Final Project Submission

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- Student pace: part time
- Scheduled project review date/time:
- Instructor name: Veronica Isiaho
- Blog post URL:

Microsoft Movie Analysis

Overview.

The project is aimed at understanding the movie industry,identify the gaps and give recommendations to Microsoft on comeback to its rightful position as the leading movie entertainment provider.We use exploratory data analysis which will provide Microsoft with the types of films that are performing well at the box office.The data set used is compiled from https://www.imdb.com/ (https://www.imdb.com/)

Data Understanding

To access the data and perform subsequent analysis, we need to import the required libraries,clean the data, and transform data into a suitable format further analysis and give insights.

In [1]:
```
#Import all libraries required: numpy, pandas, matplotlib, and seaborn.
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
```

In [2]:
```
#import all datasets to be used
title_basics=pd.read_csv("C:/Users/user/Documents/Flatiron/project/dsc-pha
title_basics
```

Out[2]:

	tconst	primary_title	original_title	start_year	runtime_minutes	ge
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,D
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,D
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	D
3	tt0069204	Sabse Bada Sukh	Sabse Bada Sukh	2018	NaN	Comedy,D
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fa
...	...	...	...	...	...	
146139	tt9916538	Kuambil Lagi Hatiku	Kuambil Lagi Hatiku	2019	123.0	D
146140	tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	Rodolpho Teóphilo - O Legado de um Pioneiro	2015	NaN	Docume
146141	tt9916706	Dankyavar Danka	Dankyavar Danka	2013	NaN	Co
146142	tt9916730	6 Gunn	6 Gunn	2017	116.0	
146143	tt9916754	Chico Albuquerque - Revelações	Chico Albuquerque - Revelações	2013	NaN	Docume

146144 rows × 6 columns

In [3]:
```
title_ratings=pd.read_csv("C:/Users/user/Documents/Flatiron/project/dsc-ph
title_ratings
```

Out[3]:

	tconst	averagerating	numvotes
0	tt10356526	8.3	31
1	tt10384606	8.9	559
2	tt1042974	6.4	20
3	tt1043726	4.2	50352
4	tt1060240	6.5	21
...	...	...	...
73851	tt9805820	8.1	25
73852	tt9844256	7.5	24
73853	tt9851050	4.7	14
73854	tt9886934	7.0	5
73855	tt9894098	6.3	128

73856 rows × 3 columns

In [4]:
```
movie_gross=pd.read_csv("C:/Users/user/Documents/Flatiron/project/dsc-phas
movie_gross
```

Out[4]:

	title	studio	domestic_gross	foreign_gross	year
0	Toy Story 3	BV	415000000.0	652000000	2010
1	Alice in Wonderland (2010)	BV	334200000.0	691300000	2010
2	Harry Potter and the Deathly Hallows Part 1	WB	296000000.0	664300000	2010
3	Inception	WB	292600000.0	535700000	2010
4	Shrek Forever After	P/DW	238700000.0	513900000	2010
...	...	...	...	...	...
3382	The Quake	Magn.	6200.0	NaN	2018
3383	Edward II (2018 re-release)	FM	4800.0	NaN	2018
3384	El Pacto	Sony	2500.0	NaN	2018
3385	The Swan	Synergetic	2400.0	NaN	2018
3386	An Actor Prepares	Grav.	1700.0	NaN	2018

3387 rows × 5 columns

In [5]:
```
#understanding each column from each data set
title_basics.columns
```

Out[5]:
```
Index(['tconst', 'primary_title', 'original_title', 'start_year',
       'runtime_minutes', 'genres'],
      dtype='object')
```

In [6]:
```
title_ratings.columns
```

Out[6]:
```
Index(['tconst', 'averagerating', 'numvotes'], dtype='object')
```

In [7]:
```
movie_gross.columns
```

Out[7]:
```
Index(['title', 'studio', 'domestic_gross', 'foreign_gross', 'year'], dty
pe='object')
```

In [8]:
```
#merge the datasets title_basic and title_ratings as title_basic_rating
title_basics_ratings = pd.merge(title_basics, title_ratings)
title_basics_ratings.columns
```

Out[8]:
```
Index(['tconst', 'primary_title', 'original_title', 'start_year',
       'runtime_minutes', 'genres', 'averagerating', 'numvotes'],
      dtype='object')
```

In [9]:
```
#merging title_basic_rating with movie_gross as df
df=pd.merge(title_basics_ratings,movie_gross,left_on='primary_title', righ
df.columns
```

Out[9]:
```
Index(['tconst', 'primary_title', 'original_title', 'start_year',
       'runtime_minutes', 'genres', 'averagerating', 'numvotes', 'title',
       'studio', 'domestic_gross', 'foreign_gross', 'year'],
      dtype='object')
```

In [10]:
```
# To display the first five rows of our dataset
df.head()
```

Out[10]:

	tconst	primary_title	original_title	start_year	runtime_minutes	genı
0	tt0315642	Wazir	Wazir	2016	103.0	Action,Crime,Drai
1	tt0337692	On the Road	On the Road	2012	124.0	Adventure,Drama,Romar
2	tt4339118	On the Road	On the Road	2014	89.0	Drai
3	tt5647250	On the Road	On the Road	2016	121.0	Drai
4	tt0359950	The Secret Life of Walter Mitty	The Secret Life of Walter Mitty	2013	114.0	Adventure,Comedy,Drai

Data Cleaning

To transform the dataset usable function, data cleaning process is as follows:

1.Dropping unnecessary columns.

2.Identifying and dropping duplicates.

3.Handling missing values.

4.Iterating over columns and making necessary adjustments.

In [11]:
```
#dropping unnecessary columns in the merged dataset
df= df.drop(['tconst', 'primary_title','original_title', 'start_year','stu
df
```

Out[11]:

	runtime_minutes	genres	averagerating	numvotes	title	d
0	103.0	Action,Crime,Drama	7.1	15378	Wazir	
1	124.0	Adventure,Drama,Romance	6.1	37886	On the Road	
2	89.0	Drama	6.0	6	On the Road	
3	121.0	Drama	5.7	127	On the Road	
4	114.0	Adventure,Comedy,Drama	7.3	275300	The Secret Life of Walter Mitty	
...	...	...	...	...	...	
3022	102.0	Drama	7.1	147	The Chambermaid	
3023	101.0	Romance	6.5	607	How Long Will I Love U	
3024	135.0	Drama	5.4	673	Helicopter Eela	
3025	114.0	Drama,Romance	6.4	322	Last Letter	
3026	84.0	Documentary,Music	8.8	2067	Burn the Stage: The Movie	

3027 rows × 8 columns

In [12]:
```
#checking for duplicates
df.duplicated().value_counts()
```

Out[12]:
```
False    3027
dtype: int64
```

In [13]:
```
#keep all duplicates and sort by title
df[df.duplicated(keep=False)].sort_values(by='title')
df
```

Out[13]:

	runtime_minutes	genres	averagerating	numvotes	title	d
0	103.0	Action,Crime,Drama	7.1	15378	Wazir	
1	124.0	Adventure,Drama,Romance	6.1	37886	On the Road	
2	89.0	Drama	6.0	6	On the Road	
3	121.0	Drama	5.7	127	On the Road	
4	114.0	Adventure,Comedy,Drama	7.3	275300	The Secret Life of Walter Mitty	
...	...	...	...	...	...	
3022	102.0	Drama	7.1	147	The Chambermaid	
3023	101.0	Romance	6.5	607	How Long Will I Love U	
3024	135.0	Drama	5.4	673	Helicopter Eela	
3025	114.0	Drama,Romance	6.4	322	Last Letter	
3026	84.0	Documentary,Music	8.8	2067	Burn the Stage: The Movie	

3027 rows × 8 columns

In [14]:
```
#dropping title duplicates and keep the first one
df = df.drop_duplicates(subset=['title'], keep='first')
df
```

Out[14]:

	runtime_minutes	genres	averagerating	numvotes	title	d
0	103.0	Action,Crime,Drama	7.1	15378	Wazir	
1	124.0	Adventure,Drama,Romance	6.1	37886	On the Road	
4	114.0	Adventure,Comedy,Drama	7.3	275300	The Secret Life of Walter Mitty	
5	114.0	Action,Crime,Drama	6.5	105116	A Walk Among the Tombstones	
6	124.0	Action,Adventure,Sci-Fi	7.0	539338	Jurassic World	
...	...	...	...	...	...	
3022	102.0	Drama	7.1	147	The Chambermaid	
3023	101.0	Romance	6.5	607	How Long Will I Love U	
3024	135.0	Drama	5.4	673	Helicopter Eela	
3025	114.0	Drama,Romance	6.4	322	Last Letter	
3026	84.0	Documentary,Music	8.8	2067	Burn the Stage: The Movie	

2598 rows × 8 columns

In [15]:
```
#missing data
df.isna().sum()
```

Out[15]:
```
runtime_minutes      14
genres                1
averagerating         0
numvotes              0
title                 0
domestic_gross       17
foreign_gross      1040
year                  0
dtype: int64
```

In [16]:
```
df.dtypes
```

Out[16]:
```
runtime_minutes    float64
genres              object
averagerating      float64
numvotes             int64
title               object
domestic_gross     float64
foreign_gross       object
year                 int64
dtype: object
```

From the above above codes,foreign gross has the highest number of missing value.The missing foreign and domestic gross values will be replaced by the most frequent value while the misiing runtime minutes will be replaced by the mean.

In [18]:
```
#remove the comma from the string(foreign gross) and then convert it to a
df['foreign_gross'] = df['foreign_gross'].astype(str).str.replace(',', '',
df
```

```
<ipython-input-18-75a87d88330b>: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: https://pandas.pydata.org/pandas-do
cs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (http
s://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returni
ng-a-view-versus-a-copy)
  df['foreign_gross'] = df['foreign_gross'].astype(str).str.replace(',',
'', regex=True).astype(float)
```

Out[18]:

	runtime_minutes	genres	averagerating	numvotes	title	d
0	103.0	Action,Crime,Drama	7.1	15378	Wazir	
1	124.0	Adventure,Drama,Romance	6.1	37886	On the Road	
4	114.0	Adventure,Comedy,Drama	7.3	275300	The Secret Life of Walter Mitty	
5	114.0	Action,Crime,Drama	6.5	105116	A Walk Among the Tombstones	
6	124.0	Action,Adventure,Sci-Fi	7.0	539338	Jurassic World	
...	...	...	...	...	...	
3022	102.0	Drama	7.1	147	The Chambermaid	
3023	101.0	Romance	6.5	607	How Long Will I Love U	
3024	135.0	Drama	5.4	673	Helicopter Eela	
3025	114.0	Drama,Romance	6.4	322	Last Letter	
3026	84.0	Documentary,Music	8.8	2067	Burn the Stage: The Movie	

2598 rows × 8 columns

In [19]:
```
#change the datatype to float
df['foreign_gross'] = df['foreign_gross'].astype(float)
df
```

```
<ipython-input-19-fdfe8524977e>: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: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  df['foreign_gross'] = df['foreign_gross'].astype(float)
```

Out[19]:

	runtime_minutes	genres	averagerating	numvotes	title	d
0	103.0	Action,Crime,Drama	7.1	15378	Wazir	
1	124.0	Adventure,Drama,Romance	6.1	37886	On the Road	
4	114.0	Adventure,Comedy,Drama	7.3	275300	The Secret Life of Walter Mitty	
5	114.0	Action,Crime,Drama	6.5	105116	A Walk Among the Tombstones	
6	124.0	Action,Adventure,Sci-Fi	7.0	539338	Jurassic World	
...	...	...	...	...	...	
3022	102.0	Drama	7.1	147	The Chambermaid	
3023	101.0	Romance	6.5	607	How Long Will I Love U	
3024	135.0	Drama	5.4	673	Helicopter Eela	
3025	114.0	Drama,Romance	6.4	322	Last Letter	
3026	84.0	Documentary,Music	8.8	2067	Burn the Stage: The Movie	

2598 rows × 8 columns

In [20]:
```
#replace missing values in the foreign_gross column with the most common v
df['foreign_gross'].fillna(df['foreign_gross'].mode()[0], inplace=True)
df
```

```
C:\Users\user\anaconda3\envs\learn-env\lib\site-packages\pandas\core\seri
es.py:4517: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-do
cs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (http
s://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returni
ng-a-view-versus-a-copy)
  return super().fillna(
```

Out[20]:

	runtime_minutes	genres	averagerating	numvotes	title	d
0	103.0	Action,Crime,Drama	7.1	15378	Wazir	
1	124.0	Adventure,Drama,Romance	6.1	37886	On the Road	
4	114.0	Adventure,Comedy,Drama	7.3	275300	The Secret Life of Walter Mitty	
5	114.0	Action,Crime,Drama	6.5	105116	A Walk Among the Tombstones	
6	124.0	Action,Adventure,Sci-Fi	7.0	539338	Jurassic World	
...	...	...	...	...	...	
3022	102.0	Drama	7.1	147	The Chambermaid	
3023	101.0	Romance	6.5	607	How Long Will I Love U	
3024	135.0	Drama	5.4	673	Helicopter Eela	
3025	114.0	Drama,Romance	6.4	322	Last Letter	
3026	84.0	Documentary,Music	8.8	2067	Burn the Stage: The Movie	

2598 rows × 8 columns

In [21]:
```
#replace missing values in the domestic_gross column with the most common
df['domestic_gross'].fillna(df['domestic_gross'].mode()[0], inplace=True)
df
```

```
C:\Users\user\anaconda3\envs\learn-env\lib\site-packages\pandas\core\seri
es.py:4517: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-do
cs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (http
s://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returni
ng-a-view-versus-a-copy)
  return super().fillna(
```

Out[21]:

	runtime_minutes	genres	averagerating	numvotes	title	d
0	103.0	Action,Crime,Drama	7.1	15378	Wazir	
1	124.0	Adventure,Drama,Romance	6.1	37886	On the Road	
4	114.0	Adventure,Comedy,Drama	7.3	275300	The Secret Life of Walter Mitty	
5	114.0	Action,Crime,Drama	6.5	105116	A Walk Among the Tombstones	
6	124.0	Action,Adventure,Sci-Fi	7.0	539338	Jurassic World	
...	...	...	...	...	...	
3022	102.0	Drama	7.1	147	The Chambermaid	
3023	101.0	Romance	6.5	607	How Long Will I Love U	
3024	135.0	Drama	5.4	673	Helicopter Eela	
3025	114.0	Drama,Romance	6.4	322	Last Letter	
3026	84.0	Documentary,Music	8.8	2067	Burn the Stage: The Movie	

2598 rows × 8 columns

In [22]:
```
#replace missing values in the runtime_minutes column with the mean.
df['runtime_minutes'].fillna(df['runtime_minutes'].mean(), inplace=True)
df
```

```
C:\Users\user\anaconda3\envs\learn-env\lib\site-packages\pandas\core\seri
es.py:4517: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-do
cs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (http
s://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returni
ng-a-view-versus-a-copy)
  return super().fillna(
```

Out[22]:

	runtime_minutes	genres	averagerating	numvotes	title	d
0	103.0	Action,Crime,Drama	7.1	15378	Wazir	
1	124.0	Adventure,Drama,Romance	6.1	37886	On the Road	
4	114.0	Adventure,Comedy,Drama	7.3	275300	The Secret Life of Walter Mitty	
5	114.0	Action,Crime,Drama	6.5	105116	A Walk Among the Tombstones	
6	124.0	Action,Adventure,Sci-Fi	7.0	539338	Jurassic World	
...	...	...	...	...	...	
3022	102.0	Drama	7.1	147	The Chambermaid	
3023	101.0	Romance	6.5	607	How Long Will I Love U	
3024	135.0	Drama	5.4	673	Helicopter Eela	
3025	114.0	Drama,Romance	6.4	322	Last Letter	
3026	84.0	Documentary,Music	8.8	2067	Burn the Stage: The Movie	

2598 rows × 8 columns

In [23]:
```
# Fill missing data with the most frequent value from genres
df['genres'].fillna(df['genres'].value_counts().index[0], inplace=True)
df
```

```
C:\Users\user\anaconda3\envs\learn-env\lib\site-packages\pandas\core\series.py:4517: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  return super().fillna(
```

Out[23]:

	runtime_minutes	genres	averagerating	numvotes	title	d
0	103.0	Action,Crime,Drama	7.1	15378	Wazir	
1	124.0	Adventure,Drama,Romance	6.1	37886	On the Road	
4	114.0	Adventure,Comedy,Drama	7.3	275300	The Secret Life of Walter Mitty	
5	114.0	Action,Crime,Drama	6.5	105116	A Walk Among the Tombstones	
6	124.0	Action,Adventure,Sci-Fi	7.0	539338	Jurassic World	
...	...	...	...	...	...	
3022	102.0	Drama	7.1	147	The Chambermaid	
3023	101.0	Romance	6.5	607	How Long Will I Love U	
3024	135.0	Drama	5.4	673	Helicopter Eela	
3025	114.0	Drama,Romance	6.4	322	Last Letter	
3026	84.0	Documentary,Music	8.8	2067	Burn the Stage: The Movie	

2598 rows × 8 columns

In [24]:
```
df
```

Out[24]:

	runtime_minutes	genres	averagerating	numvotes	title	d
0	103.0	Action,Crime,Drama	7.1	15378	Wazir	
1	124.0	Adventure,Drama,Romance	6.1	37886	On the Road	
4	114.0	Adventure,Comedy,Drama	7.3	275300	The Secret Life of Walter Mitty	
5	114.0	Action,Crime,Drama	6.5	105116	A Walk Among the Tombstones	
6	124.0	Action,Adventure,Sci-Fi	7.0	539338	Jurassic World	
...	...	...	...	...	...	
3022	102.0	Drama	7.1	147	The Chambermaid	
3023	101.0	Romance	6.5	607	How Long Will I Love U	
3024	135.0	Drama	5.4	673	Helicopter Eela	
3025	114.0	Drama,Romance	6.4	322	Last Letter	
3026	84.0	Documentary,Music	8.8	2067	Burn the Stage: The Movie	

2598 rows × 8 columns

Now that our dataset is fully cleaned and prepared for analysis, we can now use it to answer some different questions that will yield valuable insights for Microsoft.

Average analysis of gross earnings from year 2010 to 2018

Getting the average of both foreign and domestic gross earning will provide insight on the performance of the movie industry over period.

In [26]:
```
#add a column average gross
df['Average_gross'] = df[['domestic_gross', 'foreign_gross']].mean(axis=1)
```

```
<ipython-input-26-d1f5f08f919e>: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: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  df['Average_gross'] = df[['domestic_gross', 'foreign_gross']].mean(axis=1)
```

In [27]:
```
df
```

Out[27]:

	runtime_minutes	genres	averagerating	numvotes	title	d
0	103.0	Action,Crime,Drama	7.1	15378	Wazir	
1	124.0	Adventure,Drama,Romance	6.1	37886	On the Road	
4	114.0	Adventure,Comedy,Drama	7.3	275300	The Secret Life of Walter Mitty	
5	114.0	Action,Crime,Drama	6.5	105116	A Walk Among the Tombstones	
6	124.0	Action,Adventure,Sci-Fi	7.0	539338	Jurassic World	
...	...	...	...	...	...	
3022	102.0	Drama	7.1	147	The Chambermaid	
3023	101.0	Romance	6.5	607	How Long Will I Love U	
3024	135.0	Drama	5.4	673	Helicopter Eela	
3025	114.0	Drama,Romance	6.4	322	Last Letter	
3026	84.0	Documentary,Music	8.8	2067	Burn the Stage: The Movie	

2598 rows × 9 columns

In [28]:

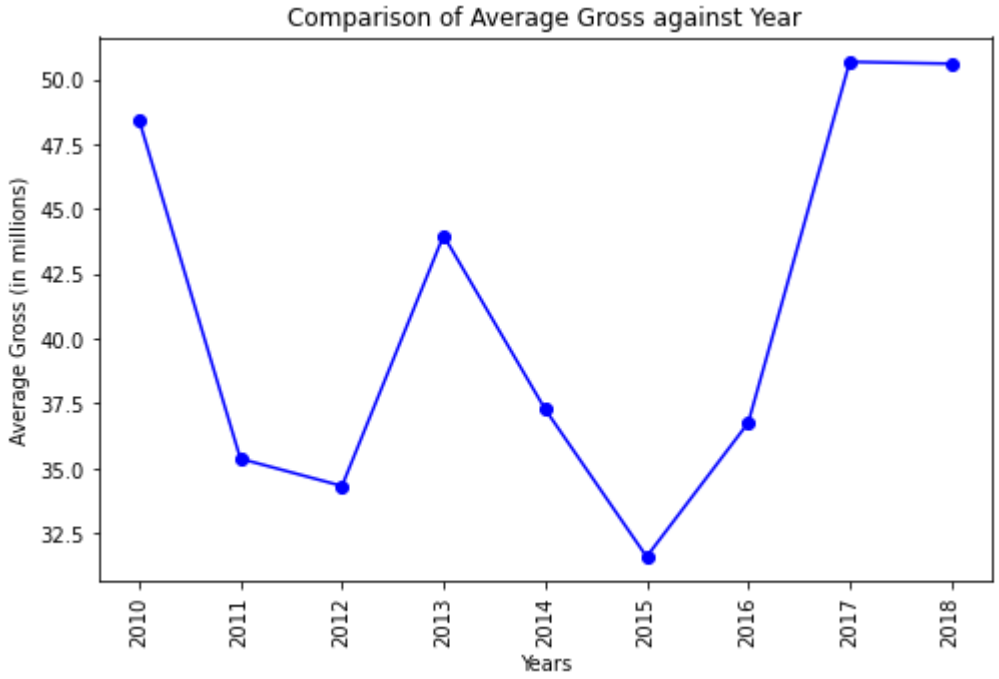
```
#slices the data to include values between 2010 and 2018,group by year
df1= df[(df['year'] <= 2018) & (df['year'] >= 2010)]
df1= df1.groupby('year')['Average_gross'].mean().reset_index()
df1
```

Out[28]:

	year	Average_gross
0	2010	4.846024e+07
1	2011	3.537233e+07
2	2012	3.432254e+07
3	2013	4.397963e+07
4	2014	3.728497e+07
5	2015	3.159594e+07
6	2016	3.675562e+07
7	2017	5.067393e+07
8	2018	5.060068e+07

In [29]:

```
# Extract x and y values to plot,
# Drawing a line graph of average revenue against year
x_values = df1['year']
y_values = df1['Average_gross']/ 1000000
xlabs = 'Years'
ylabs = 'Average Gross (in millions)'
title = 'Comparison of Average Gross against Year'

plt.figure(figsize=(8, 5))
plt.plot(x_values, y_values, marker='o', color='blue')
plt.xticks(ticks=x_values, rotation=90)
plt.xlabel(xlabs)
plt.ylabel(ylabs)
plt.title(title)
plt.show()
```



The average domestic and foreign gross showed an increasing trend from the years 2015 to 2017.In the year 2018, the average domestic and foreign gross appeared to be constant, showing no significant increase or decrease.Based on these findings, it suggests that there may be an opportunity to venture into creating movies because the average gross remained stable and there is a positive trend in the preceding years (2015 to 2017).

Genre count

What Movie Genres can be recommended for Microsoft to produce?

In [30]:
```
df['genres']
```

Out[30]:
```
0            Action,Crime,Drama
1       Adventure,Drama,Romance
4        Adventure,Comedy,Drama
5            Action,Crime,Drama
6       Action,Adventure,Sci-Fi
                 ...
3022                     Drama
3023                   Romance
3024                     Drama
3025              Drama,Romance
3026          Documentary,Music
Name: genres, Length: 2598, dtype: object
```

In [31]:
```
#changing the data type
df['genres'].astype('str')
```

Out[31]:
```
0            Action,Crime,Drama
1       Adventure,Drama,Romance
4        Adventure,Comedy,Drama
5            Action,Crime,Drama
6       Action,Adventure,Sci-Fi
                 ...
3022                     Drama
3023                   Romance
3024                     Drama
3025              Drama,Romance
3026          Documentary,Music
Name: genres, Length: 2598, dtype: object
```

In [32]:
```
#iterate over the genres column to seperate each genre into a row
genre1=[]
for value in df['genres']:
        genre1.append(value.split(','))

genre1
```

```
 ['Action', 'Adventure', 'Fantasy'],
 ['Action', 'Adventure', 'Crime'],
 ['Comedy', 'Romance'],
 ['Action', 'Adventure', 'Animation'],
 ['Action', 'Adventure', 'Drama'],
 ['Comedy', 'Drama', 'Romance'],
 ['Comedy', 'Crime', 'Drama'],
 ['Drama', 'History', 'Romance'],
 ['Comedy', 'Family'],
 ['Adventure', 'Comedy', 'Family'],
 ['Animation', 'Family'],
 ['Drama', 'Horror', 'Mystery'],
 ['Comedy', 'Drama'],
 ['Comedy', 'Romance'],
 ['Documentary', 'Music'],
 ['Action', 'Adventure', 'Sci-Fi'],
 ['Drama', 'Fantasy', 'Horror'],
 ['Adventure', 'Animation', 'Comedy'],
 ['Biography', 'Drama'],
 ['Adventure', 'Comedy', 'Fantasy'],
```

In [33]:
```
#flattening the list
Genre =[]
for item in genre1:
    for item1 in item:
        Genre.append(item1)
Genre
```

Out[33]:
```
['Action',
 'Crime',
 'Drama',
 'Adventure',
 'Drama',
 'Romance',
 'Adventure',
 'Comedy',
 'Drama',
 'Action',
 'Crime',
 'Drama',
 'Action',
 'Adventure',
 'Sci-Fi',
 'Action',
 'Crime',
 'Drama',
 'Comedy',
```

In [34]:
```
# Identify the count of each of the elements in the container
from collections import Counter
Counter(Genre)
```

Out[34]:
```
Counter({'Action': 586,
         'Crime': 344,
         'Drama': 1508,
         'Adventure': 411,
         'Romance': 427,
         'Comedy': 853,
         'Sci-Fi': 122,
         'Family': 104,
         'Animation': 148,
         'Thriller': 370,
         'Mystery': 180,
         'Biography': 262,
         'History': 122,
         'Horror': 185,
         'Fantasy': 156,
         'Western': 18,
         'Music': 85,
         'Documentary': 180,
         'War': 46,
         'Sport': 42,
         'Musical': 16,
         'News': 1})
```

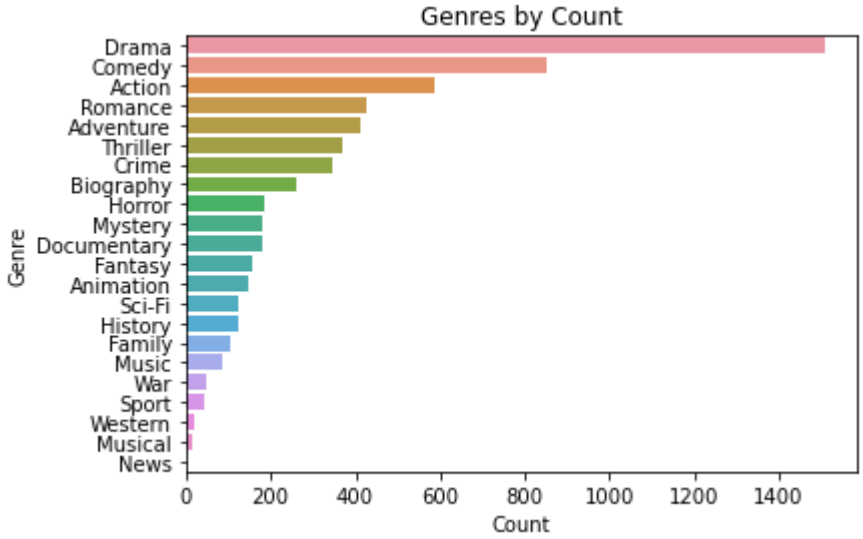
In [35]:
```
genre_counts = Counter({'Drama': 1508, 'Comedy': 853, 'Action': 586, 'Roma
```

In [36]:
```
Total_Genre=pd.DataFrame(list(genre_counts.items()), columns=['Genre', 'Co
Total_Genre
```

Out[36]:

	Genre	Count
0	Drama	1508
1	Comedy	853
2	Action	586
3	Romance	427
4	Adventure	411
5	Thriller	370
6	Crime	344
7	Biography	262
8	Horror	185
9	Mystery	180
10	Documentary	180
11	Fantasy	156
12	Animation	148
13	Sci-Fi	122
14	History	122
15	Family	104
16	Music	85
17	War	46
18	Sport	42
19	Western	18
20	Musical	16
21	News	1

In [37]:
```
#plotting Genre by Count
sns.barplot(x='Count', y='Genre', data=Total_Genre)
plt.title("Genres by Count")
plt.show()
```



As shown above the top five movie genres by count based on the dataset are: Drama,comedy,action,romance and adventure.This information can be valuable for purposes of understanding popular genres and making decisions about movie production or distribution.

Average movie runtime

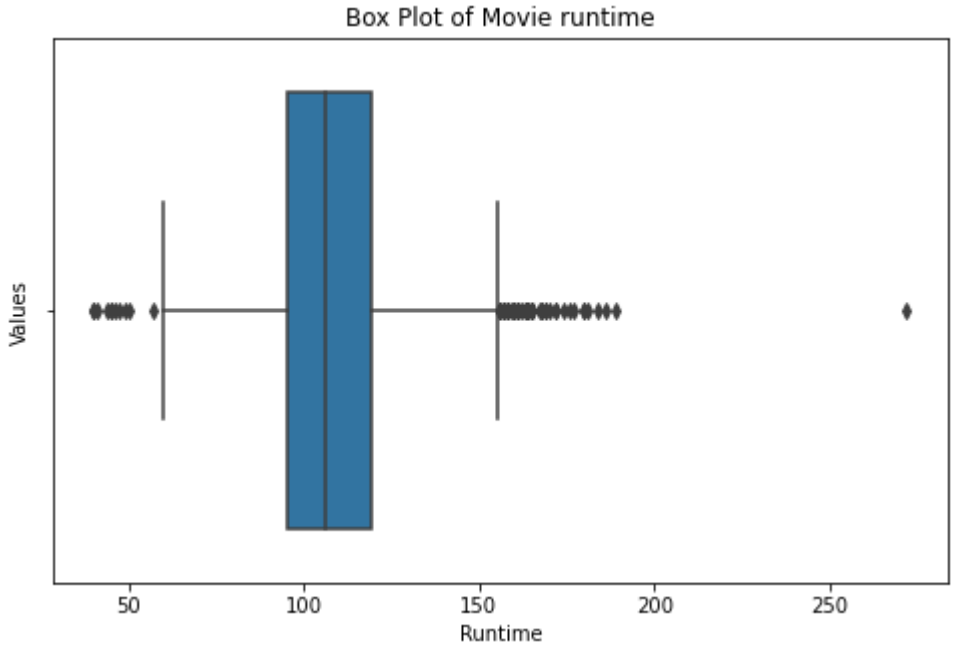
we need to get the average runtime of the movies provided in the dataset.

In [38]:
```
#movie runtime_minutes
mean_value = df['runtime_minutes'].mean()
mean_value
```

Out[38]:
```
108.51122291021673
```

In [39]:

```
#Create a box plot
plt.figure(figsize=(8, 5))
sns.boxplot(x='runtime_minutes', data=df)
plt.xlabel('Runtime')
plt.ylabel('Values')
plt.title('Box Plot of Movie runtime')

plt.show()
```



From the dataset the average runtime of a movie is 108 minutes.As show in the box plot above,the majority of movies have runtimes within the 100 to 120-minute range.Microsoft should consider the time ranges above while releasing movies as is aligns with industry standards and audience expectations.

Best movie genre based on rating and votes

For this analysis, we will consider only the vote(numvote) greater than 1000 and average rating greater than 5. Some movies that have more than one genre, so we decided to convert all data for movies with more than one genre, to become the string "mix"

In [40]:
```
df.loc[df['genres'].str.contains(','), 'genres'] = 'mix'
```

```
C:\Users\user\anaconda3\envs\learn-env\lib\site-packages\pandas\core\inde
xing.py:1765: 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: https://pandas.pydata.org/pandas-do
cs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (http
s://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returni
ng-a-view-versus-a-copy)
  isetter(loc, value)
```

In [41]:
```
df
```

Out[41]:

	runtime_minutes	genres	averagerating	numvotes	title	domestic_gross
0	103.0	mix	7.1	15378	Wazir	1100000.0
1	124.0	mix	6.1	37886	On the Road	744000.0
4	114.0	mix	7.3	275300	The Secret Life of Walter Mitty	58200000.0
5	114.0	mix	6.5	105116	A Walk Among the Tombstones	26300000.0
6	124.0	mix	7.0	539338	Jurassic World	652300000.0
...	...	...	...	...	...	...
3022	102.0	Drama	7.1	147	The Chambermaid	300.0
3023	101.0	Romance	6.5	607	How Long Will I Love U	747000.0
3024	135.0	Drama	5.4	673	Helicopter Eela	72000.0
3025	114.0	mix	6.4	322	Last Letter	181000.0
3026	84.0	mix	8.8	2067	Burn the Stage: The Movie	4200000.0

2598 rows × 9 columns

In [43]:

```
#dataset up to remove bias
df = df[df['averagerating'] >= 5]
df = df[df['numvotes'] > 1000]
df
```

Out[43]:

	runtime_minutes	genres	averagerating	numvotes	title	domestic_gross	forei
0	103.0	mix	7.1	15378	Wazir	1100000.0	
1	124.0	mix	6.1	37886	On the Road	744000.0	
4	114.0	mix	7.3	275300	The Secret Life of Walter Mitty	58200000.0	12
5	114.0	mix	6.5	105116	A Walk Among the Tombstones	26300000.0	2
6	124.0	mix	7.0	539338	Jurassic World	652300000.0	
...	...	...	...	...	...	...	
3018	139.0	mix	8.5	43409	Andhadhun	1200000.0	
3019	95.0	mix	6.1	2585	Gonjiam: Haunted Asylum	115000.0	
3020	126.0	Drama	8.5	20215	Capernaum	1700000.0	
3021	137.0	Drama	7.2	1620	The Spy Gone North	501000.0	
3026	84.0	mix	8.8	2067	Burn the Stage: The Movie	4200000.0	1

2182 rows × 9 columns

In [44]:
```
genres_rating = df[['genres', 'averagerating']]
genres_rating
```

Out[44]:

	genres	averagerating
0	mix	7.1
1	mix	6.1
4	mix	7.3
5	mix	6.5
6	mix	7.0
...	...	...
3018	mix	8.5
3019	mix	6.1
3020	Drama	8.5
3021	Drama	7.2
3026	mix	8.8

2182 rows × 2 columns

In [45]:
```
genres_votes = df[['genres', 'numvotes']]
genres_votes
```

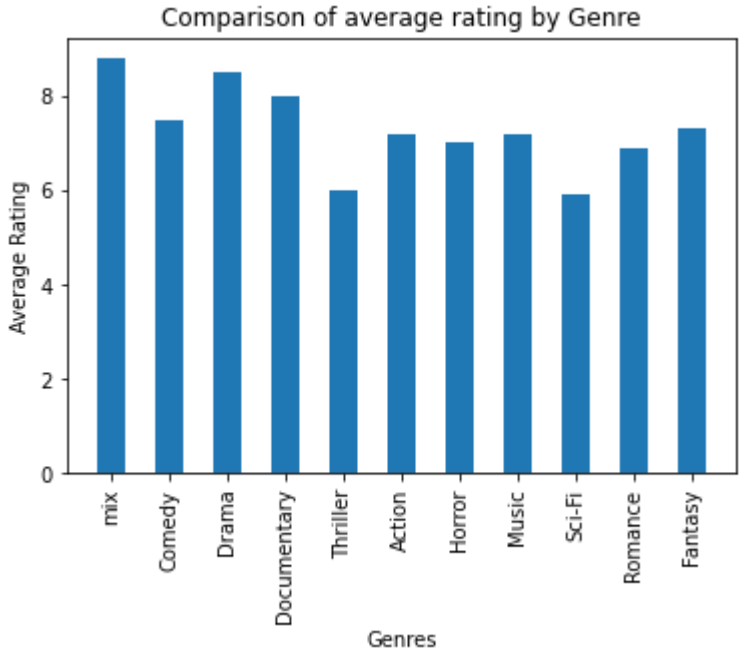
Out[45]:

	genres	numvotes
0	mix	15378
1	mix	37886
4	mix	275300
5	mix	105116
6	mix	539338
...	...	...
3018	mix	43409
3019	mix	2585
3020	Drama	20215
3021	Drama	1620
3026	mix	2067

2182 rows × 2 columns

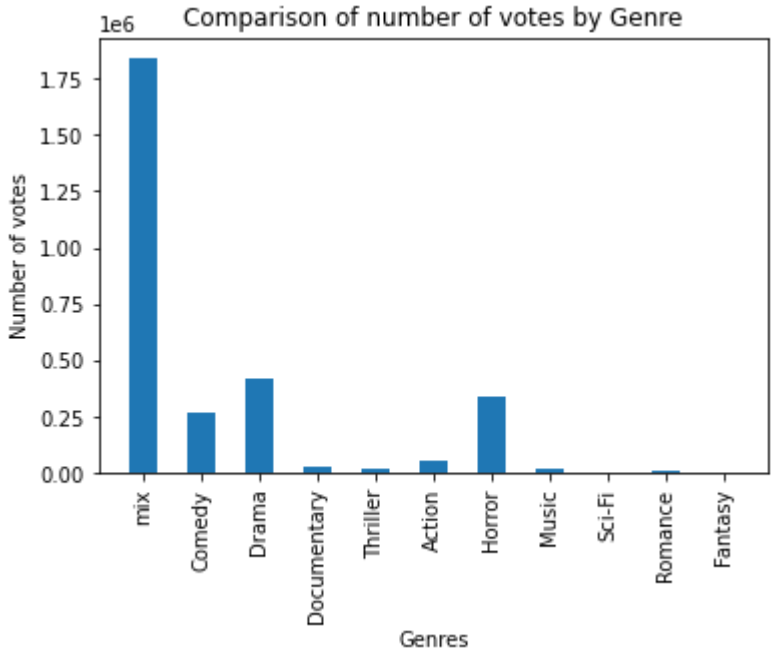
In [46]:

```
#compare average rating with genre

plt.bar(x = df['genres'], height = df['averagerating'], width = 0.5)
plt.xticks(rotation = 90)
plt.xlabel('Genres')
plt.ylabel('Average Rating')
plt.title('Comparison of average rating by Genre')
plt.show()
```



In [47]:

```
#compare number of votes with genre

plt.bar(x = df['genres'], height = df['numvotes'], width = 0.5)
plt.xticks(rotation = 90)
plt.xlabel('Genres')
plt.ylabel('Number of votes')
plt.title('Comparison of number of votes by Genre')
plt.show()
```



From the above comparison of genre with average rating and number of vote, most audience would prefer a movie that has more than one genre.It is important to note that based on the rating there is insignificant difference in the genre hence important to have a movie has a mixed genre.This aligns with the idea that the combination of genres can enhance a movie's appeal and attract a larger viewership.

Conclusion

Microsoft should consider creating films as income from the venture exhibit increasing and stable income over the years.In-depth market research to understand audience preferences and genre trends should be done to identify areas of opportunity and potential niches.

Whilst we can generalize that drama seems to be the most popular genre produced, there are many other factors which can contribute to the preference of a viewer.Microsoft might want tp blend different genres as it broader appeal and attract a larger audience. Mixing genres can provide a diverse and engaging cinematic experience.

Microsoft should take into consideration the runtime of a movie.The runtime of a movie can significantly impact the viewing experience and the concentration of the audience.

In [ ]: