Project: Investigate a Dataset (The Movie Database TMDb)

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Introduction

> This data set contains information about 10,000 movies collected from **The Movie Database (TMDb)**,including user ratings and revenue. It is contains 21 original columns like (id , budjet , revenue , vote_rate and original title .... ect) Some columns we will drop it because it is not important for us in the analysis process We will add **two** column after processing another column and make calculation. This tow column will help us in our investigation Our main purpose of this project to wrangling the data int this dataset and make analysis to gain information about cenima maker decisions on this period Also collect some information about the best film and long one and the kind of films more watching

My questions to investigate the dataset :

> - Finding the Movies with high and low **profit**
> - Finding the Movies with high and low **voteing**
> - Finding the Movies with high and low **runtime**
> - Statictics about **Runtime**
> - Finding the most and the lowest artists acting in this group of movies
> - Types of movies

In [1]:
```
# Use this cell to set up import statements for all of the packages that you
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as snb
```

My functions come here !!!!!!!

In [2]:
```
# This function using to split **movie type** from the genres column
def strip_style(strip_txt):
    movie_style_lst=[]
    movie_style_lst=strip_txt.split("|")
    fst_inxd=movie_style_lst[0]
    return fst_inxd
```

In [3]:
```
# This function to adding new column called profit to our dataset contains subtraction operation of [revenue_adj - budget_adj]
def profit_cal(df_come): #df_come is the dataframe come pass to the function
    df_come.insert(13,'profit_adj',df_come['revenue_adj']-df_come['budget_adj'])
    return df_come
```

In [4]:
```
# This function using to add new column called movie_style to our dataset contains movie type
def movie_type(df_come): #df_come is the dataframe come pass to the function
    df_come['movie_style'] = df_come['genres'].apply(strip_style)
    return df_come
```

Data Wrangling

> **Tip**: In this section of the report, you will load in the data, check for cleanliness, and then trim and clean your dataset for analysis.

General Properties

In [5]:
```
# Load your data and print out a few lines. Perform operations to inspect data
df = pd.read_csv("Database_TMDb_movie_data.csv")
#   types and look for instances of missing or possibly errant data.
df.head()
```

Out[5]:

	id	imdb_id	popularity	budget	revenue	original_title	cast	homepage	director	tagline	...	overview	run
0	135397	tt0369610	32.985763	150000000	1513528810	Jurassic World	Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...	http://www.jurassicworld.com/	Colin Trevorrow	The park is open.	...	Twenty-two years after the events of Jurassic ...	
1	76341	tt1392190	28.419936	150000000	378436354	Mad Max: Fury Road	Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...	http://www.madmaxmovie.com/	George Miller	What a Lovely Day.	...	An apocalyptic story set in the furthest reach...	

	id	imdb_id	popularity	budget	revenue	original_title	cast	homepage	director	tagline	...	overview	run
2	262500	tt2908446	13.112507	110000000	295238201	Insurgent	Shailene Woodley|Theo James|Kate Winslet|Ansel...	http://www.thedivergentseries.movie/#insurgent	Robert Schwentke	One Choice Can Destroy You	...	Beatrice Prior must confront her inner demons ...	
3	140607	tt2488496	11.173104	200000000	2068178225	Star Wars: The Force Awakens	Harrison Ford|Mark Hamill|Carrie Fisher|Adam D...	http://www.starwars.com/films/star-wars-episod...	J.J. Abrams	Every generation has a story.	...	Thirty years after defeating the Galactic Empi...	
4	168259	tt2820852	9.335014	190000000	1506249360	Furious 7	Vin Diesel|Paul Walker|Jason Statham|Michelle ...	http://www.furious7.com/	James Wan	Vengeance Hits Home	...	Deckard Shaw seeks revenge against Dominic Tor...	

5 rows × 21 columns

In [6]:
```
# Descovering Our Data Before Cleaning Step
row,col =df.shape
print('There is {} films in our dataset contains {} intities'.format(row,col))
```

```
There is 10866 films in our dataset contains 21 intities
```

In [7]:
```
#Checking for duplicate data
print('There is {} douplicated values in our dataset'.format(df.duplicated().sum()))
```

```
There is 1 douplicated values in our dataset
```

Data Clearing :

- Delete duplicate values
- Replace 0's value with NaN
- Drop NaN values
- Delete non necessary columns
- Change some column data type

In [8]:
```
df.drop_duplicates(keep ='first', inplace=True)
```

```
print('There is {} douplicated values in our dataset'.format(df.duplicated().sum()))
row =df.shape[0]
print('There is {} films in our dataset.'.format(row))
```

```
There is 0 douplicated values in our dataset
There is 10865 films in our dataset.
```

In [9]:

```
# show 0's data in specific cols
df.query('budget == 0 or revenue == 0 or runtime == 0')
```

Out[9]:

	id	imdb_id	popularity	budget	revenue	original_title	cast	homepage	director	tagline	...	overview	runtime
30	280996	tt3168230	3.927333	0	29355203	Mr. Holmes	Ian McKellen|Milo Parker|Laura Linney|Hattie M...	http://www.mrholmesfilm.com/	Bill Condon	The man behind the myth	...	The story is set in 1947, following a long-ret...	103
36	339527	tt1291570	3.358321	0	22354572	Solace	Abbie Cornish|Jeffrey Dean Morgan|Colin Farrel...	NaN	Afonso Poyart	A serial killer who can see your future, a psy...	...	A psychic doctor, John Clancy, works with an F...	101
48	265208	tt2231253	2.932340	30000000	0	Wild Card	Jason Statham|Michael Angarano|Milo Ventimigli...	NaN	Simon West	Never bet against a man with a killer hand.	...	When a Las Vegas bodyguard with lethal skills ...	92
67	334074	tt3247714	2.331636	20000000	0	Survivor	Pierce Brosnan|Milla Jovovich|Dylan McDermott|...	http://survivormovie.com/	James McTeigue	His Next Target is Now Hunting Him	...	A Foreign Service Officer in London tries to p...	96
72	284289	tt2911668	2.272044	0	45895	Beyond the Reach	Michael Douglas|Jeremy Irvine|Hanna Mangan Law...	NaN	Jean-Baptiste LÃ©onetti	NaN	...	A high-rolling corporate shark and his impover...	95
...	...	...	...	...	...	...	...	...	...	...	...	...	...

	id	imdb_id	popularity	budget	revenue	original_title	cast	homepage	director	tagline	...	overview	runtime
10861	21	tt0060371	0.080598	0	0	The Endless Summer	Michael Hynson|Robert August|Lord 'Tally Ho' B...	NaN	Bruce Brown	NaN	...	The Endless Summer, by Bruce Brown, is one of ...	95
10862	20379	tt0060472	0.065543	0	0	Grand Prix	James Garner|Eva Marie Saint|Yves Montand|Tosh...	NaN	John Frankenheimer	Cinerama sweeps YOU into a drama of speed and ...	...	Grand Prix driver Pete Aron is fired by his te...	176
10863	39768	tt0060161	0.065141	0	0	Beregis Avtomobilya	Innokentiy Smoktunovskiy|Oleg Efremov|Georgi Z...	NaN	Eldar Ryazanov	NaN	...	An insurance agent who moonlights as a carthie...	94
10864	21449	tt0061177	0.064317	0	0	What's Up, Tiger Lily?	Tatsuya Mihashi|Akiko Wakabayashi|Mie Hama|Joh...	NaN	Woody Allen	WOODY ALLEN STRIKES BACK!	...	In comic Woody Allen's film debut, he took the...	80
10865	22293	tt0060666	0.035919	19000	0	Manos: The Hands of Fate	Harold P. Warren|Tom Neyman|John Reynolds|Dian...	NaN	Harold P. Warren	It's Shocking! It's Beyond Your Imagination!	...	A family gets lost on the road and stumbles up...	74

7011 rows × 21 columns

1-Replace 0's values witn NAN and drop it from our dataset

In [10]:
```
# Replace 0's values witn NAN and drop it from our dataset

df[['budget','revenue','runtime']] = df[['budget','revenue','runtime']].replace(0, np.NAN)
df.dropna(subset = ['budget','revenue','runtime'], inplace = True)
```

In [11]:
```
row =df.shape[0]
print('There is {} films in our dataset.'.format(row))
```

```
There is 3854 films in our dataset.
```

2-Deleting not necessary columns

In [12]:
```
# create a list containing unnecessary columns to delete it
count_col = 0
for col_name in df.columns:
    count_col =count_col + 1
    if col_name == 'imdb_id'and count_col == 2 :
        del_data=[ 'imdb_id', 'popularity',  'homepage', 'tagline','keywords', 'overview', 'production_companies', 'vote_count']
        df = df.drop(del_data,1)
df.head()
```

Out[12]:

	id	budget	revenue	original_title	cast	director	runtime	genres	release_date	vote_average	release_year	budget_adj	rev
0	135397	150000000.0	1.513529e+09	Jurassic World	Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...	Colin Trevorrow	124.0	Action|Adventure|Science Fiction|Thriller	6/9/15	6.5	2015	1.379999e+08	1.392
1	76341	150000000.0	3.784364e+08	Mad Max: Fury Road	Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...	George Miller	120.0	Action|Adventure|Science Fiction|Thriller	5/13/15	7.1	2015	1.379999e+08	3.481
2	262500	110000000.0	2.952382e+08	Insurgent	Shailene Woodley|Theo James|Kate Winslet|Ansel...	Robert Schwentke	119.0	Adventure|Science Fiction|Thriller	3/18/15	6.3	2015	1.012000e+08	2.716
3	140607	200000000.0	2.068178e+09	Star Wars: The Force Awakens	Harrison Ford|Mark Hamill|Carrie Fisher|Adam D...	J.J. Abrams	136.0	Action|Adventure|Science Fiction|Fantasy	12/15/15	7.5	2015	1.839999e+08	1.902
4	168259	190000000.0	1.506249e+09	Furious 7	Vin Diesel|Paul Walker|Jason Statham|Michelle ...	James Wan	137.0	Action|Crime|Thriller	4/1/15	7.3	2015	1.747999e+08	1.385

3-Changing Datatypes of columns

In [13]:
```
# Changing some columns type like money and time
df[['budget','revenue','budget_adj','revenue_adj']]=df[['budget','revenue','budget_adj','revenue_adj']].applymap(np.int64)
df.release_date = pd.to_datetime(df['release_date'])
```

Exploratory Data Analysis

Looking at data after making necessary changes

In [14]:
```
# Use this, and more code cells, to explore your data. Don't forget to add
df.head(3)
```

Out[14]:

	id	budget	revenue	original_title	cast	director	runtime	genres	release_date	vote_average	release_year	budget_adj	revenue_adj
0	135397	150000000	1513528810	Jurassic World	Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...	Colin Trevorrow	124.0	Action|Adventure|Science Fiction|Thriller	2015-06-09	6.5	2015	137999939	1392445892
1	76341	150000000	378436354	Mad Max: Fury Road	Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...	George Miller	120.0	Action|Adventure|Science Fiction|Thriller	2015-05-13	7.1	2015	137999939	348161292
2	262500	110000000	295238201	Insurgent	Shailene Woodley|Theo James|Kate Winslet|Ansel...	Robert Schwentke	119.0	Adventure|Science Fiction|Thriller	2015-03-18	6.3	2015	101199955	271619025

Processing data for easy analysis

1-Finding the Movie profit from production date till now so we must using budget_adj and revenue_adj columns to calculate the profite

In [15]:
```
# calculate profit value
df = profit_cal(df)
```

2-Find the Movie genres

In [16]:
```
# split movie genres from genres column and insert it in new column using **movie_type function**
df = movie_type(df)
```

In [17]:
```
# show 5 rows from our new dataset
df.head(5)
```

Out[17]:

	id	budget	revenue	original_title	cast	director	runtime	genres	release_date	vote_average	release_year	budget_adj	revenue_ac
0	135397	150000000	1513528810	Jurassic World	Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...	Colin Trevorrow	124.0	Action|Adventure|Science Fiction|Thriller	2015-06-09	6.5	2015	137999939	139244589
1	76341	150000000	378436354	Mad Max: Fury Road	Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...	George Miller	120.0	Action|Adventure|Science Fiction|Thriller	2015-05-13	7.1	2015	137999939	34816129
2	262500	110000000	295238201	Insurgent	Shailene Woodley|Theo James|Kate Winslet|Ansel...	Robert Schwentke	119.0	Adventure|Science Fiction|Thriller	2015-03-18	6.3	2015	101199955	27161902
3	140607	200000000	2068178225	Star Wars: The Force Awakens	Harrison Ford|Mark Hamill|Carrie Fisher|Adam D...	J.J. Abrams	136.0	Action|Adventure|Science Fiction|Fantasy	2015-12-15	7.5	2015	183999919	190272312
4	168259	190000000	1506249360	Furious 7	Vin Diesel|Paul Walker|Jason Statham|Michelle ...	James Wan	137.0	Action|Crime|Thriller	2015-04-01	7.3	2015	174799923	138574880

Research Question 1- Finding the Movies with high and low profit

In [18]:

```
# find movies with low and high profit
high_profit= df['profit_adj'].idxmax()
high_profit=pd.DataFrame(df.loc[high_profit])
low_profit= df['profit_adj'].idxmin()
low_profit=pd.DataFrame(df.loc[low_profit])
print_value = pd.concat([high_profit,low_profit],axis=1)
print_value
```

Out[18]:

	1329	2244
id	11	46528
budget	11000000	425000000
revenue	775398007	11087569
original_title	Star Wars	The Warrior's Way

	1329	2244
cast	Mark Hamill|Harrison Ford|Carrie Fisher|Peter ...	Kate Bosworth|Jang Dong-gun|Geoffrey Rush|Dann...
director	George Lucas	Sngmoo Lee
runtime	121.0	100.0
genres	Adventure|Action|Science Fiction	Adventure|Fantasy|Action|Western|Thriller
release_date	1977-03-20 00:00:00	2010-12-02 00:00:00
vote_average	7.9	6.4
release_year	1977	2010
budget_adj	39575591	425000000
revenue_adj	2789712242	11087569
profit_adj	2750136651	-413912431
movie_style	Adventure	Adventure

- Star Wars Film is the highest profit film with 2750136651 Dollars
- The Warrior's Way is the lowest profit film with -413912431 Dollars

In [19]:
```
# Find the year with the max value of profit
profit_adj = df.groupby('release_year')['profit_adj'].sum()
print('The year which has the max profit is :{}'.format(profit_adj.idxmax()))
# Find the year with the min value of profit
profit_adj = df.groupby('release_year')['profit_adj'].sum()
print('The year which has the min profit is :{}'.format(profit_adj.idxmin()))
```

```
The year which has the max profit is :2015
The year which has the min profit is :1966
```

Research Question 2 - Finding the Movies with high and low voteing

In [20]:
```
# find movies with low and high vote
high_vote= df['vote_average'].idxmax()
high_vote=pd.DataFrame(df.loc[high_vote])
low_vote= df['vote_average'].idxmin()
low_vote=pd.DataFrame(df.loc[low_vote])
print_value = pd.concat([high_vote,low_vote],axis=1)
print_value
```

Out[20]:

	4178	4859
id	278	116977
budget	25000000	65000000
revenue	28341469	73706
original_title	The Shawshank Redemption	Foodfight!
cast	Tim Robbins|Morgan Freeman|Bob Gunton|William ...	Charlie Sheen|Wayne Brady|Hilary Duff|Eva Long...
director	Frank Darabont	Lawrence Kasanoff
runtime	142.0	87.0
genres	Drama|Crime	Animation|Action|Comedy|Family
release_date	1994-09-10 00:00:00	2012-06-15 00:00:00
vote_average	8.4	2.2
release_year	1994	2012
budget_adj	36777789	61733378
revenue_adj	41693462	70001
profit_adj	4915673	-61663377
movie_style	Drama	Animation

- The Shawshank Redemption Film is the highest voting film with 8.4 rate
- Foodfight Film is the lowest voting film with 2.2 rate

Research Question3 - Finding the Movies with high and low **runtime**

In [ ]:

In [21]:
```
# find movies with low and high runtime
high_runtime= df['runtime'].idxmax()
high_runtime=pd.DataFrame(df.loc[high_runtime])
low_runtime= df['runtime'].idxmin()
low_runtime=pd.DataFrame(df.loc[low_runtime])
print_value = pd.concat([high_runtime,low_runtime],axis=1)
print_value
```

Out[21]:

	2107	5162

	2107	5162
id	43434	24914
budget	18000000	10
revenue	871279	5
original_title	Carlos	Kid's Story
cast	Edgar RamÃrez|Alexander Scheer|Fadi Abi Samra...	Clayton Watson|Keanu Reeves|Carrie-Anne Moss|K...
director	Olivier Assayas	Shinichiro Watanabe
runtime	338.0	15.0
genres	Crime|Drama|Thriller|History	Science Fiction|Animation
release_date	2010-05-19 00:00:00	2003-06-02 00:00:00
vote_average	6.2	6.8
release_year	2010	2003
budget_adj	18000000	11
revenue_adj	871279	5
profit_adj	-17128721	-6
movie_style	Crime	Science Fiction

```
- Carlos Film is the highest Runtime film with 338.0 mins rate
- Kid's Story Film is the lowest Runtime film with 15.0 mins rate
```

Research Question 4 - Statictics about Runtime

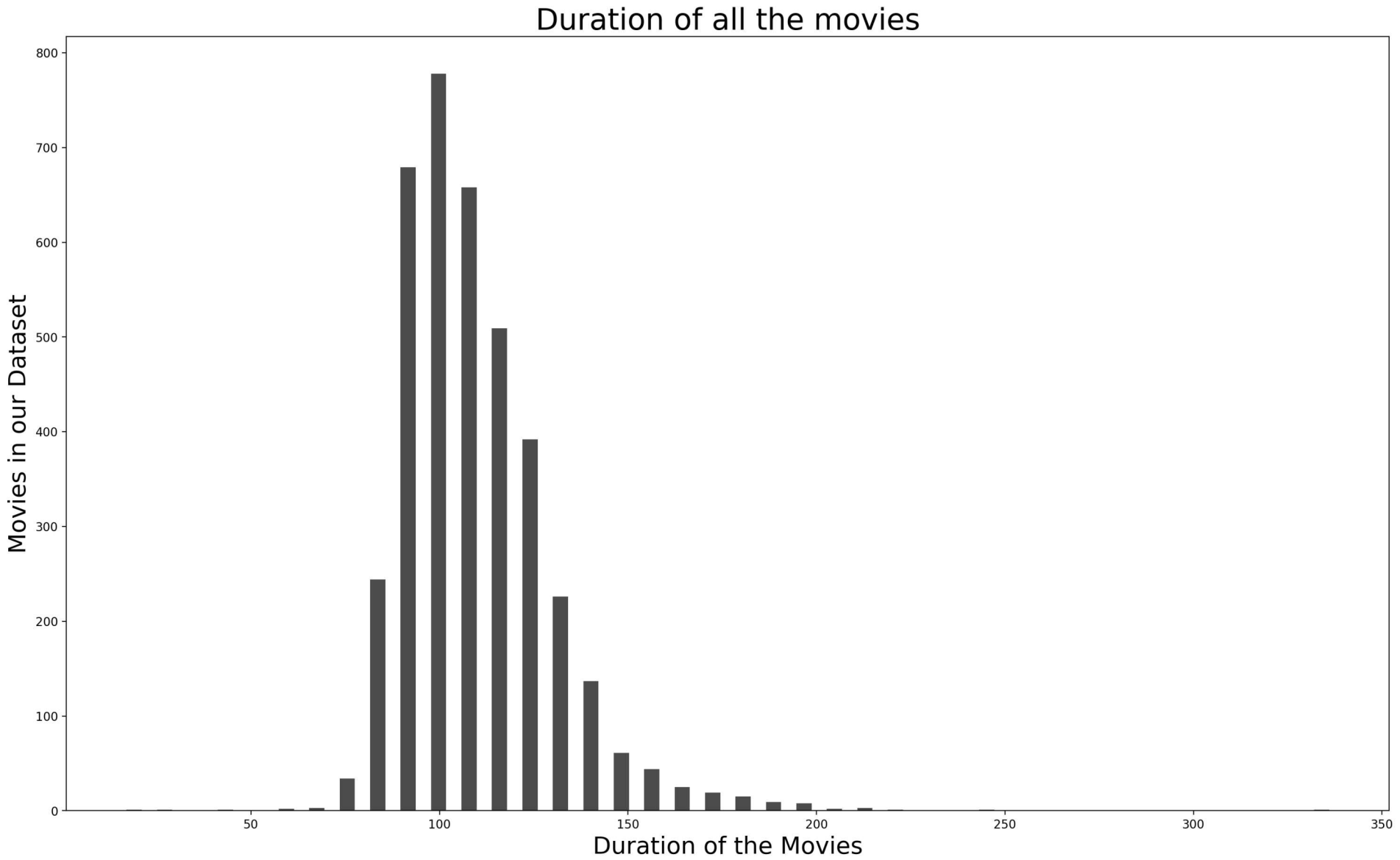
In [22]:
```
print('The average of the runtime of all movies is :{} mins'.format(df['runtime'].mean()))
print('The Maximim duration of movie is :{} mins'.format(df['runtime'].max()))
print('The Minimum duration of movie is :{} mins'.format(df['runtime'].min()))
```

```
The average of the runtime of all movies is :109.22029060716139 mins
The Maximim duration of movie is :338.0 mins
The Minimum duration of movie is :15.0 mins
```

Drow graph about Runtime

In [23]:
```
plt.figure(figsize=(20,12), dpi = 200)
plt.xlabel('Duration of the Movies', fontsize = 20)
```

```
plt.ylabel('Movies in our Dataset', fontsize=20)
plt.title('Duration of all the movies', fontsize=25)
plt.hist(df['runtime'], rwidth = 0.5, bins =40,color='r')
plt.show()
```



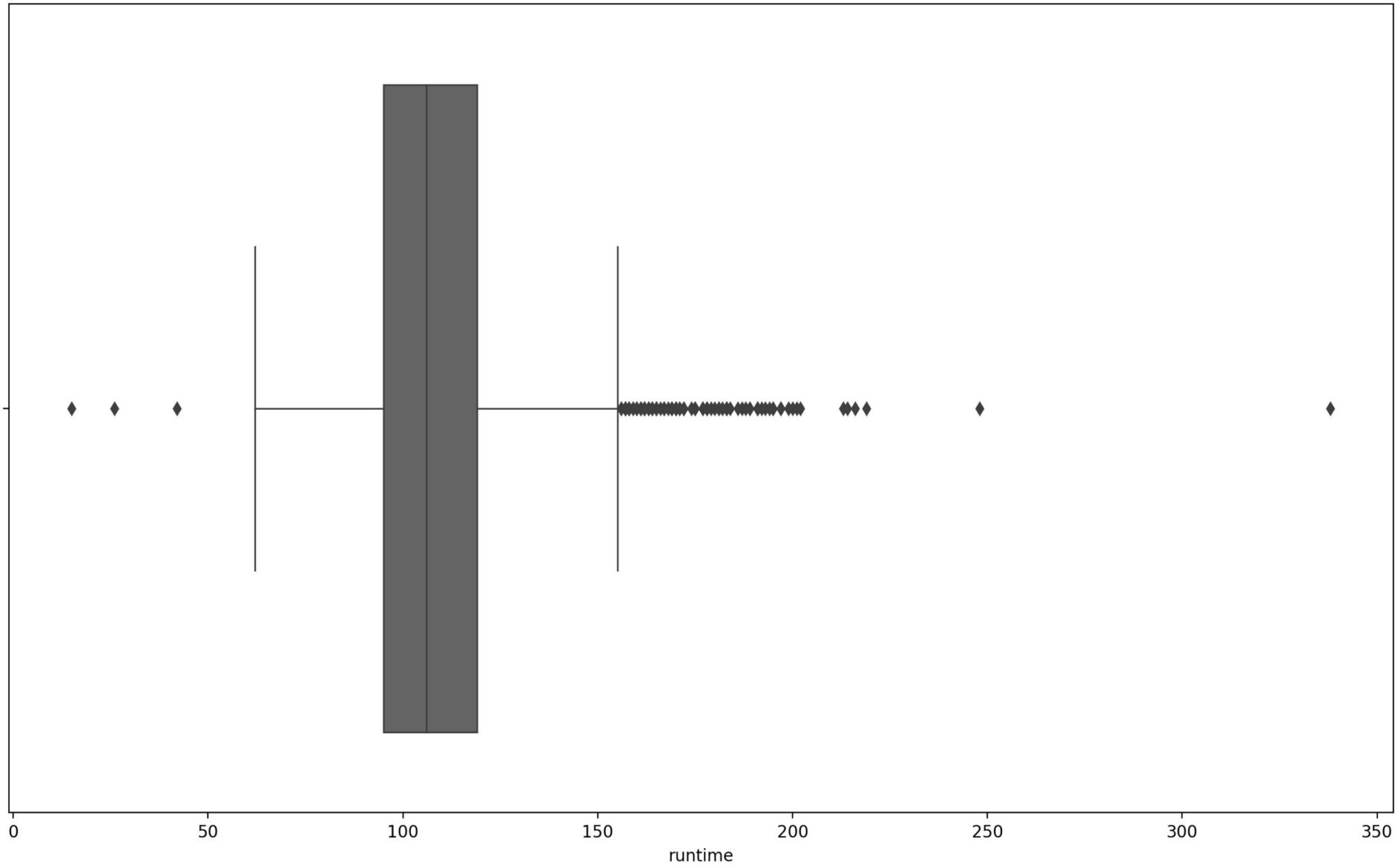
The graph above ilustrate that most movies runtime between 50 to 200 mins.

Runtime analysis using box plot

In [24]:

```
plt.figure(figsize=(15,9), dpi = 200)
snb.boxplot(df['runtime'], linewidth = 1)
plt.show()
```

```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.
12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpre
tation.
  warnings.warn(
```



Research Question 5 - Finding the most and the lowest artists acting in this group of movies

In [25]:

```
#Separate the string in column cast by '|'
artist = df['cast'].str.cat(sep = '|')
#giving pandas series and storing the values separately
artist = pd.Series(artist.split('|'))
```

```
artist_counter = artist.value_counts(ascending = False)
artist_counter.head()
```

Out[25]:
```
Robert De Niro       52
Bruce Willis         46
Samuel L. Jackson    44
Nicolas Cage         43
Matt Damon           36
dtype: int64
```

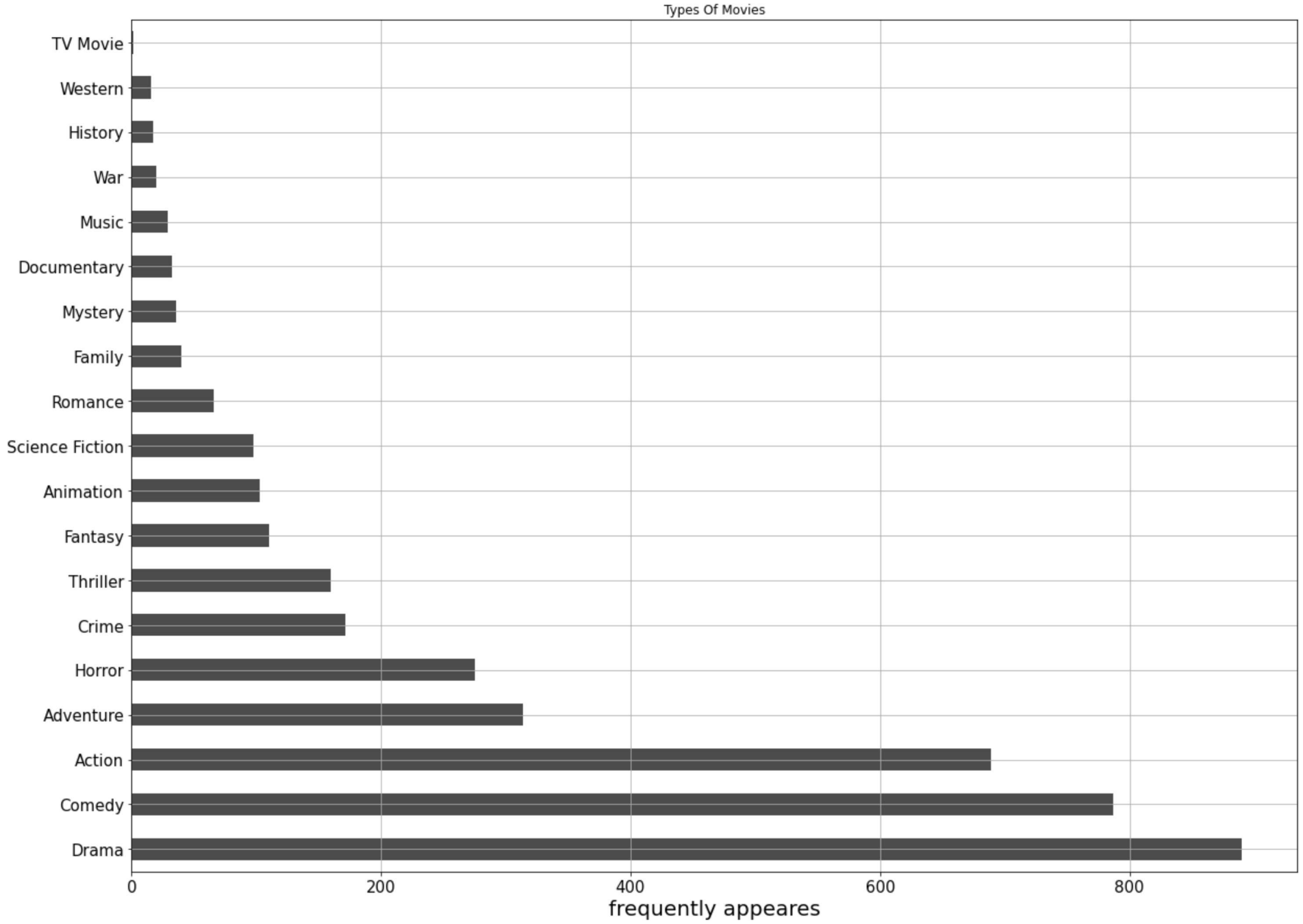
In [26]:
```
artist_counter = artist.value_counts(ascending = True)
artist_counter
```

Out[26]:
```
Peter Graves              1
Alec McCowen              1
Nora von WaldstÃ¤tten     1
Mark Elderkin             1
James Whitmore            1
                        ..
Matt Damon               36
Nicolas Cage             43
Samuel L. Jackson        44
Bruce Willis             46
Robert De Niro           52
Length: 6839, dtype: int64
```

Research Question 6 - Types of movies

In [27]:
```
movie_type = df['movie_style']
movie_type = pd.Series(movie_type)
type_counter = movie_type.value_counts(ascending = False)
gr = type_counter.plot.barh(color = 'r', fontsize = 15)
gr.set(title = 'Types Of Movies')
gr.set_xlabel('frequently appeares', color = 'black', fontsize = '20')
gr.figure.set_size_inches(20, 15)
gr.grid(True)

plt.show()
```

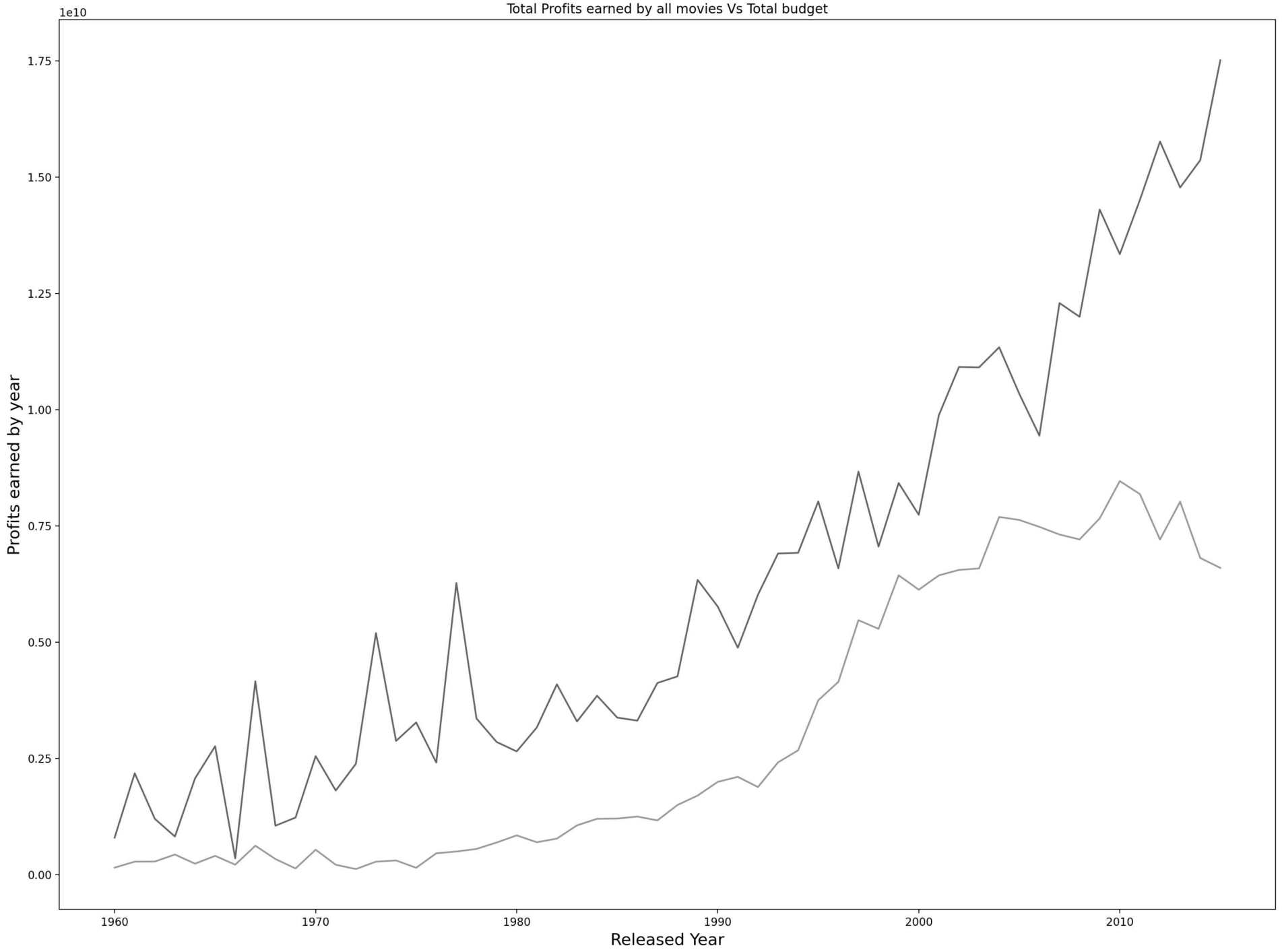

Types Of Movies
TV Movie
Western
History
War
Music
Documentary
Mystery
Family
Romance
Science Fiction
Animation
Fantasy
Thriller
Crime
Horror
Adventure
Action
Comedy
Drama
0
200
400
600
800
frequently appeares

- It turns out that the most produced films are Drama followed by Comedy and Action films
- It turns out that the lowest produced films are TV Movies preceded by Western and History films

In [28]:

```
#Using Line plot for comparing between otal Profits earned by all movies Vs Total budget

profits_adj_yearly = df.groupby('release_year')['profit_adj'].sum()
budjet_adj_yearly = df.groupby('release_year')['budget_adj'].sum()
plt.figure(figsize=(20,15), dpi = 200)
plt.xlabel('Released Year', fontsize = 15)
plt.ylabel('Profits earned by year', fontsize = 15)
plt.title('Total Profits earned by all movies Vs Total budget')
plt.plot(profits_adj_yearly)
plt.plot(budjet_adj_yearly)
plt.show()
print('The Max profit year is : {}'.format(profits_adj_yearly.idxmax()))
print('The Max budjet year is : {}'.format(budjet_adj_yearly.idxmax()))
print('The Min profit year is : {}'.format(profits_adj_yearly.idxmin()))
print('The Min budjet year is : {}'.format(budjet_adj_yearly.idxmin()))
```


Total Profits earned by all movies Vs Total budget
1e10
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Profits earned by year
1960
1970
1980
1990
2000
2010
Released Year

```
The Max profit year is : 2015
The Max budjet year is : 2010
The Min profit year is : 1966
The Min budjet year is : 1972
```

- We can see here always the profet more than budjet.
- A steady rise in expenses and profits

Conclusions

Limitations:

This dataset contains information about 10,000 movies collected from **The Movie Database (TMDb)**,but it has alot of missing values and nonnecessary informations

missing values :

Columns like revenue, budget and runtime it is contanin 0 values. So in cleaning stage we drop it

Non necessary data :

Columns like'imdb_id', 'popularity','homepage','tagline','keywords','overview','production_companies','vote_count' not necessery for me so i drop it also

To be Good analysis :

1- add new column it called profit_adj it is contains the subistitute of revene _adj from budjet_adj by profit_cal fun
2- add new column called movie_style contains movie style or kind using function to split the type from genres column
3- Finding the Movies with high and low profit
4- Finding the Movies with high and low voting
5- Finding the Movies with high and low runtime or duration
6- Find the year with the max and min value of profit
7- The average of the runtime of all movies is :109.22029060716139 mins
8- The Maximim duration of movie is :338.0 mins
9- The Minimum duration of movie is :15.0 mins
10- Drow graph about duration of all the movies
11- Finding the most artist acting in this group of movies (Robert De Niro with 52 movies)
12- Drow graph all types of movies

In [29]:
```
from subprocess import call
call(['python', '-m', 'nbconvert', 'Investigate_a_Dataset.ipynb'])
```

Out[29]: 1