Final Project Submission

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- Student pace: Full Time
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MOVIE INDUSTRY ANALYSIS

Data Mining

In [ ]:
```
#First I will import all the necessary libraries
import pandas as pd
import sqlite3
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np

%matplotlib inline
```

In [ ]:
```
#load datasets from the computer to this jupyter notebook
budget_df = pd.read_csv("tn.movie_budgets.csv", index_col = 0)
imdb = sqlite3.connect('im.db')
```

View our Data

In [ ]:
```
#view the first rows of the dataframe
budget_df.head()
```

Out[ ]:

id	release_date	movie	production_budget	domestic_gross	worldwide_gross
1	Dec 18, 2009	Avatar	$425,000,000	$760,507,625	$2,776,345,279
2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	$410,600,000	$241,063,875	$1,045,663,875
3	Jun 7, 2019	Dark Phoenix	$350,000,000	$42,762,350	$149,762,350
4	May 1, 2015	Avengers: Age of Ultron	$330,600,000	$459,005,868	$1,403,013,963
5	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	$317,000,000	$620,181,382	$1,316,721,747

In [ ]:
```
budget_df.shape
```

Out[ ]:
```
(5782, 5)
```

Select Table Names

In [ ]:
```
#check the table names in the idmb database
#use pd.read_sql
pd.read_sql("""SELECT name
                AS 'Table Names'
                FROM sqlite_master
                WHERE type='table';""", imdb)
```

Out[ ]:

	Table Names
0	movie_basics
1	directors
2	known_for
3	movie_akas
4	movie_ratings
5	persons
6	principals
7	writers

Next we check the contents of `movie_basics` table

In [ ]:
```
#View the content in the movie basics table
pd.read_sql("""SELECT * FROM  movie_basics""", imdb)
```

Out[ ]:

	movie_id	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	None
146143	tt9916754	Chico Albuquerque - Revelações	Chico Albuquerque - Revelações	2013	NaN	Documentary

146144 rows × 6 columns

check the contents of `movie_ratings` table

In [ ]:
```
first_query = pd.read_sql("""SELECT * FROM movie_ratings
                          JOIN movie_basics
                          USING(movie_id)
                          WHERE numvotes > 200
                          AND averagerating > 9""", imdb)
first_query.head()
```

Out[ ]:

	movie_id	averagerating	numvotes	primary_title	original_title	start_year	runtime_minutes	genres
0	tt9680166	9.6	624	Yeh Suhaagraat Impossible	Yeh Suhaagraat Impossible	2019	92.0	Comedy
1	tt7738784	9.4	9629	Peranbu	Peranbu	2018	147.0	Drama
2	tt8203706	9.4	500	American Deep State	American Deep State	2019	62.0	Documentary
3	tt6487784	9.2	227	Generation Freedom	Generation Freedom	2019	98.0	Documentary
4	tt5813916	9.3	100568	The Mountain II	Dag II	2016	135.0	Action,Drama,War

Establish solutions to my business questions

Question 1 : Which movie genres have the highest rating and votes?

The `imdb` dataset will provide relevant data that will be used to answer this question

This requires me to join the `movie_basics` and `movie_ratings` tables

In [ ]:
```
#Use a shared column to join movie basics and movie ratings tables
basics_ratings = pd.read_sql("""SELECT * FROM movie_basics
                             JOIN movie_ratings
                             USING(movie_id)""", imdb)
basics_ratings
```

Out[ ]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres	averagerating	numvotes
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama	7.0	77
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama	7.2	43
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9	4517
3	tt0069204	Sabse Bada Sukh	Sabse Bada Sukh	2018	NaN	Comedy,Drama	6.1	13
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy	6.5	119
...	...	...	...	...	...	...	...	...
73851	tt9913084	Diabolik sono io	Diabolik sono io	2019	75.0	Documentary	6.2	6
73852	tt9914286	Sokagin Çocuklari	Sokagin Çocuklari	2019	98.0	Drama,Family	8.7	136
73853	tt9914642	Albatross	Albatross	2017	NaN	Documentary	8.5	8
73854	tt9914942	La vida sense la Sara Amat	La vida sense la Sara Amat	2019	NaN	None	6.6	5
73855	tt9916160	Drømmeland	Drømmeland	2019	72.0	Documentary	6.5	11

73856 rows × 8 columns

Data Cleaning Process

In [ ]:
```
#check if there is any duplicated movies
basics_ratings['primary_title'].duplicated().sum()
```

Out[ ]:
```
3863
```

In [ ]:
```
#drop the duplicated values we have found
basics_ratings_no_duplicates = basics_ratings.drop_duplicates(subset=['primary_title'])
basics_ratings_no_duplicates.head()
```

Out[ ]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres	averagerating	numvotes
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama	7.0	77
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama	7.2	43
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9	4517
3	tt0069204	Sabse Bada Sukh	Sabse Bada Sukh	2018	NaN	Comedy,Drama	6.1	13
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy	6.5	119

In [ ]:
```
#confirming there are no more duplicates
basics_ratings_no_duplicates['primary_title'].duplicated().sum()
```

Out[ ]:
```
0
```

In [ ]:
```
#Next we clean the budget_df by changing the data types
#Let us start by checking the budget datatypes
budget_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 5782 entries, 1 to 82
Data columns (total 5 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   release_date       5782 non-null   object
 1   movie              5782 non-null   object
 2   production_budget  5782 non-null   object
 3   domestic_gross     5782 non-null   object
 4   worldwide_gross    5782 non-null   object
dtypes: object(5)
memory usage: 271.0+ KB
```

In [ ]:
```
#The production_budget, worldwide_gross, and domestic_gross are object types
#We have to clean them by changing them to integer type
budget_df['production_budget'] = budget_df['production_budget'].str.replace(',', '').str.replace('$', ''
budget_df['domestic_gross'] = budget_df['domestic_gross'].str.replace(',', '').str.replace('$', '').asty
budget_df['worldwide_gross'] = budget_df['worldwide_gross'].str.replace(',', '').str.replace('$', '').as
budget_df.head()
```

```
/var/folders/s4/cfrykp010nq4sqgy7zxlrj5w0000gn/T/ipykernel_1436/455337667.py:3: FutureWarning: The defau
lt value of regex will change from True to False in a future version. In addition, single character regu
lar expressions will *not* be treated as literal strings when regex=True.
  budget_df['production_budget'] = budget_df['production_budget'].str.replace(',', '').str.replace('$',
'').astype(int)
/var/folders/s4/cfrykp010nq4sqgy7zxlrj5w0000gn/T/ipykernel_1436/455337667.py:4: FutureWarning: The defau
lt value of regex will change from True to False in a future version. In addition, single character regu
lar expressions will *not* be treated as literal strings when regex=True.
  budget_df['domestic_gross'] = budget_df['domestic_gross'].str.replace(',', '').str.replace('$', '').as
type(int)
/var/folders/s4/cfrykp010nq4sqgy7zxlrj5w0000gn/T/ipykernel_1436/455337667.py:5: FutureWarning: The defau
lt value of regex will change from True to False in a future version. In addition, single character regu
lar expressions will *not* be treated as literal strings when regex=True.
  budget_df['worldwide_gross'] = budget_df['worldwide_gross'].str.replace(',', '').str.replace('$', '').
astype(int)
```

Out[ ]:

id	release_date	movie	production_budget	domestic_gross	worldwide_gross
1	Dec 18, 2009	Avatar	425000000	760507625	2776345279
2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875
3	Jun 7, 2019	Dark Phoenix	350000000	42762350	149762350
4	May 1, 2015	Avengers: Age of Ultron	330600000	459005868	1403013963
5	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747

In [ ]:
```
#Filtering basics_ratings_no_duplicates further to have only
#movies with numvotes greater than 100 and rating above 6

filtered1 = basics_ratings_no_duplicates[basics_ratings_no_duplicates['averagerating'] > 6 ]
filtered2 = filtered1[filtered1['numvotes'] > 100]
filtered2
```

Out[ ]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres	averagerating	numvote
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9	451
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy	6.5	11
6	tt0137204	Joe Finds Grace	Joe Finds Grace	2017	83.0	Adventure,Animation,Comedy	8.1	26
7	tt0146592	Pál Adrienn	Pál Adrienn	2010	136.0	Drama	6.8	45
10	tt0162942	Children of the Green Dragon	A zöld sárkány gyermekei	2010	89.0	Drama	6.9	12
...	...	...	...	...	...	...	...	.
73840	tt9904844	Ott Tänak: The Movie	Ott Tänak: The Movie	2019	125.0	Documentary	8.7	21
73841	tt9905412	Ottam	Ottam	2019	120.0	Drama	8.1	50
73842	tt9905462	Pengalila	Pengalila	2019	111.0	Drama	8.4	60
73849	tt9911774	Padmavyuhathile Abhimanyu	Padmavyuhathile Abhimanyu	2019	130.0	Drama	8.4	36
73852	tt9914286	Sokagin Çocuklari	Sokagin Çocuklari	2019	98.0	Drama,Family	8.7	13

13977 rows × 8 columns

In [ ]:
```
#use inner join to keep columns in all the joined dataframes intact
joined_df= filtered2.join(budget_df, how ="inner")
joined_df.head()
```

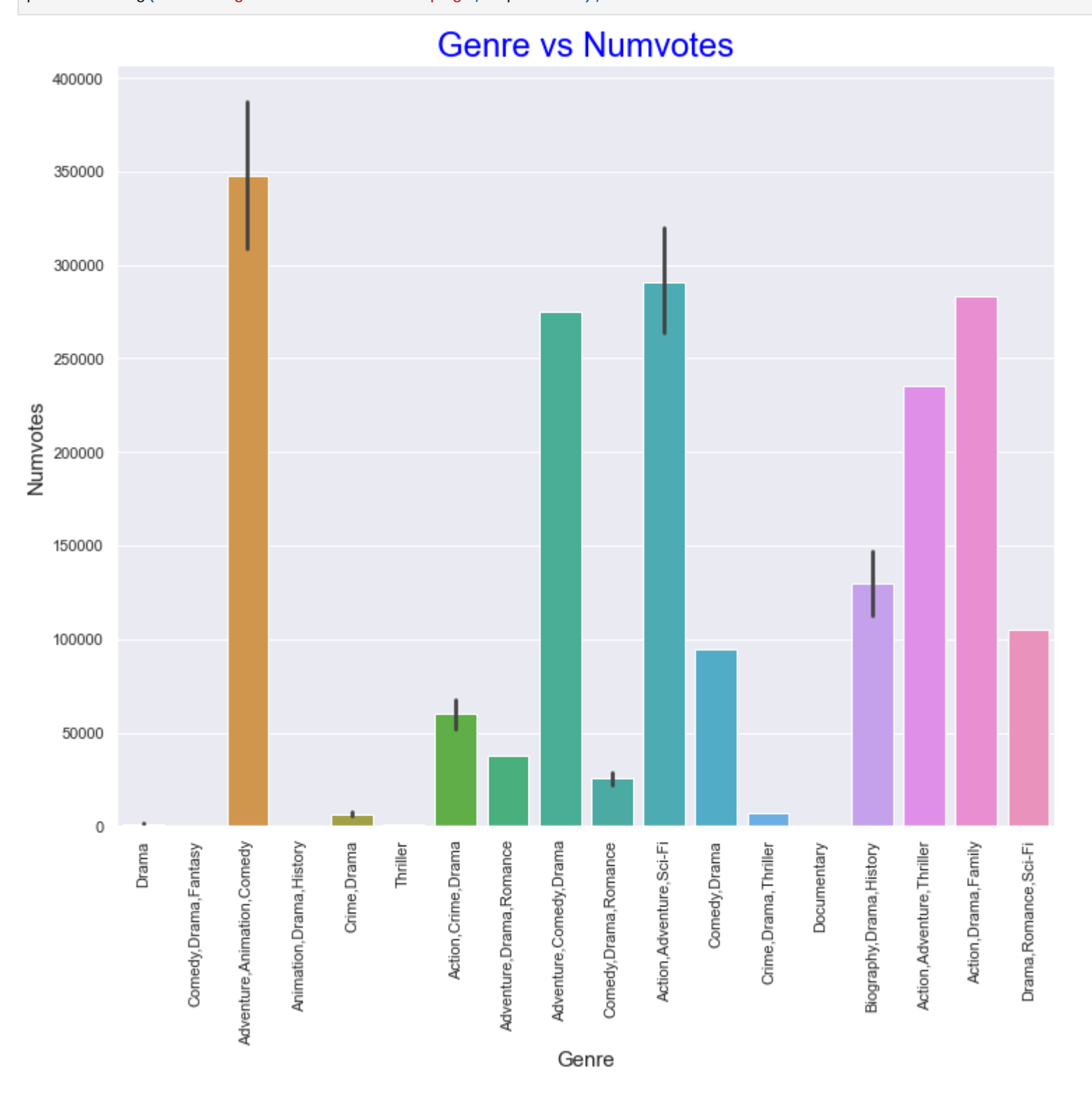
Out[ ]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres	averagerating	numvotes	release_date	movie
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9	4517	May 20, 2011	Pirates of the Caribbean: On Stranger Tides
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9	4517	Nov 22, 2017	Coco
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9	4517	Nov 21, 2012	Rise of the Guardians
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9	4517	Jun 23, 2010	Knight and Day
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9	4517	Apr 18, 2014	Transcendence

Exploratory Data Analysis

we will use data specifically a bar plot to show the relationship between movie genres and numvotes

In [ ]:
```
sns.set(rc = {'figure.figsize': (12,10)} )
ay = sns.barplot(x = 'genres', y = 'numvotes', data = joined_df)
plt.title('Genre vs Numvotes', size = 24, color = 'blue')
ay.set_ylabel('Numvotes', size = 15)
ay.set_xlabel('Genre', size = 15)
plt.xticks(rotation = 90)
plt.savefig("Movie genre vs Numvotes.png", dpi = 80);
```



My Analysis

The following movie genres have high ratings and number of votes:

1.Adventure, Animation, Comedy

2. Action, Adventure, Sci-Fi

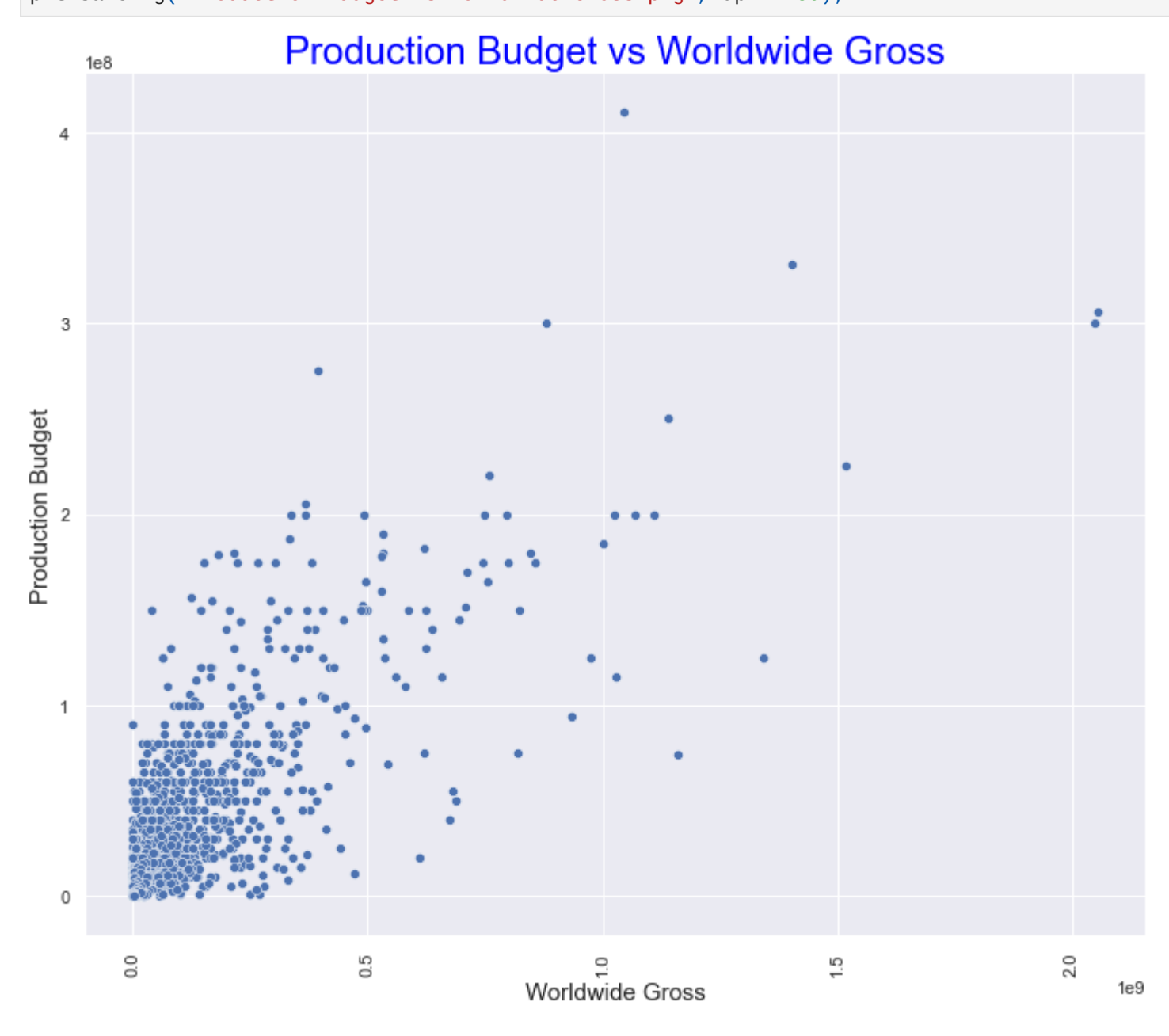
3. Action, Drama, Family

Question 2:

Does High Production Cost Translate to High Income?

I used scatter plot to show the relationship between `production_budget` and `worldwide_gross` to solve this problem

In [ ]:
```
#Scatter plot to show relation between productionbudget and worlwide gross
sns.set(rc = {'figure.figsize': (12,10)} )
ay = sns.scatterplot(x = 'worldwide_gross', y = 'production_budget', data = joined_df)
plt.xticks(rotation = 90)
plt.title('Production Budget vs Worldwide Gross', size = 24, color = 'blue')
ay.set_ylabel('Production Budget', size = 15)
ay.set_xlabel('Worldwide Gross', size = 15)
plt.savefig("Production Budget vs Worldwide Gross.png", dpi = 80);
```



Another scatter plot with `domestic_gross` instead of `worldwide_gross` can give further insight in this relationship

In [ ]:
```
sns.set(rc = {'figure.figsize': (12,10)} )
ay = sns.scatterplot(x = 'domestic_gross', y = 'production_budget', data = joined_df)
plt.title('Production Budget vs Domestic Gross', size =24, color = 'blue')
ay.set_ylabel('Production Budget', size = 15)
ay.set_xlabel('Domestic Gross', size = 15)
plt.savefig("Production Budget vs Domestic Gross.png", dpi = 80);
```

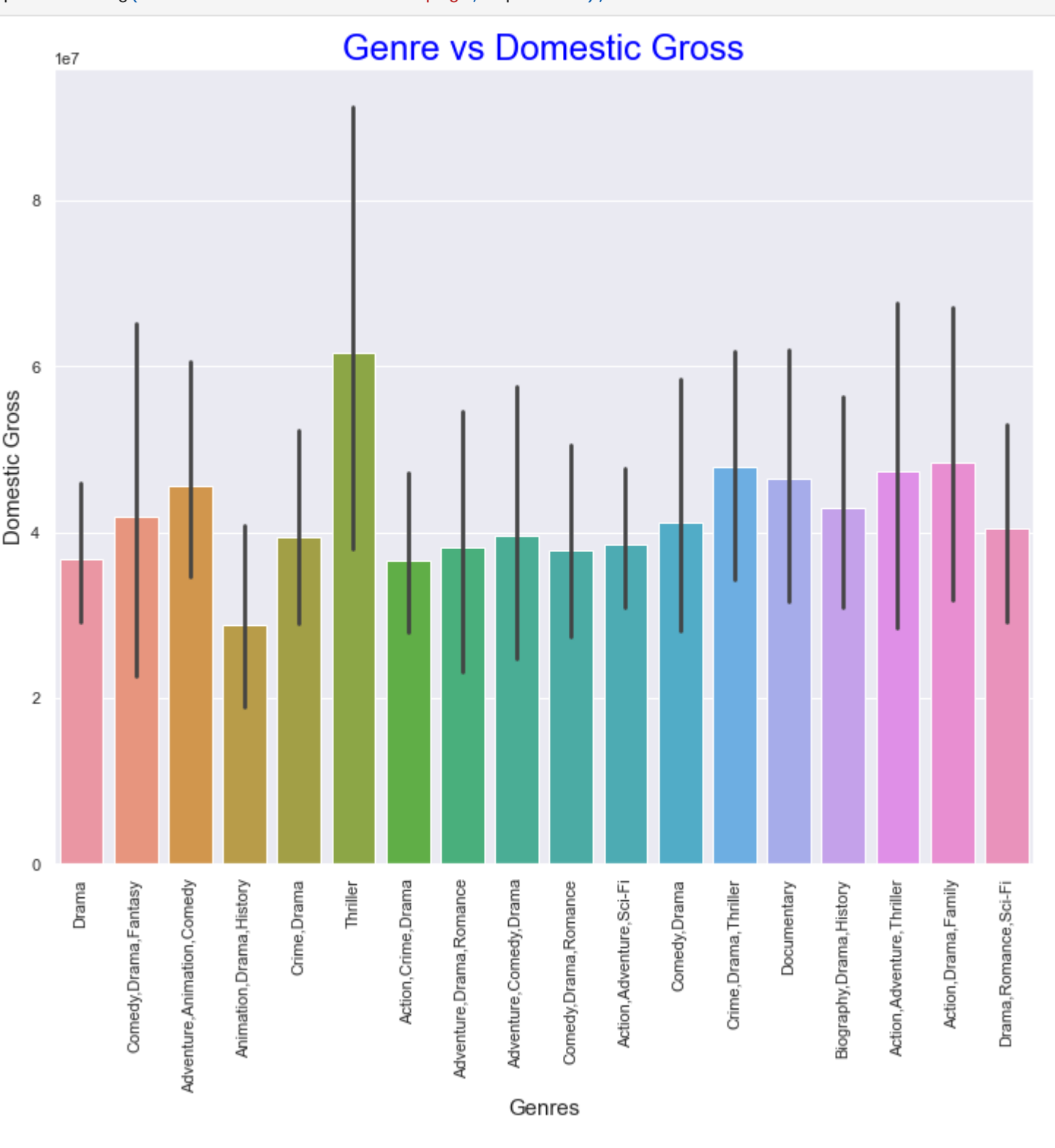
My Analysis

High production budget does not necessarily translate to high income

Question 3:

Does the movie genre determine its income?

In [ ]:
```
#barplot to show relation between Genre and Domestic Gross
sns.set(rc = {'figure.figsize': (12,10)} )
ay = sns.barplot(x = 'genres', y = 'domestic_gross', data = joined_df)
plt.title('Genre vs Domestic Gross', size =24, color = 'blue')
ay.set_ylabel('Domestic Gross', size = 15)
ay.set_xlabel('Genres', size = 15)
plt.xticks(rotation = 90)
plt.savefig("Genre vs Domestic Gross.png", dpi = 80);
```



In [ ]:
```
#compare the movie genre with the profit
#The profit calculated by substracting the production budget from worldwide gross
joined_df['Profit'] = joined_df['worldwide_gross'] - joined_df['production_budget']
```

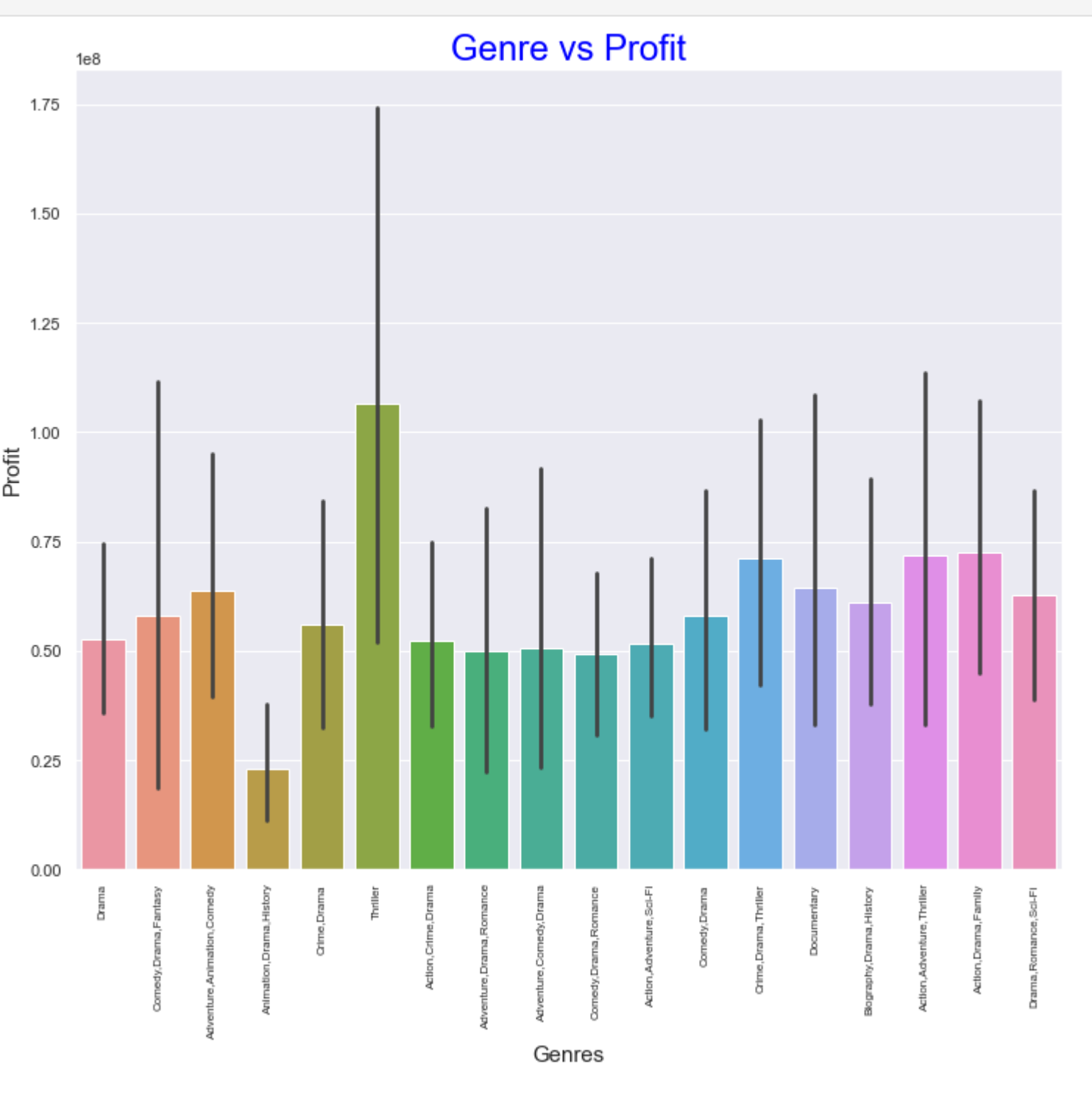
In [ ]:
```
joined_df
```

Out[ ]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres	averagerating	numvotes	release_d
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9	4517	May 20, 2(
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9	4517	Nov 22, 2(
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9	4517	Nov 21, 2(
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9	4517	Jun 23, 2(
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama	6.9	4517	Apr 18, 2(
...	...	...	...	...	...	...	...	...	...
100	tt0443465	Before We Go	Before We Go	2014	95.0	Comedy,Drama,Romance	6.8	45181	Dec 31, 2(
100	tt0443465	Before We Go	Before We Go	2014	95.0	Comedy,Drama,Romance	6.8	45181	Oct 11, 2(
100	tt0443465	Before We Go	Before We Go	2014	95.0	Comedy,Drama,Romance	6.8	45181	Jul 11, 2(
100	tt0443465	Before We Go	Before We Go	2014	95.0	Comedy,Drama,Romance	6.8	45181	Dec 31, 2(
100	tt0443465	Before We Go	Before We Go	2014	95.0	Comedy,Drama,Romance	6.8	45181	Aug 30, 1(

1676 rows × 14 columns

In [ ]:
```
#barplot to show relation between Genre and Profit
sns.set(rc = {'figure.figsize': (12,10)} )
ay = sns.barplot(x = 'genres', y = 'Profit', data = joined_df)
plt.title('Genre vs Profit', size =24, color = 'blue')
ay.set_ylabel('Profit', size = 15)
ay.set_xlabel('Genres', size = 15)
plt.xticks(rotation = 90, size= 8)
plt.savefig("Genre vs Profit.png", dpi = 80);
```



Overall Analysis

Through my analysis I have established that the movie genres that generate the most income are : Thriller Action,Drama,Family,Action, Adventure in that order. This makes them the most recommendable to the company