Final Project Submission

Please fill out:

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- Scheduled project review date/time: 18th February 2024
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- Blog post URL:

Movies data analysis for Microsoft

Problem Statement

Microsoft have decided to create a new movie studio as a new business line.

I have been charged with exploring what types of films are currently doing the best at the box office.

My task is to 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 Source

The data used in this analysis is from the folder zippedData which had movie datasets from the following sources:

Box Office Mojo, IMDB, Rotten Tomatoes, TheMovieDB and The Numbers

I start by importing the necessary libraries

In [1]:

```
import pandas as pd
import csv
import json
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

Next i load the data sets

In [2]:

```
# Loading the Bom Movie gross data set

f = r"C:\Users\Kish\Documents\DSF-PT06\DSFPT06\Assignments\DSC PHASE 1
df1 = pd.read_csv(f)
df1.head(2)
```

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

In [3]:

```
# renaming title column in df1 to primary_title to ease the merging

df1.rename(columns={'title' : 'primary_title'}, inplace = True)
print(df1.columns)
```

```
Index(['primary_title', 'studio', 'domestic_gross', 'foreign_gross',
'year'], dtype='object')
```

In [4]:

```
# Loading the title basics data set

f = r"C:\Users\Kish\Documents\DSF-PT06\DSFPT06\Assignments\DSC PHASE 1
df5 = pd.read_csv(f)
df5.head(5)
```

Out[4]:

	tconst	primary_title	original_title	start_year	runtime_minutes	gen
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Dra
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Dra
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Dra
3	tt0069204	Sabse Bada Sukh	Sabse Bada Sukh	2018	NaN	Comedy,Dra
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fant

In [5]:
```
# Loading the title ratings data set

f = r"C:\Users\Kish\Documents\DSF-PT06\DSFPT06\Assignments\DSC PHASE 1
df6 = pd.read_csv(f)
df6.head(2)
```

Out[5]:

	tconst	averagerating	numvotes
0	tt10356526	8.3	31
1	tt10384606	8.9	559

I start merging the datasets to get as much data as i need for the analysis

In [6]:
```
# merging the title basics and title ratings data sets

merged_df = pd.merge(df5, df6, on='tconst', how='inner')
merged_df.head(2)
```

Out[6]:

	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

In [7]:
```
# Loading the title crew data set

f = r"C:\Users\Kish\Documents\DSF-PT06\DSFPT06\Assignments\DSC PHASE 1
df7 = pd.read_csv(f)
df7.head(2)
```

Out[7]:

	tconst	directors	writers
0	tt0285252	nm0899854	nm0899854
1	tt0438973	NaN	nm0175726,nm1802864

In [8]:
```
# merging the  title basics, title ratings and title crew datasets

merged_df1 = pd.merge(merged_df, df7, on='tconst', how='inner')
merged_df1.head(2)
```

Out[8]:

	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

In [9]:

```
# Loading the title akas data set

f = r"C:\Users\Kish\Documents\DSF-PT06\DSFPT06\Assignments\DSC PHASE 1
df4 = pd.read_csv(f)
df4.head(2)
```

Out[9]:

	title_id	ordering	title	region	language	types	attributes	is_original_
0	tt0369610	10	Джурасик свят	BG	bg	NaN	NaN	
1	tt0369610	11	Jurashikku warudo	JP	NaN	imdbDisplay	NaN	

In [10]:

```
# renaming title id column in df4 to tconst to ease the merging

df4.rename(columns={'title_id' : 'tconst'}, inplace = True)
print(df4.columns)
```

```
Index(['tconst', 'ordering', 'title', 'region', 'language', 'types',
       'attributes', 'is_original_title'],
      dtype='object')
```

In [11]:

```
# checking if the change has reflected

df4.head(5)
```

Out[11]:

	tconst	ordering	title	region	language	types	attributes	is_original
0	tt0369610	10	Джурасик свят	BG	bg	NaN	NaN	
1	tt0369610	11	Jurashikku warudo	JP	NaN	imdbDisplay	NaN	
2	tt0369610	12	Jurassic World: O Mundo dos Dinossauros	BR	NaN	imdbDisplay	NaN	
3	tt0369610	13	O Mundo dos Dinossauros	BR	NaN	NaN	short title	
4	tt0369610	14	Jurassic World	FR	NaN	imdbDisplay	NaN	

In [12]:

```
# merge title basics, title ratings, title crew and title akas data set

merged_df2 = pd.merge(merged_df1, df4, on='tconst', how='inner')
merged_df2.head(5)
```

Out[12]:

	tconst	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama
1	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama
2	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama
3	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama
4	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama

In [13]:

```
# merge title basics, title ratings, title crew and title akas and bom

merged_df3 = pd.merge(merged_df2, df1, on='primary_title', how='inner')
merged_df3.head(2)
```

Out[13]:

	tconst	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0315642	Wazir	Wazir	2016	103.0	Action,Crime,Drama
1	tt0315642	Wazir	Wazir	2016	103.0	Action,Crime,Drama

2 rows × 21 columns

In [14]:

```
# Loading the title principals data set

f = r"C:\Users\Kish\Documents\DSF-PT06\DSFPT06\Assignments\DSC PHASE 1
df8 = pd.read_csv(f)
df8.head(5)
```

Out[14]:

	tconst	ordering	nconst	category	job	characters
0	tt0111414	1	nm0246005	actor	NaN	["The Man"]
1	tt0111414	2	nm0398271	director	NaN	NaN
2	tt0111414	3	nm3739909	producer	producer	NaN
3	tt0323808	10	nm0059247	editor	NaN	NaN
4	tt0323808	1	nm3579312	actress	NaN	["Beth Boothby"]

In [15]:

```
# merge title basics, title ratings, title crew and title akas, bom mov

merged_df4 = pd.merge(merged_df3, df8, on='tconst', how='inner')
merged_df4.head(2)
```

Out[15]:

	tconst	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0315642	Wazir	Wazir	2016	103.0	Action,Crime,Drama
1	tt0315642	Wazir	Wazir	2016	103.0	Action,Crime,Drama

2 rows × 26 columns

Chceking the columns in the merged data set

In [16]:

```
merged_df4.columns
```

Out[16]:

```
Index(['tconst', 'primary_title', 'original_title', 'start_year',
       'runtime_minutes', 'genres', 'averagerating', 'numvotes', 'dire
ctors',
       'writers', 'ordering_x', 'title', 'region', 'language', 'type
s',
       'attributes', 'is_original_title', 'studio', 'domestic_gross',
       'foreign_gross', 'year', 'ordering_y', 'nconst', 'category', 'j
ob',
       'characters'],
      dtype='object')
```

In [17]:

```
# Loading the name basics data set

f = r"C:\Users\Kish\Documents\DSF-PT06\DSFPT06\Assignments\DSC PHASE 1
df2 = pd.read_csv(f)
df2.head(2)
```

Out[17]:

	nconst	primary_name	birth_year	death_year	primary_pı
0	nm0061671	Mary Ellen Bauder	NaN	NaN	miscellaneous,production_manageı
1	nm0061865	Joseph Bauer	NaN	NaN	composer,music_department,sound_dı

In [18]:

```
# Loading the movie info data set

f = r"C:\Users\Kish\Documents\DSF-PT06\DSFPT06\Assignments\DSC PHASE 1
df3 = pd.read_table(f)
df3.head(2)
```

Out[18]:

	id	synopsis	rating	genre	director	writer	theater_da
0	1	This gritty, fast-paced, and innovative police...	R	Action and Adventure|Classics|Drama	William Friedkin	Ernest Tidyman	Oct 9, 19
1	3	New York City, not-too-distant-future: Eric Pa...	R	Drama|Science Fiction and Fantasy	David Cronenberg	David Cronenberg|Don DeLillo	Aug 20

In [19]:

```
# Loading the reviews data set

f = r"C:\Users\Kish\Documents\DSF-PT06\DSFPT06\Assignments\DSC PHASE 1
df11 = pd.read_csv(f,sep = '\t',encoding = 'latin1')
df11.head(2)
```

Out[19]:

	id	review	rating	fresh	critic	top_critic	publisher	date
0	3	A distinctly gallows take on contemporary fina...	3/5	fresh	PJ Nabarro	0	Patrick Nabarro	November 10, 2018
1	3	It's an allegory in search of a meaning that n...	NaN	rotten	Annalee Newitz	0	io9.com	May 23, 2018

In [20]:

```
# Loading the movie data set

f = r"C:\Users\Kish\Documents\DSF-PT06\DSFPT06\Assignments\DSC PHASE 1
df12 = pd.read_csv(f)
df12.head(2)
```

Out[20]:

	Unnamed: 0	Release Date	Movie	Production Budget	Domestic Gross	Worldwide Gross	Unnamed: 6
0	NaN	NaN	NaN	NaN	NaN	NaN	NaN
1	1	9-Dec-22	Avatar: The Way of Water	$460,000,000	$684,075,767	$2,317,514,386	NaN

In [21]:

```
# renaming movie column in df12 to title

df12.rename(columns={'Movie' : 'primary_title'}, inplace = True)
print(df12.columns)
```

```
Index(['Unnamed: 0', 'Release Date', 'primary_title', 'Production Budg
et',
       'Domestic Gross', 'Worldwide Gross', 'Unnamed: 6'],
      dtype='object')
```

In [22]:

```
# merge title basics, title ratings, title crew and title akas, bom mov

merged_df5 = pd.merge(merged_df4, df2, on='nconst', how='inner')
merged_df5.head(2)
```

Out[22]:

	tconst	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0315642	Wazir	Wazir	2016	103.0	Action,Crime,Drama
1	tt0315642	Wazir	Wazir	2016	103.0	Action,Crime,Drama

2 rows × 31 columns

In [23]:

```
# merge title basics, title ratings, title crew and title akas, bom mov

merged_df6 = pd.merge(merged_df5, df12, on='primary_title', how='inner'
merged_df6.head(2)
```

Out[23]:

	tconst	primary_title	original_title	start_year	runtime_minutes	
0	tt0337692	On the Road	On the Road	2012	124.0	Adventure,Drama,Rc
1	tt0337692	On the Road	On the Road	2012	124.0	Adventure,Drama,Rc

2 rows × 37 columns

In [24]:

```
merged_df6.shape
```

Out[24]:

```
(340731, 37)
```

In [25]:

```
# Renaming our dataset

merged_data = merged_df6
```

Display the top 5 Rows of the merged dataset

In [26]:

```
merged_data.head(5)
```

Out[26]:

	tconst	primary_title	original_title	start_year	runtime_minutes	
0	tt0337692	On the Road	On the Road	2012	124.0	Adventure,Drama,Ro
1	tt0337692	On the Road	On the Road	2012	124.0	Adventure,Drama,Ro
2	tt0337692	On the Road	On the Road	2012	124.0	Adventure,Drama,Ro
3	tt0337692	On the Road	On the Road	2012	124.0	Adventure,Drama,Ro
4	tt0337692	On the Road	On the Road	2012	124.0	Adventure,Drama,Ro

5 rows × 37 columns

Display Last 5 Rows of the merged dataset

In [27]:

```
merged_data.tail(5)
```

Out[27]:

	tconst	primary_title	original_title	start_year	runtime_minutes	genres
340726	tt4333662	They Will Have to Kill Us First	They Will Have to Kill Us First	2015	100.0	Documentary
340727	tt4333662	They Will Have to Kill Us First	They Will Have to Kill Us First	2015	100.0	Documentary
340728	tt4333662	They Will Have to Kill Us First	They Will Have to Kill Us First	2015	100.0	Documentary
340729	tt4333662	They Will Have to Kill Us First	They Will Have to Kill Us First	2015	100.0	Documentary
340730	tt4333662	They Will Have to Kill Us First	They Will Have to Kill Us First	2015	100.0	Documentary

5 rows × 37 columns

Find the shape of the dataset (Number of Rows and Columns)

In [28]:

```
merged_data.shape
```

Out[28]:

```
(340731, 37)
```

In [29]:

```
print("Rows: ", merged_data.shape[0])
print("Columns: ", merged_data.shape[1])
```

```
Rows:  340731
Columns:  37
```

Data Cleaning

Start by getting information about the data set

In [30]:

```
merged_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 340731 entries, 0 to 340730
Data columns (total 37 columns):
 #   Column              Non-Null Count   Dtype  
---  ------              --------------   -----  
 0   tconst              340731 non-null  object 
 1   primary_title       340731 non-null  object 
 2   original_title      340731 non-null  object 
 3   start_year          340731 non-null  int64  
 4   runtime_minutes     340394 non-null  float64
 5   genres              340637 non-null  object 
 6   averagerating       340731 non-null  float64
 7   numvotes            340731 non-null  int64  
 8   directors           340677 non-null  object 
 9   writers             339570 non-null  object 
 10  ordering_x          340731 non-null  int64  
 11  title               340731 non-null  object 
 12  region              325416 non-null  object 
 13  language            53023 non-null   object 
 14  types               247218 non-null  object 
 15  attributes          17020 non-null   object 
 16  is_original_title   340731 non-null  float64
 17  studio              340731 non-null  object 
 18  domestic_gross      340391 non-null  float64
 19  foreign_gross       305008 non-null  object 
 20  year                340731 non-null  int64  
 21  ordering_y          340731 non-null  int64  
 22  nconst              340731 non-null  object 
 23  category            340731 non-null  object 
 24  job                 142204 non-null  object 
 25  characters          136326 non-null  object 
 26  primary_name        340731 non-null  object 
 27  birth_year          236400 non-null  float64
 28  death_year          8955 non-null    float64
 29  primary_profession  340526 non-null  object 
 30  known_for_titles    340505 non-null  object 
 31  Unnamed: 0          340731 non-null  object 
 32  Release Date        340731 non-null  object 
 33  Production Budget   340731 non-null  object 
 34  Domestic Gross      340731 non-null  object 
 35  Worldwide Gross     340731 non-null  object 
 36  Unnamed: 6          0 non-null       float64
dtypes: float64(7), int64(5), object(25)
memory usage: 98.8+ MB
```

Checking for missing values in the dataset

In [31]:

```
print(merged_data.isnull().values.any())
```

```
True
```

In [32]:

```
# find number of missing values

merged_data.isnull().sum()
```

Out[32]:

```
tconst                     0
primary_title              0
original_title             0
start_year                 0
runtime_minutes          337
genres                    94
averagerating              0
numvotes                   0
directors                 54
writers                 1161
ordering_x                 0
title                      0
region                 15315
language              287708
types                  93513
attributes            323711
is_original_title          0
studio                     0
domestic_gross           340
foreign_gross          35723
year                       0
ordering_y                 0
nconst                     0
category                   0
job                   198527
characters            204405
primary_name               0
birth_year            104331
death_year            331776
primary_profession       205
known_for_titles         226
Unnamed: 0                 0
Release Date               0
Production Budget          0
Domestic Gross             0
Worldwide Gross            0
Unnamed: 6            340731
dtype: int64
```

In [33]:

```
# check percentage of missing values in the columns

merged_data.isnull().mean()*100
```

Out[33]:

```
tconst                  0.000000
primary_title           0.000000
original_title          0.000000
start_year              0.000000
runtime_minutes         0.098905
genres                  0.027588
averagerating           0.000000
numvotes                0.000000
directors               0.015848
writers                 0.340738
ordering_x              0.000000
title                   0.000000
region                  4.494748
language               84.438457
types                  27.444817
attributes             95.004857
is_original_title       0.000000
studio                  0.000000
domestic_gross          0.099785
foreign_gross          10.484224
year                    0.000000
ordering_y              0.000000
nconst                  0.000000
category                0.000000
job                    58.265024
characters             59.990139
primary_name            0.000000
birth_year             30.619756
death_year             97.371827
primary_profession      0.060165
known_for_titles        0.066328
Unnamed: 0              0.000000
Release Date            0.000000
Production Budget       0.000000
Domestic Gross          0.000000
Worldwide Gross         0.000000
Unnamed: 6            100.000000
dtype: float64
```

The columns region, language, types, attributes, foreign gross, job,characters,birth year, death year contain a significant amount of missing data. I will drop these columns.

Drop the columns with significant amount of missing values

In [34]:

```
merged_data = merged_data.drop(['region','language','types','attributes
```

In [35]:

```
# check the remaining columns in the dataset

merged_data.columns
```

Out[35]:

```
Index(['tconst', 'primary_title', 'original_title', 'start_year',
       'runtime_minutes', 'genres', 'averagerating', 'numvotes', 'dire
ctors',
       'writers', 'ordering_x', 'title', 'is_original_title', 'studi
o',
       'domestic_gross', 'year', 'ordering_y', 'nconst', 'category',
       'primary_name', 'primary_profession', 'known_for_titles', 'Unna
med: 0',
       'Release Date', 'Production Budget', 'Domestic Gross',
       'Worldwide Gross', 'Unnamed: 6'],
      dtype='object')
```

In [36]:

```
# Recheck the missing data percentage

merged_data.isnull().mean()*100
```

Out[36]:

```
tconst                  0.000000
primary_title           0.000000
original_title          0.000000
start_year              0.000000
runtime_minutes         0.098905
genres                  0.027588
averagerating           0.000000
numvotes                0.000000
directors               0.015848
writers                 0.340738
ordering_x              0.000000
title                   0.000000
is_original_title       0.000000
studio                  0.000000
domestic_gross          0.099785
year                    0.000000
ordering_y              0.000000
nconst                  0.000000
category                0.000000
primary_name            0.000000
primary_profession      0.060165
known_for_titles        0.066328
Unnamed: 0              0.000000
Release Date            0.000000
Production Budget       0.000000
Domestic Gross          0.000000
Worldwide Gross         0.000000
Unnamed: 6            100.000000
dtype: float64
```

The missing data has now been dropped

Check for duplicate data

In [37]:

```
# Check any duplicate data

dup_merged_data = merged_data.duplicated().sum()
print(dup_merged_data)
```

```
0
```

In [38]:

```
# Check shape of the data

print("Rows: ", merged_data.shape[0])
print("Columns: ", merged_data.shape[1])
```

```
Rows:  340731
Columns:  28
```

In [39]:

```
merged_data.columns
```

Out[39]:

```
Index(['tconst', 'primary_title', 'original_title', 'start_year',
       'runtime_minutes', 'genres', 'averagerating', 'numvotes', 'dire
ctors',
       'writers', 'ordering_x', 'title', 'is_original_title', 'studi
o',
       'domestic_gross', 'year', 'ordering_y', 'nconst', 'category',
       'primary_name', 'primary_profession', 'known_for_titles', 'Unna
med: 0',
       'Release Date', 'Production Budget', 'Domestic Gross',
       'Worldwide Gross', 'Unnamed: 6'],
      dtype='object')
```

The dataset has a number of columns that are irrelevant to the analysis, i will drop these columns to further refine these dataset

In [40]:

```
# drop unnecessary columns
merged_data = merged_data.drop(['Release Date','original_title','Unname
```

In [41]:

```
merged_data.columns
```

Out[41]:

```
Index(['tconst', 'primary_title', 'start_year', 'runtime_minutes', 'ge
nres',
       'averagerating', 'numvotes', 'directors', 'title', 'year', 'nco
nst',
       'category', 'primary_name', 'Production Budget', 'Worldwide Gro
ss'],
      dtype='object')
```

In [42]:

```
# Check shape of the data after dropping unnecessary columns

print("Rows: ", merged_data.shape[0])
print("Columns: ", merged_data.shape[1])
```

```
Rows:  340731
Columns:  15
```

In [43]:

```
merged_data.head(2)
```

Out[43]:

	tconst	primary_title	start_year	runtime_minutes	genres	avera
0	tt0337692	On the Road	2012	124.0	Adventure,Drama,Romance	
1	tt0337692	On the Road	2012	124.0	Adventure,Drama,Romance	

In [44]:

```
# Filetring the data in the column category to only remain with directo

merged_data = merged_data[merged_data['category']=='director']
```

In [45]:

```
#  Check shape of the data after filtering directors in category column

print("Rows: ", merged_data.shape[0])
print("Columns: ", merged_data.shape[1])
```

```
Rows:   36986
Columns:   15
```

In [46]:

```
# Keep checking for ways to elimnninate unnecessary duplicates in the mo
#Concatenate the tconst and primary name columns to get a unique term

merged_data['comb_tconst_priname'] = merged_data['tconst'] + merged_dat
```

In [47]:

```
# Check the new column created

merged_data.head()
```

Out[47]:

	tconst	primary_title	start_year	runtime_minutes	genres	ave
140	tt0337692	On the Road	2012	124.0	Adventure,Drama,Romance	
141	tt0337692	On the Road	2012	124.0	Adventure,Drama,Romance	
142	tt0337692	On the Road	2012	124.0	Adventure,Drama,Romance	
143	tt0337692	On the Road	2012	124.0	Adventure,Drama,Romance	
144	tt0337692	On the Road	2012	124.0	Adventure,Drama,Romance	

In [48]:

```
# Check shape of the data after creating the new column

print("Rows: ", merged_data.shape[0])
print("Columns: ", merged_data.shape[1])
```

```
Rows:  36986
Columns:  16
```

In [49]:

```
# check for duplicates in the combined column

dup_values = merged_data['comb_tconst_priname'].duplicated()
print(dup_values)
```

```
140       False
141        True
142        True
143        True
144        True
          ...  
340706    False
340707     True
340708     True
340709     True
340710     True
Name: comb_tconst_priname, Length: 36986, dtype: bool
```

There are some duplicates in the combined column. I next drop these duplicates.

In [50]:

```
# Drop the duplicates based on the combined column

merged_data = merged_data.drop_duplicates(subset=['comb_tconst_priname'
merged_data
```

Out[50]:

	tconst	primary_title	start_year	runtime_minutes	genres
140	tt0337692	On the Road	2012	124.0	Adventure,Drama,Romance
286	tt4339118	On the Road	2014	89.0	Drama
305	tt5647250	On the Road	2016	121.0	Drama
400	tt1233192	Brighton Rock	2010	111.0	Crime,Drama,Thriller
648	tt1374989	Pride and Prejudice and Zombies	2016	108.0	Action,Comedy,Horror
...	...	...	...	...	...
340515	tt2627798	The Last Station	2011	NaN	Drama
340519	tt3436064	The Last Station	2012	90.0	Documentary
340522	tt3436064	The Last Station	2012	90.0	Documentary
340606	tt4291600	Lady Macbeth	2016	89.0	Drama,Romance
340706	tt4333662	They Will Have to Kill Us First	2015	100.0	Documentary

1561 rows × 16 columns

In [51]:

```
# Check shape of the data after dropping

print("Rows: ", merged_data.shape[0])
print("Columns: ", merged_data.shape[1])
```

```
Rows:  1561
Columns:  16
```

Next is to make The Worldwide gross and the production budget columns into floats to enable measues of dispersion computations. I do this by removing the dollar ($) sign and the comma (,) from these columns

In [52]:

```
# remove the $ sign and comma from the worldwide gross column

merged_data['Worldwide Gross'] = merged_data['Worldwide Gross'].str.rep
```

In [53]:

```
merged_data['Worldwide Gross'] = merged_data['Worldwide Gross'].str.rep
```

In [54]:

```
# remove the $ sign and comma from the production budget column

merged_data['Production Budget'] = merged_data['Production Budget'].str
```

In [55]:

```
merged_data.columns
```

Out[55]:

```
Index(['tconst', 'primary_title', 'start_year', 'runtime_minutes', 'ge
nres',
       'averagerating', 'numvotes', 'directors', 'title', 'year', 'nco
nst',
       'category', 'primary_name', 'Production Budget', 'Worldwide Gro
ss',
       'comb_tconst_priname'],
      dtype='object')
```

In [56]:

```
merged_data['Production Budget'] = merged_data['Production Budget'].str
```

In [57]:

```
# Create a new column Movie_profit which is the difference between the

merged_data['movie_profit'] = merged_data['Worldwide Gross'] - merged_d
```

In [58]:

```
merged_data.head()
```

Out[58]:

	tconst	primary_title	start_year	runtime_minutes	genres	ave
140	tt0337692	On the Road	2012	124.0	Adventure,Drama,Romance	
286	tt4339118	On the Road	2014	89.0	Drama	
305	tt5647250	On the Road	2016	121.0	Drama	
400	tt1233192	Brighton Rock	2010	111.0	Crime,Drama,Thriller	
648	tt1374989	Pride and Prejudice and Zombies	2016	108.0	Action,Comedy,Horror	

In [59]:

```
# Drop the combined column

merged_data = merged_data.drop(['comb_tconst_priname'], axis=1)
```

Exploratory Data Analysis

Start looking at the measures of dispersion of the dataset

In [60]:

```

print("The dataset has : ", merged_data.shape[0], "rows")
print("The dataset has : ", merged_data.shape[1], "columns")
```

```
The dataset has :  1561 rows
The dataset has :  16 columns
```

In [61]:

```
# checking the descriptive statistics for the data

merged_data.describe()
```

Out[61]:

	start_year	runtime_minutes	averagerating	numvotes	year	Prod E
count	1561.000000	1534.000000	1561.000000	1.561000e+03	1561.000000	1.56100
mean	2013.665599	105.970013	6.422998	1.109882e+05	2013.805894	4.65587
std	2.521630	19.808025	1.051277	1.617296e+05	2.554808	5.51216
min	2010.000000	3.000000	1.600000	5.000000e+00	2010.000000	1.00000
25%	2011.000000	93.000000	5.800000	1.250600e+04	2011.000000	1.00000
50%	2014.000000	104.000000	6.500000	5.507100e+04	2014.000000	2.50000
75%	2016.000000	117.000000	7.100000	1.321610e+05	2016.000000	5.80000
max	2019.000000	192.000000	9.200000	1.841066e+06	2018.000000	3.79000

The data set contains movies created between 2010 and 2019.

The average length of the movies is 105 minutes. The longest movie is 192 minutes.

The average rating of these movies is 6.4. The lowest rating is 1.6 while the highest rating is 9.2.

The average budget for production of the movies is USD 4.66M. The lowest budget is USD 100000, while highest bud get is USD 3.79M

The average revenue for the movies is USD 1.58B . The lowest revenue is USD 0 meaning a number of movies had no sales , while the highest revenue is USD 2.04B

In [62]:

```python
# checking the descriptive statistics for all the data columns

merged_data.describe(include='all')
```

Out[62]:

	tconst	primary_title	start_year	runtime_minutes	genr
count	1561	1561	1561.000000	1534.000000	15
unique	1410	1191	NaN	NaN	2
top	tt1333125	One Day	NaN	NaN	Adventure,Animation,Come
freq	6	11	NaN	NaN	
mean	NaN	NaN	2013.665599	105.970013	Na
std	NaN	NaN	2.521630	19.808025	Na
min	NaN	NaN	2010.000000	3.000000	Na
25%	NaN	NaN	2011.000000	93.000000	Na
50%	NaN	NaN	2014.000000	104.000000	Na
75%	NaN	NaN	2016.000000	117.000000	Na
max	NaN	NaN	2019.000000	192.000000	Na

Check for oultiers in the data

In [63]:

```python
# calculate IQR for column runtime_minutes
Q1 = merged_data['runtime_minutes'].quantile(0.25)
Q3 = merged_data['runtime_minutes'].quantile(0.75)
IQR = Q3 - Q1

# identify outliers
threshold = 1.5
outliers_min = merged_data[(merged_data['runtime_minutes'] < Q1 - thres
```

In [64]:

```
outliers_min.sort_values(by='runtime_minutes', axis=0, ascending=True)
```

Out[64]:

	tconst	primary_title	start_year	runtime_minutes	gen
99714	tt4597838	Limitless	2015	3.0	Biography,Document
99718	tt4597838	Limitless	2015	3.0	Biography,Document
321950	tt2926868	The Call	2013	25.0	Document
294356	tt6142034	Lucy	2016	40.0	Document
335411	tt1529567	Sea Rex 3D: Journey to a Prehistoric World	2010	41.0	Document
335403	tt1529567	Sea Rex 3D: Journey to a	2010	41.0	Document

In [65]:

```
# calculate IQR for column production budget
Q1 = merged_data['Production Budget'].quantile(0.25)
Q3 = merged_data['Production Budget'].quantile(0.75)
IQR = Q3 - Q1

# identify outliers
threshold = 1.5
outliers_bud = merged_data[(merged_data['Production Budget'] < Q1 - thr
```

In [66]:

```
outliers_bud.sort_values(by='Production Budget', axis=0, ascending=True
```

Out[66]:

	tconst	primary_title	start_year	runtime_minutes	genres
137792	tt1911658	Penguins of Madagascar	2014	92.0	Adventure,Animation,Comedy
137669	tt1911658	Penguins of Madagascar	2014	92.0	Adventure,Animation,Comedy
159052	tt5523010	The Nutcracker and the Four Realms	2018	99.0	Adventure,Family,Fantasy
158956	tt5523010	The Nutcracker and the Four Realms	2018	99.0	Adventure,Family,Fantasy
177416	tt1663202	The Revenant	2015	156.0	Action,Adventure,Biography
...	...	...	...	...	...
127797	tt4154756	Avengers: Infinity War	2018	149.0	Action,Adventure,Sci-Fi
127835	tt4154756	Avengers: Infinity War	2018	149.0	Action,Adventure,Sci-Fi
87782	tt0974015	Justice League	2017	120.0	Action,Adventure,Fantasy
126676	tt2395427	Avengers: Age of Ultron	2015	141.0	Action,Adventure,Sci-Fi
50003	tt1298650	Pirates of the Caribbean: On Stranger Tides	2011	136.0	Action,Adventure,Fantasy

163 rows × 16 columns

In [67]:

```
# calculate IQR for column production budget
Q1 = merged_data['Worldwide Gross'].quantile(0.25)
Q3 = merged_data['Worldwide Gross'].quantile(0.75)
IQR = Q3 - Q1

# identify outliers
threshold = 1.5
outliers_rev = merged_data[(merged_data['Worldwide Gross'] < Q1 - thres
```

In [68]:

```
outliers_rev
```

Out[68]:

	tconst	primary_title	start_year	runtime_minutes	genres
2334	tt1325004	The Twilight Saga: Eclipse	2010	124.0	Adventure,Drama,Fantasy
3706	tt0770828	Man of Steel	2013	143.0	Action,Adventure,Sci-Fi
6846	tt2975590	Batman v Superman: Dawn of Justice	2016	151.0	Action,Adventure,Fantasy
14419	tt1277953	Madagascar 3: Europe's Most Wanted	2012	93.0	Adventure,Animation,Comedy
14634	tt1277953	Madagascar 3: Europe's Most Wanted	2012	93.0	Adventure,Animation,Comedy
...	...	...	...	...	...
323487	tt3606756	Incredibles 2	2018	118.0	Action,Adventure,Animation
333438	tt1918886	Joker	2012	104.0	Comedy,Family,Sci-Fi
333471	tt3002286	Joker	2013	94.0	Action,Thriller
333491	tt5611648	Joker	2016	130.0	Comedy,Drama
333494	tt5611648	Joker	2016	130.0	Comedy,Drama

166 rows × 16 columns

Data Visualization

Find the number of votes per year

In [69]:

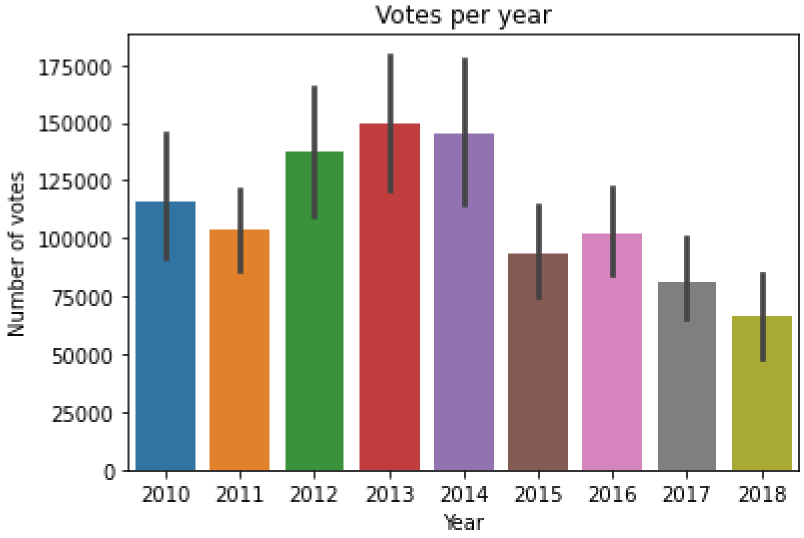
```
merged_data.groupby('year')['numvotes'].mean().sort_values(ascending=Fa
```

Out[69]:

```
year
2013    149555.176101
2014    145022.207792
2012    137203.613260
2010    116261.867021
2011    103753.279412
2016    102346.193717
2015     93793.715026
2017     81289.751592
2018     66196.768657
Name: numvotes, dtype: float64
```

In [70]:

```
sns.barplot(x = 'year', y = 'numvotes', data=merged_data)
plt.title('Votes per year')
plt.xlabel('Year')
plt.ylabel('Number of votes')
plt.show()
```



2014 had the highest number of votes while 2019 had the least number of votes

Get the average earnings or revenue per year

In [71]:

```
merged_data.columns
```

Out[71]:

```
Index(['tconst', 'primary_title', 'start_year', 'runtime_minutes', 'ge
nres',
       'averagerating', 'numvotes', 'directors', 'title', 'year', 'nco
nst',
       'category', 'primary_name', 'Production Budget', 'Worldwide Gro
ss',
       'movie_profit'],
      dtype='object')
```

In [72]:

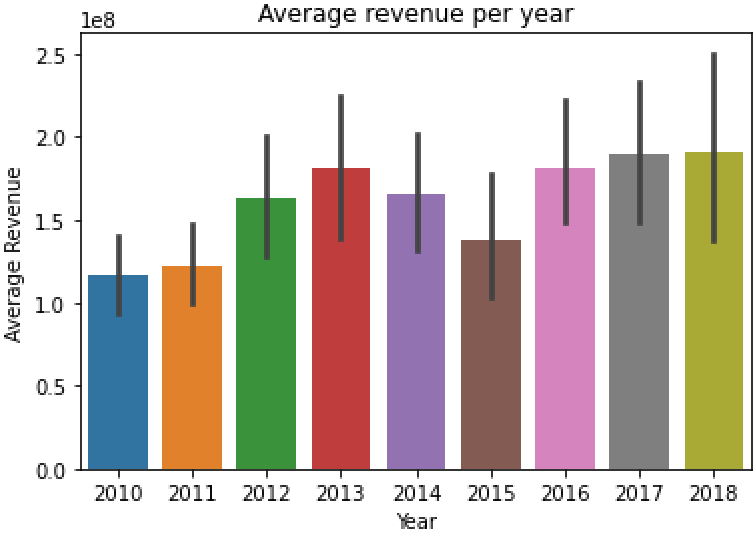
```
merged_data.groupby('year')['Worldwide Gross'].mean().sort_values(ascer
```

Out[72]:

```
year
2018    1.905569e+08
2017    1.894869e+08
2016    1.815058e+08
2013    1.807485e+08
2014    1.656570e+08
2012    1.635550e+08
2015    1.380609e+08
2011    1.219460e+08
2010    1.169798e+08
Name: Worldwide Gross, dtype: float64
```

In [73]:

```
sns.barplot(x = 'year', y = 'Worldwide Gross', data=merged_data)
plt.title('Average revenue per year')
plt.xlabel('Year')
plt.ylabel('Average Revenue')
plt.show()
```



Number of movies per year

In [74]:

```
merged_data.columns
```

Out[74]:

```
Index(['tconst', 'primary_title', 'start_year', 'runtime_minutes', 'ge
nres',
       'averagerating', 'numvotes', 'directors', 'title', 'year', 'nco
nst',
       'category', 'primary_name', 'Production Budget', 'Worldwide Gro
ss',
       'movie_profit'],
      dtype='object')
```

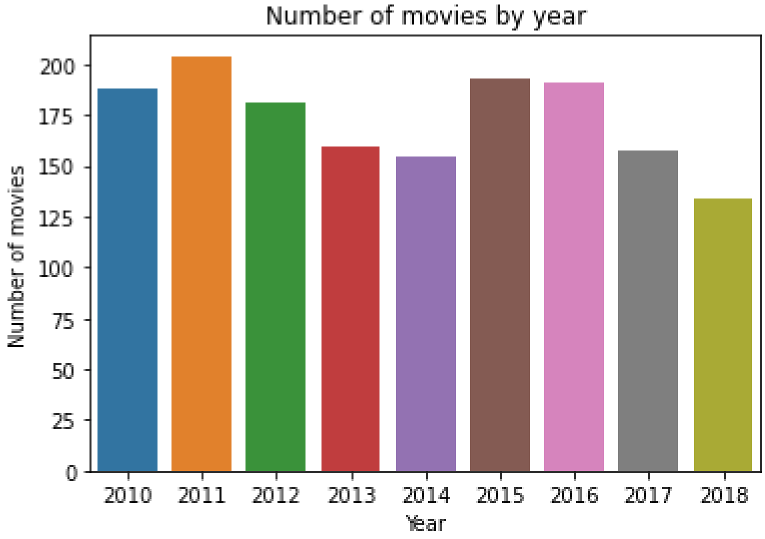
In [75]:

```
merged_data['year'].value_counts()
```

Out[75]:

```
2011    204
2015    193
2016    191
2010    188
2012    181
2013    159
2017    157
2014    154
2018    134
Name: year, dtype: int64
```

In [76]:
```
sns.countplot(x = 'year', data = merged_data)
plt.title("Number of movies by year")
plt.xlabel('Year')
plt.ylabel('Number of movies')
plt.show()
```



Most popular movie(has highest revenue)

In [77]:
```
merged_data.columns
```

Out[77]:
```
Index(['tconst', 'primary_title', 'start_year', 'runtime_minutes', 'ge
nres',
       'averagerating', 'numvotes', 'directors', 'title', 'year', 'nco
nst',
       'category', 'primary_name', 'Production Budget', 'Worldwide Gro
ss',
       'movie_profit'],
      dtype='object')
```

In [78]:
```
merged_data[merged_data['Worldwide Gross'].max() == merged_data['Worldw
```

Out[78]:
```
127797    Avengers: Infinity War
127835    Avengers: Infinity War
Name: title, dtype: object
```

Highest rated movies

In [79]:
```
merged_data.columns
```

Out[79]:
```
Index(['tconst', 'primary_title', 'start_year', 'runtime_minutes', 'ge
nres',
       'averagerating', 'numvotes', 'directors', 'title', 'year', 'nco
nst',
       'category', 'primary_name', 'Production Budget', 'Worldwide Gro
ss',
       'movie_profit'],
      dtype='object')
```

In [80]:

```
top_10_rating = merged_data.nlargest(10,'averagerating')[['primary_titl
.set_index('primary_title')
top_10_rating
```

Out[80]:

	averagerating
primary_title	
The Runaways	9.2
The Wall	9.2
Skin Trade	8.8
Inception	8.8
Upgrade	8.8
Coriolanus	8.7
Interstellar	8.6
Lights Out	8.6
Kin	8.6
Avengers: Infinity War	8.5

In [81]:

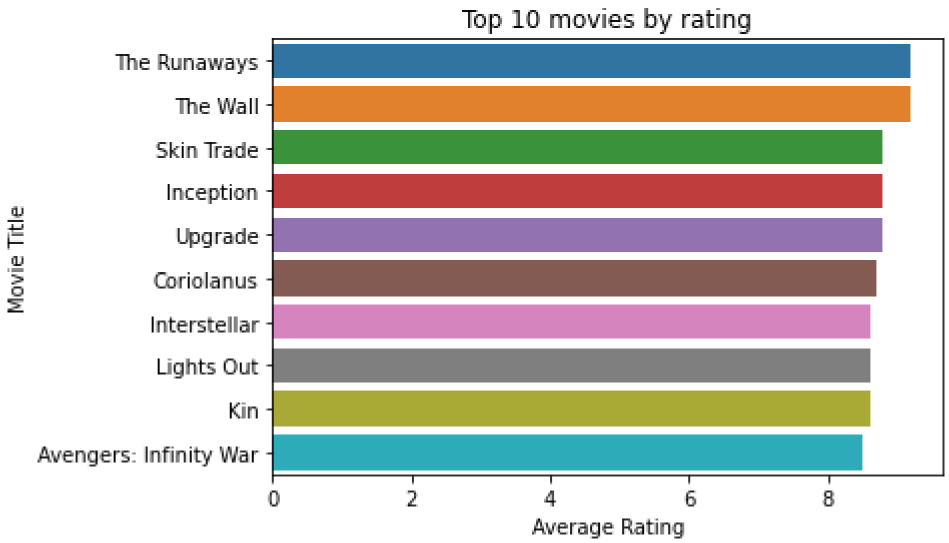
```
top_10_rating = merged_data.nlargest(10,'averagerating')[['primary_titl
.set_index('primary_title')
top_10_rating
```

Out[81]:

	averagerating	genres
primary_title		
The Runaways	9.2	Adventure
The Wall	9.2	Documentary
Skin Trade	8.8	Documentary
Inception	8.8	Action,Adventure,Sci-Fi
Upgrade	8.8	Drama
Coriolanus	8.7	Drama,History,War
Interstellar	8.6	Adventure,Drama,Sci-Fi
Lights Out	8.6	Drama
Kin	8.6	Drama,Music
Avengers: Infinity War	8.5	Action,Adventure,Sci-Fi

In [82]:

```
sns.barplot(x = 'averagerating', y = top_10_rating.index, data = top_10
plt.title('Top 10 movies by rating')
plt.xlabel("Average Rating")
plt.ylabel("Movie Title")
plt.show()
```



The Runways,the Wall and Skin trade are the top three rated movies

Top 10 directors by movie rating

In [83]:

```
merged_data.columns
```

Out[83]:

```
Index(['tconst', 'primary_title', 'start_year', 'runtime_minutes', 'ge
nres',
       'averagerating', 'numvotes', 'directors', 'title', 'year', 'nco
nst',
       'category', 'primary_name', 'Production Budget', 'Worldwide Gro
ss',
       'movie_profit'],
      dtype='object')
```

In [84]:

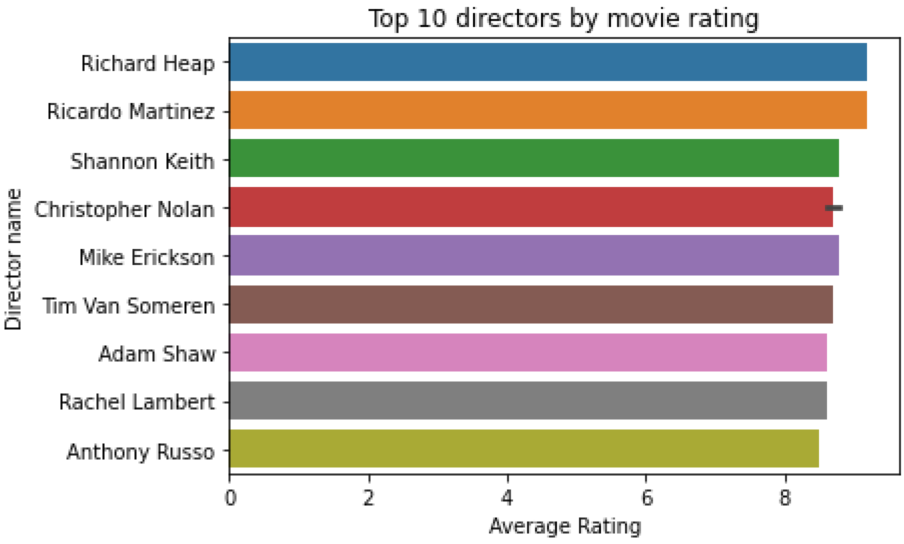
```
# merged_data.groupby('directors')['averagerating'].mean().sort_values(
top_10_directors = merged_data.nlargest(10,'averagerating')[['primary_r
.set_index('primary_name')
top_10_directors
```

Out[84]:

	averagerating
primary_name	
Richard Heap	9.2
Ricardo Martinez	9.2
Shannon Keith	8.8
Christopher Nolan	8.8
Mike Erickson	8.8
Tim Van Someren	8.7
Christopher Nolan	8.6
Adam Shaw	8.6
Rachel Lambert	8.6
Anthony Russo	8.5

In [85]:

```
sns.barplot(x = 'averagerating', y = top_10_directors.index, data = top
plt.title('Top 10 directors by movie rating')
plt.xlabel("Average Rating")
plt.ylabel("Director name")
plt.show()
```



Top 10 directors by profit

In [86]:

```
merged_data.columns
```

Out[86]:

```
Index(['tconst', 'primary_title', 'start_year', 'runtime_minutes', 'ge
nres',
       'averagerating', 'numvotes', 'directors', 'title', 'year', 'nco
nst',
       'category', 'primary_name', 'Production Budget', 'Worldwide Gro
ss',
       'movie_profit'],
      dtype='object')
```

In [87]:

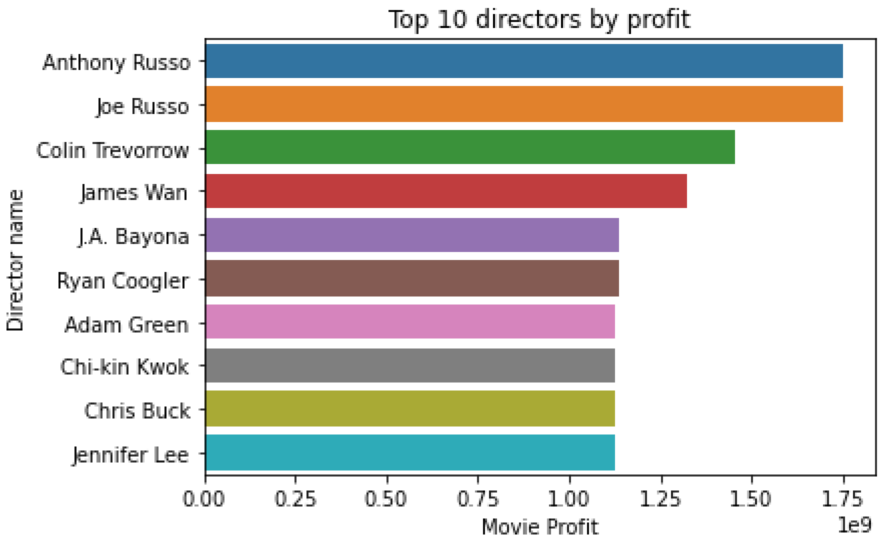
```

top_10_dir_profit = merged_data.nlargest(10,'movie_profit')[['primary_r
.set_index('primary_name')
top_10_dir_profit
```

Out[87]:

primary_name	movie_profit
Anthony Russo	1.748360e+09
Joe Russo	1.748360e+09
Colin Trevorrow	1.454964e+09
James Wan	1.321986e+09
J.A. Bayona	1.138323e+09
Ryan Coogler	1.136494e+09
Adam Green	1.124590e+09
Chi-kin Kwok	1.124590e+09
Chris Buck	1.124590e+09
Jennifer Lee	1.124590e+09

In [88]:

```
sns.barplot(x = 'movie_profit', y = top_10_dir_profit.index, data = top
plt.title('Top 10 directors by profit')
plt.xlabel("Movie Profit")
plt.ylabel("Director name")
plt.show()
```



Display the top 10 movies and runtime

In [89]:

```
merged_data.columns
```

Out[89]:

```
Index(['tconst', 'primary_title', 'start_year', 'runtime_minutes', 'ge
nres',
       'averagerating', 'numvotes', 'directors', 'title', 'year', 'nco
nst',
       'category', 'primary_name', 'Production Budget', 'Worldwide Gro
ss',
       'movie_profit'],
      dtype='object')
```

In [90]:

```
top_10_len = merged_data.nlargest(12,'runtime_minutes')[['primary_title
.set_index('primary_title')
top_10_len
```

Out[90]:

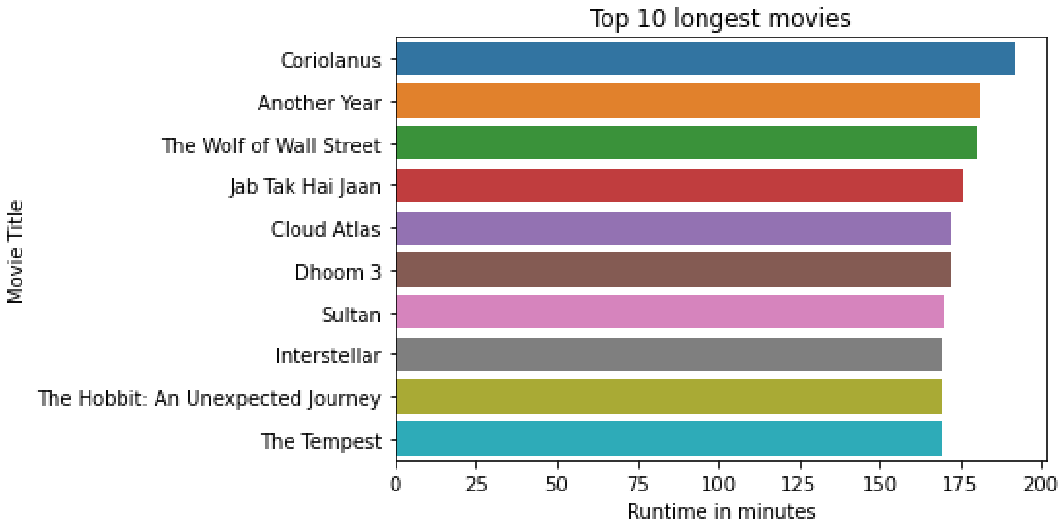
	runtime_minutes
primary_title	
Coriolanus	192.0
Another Year	181.0
The Wolf of Wall Street	180.0
Jab Tak Hai Jaan	176.0
Cloud Atlas	172.0
Cloud Atlas	172.0
Cloud Atlas	172.0
Dhoom 3	172.0
Sultan	170.0
Interstellar	169.0
The Hobbit: An Unexpected Journey	169.0
The Tempest	169.0

In [91]:

```
# repeat = 'Cloud Atlas'
# repeat_data = merged_data.loc[merged_data['primary_title'] == repeat]
# repeat_data
```

In [92]:

```
sns.barplot(x = 'runtime_minutes', y = top_10_len.index, data = top_10_
plt.title("Top 10 longest movies")
plt.xlabel("Runtime in minutes")
plt.ylabel("Movie Title")
plt.show()
```



Top 10 highest revenue movie titles

In [93]:

```
merged_data.columns
```

Out[93]:

```
Index(['tconst', 'primary_title', 'start_year', 'runtime_minutes', 'ge
nres',
       'averagerating', 'numvotes', 'directors', 'title', 'year', 'nco
nst',
       'category', 'primary_name', 'Production Budget', 'Worldwide Gro
ss',
       'movie_profit'],
      dtype='object')
```

In [94]:

```
merged_data.nlargest(15,'Worldwide Gross')['primary_title']
```

Out[94]:

```
127797            Avengers: Infinity War
127835            Avengers: Infinity War
29321                     Jurassic World
42919                          Furious 7
126676           Avengers: Age of Ultron
155902                     Black Panther
30798     Jurassic World: Fallen Kingdom
277622                            Frozen
277787                            Frozen
277951                            Frozen
277999                            Frozen
323487                     Incredibles 2
43878            The Fate of the Furious
160030                        Iron Man 3
138540                           Minions
Name: primary_title, dtype: object
```

In [95]:

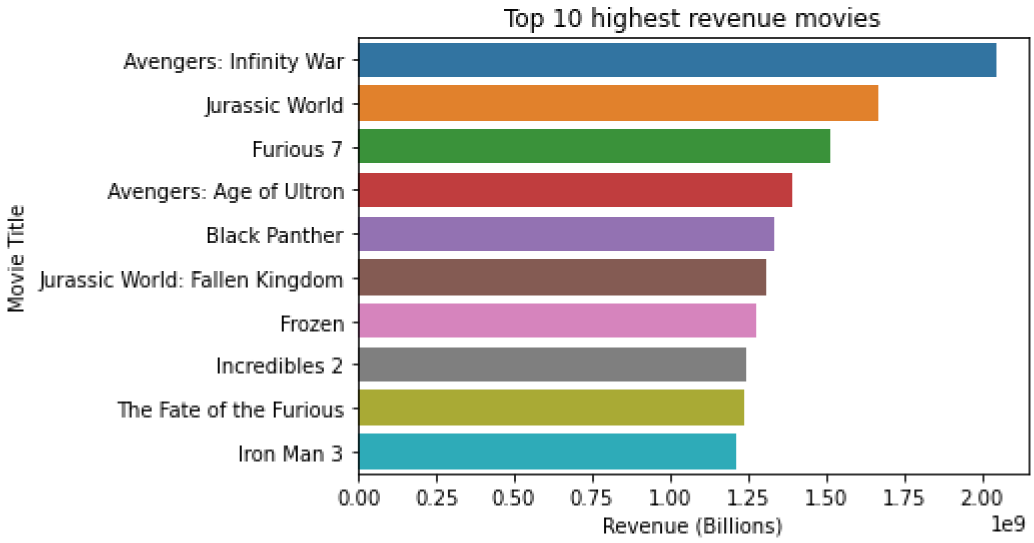
```
top_10_rev = merged_data.nlargest(14,'Worldwide Gross')[['primary_title
.set_index('primary_title')
top_10_rev
```

Out[95]:

	Worldwide Gross
primary_title	
Avengers: Infinity War	2.048360e+09
Avengers: Infinity War	2.048360e+09
Jurassic World	1.669964e+09
Furious 7	1.511986e+09
Avengers: Age of Ultron	1.395317e+09
Black Panther	1.336494e+09
Jurassic World: Fallen Kingdom	1.308323e+09
Frozen	1.274590e+09
Frozen	1.274590e+09
Frozen	1.274590e+09
Frozen	1.274590e+09
Incredibles 2	1.242805e+09
The Fate of the Furious	1.235534e+09
Iron Man 3	1.215392e+09

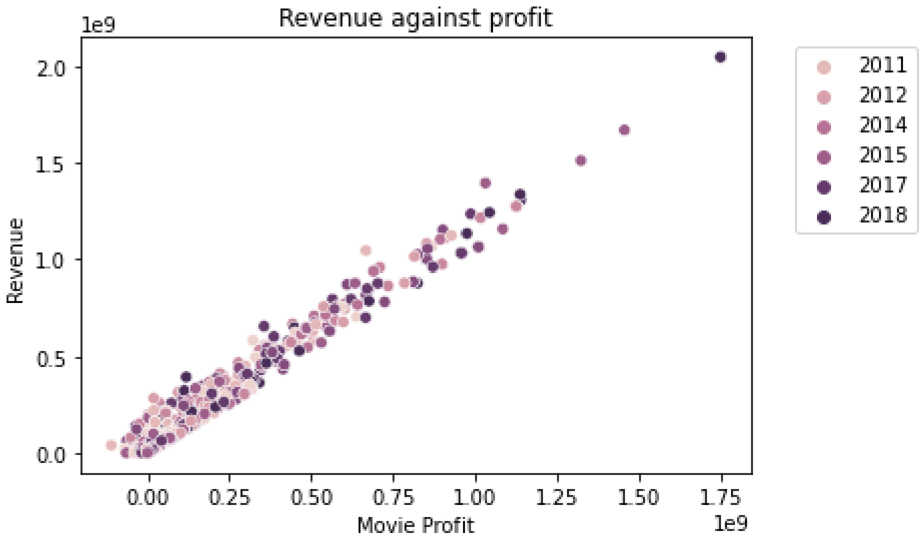
In [96]:

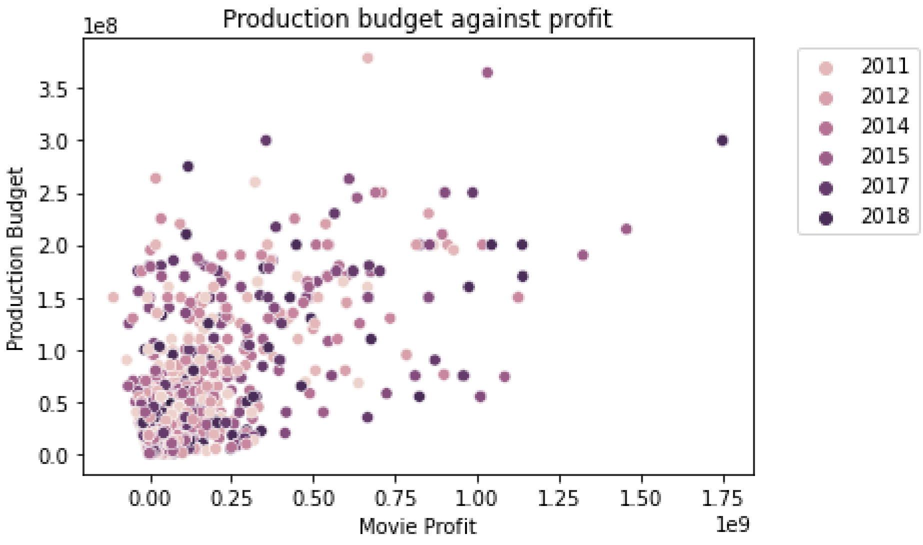
```
sns.barplot(x ='Worldwide Gross', y = top_10_rev.index, data = top_10_r
plt.title("Top 10 highest revenue movies")
plt.xlabel("Revenue (Billions)")
plt.ylabel("Movie Title")
plt.show()
```



Relationship between revenue, production budget agaisnt profitability

In [97]:
```
sns.scatterplot(x = 'movie_profit', y = 'Worldwide Gross', hue = "start
plt.legend(bbox_to_anchor=(1.05, 1.0), loc='upper left')
plt.title("Revenue against profit")
plt.xlabel("Movie Profit")
plt.ylabel("Revenue")
plt.show()

sns.scatterplot(x = 'movie_profit', y = 'Production Budget',hue = "star
plt.legend(bbox_to_anchor=(1.05, 1.0), loc='upper left')
plt.title("Production budget against profit")
plt.xlabel("Movie Profit")
plt.ylabel("Production Budget")
plt.show()
```





The revenue and profitability of movies is positively correlated.

The production budget does not have a linear relationship with the profitability of the movie

Classify Movies Based on Ratings (Excellent, Good, and Average)

In [98]:

```
def rating(rating):
    if rating >=7.0:
        return "Excellent"
    elif rating>= 6.0:
        return "Good"
    else:
        return "Average"
```

In [99]:

```
merged_data['rating_groups'] = merged_data['averagerating'].apply(ratir
```

In [100]:

```
merged_data.head()
```

Out[100]:

	tconst	primary_title	start_year	runtime_minutes	genres
140	tt0337692	On the Road	2012	124.0	Adventure,Drama,Romance
286	tt4339118	On the Road	2014	89.0	Drama
305	tt5647250	On the Road	2016	121.0	Drama
400	tt1233192	Brighton Rock	2010	111.0	Crime,Drama,Thriller

Compare Rating against the Revenue

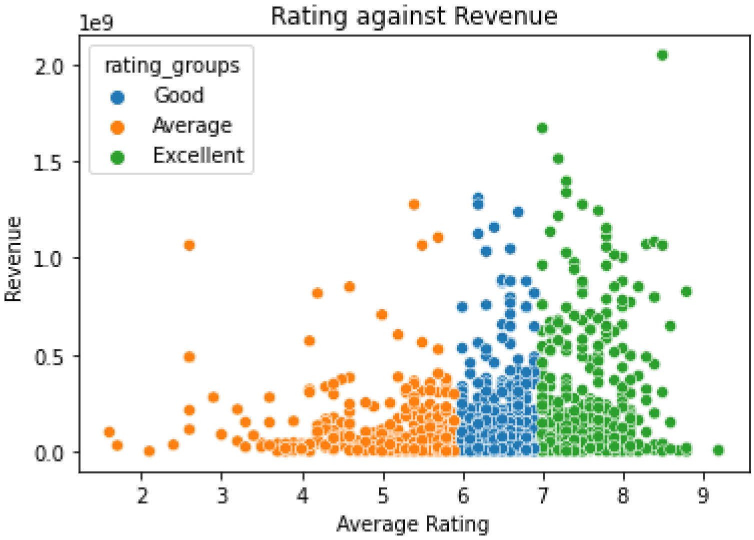
In [101]:

```
merged_data.columns
```

Out[101]:

```
Index(['tconst', 'primary_title', 'start_year', 'runtime_minutes', 'ge
nres',
       'averagerating', 'numvotes', 'directors', 'title', 'year', 'nco
nst',
       'category', 'primary_name', 'Production Budget', 'Worldwide Gro
ss',
       'movie_profit', 'rating_groups'],
      dtype='object')
```

In [102]:
```
sns.scatterplot(x = 'averagerating', y = 'Worldwide Gross',hue='rating_
plt.title("Rating against Revenue")
plt.xlabel("Average Rating")
plt.ylabel("Revenue")
plt.show()
```



A higher rating does not necesarily translate to a higher revenue however more movies with a higher revenue had a ratinging of 6 and above

Unique values from genre

In [103]:
```
merged_data.columns
```

Out[103]:
```
Index(['tconst', 'primary_title', 'start_year', 'runtime_minutes', 'ge
nres',
       'averagerating', 'numvotes', 'directors', 'title', 'year', 'nco
nst',
       'category', 'primary_name', 'Production Budget', 'Worldwide Gro
ss',
       'movie_profit', 'rating_groups'],
      dtype='object')
```

In [104]:
```
merged_data['genres']
```

Out[104]:
```
140        Adventure,Drama,Romance
286                          Drama
305                          Drama
400           Crime,Drama,Thriller
648           Action,Comedy,Horror
                  ...
340515                       Drama
340519                 Documentary
340522                 Documentary
340606               Drama,Romance
340706                 Documentary
Name: genres, Length: 1561, dtype: object
```

In [105]:

```
type('genres')
```

Out[105]:

```
str
```

In [106]:

```
# split this column by adding commas after every item

list_genre = []

for value in merged_data['genres']:
    list_genre.append(value.split(','))
```

```
----------------------------------------------------------------------
-----
AttributeError                            Traceback (most recent call
last)
<ipython-input-106-eba3ce0c317b> in <module>
      4
      5 for value in merged_data['genres']:
----> 6     list_genre.append(value.split(','))

AttributeError: 'float' object has no attribute 'split'
```

In [107]:

```
list_genre
```

Out[107]:

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

In [108]:

```
# Convert in to one dimensional list

one_d_genre = []
for x in list_genre:
    for y in x:
        one_d_genre.append(y)
```

In [109]:

```
one_d_genre
```

Out[109]:

```
['Adventure',
 'Drama',
 'Romance',
 'Drama',
 'Drama',
 'Crime',
 'Drama',
 'Thriller',
 'Action',
 'Comedy',
 'Horror',
 'Drama',
 'Music',
 'Biography',
 'Drama',
 'Sport',
 'Drama',
 'Music',
 'Drama',
 'Music',
```

In [110]:

```
# find unique vales in this list

unique_genres = []
for x in one_d_genre:
    if x not in unique_genres:
        unique_genres.append(x)
```

```
In [111]: unique_genres
```

```
Out[111]: ['Adventure',
           'Drama',
           'Romance',
           'Crime',
           'Thriller',
           'Action',
           'Comedy',
           'Horror',
           'Music',
           'Biography',
           'Sport',
           'Family',
           'Fantasy',
           'War',
           'Sci-Fi',
           'Mystery',
           'Documentary',
           'History',
           'Animation']
```

```
In [112]: print("There are ",len(unique_genres) , "genres in the dataset")
```

```
There are  19 genres in the dataset
```

Number of movies per genre

```
In [113]: one_d_genre
```

```
Out[113]: ['Adventure',
           'Drama',
           'Romance',
           'Drama',
           'Drama',
           'Crime',
           'Drama',
           'Thriller',
           'Action',
           'Comedy',
           'Horror',
           'Drama',
           'Music',
           'Biography',
           'Drama',
           'Sport',
           'Drama',
           'Music',
           'Drama',
```

```
In [114]: from collections import Counter
```

In [115]:

```
Counter(one_d_genre)
```

Out[115]:

```
Counter({'Adventure': 13,
         'Drama': 39,
         'Romance': 7,
         'Crime': 7,
         'Thriller': 5,
         'Action': 7,
         'Comedy': 14,
         'Horror': 5,
         'Music': 5,
         'Biography': 8,
         'Sport': 3,
         'Family': 2,
         'Fantasy': 2,
         'War': 1,
         'Sci-Fi': 4,
         'Mystery': 2,
         'Documentary': 1,
         'History': 2,
         'Animation': 2})
```

Directors that make popular movies(with high revenue)

In [116]:

```
merged_data.columns
```

Out[116]:

```
Index(['tconst', 'primary_title', 'start_year', 'runtime_minutes', 'ge
nres',
       'averagerating', 'numvotes', 'directors', 'title', 'year', 'nco
nst',
       'category', 'primary_name', 'Production Budget', 'Worldwide Gro
ss',
       'movie_profit', 'rating_groups'],
      dtype='object')
```

In [117]:

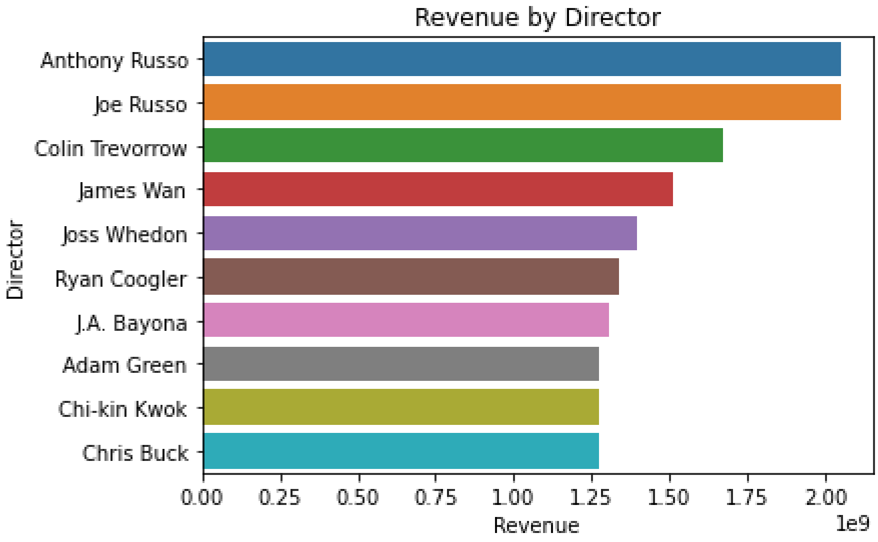
```
top_10_rev_dir = merged_data.nlargest(10,'Worldwide Gross')[['primary_r
.set_index('primary_name')
top_10_rev_dir
```

Out[117]:

primary_name	Worldwide Gross
Anthony Russo	2.048360e+09
Joe Russo	2.048360e+09
Colin Trevorrow	1.669964e+09
James Wan	1.511986e+09
Joss Whedon	1.395317e+09
Ryan Coogler	1.336494e+09
J.A. Bayona	1.308323e+09
Adam Green	1.274590e+09
Chi-kin Kwok	1.274590e+09
Chris Buck	1.274590e+09

In [118]:

```
sns.barplot(x = 'Worldwide Gross', y = top_10_rev_dir.index, data = top
plt.title("Revenue by Director")
plt.xlabel('Revenue')
plt.ylabel('Director')
plt.show()
```



I would advise Microsoft to pick the top directors Anthony Russo and Joe Russo. Since they are highly rated and they produce succesful movies, they are a great option to start off the Microsoft studio in choices of the genres to focus on and actors to consider.