Final Project Submission

Please fill out:

- Student name: Chris Flynn
- Student pace: self pace
- Scheduled project review date/time: 6/15/2022 12:30 PM MTN
- Instructor name: Morgan Jones
- Blog post URL: https://medium.com/@ceflynn_6158 (https://medium.com/@ceflynn_6158)

Microsoft Movie Studio

Project Overview

For this project, you will use 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. You are charged with exploring what types of films are currently doing the best at the box office. You must 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 Used

Box Office Mojo - bom.movie_gross.csv.gz IMDB - im.db.zip The Numbers - tn.movie_budgets.csv.gz

Importing Modules

In [1]:
```
#Importing
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import sqlite3
import datetime
%matplotlib inline
```

Compete with Major Studios

Create a Dataframe From BoxOfficeMovie.com

'movie_gross_df' from the bom.movie_gross.csv.gz file in the zippedData folder

In [2]:
```
# read the csv file
bom_df=pd.read_csv('zippedData/bom.movie_gross.csv.gz')
bom_df.head(10)
```

Out[2]:

	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
5	The Twilight Saga: Eclipse	Sum.	300500000.0	398000000	2010
6	Iron Man 2	Par.	312400000.0	311500000	2010
7	Tangled	BV	200800000.0	391000000	2010
8	Despicable Me	Uni.	251500000.0	291600000	2010
9	How to Train Your Dragon	P/DW	217600000.0	277300000	2010

In [3]:
```
#check out the dataframe for missing values
bom_df.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
```

Data Cleaning

Looks like there is 5 missing the studio, and 28 missing domestic_gross. Many are missing foreign_gross.

-Drop the ones without studio -figure out what to do with the movies without domestic_gross, foriegn_gross

In [4]:
```
#drop the movies without studio names
with_studio_df = bom_df[bom_df['studio'].notna()].copy()
with_studio_df
```

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

3382 rows × 5 columns

Handling NaN

Make all of the NaN in domestic_gross 0 and foriegn_gross we can change to float and then make it 0

In [5]:
```
#change NaN to 0 - foriegn gross needs to be a float64
with_studio_df['domestic_gross'] = with_studio_df['domestic_gross'].fillna(

with_studio_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 3382 entries, 0 to 3386
Data columns (total 5 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   title           3382 non-null   object 
 1   studio          3382 non-null   object 
 2   domestic_gross  3382 non-null   float64
 3   foreign_gross   2033 non-null   object 
 4   year            3382 non-null   int64  
dtypes: float64(1), int64(1), object(3)
memory usage: 158.5+ KB
```

In [6]:
```
#foriegn gross needs to be a float64
#we can leave it alone and then create a new column in the dataframe to sho
with_studio_df['foreign_gross'][0] #str
with_studio_df['domestic_gross'][0] #float
#sample calculation
float(with_studio_df['foreign_gross'][0]) + with_studio_df['domestic_gross'
#create a copy of the dataframe just in case
bom_clean_df = with_studio_df.copy()
```

Commas Preventing Type Change

The foriegn_gross colunmn needs some more cleaning -- need to find the values that can't be converted to floats

In [7]:
```
#bom_clean_df['foriegn_gross']=bom_clean_df['foreign_gross'].astype(float)
#seraching for this value
bom_clean_df[bom_clean_df['foreign_gross']=='1,131.6']
```

Out[7]:

	title	studio	domestic_gross	foreign_gross	year
1872	Star Wars: The Force Awakens	BV	936700000.0	1,131.6	2015

That is a prety big movie. There are probably many others that have the comma. This needs to be resolved....

In [8]:
```
#find the values with the commas
bom_clean_df.sort_values('foreign_gross').head(20)
```

Out[8]:

	title	studio	domestic_gross	foreign_gross	year
2760	The Fate of the Furious	Uni.	226000000.0	1,010.0	2017
1873	Jurassic World	Uni.	652300000.0	1,019.4	2015
1872	Star Wars: The Force Awakens	BV	936700000.0	1,131.6	2015
1874	Furious 7	Uni.	353000000.0	1,163.0	2015
3079	Avengers: Infinity War	BV	678800000.0	1,369.5	2018
3009	City of Ghosts	IFC	128000.0	100000	2017
596	The Time That Remains	IFC	32900.0	1000000	2011
955	Kid With a Bike	IFC	1500000.0	1000000	2012
594	Vanishing on 7th Street	Magn.	22700.0	1000000	2011
970	2 Days in New York	Magn.	633000.0	1000000	2012
989	Once Upon a Time in Anatolia	CGld	152000.0	1000000	2012
2427	Barbershop: The Next Cut	WB (NL)	54000000.0	1000000	2016
2859	Tyler Perry's Boo 2! A Madea Halloween	LGF	47300000.0	1000000	2017
2539	Desierto	STX	2000000.0	1000000	2016
506	Snow Flower and the Secret Fan	FoxS	1300000.0	10000000	2011
1256	Nebraska	Par.	17700000.0	10000000	2013
3218	The Sisters Brothers	Annapurna	3100000.0	10000000	2018
2032	Kung Fu Killer	WGUSA	130000.0	10000000	2015
40	The A-Team	Fox	77200000.0	100000000	2010
3124	Insidious: The Last Key	Uni.	67700000.0	100100000	2018

Conflicted Values Foreign Gross

The values with the commas are supposed to be big numbers. Will have to find a way to handle these films. There are only 5. These are preventing the column from being switched to float. Going to get this data from Box Office Mojo Numbers appear to be abbreviated

The Fate of the Furious 1,010.0 --> 1,009,996,733

Jurassic World Uni. 1,019.4 --> 1,018,130,012

Star Wars: The Force Awakens 1,131.6--> 1,131,561,399

Furious 7 1,163.0 --> 1,162,040,651

Avengers: Infinity War 1,369.5 --> 1,369,544,272

**need to be careful for movies spelled differently

Change the values for the movies above

Using the id numbers and values from Box Office Mojo we can create a dictionary then loop through the keys and change the values.

In [9]:
```
# Dictionary 'change_dict' will hold the key, values for the movies found.
change_dict = {'The Fate of the Furious': 1009996733,
               'Jurassic World': 1018130012,
               'Star Wars: The Force Awakens':1131561399,
               'Furious 7':1162040651,
               'Avengers: Infinity War':1369544272}
```

In [10]:
```
#test bom_clean_df with one of the key value pairs
bom_clean_df[bom_clean_df['title'] == 'Furious 7']
```

Out[10]:

	title	studio	domestic_gross	foreign_gross	year
1874	Furious 7	Uni.	353000000.0	1,163.0	2015

In [11]:
```
#loop through the dictionary to get the key value pairs -
for index, (key, value) in enumerate(change_dict.items()):
    bom_clean_df.loc[bom_clean_df.title == key, 'foreign_gross'] = value
```

In [12]:
```
#test the loop!
bom_clean_df[bom_clean_df['title'] == 'Avengers: Infinity War']
```

Out[12]:

	title	studio	domestic_gross	foreign_gross	year
3079	Avengers: Infinity War	BV	678800000.0	1369544272	2018

Change Column Type to Int 64

In [13]:
```
#check data types
bom_clean_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 3382 entries, 0 to 3386
Data columns (total 5 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   title           3382 non-null   object 
 1   studio          3382 non-null   object 
 2   domestic_gross  3382 non-null   float64
 3   foreign_gross   2033 non-null   object 
 4   year            3382 non-null   int64  
dtypes: float64(1), int64(1), object(3)
memory usage: 318.5+ KB
```

In [14]:
```
#create a copy called final_bom_df
final_bom_df = bom_clean_df.copy()
final_bom_df.head()
```

Out[14]:

	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

In [15]:
```
#change the NAN in 'foreign_gross' to 0
final_bom_df['foreign_gross'] = final_bom_df['foreign_gross'].fillna(0)
```

In [16]:
```
#check the info to see if this worked
final_bom_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 3382 entries, 0 to 3386
Data columns (total 5 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   title           3382 non-null   object 
 1   studio          3382 non-null   object 
 2   domestic_gross  3382 non-null   float64
 3   foreign_gross   3382 non-null   object 
 4   year            3382 non-null   int64  
dtypes: float64(1), int64(1), object(3)
memory usage: 318.5+ KB
```

In [17]:
```
#convert 'foreign_gross' to integer type
final_bom_df["foreign_gross"] = pd.to_numeric(final_bom_df["foreign_gross"]
final_bom_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 3382 entries, 0 to 3386
Data columns (total 5 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   title           3382 non-null   object 
 1   studio          3382 non-null   object 
 2   domestic_gross  3382 non-null   float64
 3   foreign_gross   3382 non-null   int64  
 4   year            3382 non-null   int64  
dtypes: float64(1), int64(2), object(2)
memory usage: 318.5+ KB
```

Find Total_Gross for each film

add the 'domestic_gross' and 'foreign_gross'

In [18]:
```
final_bom_df['total_gross'] = final_bom_df['domestic_gross'] + final_bom_df
final_bom_df
```

Out[18]:

	title	studio	domestic_gross	foreign_gross	year	total_gross
0	Toy Story 3	BV	415000000.0	652000000	2010	1.067000e+09
1	Alice in Wonderland (2010)	BV	334200000.0	691300000	2010	1.025500e+09
2	Harry Potter and the Deathly Hallows Part 1	WB	296000000.0	664300000	2010	9.603000e+08
3	Inception	WB	292600000.0	535700000	2010	8.283000e+08
4	Shrek Forever After	P/DW	238700000.0	513900000	2010	7.526000e+08
...	...	...	...	...	...	...
3382	The Quake	Magn.	6200.0	0	2018	6.200000e+03
3383	Edward II (2018 re-release)	FM	4800.0	0	2018	4.800000e+03
3384	El Pacto	Sony	2500.0	0	2018	2.500000e+03
3385	The Swan	Synergetic	2400.0	0	2018	2.400000e+03
3386	An Actor Prepares	Grav.	1700.0	0	2018	1.700000e+03

3382 rows × 6 columns

In [19]:

```
## Drop Columns
#keep title, studio, total_gross


#drop columns 'domestic_gross','foreign_gross', 'year'
final_bom_df = final_bom_df.drop(columns=['domestic_gross','foreign_gross',
final_bom_df.head()
```

Out[19]:

	title	studio	total_gross
0	Toy Story 3	BV	1.067000e+09
1	Alice in Wonderland (2010)	BV	1.025500e+09
2	Harry Potter and the Deathly Hallows Part 1	WB	9.603000e+08
3	Inception	WB	8.283000e+08
4	Shrek Forever After	P/DW	7.526000e+08

In [20]:

```
#group by studio -- create new df 'studio_gross'
studio_gross = final_bom_df.groupby(['studio']).sum()
studio_gross.head()
```

Out[20]:

	total_gross
studio	
3D	16000000.0
A23	164200.0
A24	562656400.0
ADC	248200.0
AF	5642900.0

In [21]:
```
#sort the studios by total_Gross -- display top 10
studio_gross = studio_gross.sort_values('total_gross',ascending=False)
studio_gross.head(10)
```

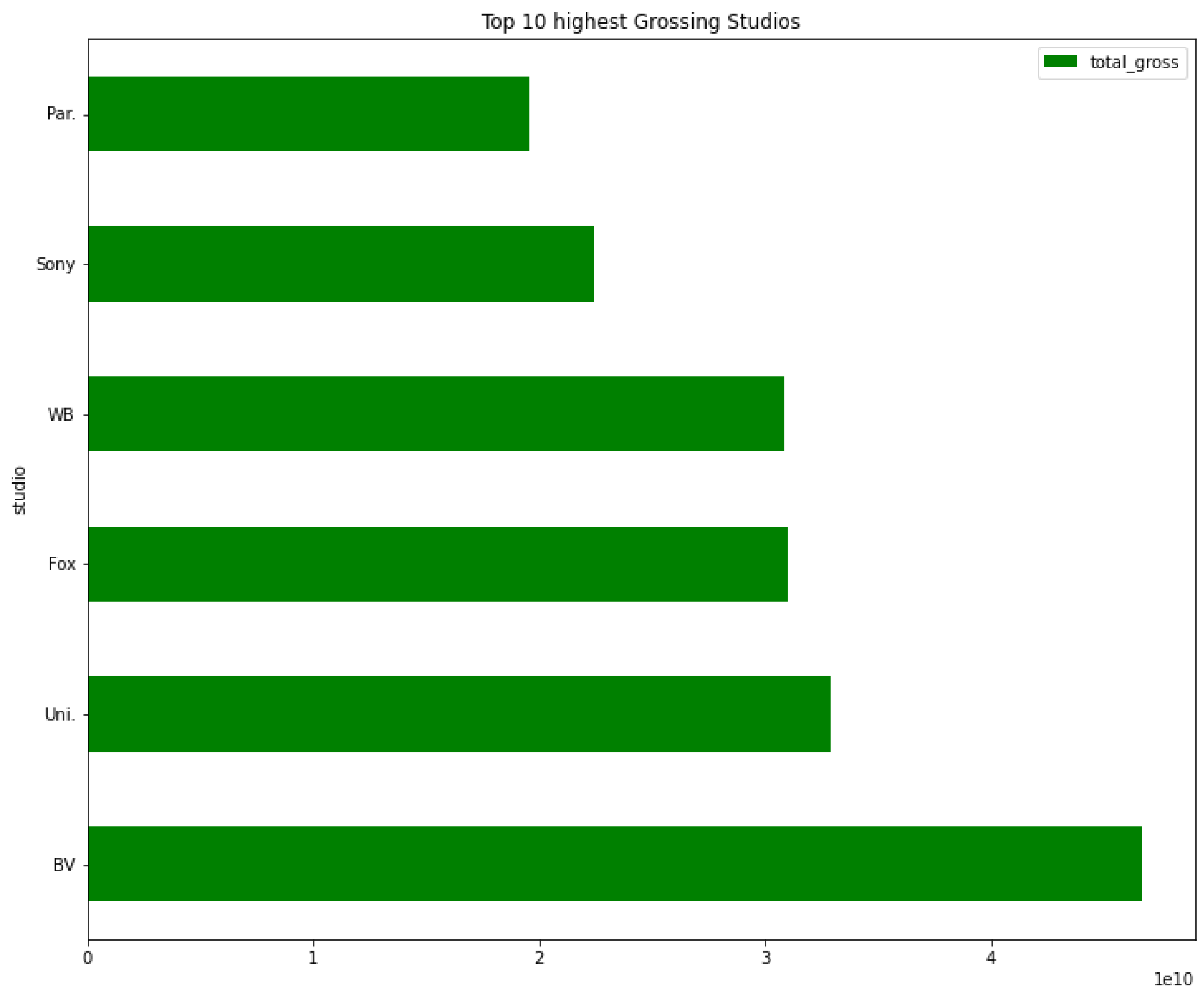
Out[21]:
```
          total_gross
studio
BV       4.671399e+10
Uni.     3.294733e+10
Fox      3.100537e+10
WB       3.083595e+10
Sony     2.240504e+10
Par.     1.954926e+10
WB (NL)  1.033470e+10
LGF      8.601583e+09
LG/S     5.431924e+09
P/DW     5.076500e+09
```

Data Visualization for Studio Total Gross

create a bar chart of the top six studios by total_gross

```
In [22]: #total_gross
         studio_gross.head(6).plot.barh(title="Top 10 highest Grossing Studios", fig
```

```
Out[22]: <AxesSubplot:title={'center':'Top 10 highest Grossing Studios'}, ylabel
         ='studio'>
```



Get Profit Data

use tn.movie_budgets.csv.gz

In [23]:
```
budget_df = pd.read_csv('zippedData/tn.movie_budgets.csv.gz')
budget_df.head()
```

Out[23]:

	id	release_date	movie	production_budget	domestic_gross	worldwide_gross
0	1	Dec 18, 2009	Avatar	$425,000,000	$760,507,625	$2,776,345,279
1	2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	$410,600,000	$241,063,875	$1,045,663,875
2	3	Jun 7, 2019	Dark Phoenix	$350,000,000	$42,762,350	$149,762,350
3	4	May 1, 2015	Avengers: Age of Ultron	$330,600,000	$459,005,868	$1,403,013,963
4	5	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	$317,000,000	$620,181,382	$1,316,721,747

In [24]:
```
budget_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5782 entries, 0 to 5781
Data columns (total 6 columns):
 #   Column             Non-Null Count  Dtype 
---  ------             --------------  ----- 
 0   id                 5782 non-null   int64 
 1   release_date       5782 non-null   object
 2   movie              5782 non-null   object
 3   production_budget  5782 non-null   object
 4   domestic_gross     5782 non-null   object
 5   worldwide_gross    5782 non-null   object
dtypes: int64(1), object(5)
memory usage: 271.2+ KB
```

Data Cleaning for Profits by Movie

we will subtract the 'production_budget' from 'worldwide_gross'. We will need to clean up those columns and change their type

In [25]:
```
#strip the dollar signs and columns from each column
columns_change=['production_budget','worldwide_gross']
for c in columns_change:
    budget_df[c] = budget_df[c].str.strip('$')
    budget_df[c] = budget_df[c].replace(',','', regex=True)


budget_df.head()
```

Out[25]:

	id	release_date	movie	production_budget	domestic_gross	worldwide_gross
0	1	Dec 18, 2009	Avatar	425000000	$760,507,625	2776345279
1	2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	410600000	$241,063,875	1045663875
2	3	Jun 7, 2019	Dark Phoenix	350000000	$42,762,350	149762350
3	4	May 1, 2015	Avengers: Age of Ultron	330600000	$459,005,868	1403013963
4	5	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	317000000	$620,181,382	1316721747

In [26]:
```
#change production_budget and worldwide_gross to numeric
budget_df['production_budget'] = pd.to_numeric(budget_df['production_budget
budget_df['worldwide_gross'] = pd.to_numeric(budget_df['worldwide_gross'])
#check data types
budget_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5782 entries, 0 to 5781
Data columns (total 6 columns):
 #   Column             Non-Null Count  Dtype 
---  ------             --------------  ----- 
 0   id                 5782 non-null   int64 
 1   release_date       5782 non-null   object
 2   movie              5782 non-null   object
 3   production_budget  5782 non-null   int64 
 4   domestic_gross     5782 non-null   object
 5   worldwide_gross    5782 non-null   int64 
dtypes: int64(3), object(3)
memory usage: 271.2+ KB
```

Creat Column for profit

create profit column and perform calculations

In [27]:
```
#make copy of dataframe - profit
profit_df = budget_df.copy()
#Make column profit in billions
profit_df['Profit In Billions'] = (profit_df['worldwide_gross'] - profit_df
profit_df
```

Out[27]:

	id	release_date	movie	production_budget	domestic_gross	worldwide_gross	Profit In Billions
0	1	Dec 18, 2009	Avatar	425000000	$760,507,625	2776345279	2.351345
1	2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	410600000	$241,063,875	1045663875	0.635064
2	3	Jun 7, 2019	Dark Phoenix	350000000	$42,762,350	149762350	-0.200238
3	4	May 1, 2015	Avengers: Age of Ultron	330600000	$459,005,868	1403013963	1.072414
4	5	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	317000000	$620,181,382	1316721747	0.999722
...	...	...	...	...	...	...	...
5777	78	Dec 31, 2018	Red 11	7000	$0	0	-0.000007
5778	79	Apr 2, 1999	Following	6000	$48,482	240495	0.000234
5779	80	Jul 13, 2005	Return to the Land of Wonders	5000	$1,338	1338	-0.000004
5780	81	Sep 29, 2015	A Plague So Pleasant	1400	$0	0	-0.000001
5781	82	Aug 5, 2005	My Date With Drew	1100	$181,041	181041	0.000180

5782 rows × 7 columns

Create a DataFrame to Merge

it will be easier if we drop unecessary columns now and change the 'movie' column to 'title'

In [28]:
```
#create dataframe 'to_merge_df'
to_merge_df = profit_df[['movie','Profit In Billions','release_date']].copy
to_merge_df.head()

#change movie column to 'title'
to_merge_df = to_merge_df.rename(columns={'movie':'title','release_date':'y
to_merge_df.head()
```

Out[28]:

	title	Profit In Billions	year
0	Avatar	2.351345	Dec 18, 2009
1	Pirates of the Caribbean: On Stranger Tides	0.635064	May 20, 2011
2	Dark Phoenix	-0.200238	Jun 7, 2019
3	Avengers: Age of Ultron	1.072414	May 1, 2015
4	Star Wars Ep. VIII: The Last Jedi	0.999722	Dec 15, 2017

Change Release Date Column

only have the 4 digit year

In [29]:
```
#convert column to datetime
to_merge_df['year'] = pd.to_datetime(to_merge_df['year'], format='%b %d, %Y
to_merge_df['year'] = pd.DatetimeIndex(to_merge_df['year']).year
to_merge_df.head()
```

Out[29]:

	title	Profit In Billions	year
0	Avatar	2.351345	2009
1	Pirates of the Caribbean: On Stranger Tides	0.635064	2011
2	Dark Phoenix	-0.200238	2019
3	Avengers: Age of Ultron	1.072414	2015
4	Star Wars Ep. VIII: The Last Jedi	0.999722	2017

In [30]:
```
#test data types
to_merge_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5782 entries, 0 to 5781
Data columns (total 3 columns):
 #   Column              Non-Null Count  Dtype  
---  ------              --------------  -----  
 0   title               5782 non-null   object 
 1   Profit In Billions  5782 non-null   float64
 2   year                5782 non-null   int64  
dtypes: float64(1), int64(1), object(1)
memory usage: 135.6+ KB
```

Merge Profit Data with Studio Data

This will give us the most profitable studios We could also do a rating / profit comparison if time allows...

'to_merge_df' has the profit data - 'final_bom_df' has the box office mojo data with studio names

In [31]:
```
##merge the two tables, drop total gross, year
profit_studio_df = final_bom_df.merge(to_merge_df)
profit_studio_df = profit_studio_df.groupby(['studio']).sum()
profit_studio_df = profit_studio_df.drop(columns=['total_gross','year'])
#charting data
chart_data = profit_studio_df.reset_index()
chart_data.head()
```

Out[31]:

	studio	Profit In Billions
0	3D	0.011515
1	A24	0.256905
2	ALP	-0.023076
3	ATO	-0.010228
4	Affirm	0.024471

Sort the chart_data

sort descending

In [32]:
```
chart_data = chart_data.sort_values('Profit In Billions', ascending=False)
chart_data.head(6)
```

Out[32]:

	studio	Profit In Billions
15	BV	23.835218
90	Uni.	20.731588
32	Fox	19.040313
94	WB	13.996112
82	Sony	12.551310
69	Par.	9.668207

Get Full Studio Names

use a dictionary with the abbrev. to get the full studio name. Should look better on graph

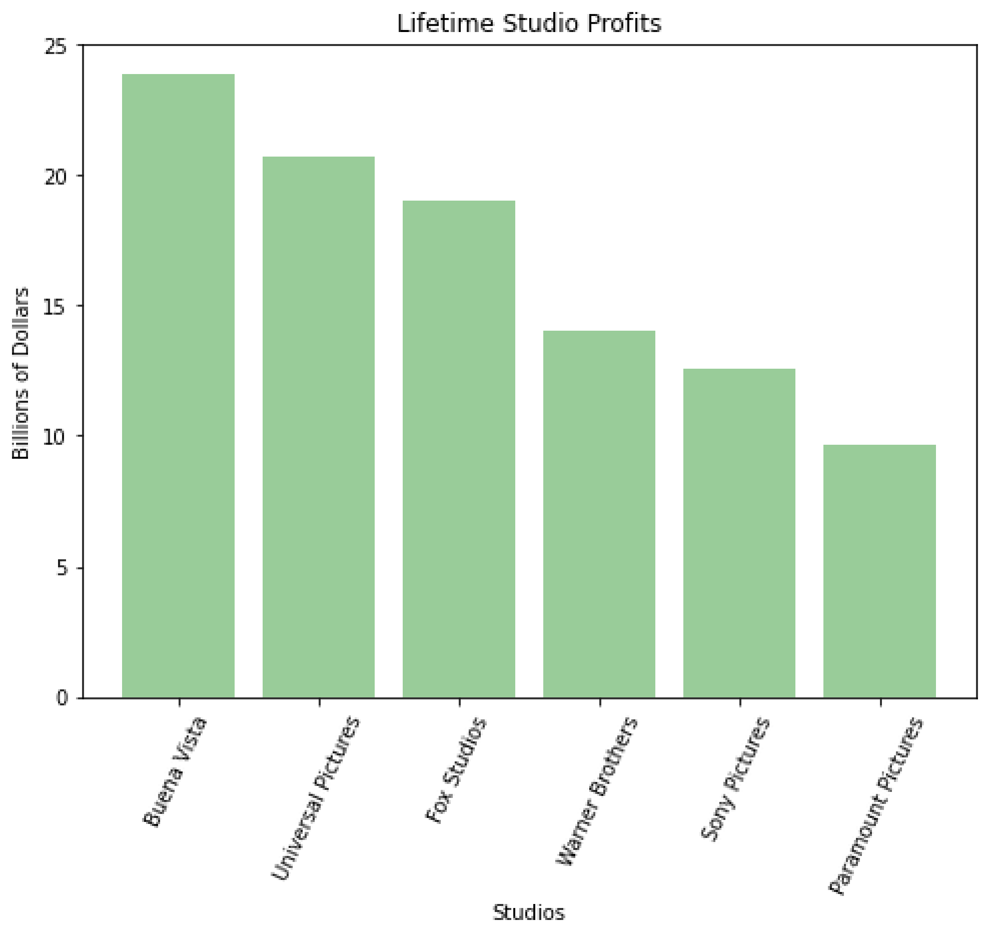
In [33]:
```
#dictionary of studio names
studio_dict={'BV':'Buena Vista',
            'Uni.': 'Universal Pictures',
            'Fox':'Fox Studios',
            'WB': 'Warner Brothers',
            'Sony':'Sony Pictures',
            'Par.': 'Paramount Pictures'}
#change studio column using dictionary
chart_data = chart_data.replace({'studio':studio_dict})
```

Data Visualization for Movie Studio Profit

Make a bar chart this should be a better use of data then the total_gross chart. only display the top 6

In [34]:
```
#data to plot
x_val = chart_data.studio.head(6)
y_val = chart_data['Profit In Billions'].head(6)
# Set up the plot
fig, ax = plt.subplots(figsize=(8,6))
plt.bar(x_val,y_val,color="g",alpha=0.4)
plt.title("Lifetime Studio Profits")
plt.xlabel('Studios')
plt.ylabel('Billions of Dollars')
plt.xticks(rotation = 65)
```

Out[34]:
```
([0, 1, 2, 3, 4, 5],
 [Text(0, 0, ''),
  Text(0, 0, ''),
  Text(0, 0, ''),
  Text(0, 0, ''),
  Text(0, 0, ''),
  Text(0, 0, '')])
```



Top Studio Profits

As expected these are all major studios. Micrsoft should be aiming to compete with these studios. These studios create blockbuster movies and build movie franchises.

Limitations

Most likely data was lost during the merge process, most likely from smaller studio movies. It may be worth investigating at a later date. This is also lifetime profits. Data could be limited to a more recent time span. Th

Multi-Genre Movies

Create a Dataframe from the IMDB file in the zippedData folder

Write a query to join the movie_basics and movie_ratings tables. We want to see all movies with atleast 5000 votes(popular movies) and rating above 7(high quality movies).

rating_df is the DataFrame

In [35]:
```
conn = sqlite3.connect('im.db')
cur = conn.cursor()
q= """SELECT
             primary_title as Title,
             start_year as Year,
             genres as Genre,
             averagerating as Rating,
             numvotes as Votes
        FROM movie_basics
        JOIN movie_ratings
             USING(movie_id)

       WHERE votes > 5000 AND rating >= 7
       ORDER BY rating DESC

                 ;"""
rating_df = pd.read_sql(q,conn)
rating_df.head()
```

Out[35]:

	Title	Year	Genre	Rating	Votes
0	Once Upon a Time ... in Hollywood	2019	Comedy,Drama	9.7	5600
1	Aloko Udapadi	2017	Drama,History	9.5	6509
2	Peranbu	2018	Drama	9.4	9629
3	The Mountain II	2016	Action,Drama,War	9.3	100568
4	Aynabaji	2016	Crime,Mystery,Thriller	9.3	18470

Explore / Clean up the Genres Column

Look at the counts and determine which sub categories (new columns) need to be created. Multi-Genre(boolean) would be a good start.

In [36]:
```
rating_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1322 entries, 0 to 1321
Data columns (total 5 columns):
 #   Column  Non-Null Count  Dtype  
---  ------  --------------  -----  
 0   Title   1322 non-null   object 
 1   Year    1322 non-null   int64  
 2   Genre   1322 non-null   object 
 3   Rating  1322 non-null   float64
 4   Votes   1322 non-null   int64  
dtypes: float64(1), int64(2), object(2)
memory usage: 51.8+ KB
```

Fortunately, there are no missing values in this

subgroup.

In [37]:
```
rating_df.Genre.value_counts()
```

Out[37]:
```
Drama                          109
Comedy,Drama                    81
Drama,Romance                   54
Documentary                     46
Comedy,Drama,Romance            46
                              ... 
Animation,History                1
Crime,Horror,Thriller            1
Comedy,Drama,Thriller            1
Comedy,Documentary,Music         1
Animation,Crime,Drama            1
Name: Genre, Length: 231, dtype: int64
```

Add a Multi-Genre column and fill with boolean values. True if ',' exists. False if only one category

In [38]:
```
example = ',' in rating_df['Genre'][0]
example
```

Out[38]:
```
True
```

Now try for all of them... lambda function opportunity...

In [39]:
```
rating_df['Multi-Genre'] = rating_df['Genre'].map(lambda x: ',' in x)
rating_df.head()
```

Out[39]:

	Title	Year	Genre	Rating	Votes	Multi-Genre
0	Once Upon a Time ... in Hollywood	2019	Comedy,Drama	9.7	5600	True
1	Aloko Udapadi	2017	Drama,History	9.5	6509	True
2	Peranbu	2018	Drama	9.4	9629	False
3	The Mountain II	2016	Action,Drama,War	9.3	100568	True
4	Aynabaji	2016	Crime,Mystery,Thriller	9.3	18470	True

In [40]:
```
#get value counts for Multi-Genre
rating_df['Multi-Genre'].value_counts()
```

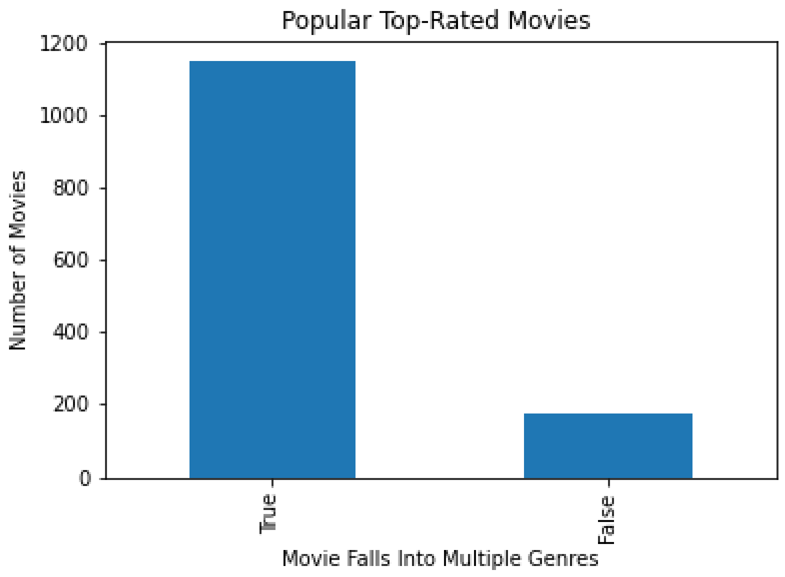
Out[40]:
```
True     1145
False     177
Name: Multi-Genre, dtype: int64
```

Data Visualization for Popular Top-Rated Movies

Looking at the data from the value_counts() above an overwhelming majority of the popular highly rated movies were listed in multiple genres. Below is a bar chart showing the data. (would this be better as a %????)

```
In [41]: #plot bar chart
         rating_df['Multi-Genre'].value_counts().plot(kind='bar');
         plt.title("Popular Top-Rated Movies ")
         plt.xlabel("Movie Falls Into Multiple Genres")
         plt.ylabel("Number of Movies")
```

```
Out[41]: Text(0, 0.5, 'Number of Movies')
```



```
In [42]: #value counts
         rating_df['Multi-Genre'].value_counts()
```

```
Out[42]: True     1145
         False     177
         Name: Multi-Genre, dtype: int64
```

Find the Genres

Create a subset data frame to get the most common genres from the multi-genre movies. We will use these later to create more boolean columns in rating_df.

```
In [43]: multi_df = rating_df[rating_df['Multi-Genre']==True]
         multi_df
```

Out[43]:

	Title	Year	Genre	Rating	Votes	Multi-Genre
0	Once Upon a Time ... in Hollywood	2019	Comedy,Drama	9.7	5600	True
1	Aloko Udapadi	2017	Drama,History	9.5	6509	True
3	The Mountain II	2016	Action,Drama,War	9.3	100568	True
4	Aynabaji	2016	Crime,Mystery,Thriller	9.3	18470	True
6	CM101MMXI Fundamentals	2013	Comedy,Documentary	9.2	41560	True
...	...	...	...	...	...	...
1317	The Silence	2010	Crime,Drama,Thriller	7.0	5792	True
1318	Raw	2016	Drama,Horror	7.0	49570	True
1319	Game Night	2018	Action,Comedy,Crime	7.0	163279	True
1320	Crimea	2017	Action,Drama	7.0	32800	True
1321	Boy Erased	2018	Biography,Drama	7.0	18768	True

1145 rows × 6 columns

Focus on Biographies

List of Genres

create a list of genres. Need to go through each row and split on the commas. Then check to see if those items are already in the list before adding them.

In [44]:
```
#list to hold the genres
genre_list = []
#function to get all the genres separated and added to the list
def get_genre(row):
    words = row.split(',')
    for w in words:
        if w not in genre_list:
            genre_list.append(w)

#lambda function to get the entire dataframe
multi_df['Genre'].map(lambda x: get_genre(x))
genre_list
```

Out[44]:
```
['Comedy',
 'Drama',
 'History',
 'Action',
 'War',
 'Crime',
 'Mystery',
 'Thriller',
 'Documentary',
 'Biography',
 'Music',
 'Musical',
 'Romance',
 'Adventure',
 'Sci-Fi',
 'Sport',
 'Animation',
 'Western',
 'Fantasy',
 'Horror',
 'Family',
 'News']
```

Columns for each Genre

Adding columns to rating_df for each category and entering the boolean value

In [45]:
```
# loop through genre_list and create a new column and then check if
#that genre is listed in the main genre category
subgenre_df = rating_df.copy(deep=True)
for g in genre_list:
    subgenre_df[g] = subgenre_df['Genre'].map(lambda x: g in x)
subgenre_df
```

Out[45]:

	Title	Year	Genre	Rating	Votes	Multi-Genre	Comedy	Drama	History	Actio
0	Once Upon a Time ... in Hollywood	2019	Comedy,Drama	9.7	5600	True	True	True	False	Fal
1	Aloko Udapadi	2017	Drama,History	9.5	6509	True	False	True	True	Fal
2	Peranbu	2018	Drama	9.4	9629	False	False	True	False	Fal
3	The Mountain II	2016	Action,Drama,War	9.3	100568	True	False	True	False	Tr
4	Aynabaji	2016	Crime,Mystery,Thriller	9.3	18470	True	False	False	False	Fal
...	...	...	...	...	...	...	...	...	...	
1317	The Silence	2010	Crime,Drama,Thriller	7.0	5792	True	False	True	False	Fal
1318	Raw	2016	Drama,Horror	7.0	49570	True	False	True	False	Fal
1319	Game Night	2018	Action,Comedy,Crime	7.0	163279	True	True	False	False	Tr
1320	Crimea	2017	Action,Drama	7.0	32800	True	False	True	False	Tr
1321	Boy Erased	2018	Biography,Drama	7.0	18768	True	False	True	False	Fal

1322 rows × 28 columns

Count Column Data

get counts for each of the columns

In [46]:
```
#use the genre_list to find the counts of each group
#creating key,value pairs for dictionary of sums
genre_count_dict ={}
for g in genre_list:
    genre_count_dict[g] = subgenre_df[g].sum()
genre_count_dict
```

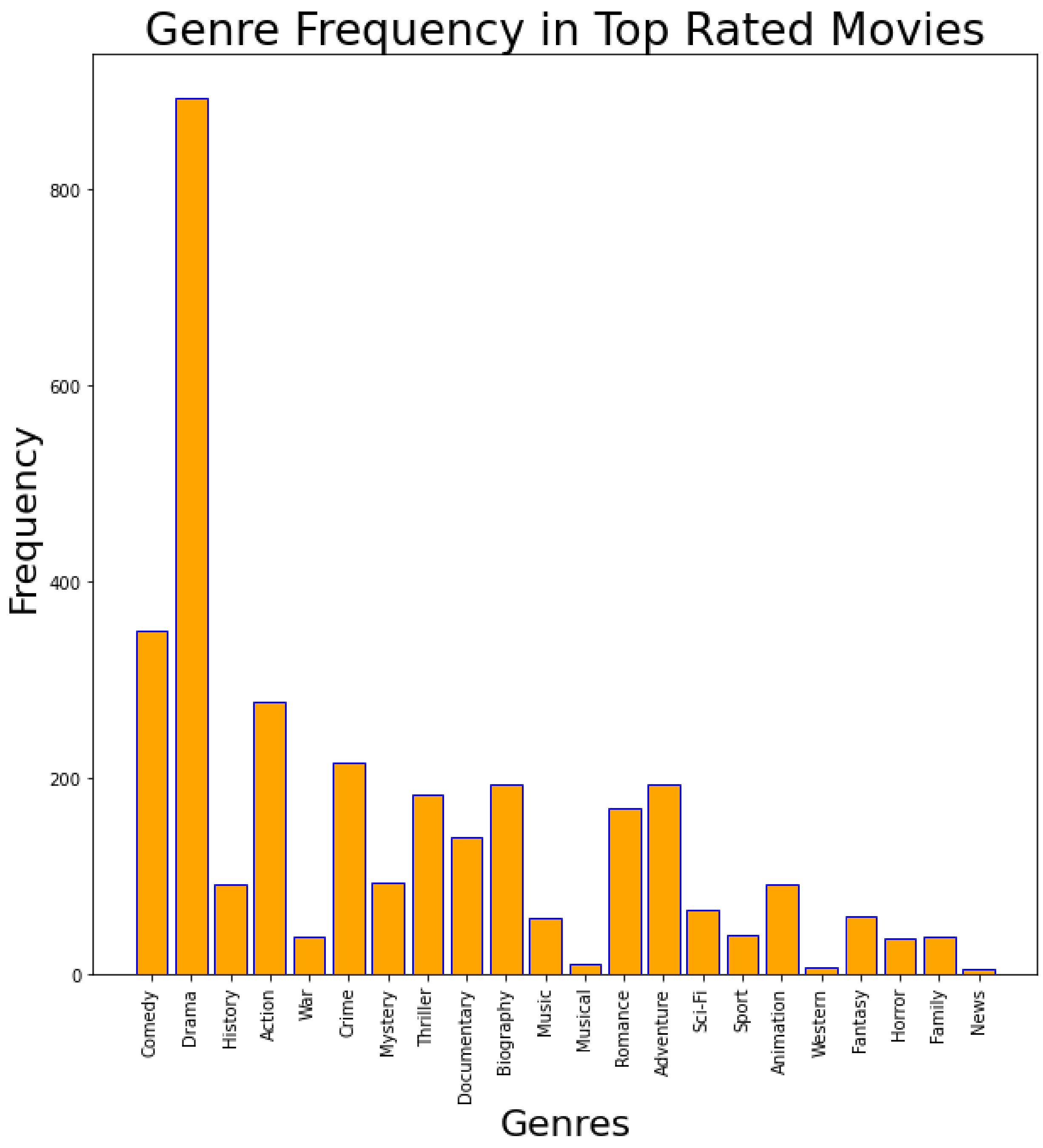
Out[46]:
```
{'Comedy': 351,
 'Drama': 893,
 'History': 91,
 'Action': 277,
 'War': 38,
 'Crime': 216,
 'Mystery': 94,
 'Thriller': 183,
 'Documentary': 140,
 'Biography': 193,
 'Music': 57,
 'Musical': 10,
 'Romance': 169,
 'Adventure': 194,
 'Sci-Fi': 65,
 'Sport': 40,
 'Animation': 92,
 'Western': 7,
 'Fantasy': 58,
 'Horror': 36,
 'Family': 38,
 'News': 5}
```

Data Visualization - Genres

Create a bar graph from the 'genre_count_dict'

In [47]:
```
# Plotting the genre frequency in a bar chart
plt.figure(figsize=(10,10))
#create variables for x and y values
x_val = list(genre_count_dict.keys())
y_val = genre_count_dict.values()
#plotting the bar chart
plt.bar(x_val,y_val, color='orange', edgecolor='b')
#make the bar chart look nicer
plt.rc('font', size = 22)
plt.rc('axes', labelsize=12)
plt.xticks(rotation=90)
plt.ylabel('Frequency',size=22)
plt.xlabel('Genres', size=22)
plt.title("Genre Frequency in Top Rated Movies")
```

Out[47]:
```
Text(0.5, 1.0, 'Genre Frequency in Top Rated Movies')
```



Data Analysis - Genres

It looks like almost 70% of the movies are categorized as some sort of Drama. I suspect that this is a generic term and that there are very few movies just listed.

We will want to go back and look at ratings by genre

Average Movie Rating per Genre

Now let's find the average rating of movies that classify in each of these categories.

Creating a new query to get a df with all of the movies. Copy from above

In [48]:
```
q= """SELECT
            primary_title as Title,
            start_year as Year,
            genres as Genre,
            averagerating as Rating,
            numvotes as Votes
        FROM movie_basics
        JOIN movie_ratings
            USING(movie_id)


                ;"""
all_df = pd.read_sql(q,conn)
all_df
```

Out[48]:

	Title	Year	Genre	Rating	Votes
0	Sunghursh	2013	Action,Crime,Drama	7.0	77
1	One Day Before the Rainy Season	2019	Biography,Drama	7.2	43
2	The Other Side of the Wind	2018	Drama	6.9	4517
3	Sabse Bada Sukh	2018	Comedy,Drama	6.1	13
4	The Wandering Soap Opera	2017	Comedy,Drama,Fantasy	6.5	119
...	...	...	...	...	...
73851	Diabolik sono io	2019	Documentary	6.2	6
73852	Sokagin Çocuklari	2019	Drama,Family	8.7	136
73853	Albatross	2017	Documentary	8.5	8
73854	La vida sense la Sara Amat	2019	None	6.6	5
73855	Drømmeland	2019	Documentary	6.5	11

73856 rows × 5 columns

Data Cleaning

Clean up the all_df to change None to 'no genre' This will make it possible to use the same code from above to create sub genre columns, which we will need to find the average ratings for each sub category.

In [49]:
```
#How many of these movies do not have a genre
all_df['Genre'].isna().value_counts()

#looks like None is entered -- we can change those to 'no genre'
all_df['Genre'] = all_df['Genre'].map(lambda x: 'no genre' if x == None els
```

In [50]:
```
all_df
```

Out[50]:

	Title	Year	Genre	Rating	Votes
0	Sunghursh	2013	Action,Crime,Drama	7.0	77
1	One Day Before the Rainy Season	2019	Biography,Drama	7.2	43
2	The Other Side of the Wind	2018	Drama	6.9	4517
3	Sabse Bada Sukh	2018	Comedy,Drama	6.1	13
4	The Wandering Soap Opera	2017	Comedy,Drama,Fantasy	6.5	119
...	...	...	...	...	...
73851	Diabolik sono io	2019	Documentary	6.2	6
73852	Sokagin Çocuklari	2019	Drama,Family	8.7	136
73853	Albatross	2017	Documentary	8.5	8
73854	La vida sense la Sara Amat	2019	no genre	6.6	5
73855	Drømmeland	2019	Documentary	6.5	11

73856 rows × 5 columns

In [51]:
```
#use the subgenre code from above on the all_df
for g in genre_list:
    all_df[g] = all_df['Genre'].map(lambda x: g in x)
all_df
```

Out[51]:

	Title	Year	Genre	Rating	Votes	Comedy	Drama	History	Action
0	Sunghursh	2013	Action,Crime,Drama	7.0	77	False	True	False	True
1	One Day Before the Rainy Season	2019	Biography,Drama	7.2	43	False	True	False	False
2	The Other Side of the Wind	2018	Drama	6.9	4517	False	True	False	False
3	Sabse Bada Sukh	2018	Comedy,Drama	6.1	13	True	True	False	False
4	The Wandering Soap Opera	2017	Comedy,Drama,Fantasy	6.5	119	True	True	False	False
...	...	...	...	...	...	...	...	...	...
73851	Diabolik sono io	2019	Documentary	6.2	6	False	False	False	False
73852	Sokagin Çocuklari	2019	Drama,Family	8.7	136	False	True	False	False
73853	Albatross	2017	Documentary	8.5	8	False	False	False	False
73854	La vida sense la Sara Amat	2019	no genre	6.6	5	False	False	False	False
73855	Drømmeland	2019	Documentary	6.5	11	False	False	False	False

73856 rows × 27 columns

In [52]:
```
#get descriptive stats for each numerical category
all_df.describe()
```

Out[52]:

	Year	Rating	Votes
count	73856.000000	73856.000000	7.385600e+04
mean	2014.276132	6.332729	3.523662e+03
std	2.614807	1.474978	3.029402e+04
min	2010.000000	1.000000	5.000000e+00
25%	2012.000000	5.500000	1.400000e+01
50%	2014.000000	6.500000	4.900000e+01
75%	2016.000000	7.400000	2.820000e+02
max	2019.000000	10.000000	1.841066e+06

In [53]:
```
all_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 73856 entries, 0 to 73855
Data columns (total 27 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   Title         73856 non-null  object 
 1   Year          73856 non-null  int64  
 2   Genre         73856 non-null  object 
 3   Rating        73856 non-null  float64
 4   Votes         73856 non-null  int64  
 5   Comedy        73856 non-null  bool   
 6   Drama         73856 non-null  bool   
 7   History       73856 non-null  bool   
 8   Action        73856 non-null  bool   
 9   War           73856 non-null  bool   
 10  Crime         73856 non-null  bool   
 11  Mystery       73856 non-null  bool   
 12  Thriller      73856 non-null  bool   
 13  Documentary   73856 non-null  bool   
 14  Biography     73856 non-null  bool   
 15  Music         73856 non-null  bool   
 16  Musical       73856 non-null  bool   
 17  Romance       73856 non-null  bool   
 18  Adventure     73856 non-null  bool   
 19  Sci-Fi        73856 non-null  bool   
 20  Sport         73856 non-null  bool   
 21  Animation     73856 non-null  bool   
 22  Western       73856 non-null  bool   
 23  Fantasy       73856 non-null  bool   
 24  Horror        73856 non-null  bool   
 25  Family        73856 non-null  bool   
 26  News          73856 non-null  bool   
dtypes: bool(22), float64(1), int64(2), object(2)
memory usage: 4.4+ MB
```

Get Average Mean for a Genre

Get the average rating for all comedy movies.

In [54]:
```
#Trying to get the average for all movies that mark true for each category
#Testing logic on comedy column
Comedy_df = all_df[all_df['Comedy']==True]
comedy_mean = Comedy_df['Rating'].mean()
comedy_mean
```

Out[54]:
```
6.0026894158473105
```

Most Common Genres

From our bar chart above, we can see that the most common genres are Drama, Comedy, Action, Crime, Thriller, Biography, Romance and Adventure - Creating dataframe for each of these and storing their means in a list to use for data visualization. Allso inclued the rating mean for all_df.

In [55]:
```
#dictionary of dataframes, means
dataframes ={}
#add the all_df mean Comedy_df mean from above
dataframes['All'] = all_df['Rating'].mean()
dataframes['Comedy'] = comedy_mean
dataframes
```

Out[55]:
```
{'All': 6.332728552859619, 'Comedy': 6.0026894158473105}
```

Top Genre Means

In [56]:
```
#now add the rest of the means(I gave up on trying to loop the creation of
#combine the logic from above except subtract the all_df.mean from each val
#should write a function - looping was difficult...

#drama movies

Drama_df = all_df[all_df['Drama']==True]
drama_mean = Drama_df['Rating'].mean()
dataframes['Drama'] = drama_mean

# action movies
Action_df = all_df[all_df['Action']==True]
action_mean = Action_df['Rating'].mean()
dataframes['Action'] = action_mean

# crime movies
Crime_df = all_df[all_df['Crime']==True]
crime_mean = Crime_df['Rating'].mean()
dataframes['Action'] = crime_mean

#Thriller movies
Thriller_df = all_df[all_df['Thriller']==True]
thriller_mean = Thriller_df['Rating'].mean()
dataframes['Thriller'] = thriller_mean

#biographies
Biography_df = all_df[all_df['Biography']==True]
biography_mean = Biography_df['Rating'].mean()
dataframes['Biography'] = biography_mean

#romance movies
Romance_df = all_df[all_df['Romance']==True]
romance_mean = Romance_df['Rating'].mean()
dataframes['Romance'] = romance_mean

#adventure movies
Adventure_df = all_df[all_df['Adventure']==True]
adventure_mean = Adventure_df['Rating'].mean()
dataframes['Adventure'] = adventure_mean

dataframes
```

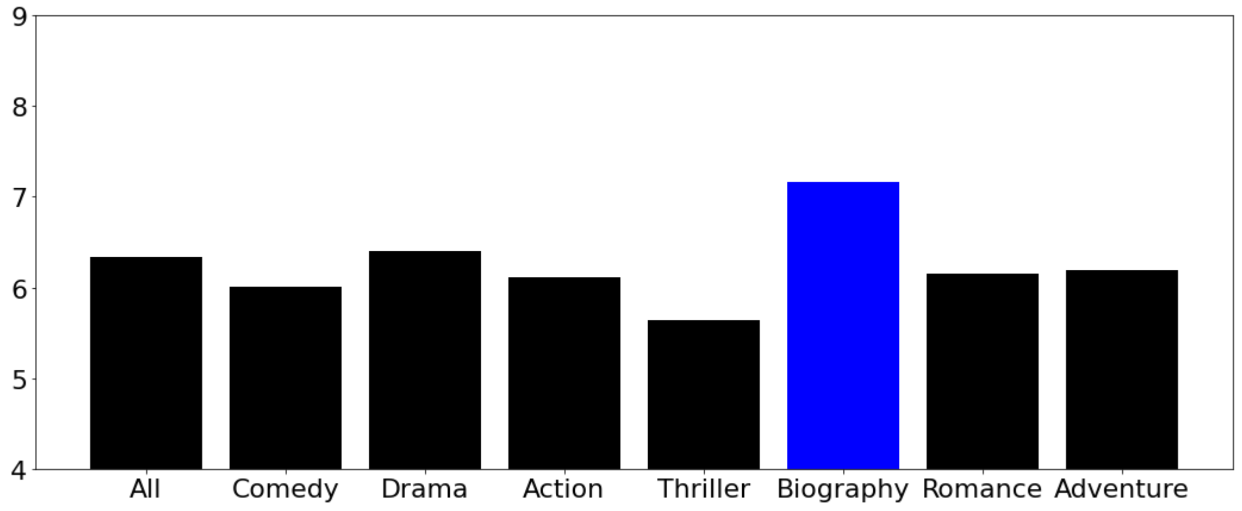
Out[56]:
```
{'All': 6.332728552859619,
 'Comedy': 6.0026894158473105,
 'Drama': 6.401559048980123,
 'Action': 6.115441335935806,
 'Thriller': 5.639114031885116,
 'Biography': 7.1622735626148595,
 'Romance': 6.146607983001973,
 'Adventure': 6.196201205134923}
```

Data Visualization - Genre Average Rating

Create a chart to compare the means of each genre of movies. Try to plot the difference of each value from the average

```
In [57]: #plotting the genre averages
         plt.figure(figsize=(18,7))
         c = ["black","black","black","black","black","b","black","black"]
         x_val = list(dataframes.keys())
         y_val = dataframes.values()
         plt.bar(x_val,y_val, color = c)
         plt.ylim(4,9)

Out[57]: (4.0, 9.0)
```



Genre Average Rating Analysis

Biographies are the highest rated movie genre Data suggest that most genres fall right around the 6 out of 10 rating. This suggest that movie genre has little affect on rating. This would have to be explored further...