Final Project Submission

Please fill out:

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

PROJECT OVERVIEW

This project uses exploratory data analysis to generate insights for a business stakeholder.

BUSINESS PROBLEM

Microsoft sees all the big companies creating original video content and they want to get in on the fun. They have decided to create a new movie studio, but they don't know anything about creating movies. I am charged with exploring what types of films are currently doing the best at the box office, then translate those findings into actionable insights that the head of Microsoft's new movie studio can use to help decide what type of films to create.

DATA UNDERSTANDING

Box office has a large dataset that shows the financial details, ratings,gross performance of different films. Each genre has an average rating, start year,primary title and runtime in minutes.

In [245]:
```
#importing libraries
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
```

In [246]:
```
#Loading the "imdb.title.basics" dataset and the "imdb.title.ratings" data set
basics_df = pd.read_csv('title.basics.csv')
ratings_df = pd.read_csv('title.ratings.csv')
```

In [247]:
```
# Getting basic information about "imdb.title.basics" the dataset
basics_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 146144 entries, 0 to 146143
Data columns (total 6 columns):
 #   Column           Non-Null Count   Dtype  
---  ------           --------------   -----  
 0   tconst           146144 non-null  object 
 1   primary_title    146143 non-null  object 
 2   original_title   146122 non-null  object 
 3   start_year       146144 non-null  int64  
 4   runtime_minutes  114405 non-null  float64
 5   genres           140736 non-null  object 
dtypes: float64(1), int64(1), object(4)
memory usage: 6.7+ MB
```

In [248]:
```
# Getting basic information about the "imdb.title.ratings" dataset
ratings_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 73856 entries, 0 to 73855
Data columns (total 3 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   tconst         73856 non-null  object 
 1   averagerating  73856 non-null  float64
 2   numvotes       73856 non-null  int64  
dtypes: float64(1), int64(1), object(1)
memory usage: 1.7+ MB
```

DATA CLEANING

In [269]:
```
#checking on missing values
basics_df.isnull().sum()
```

Out[269]:
```
tconst                 0
primary_title          1
original_title        22
start_year             0
runtime_minutes    31739
genres              5408
dtype: int64
```

In [250]:
```
#imputing the missing values in "runtime_minutes" using median
median_runtime = df['runtime_minutes'].median()
df['runtime_minutes'].fillna(median_runtime, inplace=True)
```

In [251]:
```
#imputing the missing values in "genre" using mode(most occuring genre)
most_common_genre = df['genres'].mode().iloc[0]
df['genres'].fillna(most_common_genre, inplace=True)
```

In [252]:
```
basics df
```

Out[252]:

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

146144 rows × 6 columns

In [253]:
```
#I started by dropping duplicates,then sample to get an overview of the DataFrame
basics_df.drop_duplicates()
sample_df = basics_df.sample(n=20)
sample_df
```

Out[253]:

	tconst	primary_title	original_title	start_year	runtime_minutes	genres
5328	tt10461666	Recovering Forgotten History	Recovering Forgotten History	2019	NaN	History
83169	tt4799426	Pentatonix: On My Way Home	Pentatonix: On My Way Home	2015	90.0	Documentary,Music
100056	tt5846848	Christmas Is Real	Christmas Is Real	2016	48.0	Documentary,History
60639	tt3509176	Die Moskauer Prozesse	Die Moskauer Prozesse	2014	84.0	Documentary,History
127207	tt7784818	Unexpected Arrival	Unexpected Arrival	2017	NaN	NaN
24264	tt1980209	Pain & Gain	Pain & Gain	2013	129.0	Action,Comedy,Crime
31806	tt2199679	Theatre of the Dead	Theatre of the Dead	2013	85.0	Action,Horror,Thriller
23128	tt1945148	Off the Boulevard	Off the Boulevard	2011	96.0	Biography,Comedy,Documentary
136353	tt8684952	Kubrick's Odyssey II: Secrets Hidden in the Fi...	Kubrick's Odyssey II: Secrets Hidden in the Fi...	2012	61.0	Documentary
52508	tt3105500	E muet	E muet	2013	55.0	Documentary,Romance
119526	tt7176512	Beyond Deception Strategy	Beyond Deception Strategy	2015	52.0	Documentary
130635	tt8098416	White Lie aka Kezbe Bayda	White Lie aka Kezbe Bayda	2018	NaN	Comedy
102008	tt5965960	Escaping the Temple	Escaping the Temple	2016	69.0	Documentary
95729	tt5586052	The Invisibles	Die Unsichtbaren	2017	110.0	Biography,Drama,History
60949	tt3522158	La tierra sin habitantes	La tierra sin habitantes	2012	NaN	Documentary
91750	tt5305246	93 Days	93 Days	2016	118.0	Drama
9835	tt1577888	Miracle Girls: Neva-da Stop Dreaming	Yajima Biyôshitsu the movie: Yume o tsukama Ne...	2010	98.0	Comedy
15677	tt1743230	Drummer for the Mob	Drummer for the Mob	2014	92.0	Drama
83343	tt4813702	Anconetani	Anconetani	2015	76.0	Documentary
106531	tt6235154	Armageddon Gospels	Armageddon Gospels	2020	NaN	Drama,Horror,Mystery

In [254]:
```
# Then dropping rows with NaN values in the 'runtime_minutes' and 'genres' columns
Cleaned_basics_df = basics_df.dropna(subset=['runtime_minutes', 'genres'])
Cleaned_basics_df
```

Out[254]:

	tconst	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy
5	tt0111414	A Thin Life	A Thin Life	2018	75.0	Comedy
...	...	...	...	...	...	...
146134	tt9916160	Drømmeland	Drømmeland	2019	72.0	Documentary
146135	tt9916170	The Rehearsal	O Ensaio	2019	51.0	Drama
146136	tt9916186	Illenau - die Geschichte einer ehemaligen Heil...	Illenau - die Geschichte einer ehemaligen Heil...	2017	84.0	Documentary
146137	tt9916190	Safeguard	Safeguard	2019	90.0	Drama,Thriller
146139	tt9916538	Kuambil Lagi Hatiku	Kuambil Lagi Hatiku	2019	123.0	Drama

112233 rows × 6 columns

In [255]:
```
# checking if there are missing values in the ratings Dataset before merging with the clea
ratings_df.isnull().sum()
```

Out[255]:
```
tconst           0
averagerating    0
numvotes         0
dtype: int64
```

In [256]:

```
# merging the two Datasets for analysis using .merge() method
combined_df = pd.merge(Cleaned_basics_df, ratings_df, on='tconst')
combined_df
```

Out[256]:

	tconst	primary_title	original_title	start_year	runtime_minutes	genres	av
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama	
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama	
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	
3	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy	
4	tt0137204	Joe Finds Grace	Joe Finds Grace	2017	83.0	Adventure,Animation,Comedy	
...	...	...	...	...	...	...	
65715	tt9911774	Padmavyuhathile Abhimanyu	Padmavyuhathile Abhimanyu	2019	130.0	Drama	
65716	tt9913056	Swarm Season	Swarm Season	2019	86.0	Documentary	
65717	tt9913084	Diabolik sono io	Diabolik sono io	2019	75.0	Documentary	
65718	tt9914286	Sokagin Çocuklari	Sokagin Çocuklari	2019	98.0	Drama,Family	
65719	tt9916160	Drømmeland	Drømmeland	2019	72.0	Documentary	

65720 rows × 8 columns

In [257]:

```
# having a look at the combined dataset
combined_df.info()
combined_df.isnull().sum()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 65720 entries, 0 to 65719
Data columns (total 8 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   tconst           65720 non-null  object 
 1   primary_title    65720 non-null  object 
 2   original_title   65720 non-null  object 
 3   start_year       65720 non-null  int64  
 4   runtime_minutes  65720 non-null  float64
 5   genres           65720 non-null  object 
 6   averagerating    65720 non-null  float64
 7   numvotes         65720 non-null  int64  
dtypes: float64(2), int64(2), object(4)
memory usage: 4.0+ MB
```

Out[257]:

```
tconst             0
primary_title      0
original_title     0
start_year         0
runtime_minutes    0
genres             0
averagerating      0
numvotes           0
dtype: int64
```

In [258]:
```
#dropping columns not needed
df = combined_df.drop(columns=['tconst'])
df
```

Out[258]:

	primary_title	original_title	start_year	runtime_minutes	genres	averagerating
0	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama	7.0
1	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama	7.2
2	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9
3	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy	6.5
4	Joe Finds Grace	Joe Finds Grace	2017	83.0	Adventure,Animation,Comedy	8.1
...	...	...	...	...	...	...
65715	Padmavyuhathile Abhimanyu	Padmavyuhathile Abhimanyu	2019	130.0	Drama	8.4
65716	Swarm Season	Swarm Season	2019	86.0	Documentary	6.2
65717	Diabolik sono io	Diabolik sono io	2019	75.0	Documentary	6.2
65718	Sokagin Çocuklari	Sokagin Çocuklari	2019	98.0	Drama,Family	8.7
65719	Drømmeland	Drømmeland	2019	72.0	Documentary	6.5

65720 rows × 7 columns

Data Analysis

I started by having an overview of the top rate movies and low rated movies. Then explored on the distribution of genres, to check on which is highly or lowly distributed.

In [259]:

```
# finding the top-rated movies based on IMDb ratings
top_rated_movies = df.sort_values(by='averagerating', ascending=False)
print("Top-Rated Movies:")
print(top_rated_movies[['primary_title', 'start_year', 'averagerating']].head(10))
```

```
Top-Rated Movies:
                                          primary_title  start_year  \
763              The Dark Knight: The Ballad of the N Word        2018   
48436                  The Paternal Bond: Barbary Macaques        2015   
38900                                 I Was Born Yesterday!        2015   
58850  Ellis Island: The Making of a Master Race in A...        2018   
54672                                 Requiem voor een Boom        2016   
63823                         Pick It Up! - Ska in the '90s        2019   
610       Exteriores: Mulheres Brasileiras na Diplomacia        2018   
57886    A Dedicated Life: Phoebe Brand Beyond the Group        2015   
24816                                 Hercule contre Hermès        2012   
59019                                         Calamity Kevin        2019   

       averagerating  
763             10.0  
48436           10.0  
38900           10.0  
58850           10.0  
54672           10.0  
63823           10.0  
610             10.0  
57886           10.0  
24816           10.0  
59019           10.0  
```

In [260]:

```
#finding the lowest rated movies
lowest_rated_movies = df.sort_values(by='averagerating', ascending=True)

# Displaying the lowest-rated movies
print("Lowest-Rated Movies:")
print(lowest_rated_movies[['primary_title', 'start_year', 'averagerating']].head(10))
```

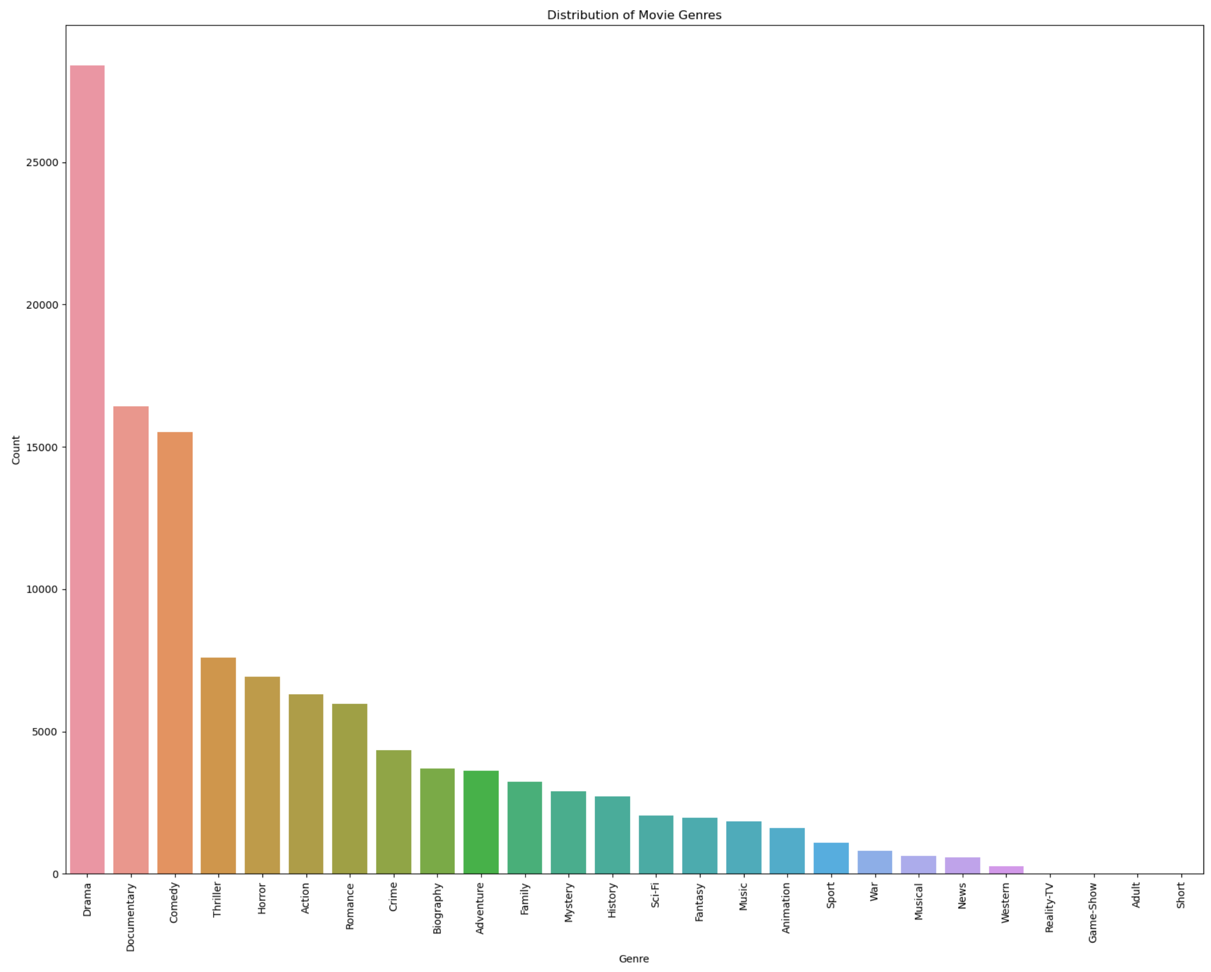
```
Lowest-Rated Movies:
                            primary_title  start_year  averagerating
53667                          Onverwacht        2011            1.0
54837                     Ya vas vsyekh ub'yu        2016            1.0
51698                Delusion of Persecution        2016            1.0
45393  Pure Hearts: Into Chinese Showbiz        2015            1.0
30022                              Ryûsei        2013            1.0
51643                     Bloody Massacre        2016            1.0
19564                     Finding Anthony        2012            1.0
22732              Momok jangan cari pasal!        2012            1.0
12677                     In a Lonely Planet        2011            1.0
62819                  Glaza i mir. Chast 1        2018            1.0
```

In [261]:
```
#Exploring the distribution of movie genres in the dataset by split method and explode the
genres = df['genres'].str.split(',').explode()
genre_counts = genres.value_counts()
genre_counts
```

Out[261]:
```
genres
Drama          28394
Documentary    16423
Comedy         15514
Thriller        7583
Horror          6917
Action          6297
Romance         5976
Crime           4338
Biography       3693
Adventure       3621
Family          3231
Mystery         2889
History         2704
Sci-Fi          2048
Fantasy         1969
Music           1844
Animation       1615
Sport           1099
War              795
Musical          638
News             575
Western          256
Reality-TV        13
Game-Show          2
Adult              2
Short              1
Name: count, dtype: int64
```

In [263]:
```
#visualizing genre distribution using bar plot
plt.figure(figsize=(20, 15))
sns.barplot(x=genre_counts.index, y=genre_counts.values)
plt.title('Distribution of Movie Genres')
plt.xlabel('Genre')
plt.ylabel('Count')
plt.xticks(rotation=90)
plt.show()
```

```
C:\Users\Sieku\anaconda3\Anaconda\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarn
ing: is_categorical_dtype is deprecated and will be removed in a future version. Use isi
nstance(dtype, CategoricalDtype) instead
  if pd.api.types.is_categorical_dtype(vector):
C:\Users\Sieku\anaconda3\Anaconda\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarn
ing: is_categorical_dtype is deprecated and will be removed in a future version. Use isi
nstance(dtype, CategoricalDtype) instead
  if pd.api.types.is_categorical_dtype(vector):
C:\Users\Sieku\anaconda3\Anaconda\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarn
ing: is_categorical_dtype is deprecated and will be removed in a future version. Use isi
nstance(dtype, CategoricalDtype) instead
  if pd.api.types.is_categorical_dtype(vector):
```



In [332]:
```
#descriptive analysis
df.describe()
```

Out[332]:

	start_year	runtime_minutes	averagerating	numvotes	domestic_gross	foreign_gross
count	2973.000000	2973.000000	2973.000000	2.973000e+03	2.973000e+03	2.969000e+03
mean	2013.786747	107.320552	6.461789	6.282036e+04	3.041947e+07	4.742381e+07
std	2.461329	19.906558	0.997358	1.263703e+05	6.689915e+07	1.151021e+08
min	2010.000000	40.000000	1.600000	5.000000e+00	0.000000e+00	0.000000e+00
25%	2012.000000	94.000000	5.900000	2.486000e+03	1.250000e+05	0.000000e+00
50%	2014.000000	105.000000	6.600000	1.375500e+04	1.900000e+06	2.300000e+06
75%	2016.000000	118.000000	7.100000	6.600800e+04	3.190000e+07	3.360000e+07
max	2019.000000	272.000000	9.200000	1.841066e+06	7.001000e+08	9.464000e+08

Handling Outliers

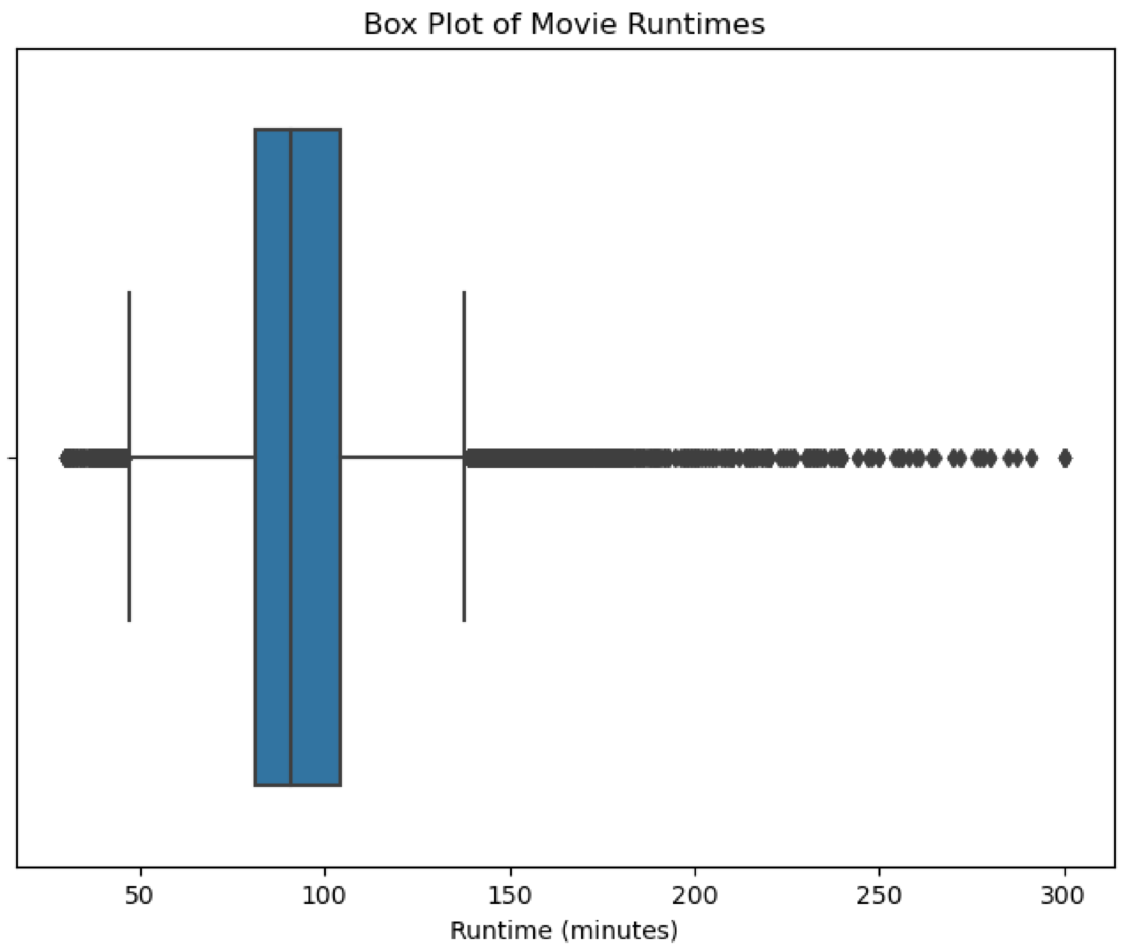
After checking on the distribution, i analyzed the runtime column just to check on the extreme runtime in minutes

In [ ]:

In [265]:

```
# Creating a box plot to visualize runtime trends and identify outliers
plt.figure(figsize=(8, 6))
sns.boxplot(x=filtered_df['runtime_minutes'])
plt.title('Box Plot of Movie Runtimes')
plt.xlabel('Runtime (minutes)')
plt.show()
```

```
C:\Users\Sieku\anaconda3\Anaconda\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarn
ing: is_categorical_dtype is deprecated and will be removed in a future version. Use isi
nstance(dtype, CategoricalDtype) instead
  if pd.api.types.is_categorical_dtype(vector):
```



In [266]:

```
# Filtering out movies with extreme runtimes (very short or very long)
runtime_threshold = (df['runtime_minutes'] >= 30) & (df['runtime_minutes'] <= 300)
filtered_df =df[runtime_threshold]
filtered_df
```

Out[266]:

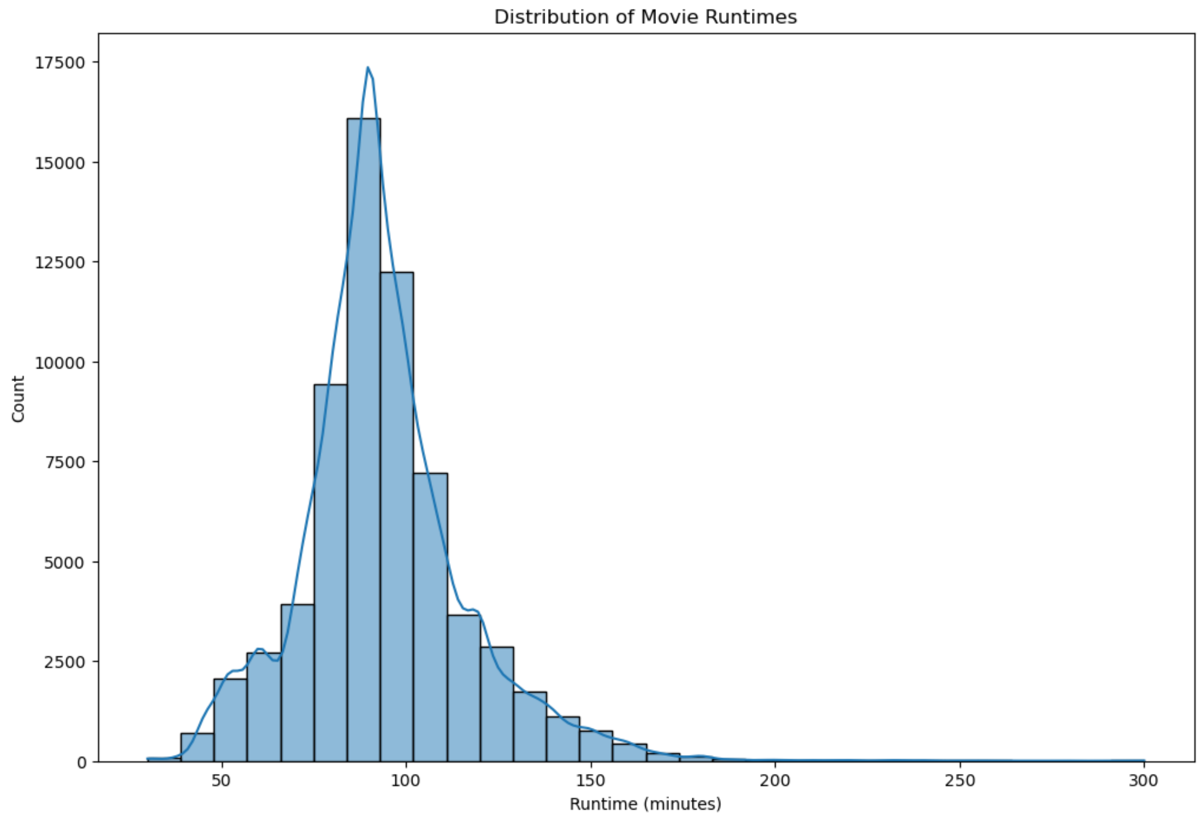
	primary_title	original_title	start_year	runtime_minutes	genres	averagerating
0	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama	7.0
1	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama	7.2
2	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9
3	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy	6.5
4	Joe Finds Grace	Joe Finds Grace	2017	83.0	Adventure,Animation,Comedy	8.1
...	...	...	...	...	...	...
65715	Padmavyuhathile Abhimanyu	Padmavyuhathile Abhimanyu	2019	130.0	Drama	8.4
65716	Swarm Season	Swarm Season	2019	86.0	Documentary	6.2
65717	Diabolik sono io	Diabolik sono io	2019	75.0	Documentary	6.2
65718	Sokagin Çocuklari	Sokagin Çocuklari	2019	98.0	Drama,Family	8.7
65719	Drømmeland	Drømmeland	2019	72.0	Documentary	6.5

65470 rows × 7 columns

In [267]:

```
# Creating a histogram to visualize the distribution of movie runtimes
plt.figure(figsize=(12, 8))
sns.histplot(filtered_df['runtime_minutes'], bins=30, kde=True)
plt.title('Distribution of Movie Runtimes')
plt.xlabel('Runtime (minutes)')
plt.ylabel('Count')
plt.show()
```

```
C:\Users\Sieku\anaconda3\Anaconda\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarn
ing: is_categorical_dtype is deprecated and will be removed in a future version. Use isi
nstance(dtype, CategoricalDtype) instead
  if pd.api.types.is_categorical_dtype(vector):
C:\Users\Sieku\anaconda3\Anaconda\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWarn
ing: use_inf_as_na option is deprecated and will be removed in a future version. Convert
inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
```



Movies with a run time of 90 minutes have the most count.The count gradually increases from 50 minutes to 90 as the peak the it gradually falls to 300 minutes as an outlier.

In [268]:
```
df = filtered_df
df
```

Out[268]:

	primary_title	original_title	start_year	runtime_minutes	genres	averagerating
0	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama	7.0
1	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama	7.2
2	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9
3	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy	6.5
4	Joe Finds Grace	Joe Finds Grace	2017	83.0	Adventure,Animation,Comedy	8.1
...	...	...	...	...	...	...
65715	Padmavyuhathile Abhimanyu	Padmavyuhathile Abhimanyu	2019	130.0	Drama	8.4
65716	Swarm Season	Swarm Season	2019	86.0	Documentary	6.2
65717	Diabolik sono io	Diabolik sono io	2019	75.0	Documentary	6.2
65718	Sokagin Çocuklari	Sokagin Çocuklari	2019	98.0	Drama,Family	8.7
65719	Drømmeland	Drømmeland	2019	72.0	Documentary	6.5

65470 rows × 7 columns

BIVARIATE ANALYSIS

Performed a bivariate analysis between two numerical variables,average rating and number of votes to check on the relationship

In [270]:
```
#Exploring the relationship between numvotes and averagerating using correlation
correlation = df['averagerating'].corr(df['numvotes'])
if correlation > 0:
    feedback = "There is a positive correlation between ratings and the number of votes."
elif correlation < 0:
    feedback = "There is a negative correlation between ratings and the number of votes."
else:
    feedback = "There is no significant correlation between ratings and the number of vote
print(correlation)
print(feedback)
```

```
0.049196411072546846
There is a positive correlation between ratings and the number of votes.
```

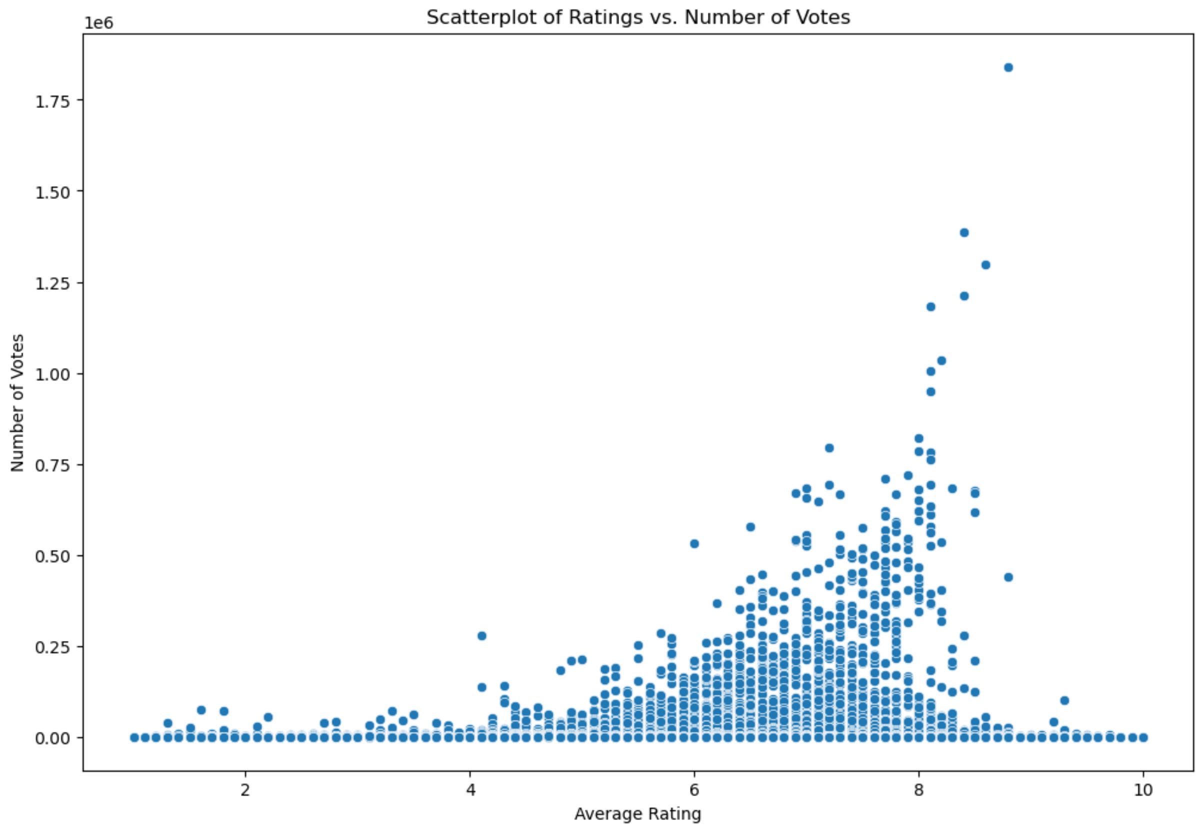
In [271]:
```
correlation_matrix = df[[ 'averagerating', 'numvotes']].corr()
print(correlation_matrix)
```

```
               averagerating  numvotes
averagerating       1.000000  0.049196
numvotes            0.049196  1.000000
```

In [275]:
```
# Creating a scatterplot to visualize the relationship
plt.figure(figsize=(12, 8))
sns.scatterplot(data=df, x='averagerating', y='numvotes')
plt.title('Scatterplot of Ratings vs. Number of Votes')
plt.xlabel('Average Rating')
plt.ylabel('Number of Votes')
```

```
C:\Users\Sieku\anaconda3\Anaconda\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarn
ing: is_categorical_dtype is deprecated and will be removed in a future version. Use isi
nstance(dtype, CategoricalDtype) instead
  if pd.api.types.is_categorical_dtype(vector):
C:\Users\Sieku\anaconda3\Anaconda\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarn
ing: is_categorical_dtype is deprecated and will be removed in a future version. Use isi
nstance(dtype, CategoricalDtype) instead
  if pd.api.types.is_categorical_dtype(vector):
```

Out[275]:
```
Text(0, 0.5, 'Number of Votes')
```



In [274]:
```
df['decade'] = (df['start_year'] // 10) * 10

# Grouping the data by decade and calculate the average rating for each decade
decade_ratings = df.groupby('decade')['averagerating'].mean()
decade_ratings
```

```
C:\Users\Sieku\AppData\Local\Temp\ipykernel_9428\3146013470.py:1: SettingWithCopyWarnin
g:
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-doc
s/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  df['decade'] = (df['start_year'] // 10) * 10
```

Out[274]:
```
decade
2010    6.316678
Name: averagerating, dtype: float64
```

Identifying the most popular and successful genres based on ratings and box office performance.

I started by loading the data, having an overview and cleaning afterwards before doing analysis

In [276]:
```
# Loading data from 'bom.movie_gross.csv' data set
df2= pd.read_csv('bom.movie_gross.csv')
df2
```

Out[276]:

	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 [277]:
```
#cleaning the data set
df2.drop_duplicates()
```

Out[277]:

	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 [278]:
```
#checking on information in the dataset
df2.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3387 entries, 0 to 3386
Data columns (total 5 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   title           3387 non-null   object 
 1   studio          3382 non-null   object 
 2   domestic_gross  3359 non-null   float64
 3   foreign_gross   2037 non-null   object 
 4   year            3387 non-null   int64  
dtypes: float64(1), int64(1), object(3)
memory usage: 132.4+ KB
```

In [279]:
```
#checking if there are missing values
df2.isnull().sum()
```

Out[279]:
```
title                0
studio               5
domestic_gross      28
foreign_gross     1350
year                 0
dtype: int64
```

In [280]:
```
# Filling missing values in 'domestic_gross' and 'foreign_gross' with zeros
df2['domestic_gross'].fillna(0, inplace = True)
df2['foreign_gross'].fillna(0, inplace = True)
```

In [281]:
```
# Checking if there are any remaining missing values in the Dataset
missing_values = df2.isnull().sum()
print(missing_values)
```

```
title             0
studio            5
domestic_gross    0
foreign_gross     0
year              0
dtype: int64
```

```
In [282]: df2.sample(20)
```

Out[282]:

	title	studio	domestic_gross	foreign_gross	year
1446	Our Children	Distrib.	23200.0	0	2013
2174	Love and Lost (Shi Gu)	CL	189000.0	0	2015
2905	Wish Upon	BG	14300000.0	0	2017
1083	Vulgaria	CL	59100.0	0	2012
1327	Stand Up Guys	LGF	3300000.0	0	2013
901	The Sessions	FoxS	6000000.0	3100000	2012
1353	The Kings of Summer	CBS	1300000.0	0	2013
2262	The Keeping Room	Drft.	27200.0	0	2015
3232	Can You Ever Forgive Me?	FoxS	8800000.0	0	2018
1917	The Hateful Eight	Wein.	54100000.0	101600000	2015
142	71 Into the Fire	JS	177000.0	20800000	2010
2006	American Ultra	LGF	14400000.0	12700000	2015
489	The Last Godfather	RAtt.	164000.0	16600000	2011
281	Eyes Wide Open	NAV	26300.0	250000	2010
1966	The Gift (2015)	STX	43800000.0	15200000	2015
415	The Change-Up	Uni.	37100000.0	38400000	2011
2973	The Sense of an Ending	CBS	1300000.0	0	2017
2740	Serial Killer 1	KL	10300.0	0	2016
754	Battleship	Uni.	65400000.0	237600000	2012
2022	Suffragette	Focus	4700000.0	11300000	2015

Merging gross data set and the combined data set of ratings and basics for further analysis

In [283]:
```
# Merging the datasets
merged_data = df.merge(df2, left_on='primary_title', right_on='title', how='inner')

# Grouping the merged data by genres
grouped_data = merged_data.groupby('genres')
grouped_data.head()
```

Out[283]:

riginal_title	start_year	runtime_minutes	genres	averagerating	numvotes	decade	title
Wazir	2016	103.0	Action,Crime,Drama	7.1	15378	2010	Wazir
On the Road	2012	124.0	Adventure,Drama,Romance	6.1	37886	2010	On the Road
On the Road	2014	89.0	Drama	6.0	6	2010	On the Road
On the Road	2016	121.0	Drama	5.7	127	2010	On the Road
The Secret ife of Walter Mitty	2013	114.0	Adventure,Comedy,Drama	7.3	275300	2010	The Secret Life of Walter Mitty
...	...	...	...	...	...	...	...
Tang ren jie tan an 2	2018	121.0	Action,Comedy,Mystery	6.1	1250	2010	Detective Chinatown 2
Free Solo	2018	100.0	Documentary,Sport	8.2	32250	2010	Free Solo
They Shall Not Grow Old	2018	99.0	Documentary,History,War	8.4	15612	2010	They Shall Not Grow Old
Gon-ji-am	2018	95.0	Horror,Mystery	6.1	2585	2010	Gonjiam: Haunted Asylum
Chao shi kong tong ju	2018	101.0	Romance	6.5	607	2010	How Long Will I Love U

ns

In [317]:
```python
#dropping columns not needed
columns_to_drop = [ 'title','original_title','decade','studio','year']
df = merged_data.drop(columns_to_drop, axis=1)
df
```

Out[317]:

	primary_title	start_year	runtime_minutes	genres	averagerating	numvotes	domestic_
0	Wazir	2016	103.0	Action,Crime,Drama	7.1	15378	110
1	On the Road	2012	124.0	Adventure,Drama,Romance	6.1	37886	74
2	On the Road	2014	89.0	Drama	6.0	6	74
3	On the Road	2016	121.0	Drama	5.7	127	74
4	The Secret Life of Walter Mitty	2013	114.0	Adventure,Comedy,Drama	7.3	275300	5820
...	...	...	...	...	...	...	
2968	The Chambermaid	2018	102.0	Drama	7.1	147	
2969	How Long Will I Love U	2018	101.0	Romance	6.5	607	74
2970	Helicopter Eela	2018	135.0	Drama	5.4	673	7
2971	Last Letter	2018	114.0	Drama,Romance	6.4	322	18
2972	Burn the Stage: The Movie	2018	84.0	Documentary,Music	8.8	2067	420

2973 rows × 8 columns

In [318]:
```python
#checking the data types of data structures in the columns
df.dtypes
```

Out[318]:
```
primary_title       object
start_year           int64
runtime_minutes    float64
genres              object
averagerating      float64
numvotes             int64
domestic_gross     float64
foreign_gross       object
dtype: object
```

In [319]:
```
# changing foreign gross column to float
df['foreign_gross'] = pd.to_numeric(df['foreign_gross'], errors='coerce')
df
```

Out[319]:

	primary_title	start_year	runtime_minutes	genres	averagerating	numvotes	domestic_
0	Wazir	2016	103.0	Action,Crime,Drama	7.1	15378	110
1	On the Road	2012	124.0	Adventure,Drama,Romance	6.1	37886	74
2	On the Road	2014	89.0	Drama	6.0	6	74
3	On the Road	2016	121.0	Drama	5.7	127	74
4	The Secret Life of Walter Mitty	2013	114.0	Adventure,Comedy,Drama	7.3	275300	5820
...	...	...	...	...	...	...	
2968	The Chambermaid	2018	102.0	Drama	7.1	147	
2969	How Long Will I Love U	2018	101.0	Romance	6.5	607	74
2970	Helicopter Eela	2018	135.0	Drama	5.4	673	7
2971	Last Letter	2018	114.0	Drama,Romance	6.4	322	18
2972	Burn the Stage: The Movie	2018	84.0	Documentary,Music	8.8	2067	420

2973 rows × 8 columns

ANALYSIS ON GENRE BOX OFFICE EARNINGS IN RELATION TO AVERAGE RATING

In [320]:
```
#sorting the results by the average rating or box office earnings
genre_stats = genre_stats.sort_values(by=['averagerating','domestic_gross'], ascending=Fa
genre_stats
```
Out[320]:

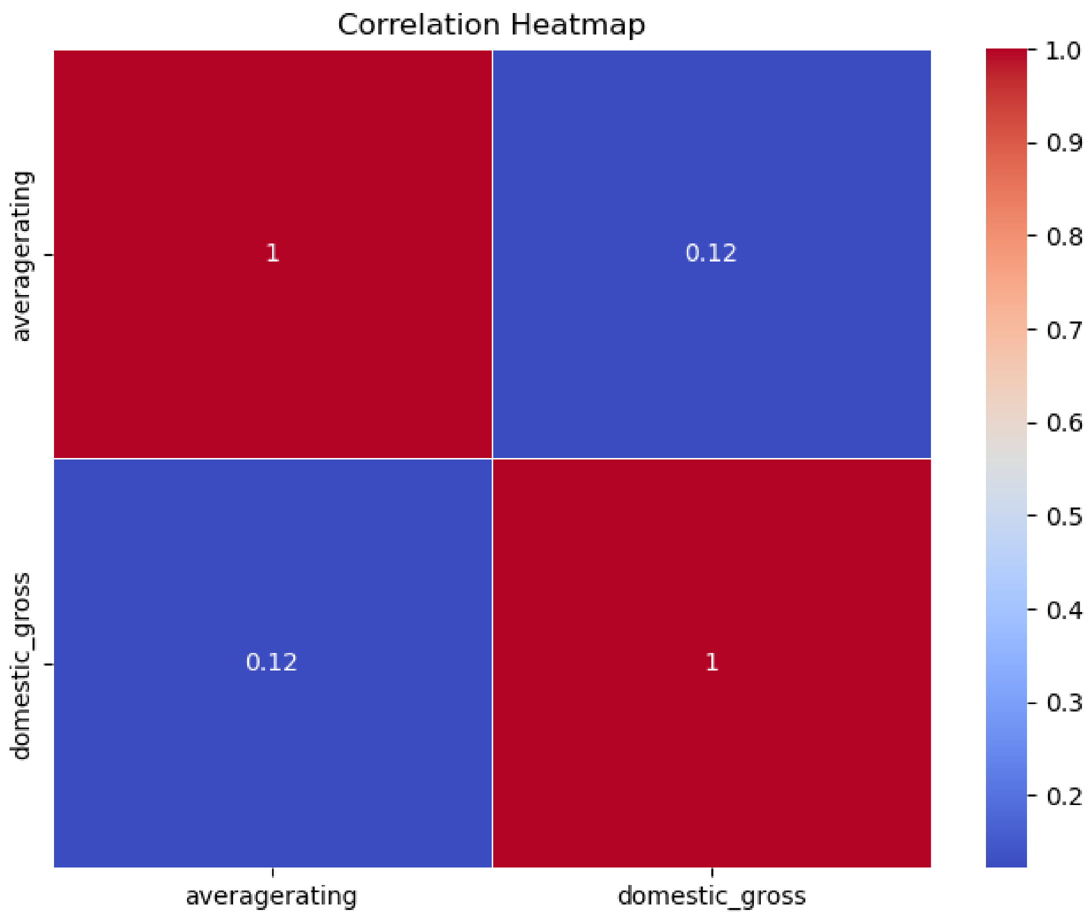
genres	averagerating	domestic_gross
Adventure	9.2	3600000.0
Action,Sport	8.4	4200000.0
Adventure,Drama,Sci-Fi	8.3	416400000.0
Biography,Documentary,Family	8.3	24500.0
Documentary,Sport	8.2	17500000.0
...	...	...
Fantasy,Horror	3.8	13000000.0
Drama,Mystery,Western	3.4	354000.0
Action,Drama,Music	3.4	99600.0
Comedy,Family,Sci-Fi	2.6	169000.0
Comedy,Thriller	2.1	800.0

320 rows × 2 columns

In [321]:
```
#Calculating the correlation between 'averagerating' and 'domestic_gross'
correlation = df['averagerating'].corr(df['domestic_gross'])
if correlation > 0:
    feedback = "There is a positive correlation between ratings and domestic gross."
elif correlation < 0:
    feedback = "There is a negative correlation between ratings and the domestic gross."
else:
    feedback = "There is no significant correlation between ratings and the domestic gros
print(correlation)
print(feedback)
```
```
0.12215524950139105
There is a positive correlation between ratings and domestic gross.
```

In [322]:
```
correlation_matrix = df[[ 'averagerating', 'domestic_gross']].corr()
print(correlation_matrix)
```
```
                averagerating  domestic_gross
averagerating        1.000000        0.122155
domestic_gross       0.122155        1.000000
```

In [323]:
```
# Creating a heatmap
plt.figure(figsize=(8, 6))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', linewidths=.5)
plt.title('Correlation Heatmap')
plt.show()
```



There is a positive correlation between average rating and domestic gross but it is relatively weak.

In [324]:
```
#Determining the most popular genres based on the number of movies released.

# Creating a DataFrame with one row per genre per movie
melted_genres_df = genres_df.melt(value_name='genre').dropna()

# Counting the number of movies per genre
genre_counts = melted_genres_df['genre'].value_counts()

# Finding the most popular genre
most_popular_genre = genre_counts.idxmax()
most_popular_genre_count = genre_counts.max()
print(f"The most popular genre is {most_popular_genre} with {most_popular_genre_count} mo
```

```
The most popular genre is Drama with 1734 movies.
```

Bivariate analysis between runtime and box office earnings

In [325]:

```
#correlation between runtime and box office earnings
correlation = df['runtime_minutes'].corr(df['domestic_gross'])
if correlation > 0:
    feedback = "There is a positive correlation between runtime and domestic gross."
elif correlation < 0:
    feedback = "There is a negative correlation between runtime and the domestic gross."
else:
    feedback = "There is no significant correlation between runtime and the domestic gros
print(correlation)
print(feedback)
```

```
0.13054866790342642
There is a positive correlation between runtime and domestic gross.
```

In [326]:

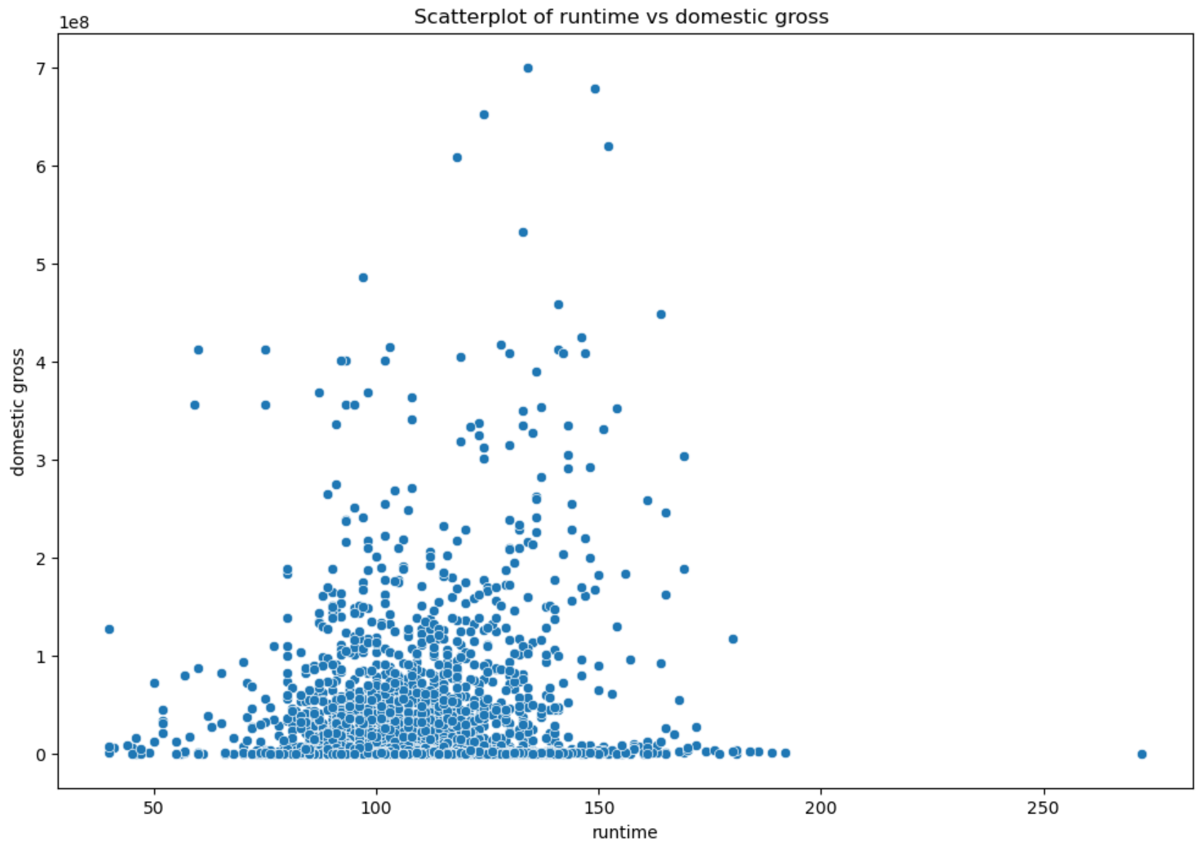
```
correlation_matrix = df[[ 'runtime_minutes', 'domestic_gross']].corr()
print(correlation_matrix)
```

```
                 runtime_minutes  domestic_gross
runtime_minutes         1.000000        0.130549
domestic_gross          0.130549        1.000000
```

In [327]:
```
# Creating a scatterplot to visualize the relationship
plt.figure(figsize=(12, 8))
sns.scatterplot(data=df, x='runtime_minutes', y='domestic_gross')
plt.title('Scatterplot of runtime vs domestic gross ')
plt.xlabel('runtime')
plt.ylabel('domestic gross')
```

```
C:\Users\Sieku\anaconda3\Anaconda\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarn
ing: is_categorical_dtype is deprecated and will be removed in a future version. Use isi
nstance(dtype, CategoricalDtype) instead
  if pd.api.types.is_categorical_dtype(vector):
C:\Users\Sieku\anaconda3\Anaconda\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarn
ing: is_categorical_dtype is deprecated and will be removed in a future version. Use isi
nstance(dtype, CategoricalDtype) instead
  if pd.api.types.is_categorical_dtype(vector):
```

Out[327]:
```
Text(0, 0.5, 'domestic gross')
```



Analysis to find the correlation of popular genres to Domestic gross

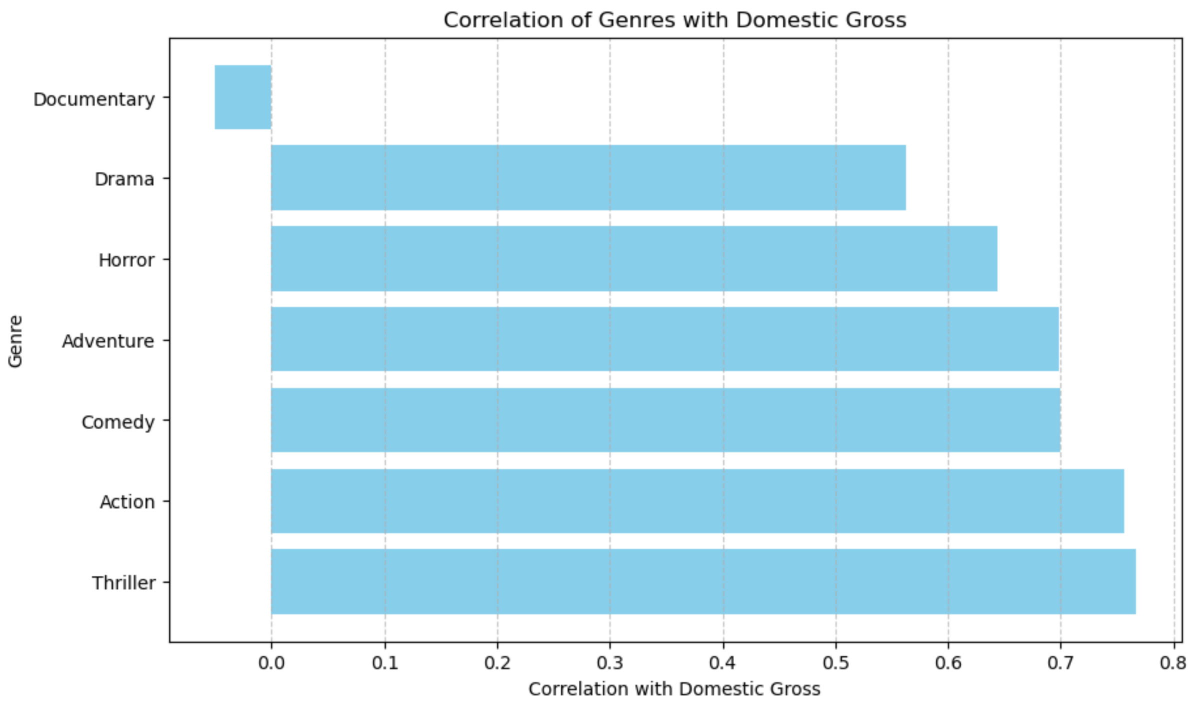
In [329]:

```
# Defining the popular genres analyze
genres_to_analyze = ['Drama', 'Documentary', 'Comedy', 'Action', 'Adventure', 'Thriller',

# Create an empty dictionary to store genre correlations with domestic gross
genre_correlations = {}

# Calculate the correlations for each genre
for genre in genres_to_analyze:
    genre_data = df[df['genres'].str.contains(genre, case=False, na=False)]
    correlation = genre_data['domestic_gross'].corr(genre_data['numvotes'])
    genre_correlations[genre] = correlation

# Create a DataFrame from the genre correlations
genre_correlation_df = pd.DataFrame(list(genre_correlations.items()), columns=['Genre', '(

# Sort the DataFrame by correlation values
genre_correlation_df = genre_correlation_df.sort_values(by='Correlation', ascending=False
genre_correlation_df
```

Out[329]:

	Genre	Correlation
5	Thriller	0.766348
3	Action	0.756357
2	Comedy	0.700060
4	Adventure	0.698739
6	Horror	0.643491
0	Drama	0.563014
1	Documentary	-0.050340
7	Science Fiction	NaN

In [330]:
```
# Createing a bar plot to visualize the genre correlations
plt.figure(figsize=(10, 6))
plt.barh(genre_correlation_df['Genre'], genre_correlation_df['Correlation'], color='skyblu
plt.xlabel('Correlation with Domestic Gross')
plt.ylabel('Genre')
plt.title('Correlation of Genres with Domestic Gross')
plt.grid(axis='x', linestyle='--', alpha=0.7)
plt.show()
```



Thriller, action are the genres with the highest correlation to Domestic gross followed by comedy and adventure.

In [331]:
```
df
```

Out[331]:

	primary_title	start_year	runtime_minutes	genres	averagerating	numvotes	domestic_
0	Wazir	2016	103.0	Action,Crime,Drama	7.1	15378	110
1	On the Road	2012	124.0	Adventure,Drama,Romance	6.1	37886	74
2	On the Road	2014	89.0	Drama	6.0	6	74
3	On the Road	2016	121.0	Drama	5.7	127	74
4	The Secret Life of Walter Mitty	2013	114.0	Adventure,Comedy,Drama	7.3	275300	5820
...	...	...	...	...	...	...	
2968	The Chambermaid	2018	102.0	Drama	7.1	147	
2969	How Long Will I Love U	2018	101.0	Romance	6.5	607	74
2970	Helicopter Eela	2018	135.0	Drama	5.4	673	7
2971	Last Letter	2018	114.0	Drama,Romance	6.4	322	18
2972	Burn the Stage: The Movie	2018	84.0	Documentary,Music	8.8	2067	420

2973 rows × 8 columns

CONCLUSION

Microsoft should consider the following;

1.Optimal Runtime: The analysis of film runtimes revealed that movies with a duration of around 90 minutes are the most prevalent. This finding suggests that,audiences may prefer films of this length. However, it's important to note that runtimes ranging from 50 to 90 minutes are also well-represented. I recommend considering these durations for the film production, with the understanding that exceptionally long films (e.g., 300 minutes) are outliers and may not align with audience preferences.

2.Engagement and Popularity: The positive correlation between ratings and the number of votes indicates that films with higher ratings tend to attract more viewer engagement and participation. Therefore, producing a film that resonates with audiences and garners positive reviews is likely to result in increased viewer involvement and word-of-mouth marketing.

3.Box Office Success: The positive correlation between ratings and domestic gross underscores the importance of producing high-quality films. A well-received film not only pleases audiences but is also likely to perform well at the box office. Thus, prioritizing the production of high-quality content can lead to financial success. This means selection of the top rated studios would be wise.

4.Runtime and Earnings: The positive correlation between runtime and domestic gross suggests that the duration of a film can influence its box office performance. While longer films may have higher earning potential, we should consider producing films with moderate runtimes that align with audience preferences to achieve a balance between viewer satisfaction and financial success.

And therefore my advice to the Microsoft head to is consider Comedy with 90 minutes as the runtime as the film to create reason being;

1.Comedy has a high popularity meaning it is well received by a larger audience, which also influences the number of votes. Thrillers, Horrors and Action can also be put into consideration as the second and third consecutively.

2.Using a runtime of 90 minutes, this will influence the number of votes which will translate to higher audience

```
In [ ]:
```