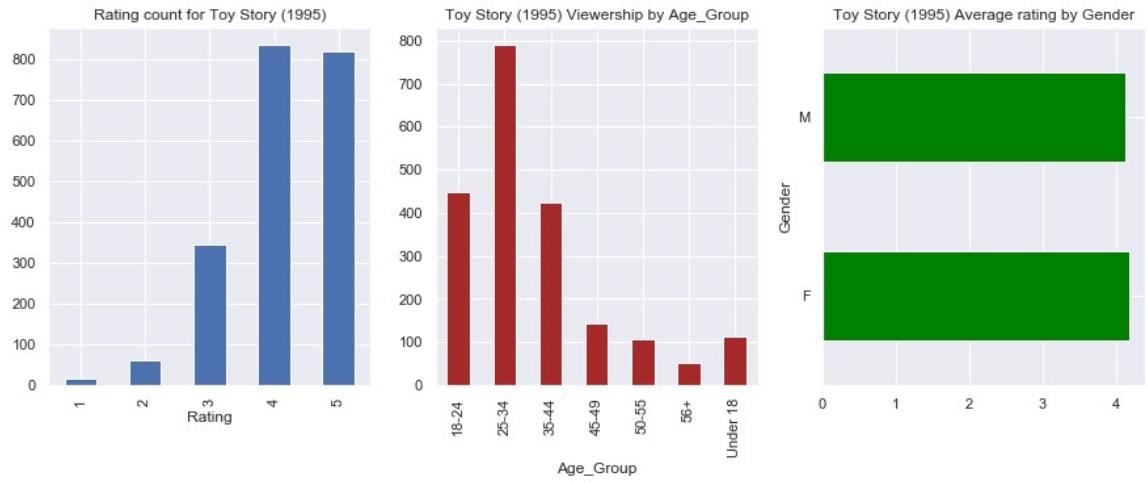


User rating of the movie “Toy Story”

In [64]:
```
# User rating of the movie "Toy Story"

df_toystory = df_100plus_Ratings_data[df_100plus_Ratings_data['Title']=
='Toy Story (1995)']

df_toystory['Rating'].mean()
```

Out[64]: 4.146846413095811

In [65]:
```
plt.subplot(1, 3, 1)
df_toystory.groupby(['Rating']).size().plot(kind='bar')
plt.title('Rating count for Toy Story (1995)')

plt.subplot(1, 3, 2)
df_toystory.groupby(['Age_Group']).size().plot(kind='bar', color='brown
')
plt.title('Toy Story (1995) Viewership by Age_Group')

plt.subplot(1, 3, 3)
df_toystory.groupby(['Gender'])['Rating'].mean().plot(kind='barh', colo
r='green')
plt.title('Toy Story (1995) Average rating by Gender')

plt.show()
```



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

In [66]:
```
df_userid_2696 = df_100plus_Ratings_data[df_100plus_Ratings_data['UserID']==2696]
df_userid_2696=df_userid_2696[['Title','Rating']].sort_values('Rating', ascending=False).set_index('Title')
df_userid_2696
```

Out[66]:

Title	Rating
Lone Star (1996)	5
Midnight in the Garden of Good and Evil (1997)	4
Basic Instinct (1992)	4
Psycho (1998)	4
Perfect Murder, A (1998)	4
Wild Things (1998)	4
L.A. Confidential (1997)	4
Palmetto (1998)	4
Devil's Advocate, The (1997)	4
Game, The (1997)	4
Shining, The (1980)	4
Talented Mr. Ripley, The (1999)	4
Client, The (1994)	3
Cop Land (1997)	3
E.T. the Extra-Terrestrial (1982)	3
I Know What You Did Last Summer (1997)	2
I Still Know What You Did Last Summer (1998)	2
Back to the Future (1985)	2
JFK (1991)	1
Lake Placid (1999)	1

In [67]:
```
##########################################
```

Rating by Gender

Q3: Feature Engineering:

Use column genres:
    * Find out all the unique genres (Hint: split the data in column genre making a list and then process the data to find out only the unique categories of genres)
    * Create a separate column for each genre category with a one-hot encoding (1 and 0) whether or not the movie belongs to that genre.
    * Determine the features affecting the ratings of any particular movie.
    * Develop an appropriate model to predict the movie ratings

In [68]:
```
genres_list = df_Master_Data['Genres'].to_list()
print(type(genres_list))
genres_list[0:5]
```

```
<class 'list'>
```

Out[68]:
```
["Animation|Children's|Comedy",
 "Animation|Children's|Musical|Romance",
 'Drama',
 'Action|Adventure|Fantasy|Sci-Fi',
 'Drama|War']
```

In [69]:
```
g_list=[]
for genre in  genres_list:
    g_list.append(genre.split(sep='|'))

flat_list = []
for sublist in g_list:
    for item in sublist:
        flat_list.append(item)

final_genres =list(set(flat_list))
final_genres
```

Out[69]:
```
['Animation',
 'Thriller',
 'Adventure',
 'Sci-Fi',
 'Romance',
 'Fantasy',
 'Action',
 'War',
 "Children's",
 'Drama',
 'Film-Noir',
 'Musical',
 'Crime',
 'Mystery',
 'Horror',
 'Comedy',
 'Western',
 'Documentary']
```

In [71]:
```
# finding the frequency of the words appear in the Genres and visualing
using wordcloud
from wordcloud import WordCloud, STOPWORDS
```

In [72]:
```
from collections import Counter
word_could_dict=Counter(flat_list)
wordcloud = WordCloud(width = 1000, height = 500).generate_from_frequen
cies(word_could_dict)

plt.figure(figsize=(15,8))
plt.imshow(wordcloud)
plt.axis("off")
plt.show()
```

Observations:

* Comedy, Drama and Action appears to be the most popular genres among the users

**** Create a separate column for each genre category with a one-hot encoding (1 and 0) whether or not the movie belongs to that genre.***

In [75]:
```
df_Master_Data.head()
df_Master_Data['Genres_extract'] = df_Master_Data['Genres'].
```

Out[75]:

	MovieID	Title	Genres	UserID	Age	Age_Group	Gender
0	1	Toy Story (1995)	Animation|Children's|Comedy	1	1	Under 18	F
1	48	Pocahontas (1995)	Animation|Children's|Musical|Romance	1	1	Under 18	F
2	150	Apollo 13 (1995)	Drama	1	1	Under 18	F
3	260	Star Wars: Episode IV - A New Hope (1977)	Action|Adventure|Fantasy|Sci-Fi	1	1	Under 18	F
4	527	Schindler's List (1993)	Drama|War	1	1	Under 18	F

In [101]:
```
```

In [103]:
```
df_genres= df_Master_Data['Genres'].str.get_dummies('|')
df_genres.head()
```

Out[103]:

	Action	Adventure	Animation	Children's	Comedy	Crime	Documentary	Drama	Fantasy
0	0	0	1	1	1	0	0	0	0
1	0	0	1	1	0	0	0	0	0
2	0	0	0	0	0	0	0	1	0
3	1	1	0	0	0	0	0	0	1
4	0	0	0	0	0	0	0	1	0

In [104]:
```
### Merging the dataset with the Genre encoded data

df_Master_Data_Genre_encoded = pd.concat([df_Master_Data, df_genres],
axis=1)
```

In [105]:
```
df_Master_Data_Genre_encoded.head()
```

Out[105]:

	MovieID	Title	Genres	UserID	Age	Age_Group	Gender
0	1	Toy Story (1995)	Animation|Children's|Comedy	1	1	Under 18	F
1	48	Pocahontas (1995)	Animation|Children's|Musical|Romance	1	1	Under 18	F
2	150	Apollo 13 (1995)	Drama	1	1	Under 18	F
3	260	Star Wars: Episode IV - A New Hope (1977)	Action|Adventure|Fantasy|Sci-Fi	1	1	Under 18	F
4	527	Schindler's List (1993)	Drama|War	1	1	Under 18	F

5 rows × 29 columns

In [110]:
```
# top 6 genres by the total number of movies

top6_genre  = df_Master_Data_Genre_encoded.iloc[:,11:-1].sum().sort_values(ascending=False).head(6).index.values
```

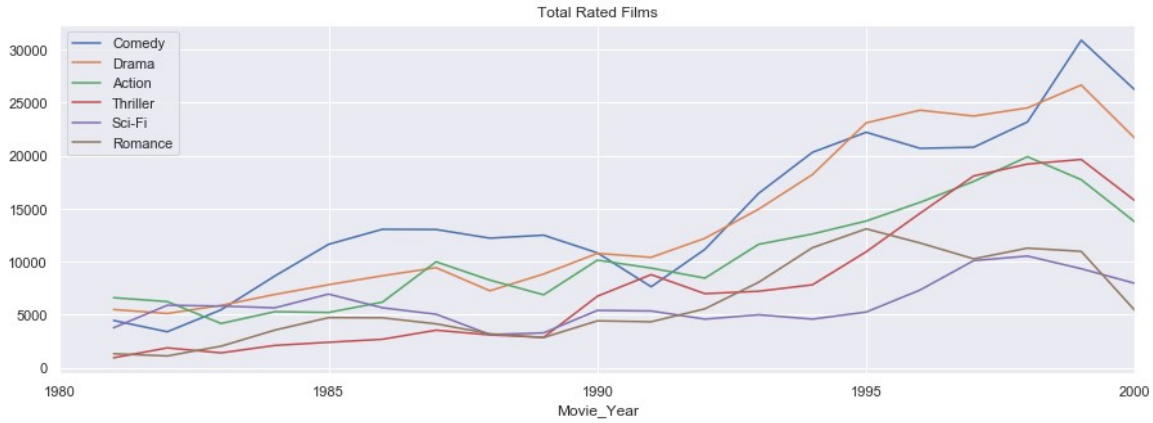
In [111]:
```
top6_genre
```

Out[111]:
```
array(['Comedy', 'Drama', 'Action', 'Thriller', 'Sci-Fi', 'Romance'],
      dtype=object)
```

In [134]:
```
genre_groups = (df_Master_Data_Genre_encoded.iloc[:, 10:].groupby('Movie_Year').sum()
                ).loc['1980-01-01':'2000-01-01',top6_genre]
```

In [137]:
```
# graph showing a 2-year moving average of the total volume of rated films
genre_groups.rolling(2).mean().plot(figsize=(15,5),
                                    title="Total Rated Films")
```

Out[137]: <matplotlib.axes._subplots.AxesSubplot at 0x18287c19e48>



Observations:

* Comedy, Drama and Action appears to be the most rated genres among the users

In [ ]:
```
genre_groups_rating = (df_Master_Data_Genre_encoded.iloc[:, 10:].groupby('Movie_Year').sum()
                       ).loc['1980-01-01':'2000-01-01',top6_genre]
```

In [146]:
```
genre_groups_rating = df_Master_Data_Genre_encoded[['Rating','Comedy','Drama','Action','Thriller','Sci-Fi','Romance']]
```

In [147]:
```
genre_groups_rating.head()
```

Out[147]:

	Rating	Comedy	Drama	Action	Thriller	Sci-Fi	Romance
0	5	1	0	0	0	0	0
1	5	0	0	0	0	0	1
2	5	0	1	0	0	0	0
3	4	0	0	1	0	1	0
4	5	0	1	0	0	0	0

In [148]:
```
genre_groups_ratings = (genre_groups_rating.groupby('Rating').mean()
                        .loc['1':'5',top6_genre])
```

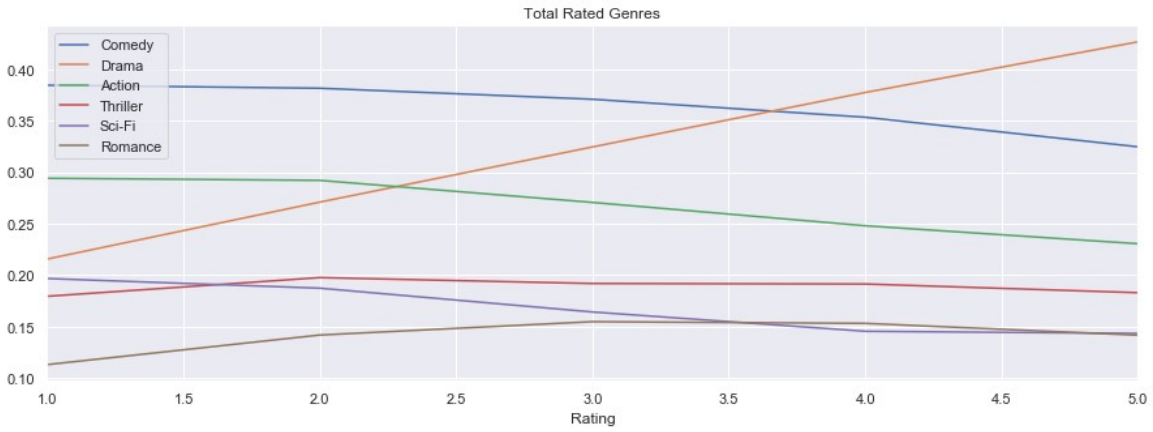
In [149]:

Out[149]:

Rating	Comedy	Drama	Action	Thriller	Sci-Fi	Romance
1	0.384804	0.215651	0.294282	0.179460	0.196746	0.112988
2	0.381872	0.271056	0.292236	0.197625	0.187370	0.141776
3	0.371160	0.324740	0.270784	0.191913	0.164213	0.154780
4	0.353654	0.377713	0.248098	0.191443	0.145445	0.153136
5	0.324908	0.426976	0.230600	0.182970	0.143348	0.141660

In [151]:
```
genre_groups_ratings.plot(figsize=(15,5),
                                    title="Total Rated Genres")
```

Out[151]: <matplotlib.axes._subplots.AxesSubplot at 0x182814d3f98>



Observations:

* Drama ratings appears to be on high trend among the users

Determine the features affecting the ratings of any particular movie.

In [383]:
```
df_movie = df_Master_Data_Genre_encoded[['Age_Group','Gender','Occupation','Rating']]
df_movie.head()
```

Out[383]:

	Age_Group	Gender	Occupation	Rating
0	Under 18	F	10	5
1	Under 18	F	10	5
2	Under 18	F	10	5
3	Under 18	F	10	4
4	Under 18	F	10	5

In [384]:
```
df_movie.shape
```

Out[384]:
```
(1000209, 4)
```

In [314]:
```
df_movie.isnull().sum()
```

Out[314]:
```
Age_Group     0
Gender        0
Occupation    0
Rating        0
dtype: int64
```

In [385]:
```
Age_dummies = pd.get_dummies(df_movie['Age_Group'], prefix = 'Age')
Gender_dummies = pd.get_dummies(df_movie['Gender'], prefix = 'Sex')
Occupation_dummies = pd.get_dummies(df_movie['Occupation'], prefix = 'Occupa')
Occupation_dummies.head()
```

Out[385]:

	Occupa_0	Occupa_1	Occupa_2	Occupa_3	Occupa_4	Occupa_5	Occupa_6	Occupa_7	O
0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	

5 rows × 21 columns

In [386]:
```
Age_dummies.head()
```

Out[386]:

	Age_18-24	Age_25-34	Age_35-44	Age_45-49	Age_50-55	Age_56+	Age_Under 18
0	0	0	0	0	0	0	1
1	0	0	0	0	0	0	1
2	0	0	0	0	0	0	1
3	0	0	0	0	0	0	1
4	0	0	0	0	0	0	1

In [387]:
```
Gender_dummies.head()
```

Out[387]:

	Sex_F	Sex_M
0	1	0
1	1	0
2	1	0
3	1	0
4	1	0

In [388]:
```
df_movie_model = pd.concat([df_movie, Age_dummies], axis = 1)
df_movie_model = pd.concat([df_movie_model, Gender_dummies], axis = 1)
df_movie_model = pd.concat([df_movie_model, Occupation_dummies], axis
= 1)
df_movie_model.drop(columns =['Age_Group','Gender','Occupation','Sex_F
','Age_56+','Occupa_20'], inplace=True)
df_movie_model.head()
```

Out[388]:

	Rating	Age_18-24	Age_25-34	Age_35-44	Age_45-49	Age_50-55	Age_Under 18	Sex_M	Occ
0	5	0	0	0	0	0	1	0	
1	5	0	0	0	0	0	1	0	
2	5	0	0	0	0	0	1	0	
3	4	0	0	0	0	0	1	0	
4	5	0	0	0	0	0	1	0	

5 rows × 28 columns

In [389]:
```
df_movie_model.columns
```

Out[389]:
```
Index(['Rating', 'Age_18-24', 'Age_25-34', 'Age_35-44', 'Age_45-49',
       'Age_50-55', 'Age_Under 18', 'Sex_M', 'Occupa_0', 'Occupa_1',
       'Occupa_2', 'Occupa_3', 'Occupa_4', 'Occupa_5', 'Occupa_6', 'O
ccupa_7',
       'Occupa_8', 'Occupa_9', 'Occupa_10', 'Occupa_11', 'Occupa_12',
       'Occupa_13', 'Occupa_14', 'Occupa_15', 'Occupa_16', 'Occupa_17
',
       'Occupa_18', 'Occupa_19'],
      dtype='object')
```

In [390]:
```
df_movie_model.corr()
```

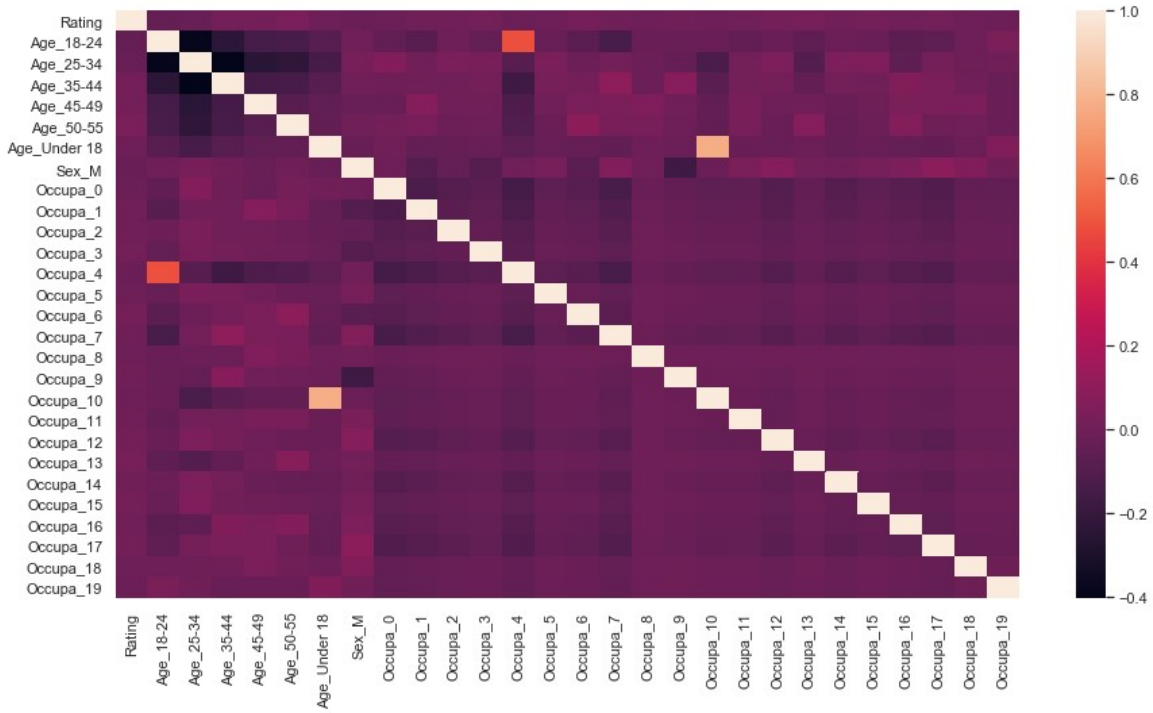
Out[390]:

	Rating	Age_18-24	Age_25-34	Age_35-44	Age_45-49	Age_50-55	Age_Under 18
Rating	1.000000	-0.031400	-0.026304	0.016327	0.015277	0.033267	-0.004797
Age_18-24	-0.031400	1.000000	-0.383431	-0.236262	-0.143199	-0.132516	-0.079278
Age_25-34	-0.026304	-0.383431	1.000000	-0.403096	-0.244318	-0.226090	-0.135259
Age_35-44	0.016327	-0.236262	-0.403096	1.000000	-0.150544	-0.139312	-0.083344
Age_45-49	0.015277	-0.143199	-0.244318	-0.150544	1.000000	-0.084438	-0.050515
Age_50-55	0.033267	-0.132516	-0.226090	-0.139312	-0.084438	1.000000	-0.046746
Age_Under 18	-0.004797	-0.079278	-0.135259	-0.083344	-0.050515	-0.046746	1.000000
Sex_M	-0.019861	-0.001234	0.029043	-0.002563	-0.029368	-0.001819	-0.030272
Occupa_0	-0.015264	-0.046957	0.064205	-0.012122	-0.028500	0.018582	0.005360
Occupa_1	-0.001346	-0.080358	0.000790	0.004782	0.070140	0.027553	-0.035989
Occupa_2	-0.001743	-0.013164	0.033930	-0.000099	0.001831	-0.017589	-0.030836
Occupa_3	0.012123	-0.037388	0.025568	0.015203	0.005962	-0.008019	-0.030217
Occupa_4	-0.015561	0.489787	-0.077866	-0.170317	-0.114608	-0.103482	-0.060905
Occupa_5	-0.005891	-0.025611	0.032437	0.020588	0.006301	-0.023915	-0.024992
Occupa_6	0.014078	-0.065364	-0.019423	0.017728	0.034527	0.093845	-0.032870
Occupa_7	0.005595	-0.131272	0.009251	0.096975	0.036614	0.027820	-0.051718
Occupa_8	-0.005354	-0.023299	-0.016657	-0.017472	0.051506	0.027682	-0.003623
Occupa_9	0.007194	-0.026996	-0.034112	0.078203	0.002912	-0.005070	-0.017912
Occupa_10	-0.006757	-0.020650	-0.124206	-0.071936	-0.046640	-0.043160	0.775607
Occupa_11	0.004644	-0.045420	0.010604	0.011750	0.029261	0.026949	-0.022929
Occupa_12	0.015972	-0.024321	0.043148	0.013864	-0.006283	-0.022758	-0.029389
Occupa_13	0.021159	-0.055977	-0.095505	-0.042763	0.000340	0.070270	-0.018533
Occupa_14	0.007509	-0.015688	0.043670	0.008938	-0.024894	-0.033108	-0.033847
Occupa_15	0.014845	-0.029230	0.048090	0.000596	-0.009940	-0.019144	-0.025628
Occupa_16	0.002951	-0.064635	-0.052635	0.053284	0.037857	0.066677	-0.036726
Occupa_17	0.008029	-0.056773	0.016868	0.039207	0.031633	-0.011908	-0.045464
Occupa_18	-0.005093	-0.007583	-0.010606	0.006082	0.034195	0.001767	-0.018495
Occupa_19	-0.018443	0.037354	0.003373	-0.026982	-0.023438	-0.023335	0.055267

28 rows × 28 columns

In [391]:
```
plt.figure(figsize=(15,8))
sns.heatmap(df_movie_model.corr())
```

Out[391]: <matplotlib.axes._subplots.AxesSubplot at 0x183b4f5bdd8>



Observations:

* based on all the fields of the dataset, it appears Occupation, Age and Gender are the most influential features
* However looking at the corelation, we do see that, these features does not have a strong corelation with Rating
* Looking at the Heatmap, we can probably take, Age_18-24, Age_35-34,Age_35_44,sex_M,Occupa_0,Occupa_1,Occupa_4,
  Occupa_7

Develop an appropriate model to predict the movie ratings

In [402]:
```
#selecting a 10% sample of the data
df_movie_model_sample=df_movie_model.sample(frac=0.1, replace=False, random_state=1)
df_movie_model_sample.shape
```

Out[402]: (100021, 28)

In [403]:
```
# Age, gender , Occupation and rating

features_df = df_movie_model_sample.drop(columns = ['Rating'])
labels = df_movie_model_sample['Rating']
```

In [404]:
```
features_df.reset_index(inplace=True)
features_df.drop(['index'],axis=1, inplace=True)

labels=labels.reset_index()
labels.drop(['index'],axis=1, inplace=True)
```

In [407]:
```
print(features_df.shape)
print(labels.shape)
```

```
(100021, 27)
(100021, 1)
```

In [409]:
```
# predicting rating using Age, gender and Occupation

from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(features_df, label
s, test_size=0.3, random_state=42)

from sklearn.linear_model import LogisticRegression

logreg = LogisticRegression(max_iter=1000000)

logreg.fit(X_train,y_train)

y_pred = logreg.predict(X_test)

# print the first 30 true and predicted responses
print ('actual:    ', y_test.values[0:10])
print ('predicted: ', y_pred[0:10])

### Evaluating our Model
from sklearn import metrics
metrics.accuracy_score(y_test,y_pred)
```

```
C:\Users\SujitSonar\Anaconda3\lib\site-packages\sklearn\linear_model\
logistic.py:433: FutureWarning: Default solver will be changed to 'lb
fgs' in 0.22. Specify a solver to silence this warning.
  FutureWarning)
C:\Users\SujitSonar\Anaconda3\lib\site-packages\sklearn\utils\validat
ion.py:761: DataConversionWarning: A column-vector y was passed when
a 1d array was expected. Please change the shape of y to (n_samples,
), for example using ravel().
  y = column_or_1d(y, warn=True)
C:\Users\SujitSonar\Anaconda3\lib\site-packages\sklearn\linear_model\
logistic.py:460: FutureWarning: Default multi_class will be changed t
o 'auto' in 0.22. Specify the multi_class option to silence this warn
ing.
  "this warning.", FutureWarning)

actual:     [[4]
 [3]
 [4]
 [2]
 [3]
 [3]
 [4]
 [5]
 [1]
 [4]]
predicted:  [4 4 4 4 4 4 4 4 4 4]
```

Out[409]: 0.34175359082880663

In [ ]:

In [411]:
```
# predicting using Age_18-24', 'Age_25-34', 'Age_35-44',sex_M,Occupa_
0,Occupa_1,Occupa_4,Occupa_7

features_df1 = features_df[['Age_18-24', 'Age_25-34', 'Age_35-44', 'Se
x_M','Occupa_0','Occupa_1','Occupa_4','Occupa_7']]
labels1=labels.reset_index()
labels1.drop(['index'],axis=1, inplace=True)

from sklearn.model_selection import train_test_split
X_train1, X_test1, y_train1, y_test1 = train_test_split(features_df1,
labels1, test_size=0.3, random_state=42)

from sklearn.linear_model import LogisticRegression

logreg1 = LogisticRegression(max_iter=1000000)

logreg1.fit(X_train1,y_train1)

y_pred1 = logreg1.predict(X_test1)

print ('actual:    ', y_test1.values[0:10])
print ('predicted: ', y_pred1[0:10])

from sklearn import metrics
metrics.accuracy_score(y_test1,y_pred1)
```

```
C:\Users\SujitSonar\Anaconda3\lib\site-packages\sklearn\linear_model\
logistic.py:433: FutureWarning: Default solver will be changed to 'lb
fgs' in 0.22. Specify a solver to silence this warning.
  FutureWarning)
C:\Users\SujitSonar\Anaconda3\lib\site-packages\sklearn\utils\validat
ion.py:761: DataConversionWarning: A column-vector y was passed when
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  y = column_or_1d(y, warn=True)
C:\Users\SujitSonar\Anaconda3\lib\site-packages\sklearn\linear_model\
logistic.py:460: FutureWarning: Default multi_class will be changed t
o 'auto' in 0.22. Specify the multi_class option to silence this warn
ing.
  "this warning.", FutureWarning)

actual:     [[4]
 [3]
 [4]
 [2]
 [3]
 [3]
 [4]
 [5]
 [1]
 [4]]
predicted:  [4 4 4 4 4 4 4 4 4 4]
```

Out[411]: 0.34155363748458695

In [412]:
```
# age and rating
features_df2 = features_df[['Age_18-24', 'Age_25-34', 'Age_35-44', 'Se
x_M']]

labels2=labels.reset_index()
labels2.drop(['index'],axis=1, inplace=True)

from sklearn.model_selection import train_test_split
X_train2, X_test2, y_train2, y_test2 = train_test_split(features_df2,
labels2, test_size=0.3, random_state=42)

from sklearn.linear_model import LogisticRegression

logreg2 = LogisticRegression(max_iter=1000000)

logreg2.fit(X_train2,y_train2)

y_pred2 = logreg2.predict(X_test2)

print ('actual:    ', y_test2.values[0:10])
print ('predicted: ', y_pred2[0:10])

from sklearn import metrics
metrics.accuracy_score(y_test2,y_pred2)
```

```
C:\Users\SujitSonar\Anaconda3\lib\site-packages\sklearn\linear_model\
logistic.py:433: FutureWarning: Default solver will be changed to 'lb
fgs' in 0.22. Specify a solver to silence this warning.
  FutureWarning)
C:\Users\SujitSonar\Anaconda3\lib\site-packages\sklearn\utils\validat
ion.py:761: DataConversionWarning: A column-vector y was passed when
a 1d array was expected. Please change the shape of y to (n_samples,
), for example using ravel().
  y = column_or_1d(y, warn=True)
C:\Users\SujitSonar\Anaconda3\lib\site-packages\sklearn\linear_model\
logistic.py:460: FutureWarning: Default multi_class will be changed t
o 'auto' in 0.22. Specify the multi_class option to silence this warn
ing.
  "this warning.", FutureWarning)

actual:     [[4]
 [3]
 [4]
 [2]
 [3]
 [3]
 [4]
 [5]
 [1]
 [4]]
predicted:  [4 4 4 4 4 4 4 4 4 4]
```

Out[412]: 0.34155363748458695

In [413]:
```
#gender and rating
features_df3 = features_df[[ 'Sex_M']]

labels3=labels.reset_index()
labels3.drop(['index'],axis=1, inplace=True)

from sklearn.model_selection import train_test_split
X_train3, X_test3, y_train3, y_test3 = train_test_split(features_df3,
labels3, test_size=0.3, random_state=42)

from sklearn.linear_model import LogisticRegression

logreg3 = LogisticRegression(max_iter=1000000)

logreg3.fit(X_train3,y_train3)

y_pred3 = logreg3.predict(X_test3)

print ('actual:    ', y_test3.values[0:10])
print ('predicted: ', y_pred3[0:10])

from sklearn import metrics
metrics.accuracy_score(y_test3,y_pred3)
```

```
C:\Users\SujitSonar\Anaconda3\lib\site-packages\sklearn\linear_model\
logistic.py:433: FutureWarning: Default solver will be changed to 'lb
fgs' in 0.22. Specify a solver to silence this warning.
  FutureWarning)
C:\Users\SujitSonar\Anaconda3\lib\site-packages\sklearn\utils\validat
ion.py:761: DataConversionWarning: A column-vector y was passed when
a 1d array was expected. Please change the shape of y to (n_samples,
), for example using ravel().
  y = column_or_1d(y, warn=True)
C:\Users\SujitSonar\Anaconda3\lib\site-packages\sklearn\linear_model\
logistic.py:460: FutureWarning: Default multi_class will be changed t
o 'auto' in 0.22. Specify the multi_class option to silence this warn
ing.
  "this warning.", FutureWarning)

actual:     [[4]
 [3]
 [4]
 [2]
 [3]
 [3]
 [4]
 [5]
 [1]
 [4]]
predicted:  [4 4 4 4 4 4 4 4 4 4]
```

Out[413]: 0.34155363748458695

Observations:

* using just Gender or Age or occupation, we see the accuracy of the model remains approximately the same
* the the best accuracy score is 34%

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]: