Data understanding and preparation

Before any analysis we strive to understand how the data is organised in the various datasets. The steps highlighted below helps to understand the datasets provided and as well as to clean them.

1. .Dataset = bom.movie_gross.csv'

In [1]:
```
#importing relevant libraries
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
```

In [3]:
```
# Reading the data
movies_gross=pd.read_csv('.data/bom.movie_gross.csv')
movies_gross
```

Out[3]:

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

3387 rows × 5 columns

In [4]:
```
# it displays the number of rows and columns in the dataset
movies_gross.shape
```

Out[4]:
```
(3387, 5)
```

In [5]:
```
#info for overview of the dataset(it gives a condensed summary of the dataset)
movies_gross.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
```

From the above cell we find that the column title has 3387 rows of entries while studio has 3382 to mean that 5 entries from the colunm title dont have studios where they we produced

In [6]:
```
# checking for miss values
movies_gross.isnull().sum()
```

Out[6]:
```
title                0
studio               5
domestic_gross      28
foreign_gross     1350
year                 0
dtype: int64
```

In [7]:
```
# describe for descriptive statistics

movies_gross.describe()
```

Out[7]:

	domestic_gross	year
count	3.359000e+03	3387.000000
mean	2.874585e+07	2013.958075
std	6.698250e+07	2.478141
min	1.000000e+02	2010.000000
25%	1.200000e+05	2012.000000
50%	1.400000e+06	2014.000000
75%	2.790000e+07	2016.000000
max	9.367000e+08	2018.000000

In [8]:
```
#check for duplicates
duplicates=movies_gross.duplicated().sum()
duplicates
```

Out[8]:
```
0
```

In [9]:
```
"""The studio contains 5 missing values. The entire dataset only contains arou
nd 3387 rows of
data. In this case, it makes more sense to just remove the studio column from
the dataset entirely.
we cannot drop the foreign_gross because if we dropped this column,we would be
throwing out all that
information just to deal with a small subset of missing values and my not give
a true value of the dataset
set studio because it does not have a huge impact on the dataset"""

movies_gross=movies_gross.dropna(subset=["studio"])
movies_gross.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  3356 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
```

we are using the built in function to see the number of Null value in the database

movies_gross.isnull().sum()

In [10]:
```
#change foreign _gross to int
"""we use the to_numeric approach to change the foreign_gross from an object t
o a float"""
movies_gross['foreign_gross'] = movies_gross['foreign_gross'].str.replace
(',','')
movies_gross['foreign_gross'] = movies_gross['foreign_gross'].astype(float)
movies_gross.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  3356 non-null   float64
 3   foreign_gross   2033 non-null   float64
 4   year            3382 non-null   int64  
dtypes: float64(2), int64(1), object(2)
memory usage: 158.5+ KB

<ipython-input-10-f48f19cdec15>:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/s
table/user_guide/indexing.html#returning-a-view-versus-a-copy
  movies_gross['foreign_gross'] = movies_gross['foreign_gross'].str.replace
(',','')
<ipython-input-10-f48f19cdec15>:4: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/s
table/user_guide/indexing.html#returning-a-view-versus-a-copy
  movies_gross['foreign_gross'] = movies_gross['foreign_gross'].astype(float)
```

In [11]:
```
movies_gross=movies_gross.dropna(subset=["domestic_gross"])
movies_gross.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 3356 entries, 0 to 3386
Data columns (total 5 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   title           3356 non-null   object 
 1   studio          3356 non-null   object 
 2   domestic_gross  3356 non-null   float64
 3   foreign_gross   2007 non-null   float64
 4   year            3356 non-null   int64  
dtypes: float64(2), int64(1), object(2)
memory usage: 157.3+ KB
```

In [12]:
```
movies_gross['foreign_gross']
```

Out[12]:
```
0       652000000.0
1       691300000.0
2       664300000.0
3       535700000.0
4       513900000.0
           ...
3382           NaN
3383           NaN
3384           NaN
3385           NaN
3386           NaN
Name: foreign_gross, Length: 3356, dtype: float64
```

2. Dataset = movies_budgets.csv

In [13]:
```
#importing relevant libraries
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
```

In [16]:
```
# Reading the data
movies_gross=pd.read_csv('.data/tn.movie_budgets.csv', index_col=0)
movies_gross
```

Out[16]:

id	release_date	movie	production_budget	domestic_gross	worldwide_gross
1	Dec 18, 2009	Avatar	$425,000,000	$760,507,625	$2,776,345,279
2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	$410,600,000	$241,063,875	$1,045,663,875
3	Jun 7, 2019	Dark Phoenix	$350,000,000	$42,762,350	$149,762,350
4	May 1, 2015	Avengers: Age of Ultron	$330,600,000	$459,005,868	$1,403,013,963
5	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	$317,000,000	$620,181,382	$1,316,721,747
...	...	...	...	...	...
78	Dec 31, 2018	Red 11	$7,000	$0	$0
79	Apr 2, 1999	Following	$6,000	$48,482	$240,495
80	Jul 13, 2005	Return to the Land of Wonders	$5,000	$1,338	$1,338
81	Sep 29, 2015	A Plague So Pleasant	$1,400	$0	$0
82	Aug 5, 2005	My Date With Drew	$1,100	$181,041	$181,041

5782 rows × 5 columns

In [17]:
```
type(movies_gross)
```

Out[17]:
```
pandas.core.frame.DataFrame
```

It shows what is in the dataset the first five columns and rows

In [18]:
```
movies_gross.head()
```

Out[18]:

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

It shows what is in the dataset the last five columns and rows

In [19]:
```
movies_gross.tail()
```

Out[19]:

id	release_date	movie	production_budget	domestic_gross	worldwide_gross
78	Dec 31, 2018	Red 11	$7,000	$0	$0
79	Apr 2, 1999	Following	$6,000	$48,482	$240,495
80	Jul 13, 2005	Return to the Land of Wonders	$5,000	$1,338	$1,338
81	Sep 29, 2015	A Plague So Pleasant	$1,400	$0	$0
82	Aug 5, 2005	My Date With Drew	$1,100	$181,041	$181,041

From these particular dataset the item of interest is- is there a direct relationship between the production_budget and world wide-gross sales of the movies? this question informs how we will clean our dataset for analysis.

In [20]:
```
#list of columm to remove$ sign
col_to_clean = ['production_budget','domestic_gross','worldwide_gross']
#loop through each column in cols_to_clean and replace the $ sign with an empt
y string
for col in col_to_clean:
    movies_gross[col]=movies_gross[col].str.replace('$','')
# save the cleaned Dataframe to a new csv file
movies_gross.to_csv('cleaned_csv_file.csv', index=False)
movies_gross
```

Out[20]:

id	release_date	movie	production_budget	domestic_gross	worldwide_gross
1	Dec 18, 2009	Avatar	425,000,000	760,507,625	2,776,345,279
2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	410,600,000	241,063,875	1,045,663,875
3	Jun 7, 2019	Dark Phoenix	350,000,000	42,762,350	149,762,350
4	May 1, 2015	Avengers: Age of Ultron	330,600,000	459,005,868	1,403,013,963
5	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	317,000,000	620,181,382	1,316,721,747
...	...	...	...	...	...
78	Dec 31, 2018	Red 11	7,000	0	0
79	Apr 2, 1999	Following	6,000	48,482	240,495
80	Jul 13, 2005	Return to the Land of Wonders	5,000	1,338	1,338
81	Sep 29, 2015	A Plague So Pleasant	1,400	0	0
82	Aug 5, 2005	My Date With Drew	1,100	181,041	181,041

5782 rows × 5 columns

In [21]:
```
#list of colunm to remove, sign
col_to_clean = ['production_budget','domestic_gross','worldwide_gross']
#loop through each column in cols_to_clean and replace the $ sign with an empt
y string
for col in col_to_clean:
    movies_gross[col]=movies_gross[col].str.replace(',','')
# save the cleaned Dataframe to a new csv file
movies_gross.to_csv('cleaned_csv_file.csv', index=False)
movies_gross
```

Out[21]:

id	release_date	movie	production_budget	domestic_gross	worldwide_gross
1	Dec 18, 2009	Avatar	425000000	760507625	2776345279
2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875
3	Jun 7, 2019	Dark Phoenix	350000000	42762350	149762350
4	May 1, 2015	Avengers: Age of Ultron	330600000	459005868	1403013963
5	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747
...	...	...	...	...	...
78	Dec 31, 2018	Red 11	7000	0	0
79	Apr 2, 1999	Following	6000	48482	240495
80	Jul 13, 2005	Return to the Land of Wonders	5000	1338	1338
81	Sep 29, 2015	A Plague So Pleasant	1400	0	0
82	Aug 5, 2005	My Date With Drew	1100	181041	181041

5782 rows × 5 columns

In [22]:
```
# creating a copy of the cleaned csv file

df1=pd.read_csv("cleaned_csv_file.csv")
df1
```

Out[22]:

	release_date	movie	production_budget	domestic_gross	worldwide_gross
0	Dec 18, 2009	Avatar	425000000	760507625	2776345279
1	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875
2	Jun 7, 2019	Dark Phoenix	350000000	42762350	149762350
3	May 1, 2015	Avengers: Age of Ultron	330600000	459005868	1403013963
4	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747
...	...	...	...	...	...
5777	Dec 31, 2018	Red 11	7000	0	0
5778	Apr 2, 1999	Following	6000	48482	240495
5779	Jul 13, 2005	Return to the Land of Wonders	5000	1338	1338
5780	Sep 29, 2015	A Plague So Pleasant	1400	0	0
5781	Aug 5, 2005	My Date With Drew	1100	181041	181041

5782 rows × 5 columns

In [23]:
```
# shows the rows and column present in the dataset
df1.shape
```

Out[23]:
```
(5782, 5)
```

In [24]:
```
# describe for descriptive statistics
df1.describe()
```

Out[24]:

	production_budget	domestic_gross	worldwide_gross
count	5.782000e+03	5.782000e+03	5.782000e+03
mean	3.158776e+07	4.187333e+07	9.148746e+07
std	4.181208e+07	6.824060e+07	1.747200e+08
min	1.100000e+03	0.000000e+00	0.000000e+00
25%	5.000000e+06	1.429534e+06	4.125415e+06
50%	1.700000e+07	1.722594e+07	2.798445e+07
75%	4.000000e+07	5.234866e+07	9.764584e+07
max	4.250000e+08	9.366622e+08	2.776345e+09

In [25]:
```
#  checking for the null value count for each column
df1.isnull().sum()
```

Out[25]:
```
release_date         0
movie                0
production_budget    0
domestic_gross       0
worldwide_gross      0
dtype: int64
```

In [26]:
```
#unique count column movies_gross
df1.nunique()
```

Out[26]:
```
release_date         2418
movie                5698
production_budget     509
domestic_gross       5164
worldwide_gross      5356
dtype: int64
```

In [27]:
```
#check for duplicates
df1.duplicated().sum()
```

Out[27]:
```
0
```

Sorting the dataset

In [28]:
```
df1.sort_values(by='production_budget', ascending =False)
```

Out[28]:

	release_date	movie	production_budget	domestic_gross	worldwide_gross
0	Dec 18, 2009	Avatar	425000000	760507625	2776345279
1	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875
2	Jun 7, 2019	Dark Phoenix	350000000	42762350	149762350
3	May 1, 2015	Avengers: Age of Ultron	330600000	459005868	1403013963
4	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747
...	...	...	...	...	...
5777	Dec 31, 2018	Red 11	7000	0	0
5778	Apr 2, 1999	Following	6000	48482	240495
5779	Jul 13, 2005	Return to the Land of Wonders	5000	1338	1338
5780	Sep 29, 2015	A Plague So Pleasant	1400	0	0
5781	Aug 5, 2005	My Date With Drew	1100	181041	181041

5782 rows × 5 columns

In [29]:
```
df1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5782 entries, 0 to 5781
Data columns (total 5 columns):
 #   Column             Non-Null Count  Dtype 
---  ------             --------------  ----- 
 0   release_date       5782 non-null   object
 1   movie              5782 non-null   object
 2   production_budget  5782 non-null   int64 
 3   domestic_gross     5782 non-null   int64 
 4   worldwide_gross    5782 non-null   int64 
dtypes: int64(3), object(2)
memory usage: 226.0+ KB
```

In [30]:
```
# convert numeric columns to numeric type
df1['production_budget'] = pd.to_numeric(df1['production_budget'])
df1['domestic_gross'] = pd.to_numeric(df1['domestic_gross'])
df1['worldwide_gross'] = pd.to_numeric(df1['worldwide_gross'])

#calculate ROI and add it as a new column
df1['ROI'] = ((df1['worldwide_gross'] - df1['production_budget']) / df1['produ
ction_budget'])*100

#save the updated dataframe to a csv file
df1.to_csv("movies_with_ROI.csv", index=False)
df1
```

Out[30]:

	release_date	movie	production_budget	domestic_gross	worldwide_gross	RO
0	Dec 18, 2009	Avatar	425000000	760507625	2776345279	553.25771
1	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875	154.66728
2	Jun 7, 2019	Dark Phoenix	350000000	42762350	149762350	-57.21075
3	May 1, 2015	Avengers: Age of Ultron	330600000	459005868	1403013963	324.38413
4	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747	315.36963
...	...	...	...	...	...	.
5777	Dec 31, 2018	Red 11	7000	0	0	-100.00000
5778	Apr 2, 1999	Following	6000	48482	240495	3908.25000
5779	Jul 13, 2005	Return to the Land of Wonders	5000	1338	1338	-73.24000
5780	Sep 29, 2015	A Plague So Pleasant	1400	0	0	-100.00000
5781	Aug 5, 2005	My Date With Drew	1100	181041	181041	16358.27272

5782 rows × 6 columns

sum is the total number of all the columns data count is the number of entries or rows in a column.

In [31]:
```
df1.production_budget.agg(['sum','count','mean', 'std','median']).head()
```

Out[31]:
```
sum       1.826404e+11
count     5.782000e+03
mean      3.158776e+07
std       4.181208e+07
median    1.700000e+07
Name: production_budget, dtype: float64
```

In [32]:
```
df1.worldwide_gross.agg(['sum','count','mean', 'std','median']).head()
```

Out[32]:
```
sum       5.289805e+11
count     5.782000e+03
mean      9.148746e+07
std       1.747200e+08
median    2.798445e+07
Name: worldwide_gross, dtype: float64
```

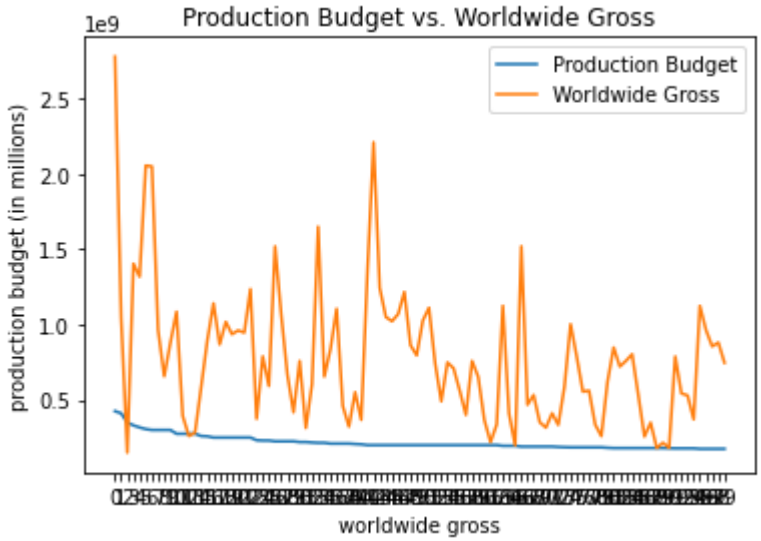
In [33]:
```
df1.domestic_gross.agg(['sum','count','mean', 'std','median']).head()
```

Out[33]:
```
sum       2.421116e+11
count     5.782000e+03
mean      4.187333e+07
std       6.824060e+07
median    1.722594e+07
Name: domestic_gross, dtype: float64
```

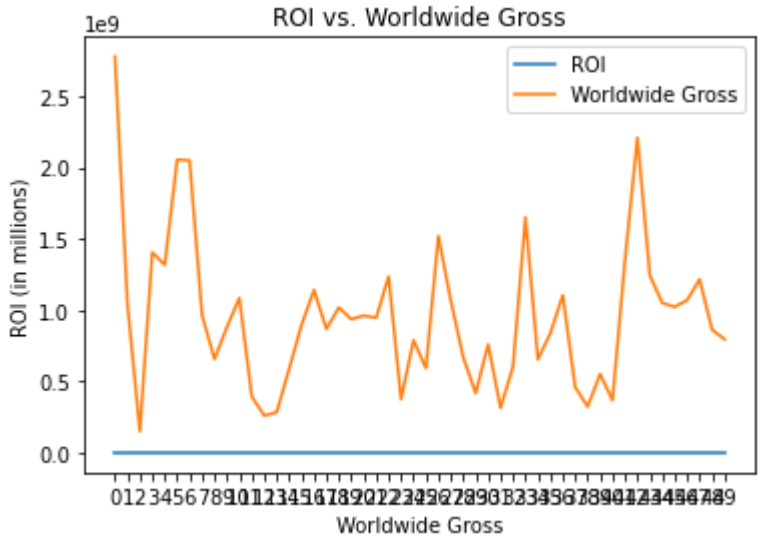
visualizing the dataset

In [34]:
```
import matplotlib.pyplot as plt
import pandas as pd
```

In [35]:
```
# Load the CSV file into a pandas DataFrame, limiting to first 1000 rows
df1=pd.read_csv("cleaned_csv_file.csv", nrows=100)

# Create a scatter plot using Matplotlib
plt.plot(df1.index, df1['production_budget'], label='Production Budget')
plt.plot(df1.index, df1['worldwide_gross'], label='Worldwide Gross')

# Set the x-axis ticks and labels
plt.xticks(df1.index, df1.index)

# Set the title and axis labels
plt.title('Production Budget vs. Worldwide Gross')
plt.xlabel('worldwide gross')
plt.ylabel('production budget (in millions)')

# Add a legend
plt.legend()

# Display the chart
plt.show()
```



In [36]:
```
df1=pd.read_csv("movies_with_ROI.csv", nrows=50)
# Create a line chart using Matplotlib
plt.plot(df1.index, df1['ROI'], label='ROI')
plt.plot(df1.index, df1['worldwide_gross'], label='Worldwide Gross')

# Set the x-axis ticks and labels
plt.xticks(df1.index, df1.index)

# Set the title and axis labels
plt.title('ROI vs. Worldwide Gross')
plt.xlabel('Worldwide Gross')
plt.ylabel('ROI (in millions)')

# Add a legend
plt.legend()
# Display the chart
plt.show()
```



3. DATASET = tmdb.movies.csv

In [44]:
```
# Reading the data
df3=pd.read_csv('.data/tmdb.movies.csv')
df3
```

Out[44]:

	Unnamed: 0	genre_ids	id	original_language	original_title	popularity	release_dat
0	0	[12, 14, 10751]	12444	en	Harry Potter and the Deathly Hallows: Part 1	33.533	2010-11-1
1	1	[14, 12, 16, 10751]	10191	en	How to Train Your Dragon	28.734	2010-03-2
2	2	[12, 28, 878]	10138	en	Iron Man 2	28.515	2010-05-0
3	3	[16, 35, 10751]	862	en	Toy Story	28.005	1995-11-2
4	4	[28, 878, 12]	27205	en	Inception	27.920	2010-07-1
...	...	...	...	...	...	...	.
26512	26512	[27, 18]	488143	en	Laboratory Conditions	0.600	2018-10-1
26513	26513	[18, 53]	485975	en	_EXHIBIT_84xxx_	0.600	2018-05-0
26514	26514	[14, 28, 12]	381231	en	The Last One	0.600	2018-10-0
26515	26515	[10751, 12, 28]	366854	en	Trailer Made	0.600	2018-06-2
26516	26516	[53, 27]	309885	en	The Church	0.600	2018-10-0

26517 rows × 10 columns

Data preprocessing to understand the shape and arrangement of the dataset

In [45]:
```
#sorting by popularity to see which movie is popular
df3.sort_values(by='popularity', ascending =False).head(10)
```

Out[45]:

	Unnamed: 0	genre_ids	id	original_language	original_title	popularity	release_date	
23811	23811	[12, 28, 14]	299536	en	Avengers: Infinity War	80.773	2018-04-27	I
11019	11019	[28, 53]	245891	en	John Wick	78.123	2014-10-24	
23812	23812	[28, 12, 16, 878, 35]	324857	en	Spider-Man: Into the Spider-Verse	60.534	2018-12-14	t
11020	11020	[28, 12, 14]	122917	en	The Hobbit: The Battle of the Five Armies	53.783	2014-12-17	T
5179	5179	[878, 28, 12]	24428	en	The Avengers	50.289	2012-05-04	
11021	11021	[28, 878, 12]	118340	en	Guardians of the Galaxy	49.606	2014-08-01	
20617	20617	[878, 28, 53]	335984	en	Blade Runner 2049	48.571	2017-10-06	
23813	23813	[878, 28, 53]	335984	en	Blade Runner 2049	48.571	2017-10-06	
23814	23814	[12]	338952	en	Fantastic Beasts: The Crimes of Grindelwald	48.508	2018-11-16	T G
23815	23815	[10751, 16, 35, 14, 12]	404368	en	Ralph Breaks the Internet	48.057	2018-11-21	F

In [46]:
```
df3.sort_values(by='release_date', ascending =False).tail(10)
```

Out[46]:

	Unnamed: 0	genre_ids	id	original_language	original_title	popularity	release_date
24268	24268	[14, 18]	490	sv	Det sjunde inseglet	8.693	1958-10-13
24621	24621	[18, 10749]	35861	ja	近松物語	5.754	1958-01-01
24211	24211	[18]	614	sv	Smultronstället	9.381	1957-12-26
120	120	[878]	830	en	Forbidden Planet	10.274	1956-03-15
14740	14740	[18, 53]	43397	en	Caught	5.439	1949-02-17
11192	11192	[18, 36, 10749]	887	en	The Best Years of Our Lives	9.647	1946-12-25
26345	26345	[]	316707	en	How Walt Disney Cartoons Are Made	0.600	1939-01-19
3580	3580	[35, 18, 10749]	263768	fr	Le Bonheur	1.653	1936-02-27
21758	21758	[27, 53]	43148	en	The Vampire Bat	2.292	1933-01-21
14335	14335	[18, 10752]	143	en	All Quiet on the Western Front	9.583	1930-04-29

In [47]:
```
#checking for duplicates
df3.duplicated().sum()
```

Out[47]:
```
0
```

In [48]:
```
#checking for missing data
df3.isnull().sum()
```

Out[48]:
```
Unnamed: 0          0
genre_ids           0
id                  0
original_language   0
original_title      0
popularity          0
release_date        0
title               0
vote_average        0
vote_count          0
dtype: int64
```

In [49]:
```
#unique count column
df3.nunique()
```

Out[49]:
```
Unnamed: 0          26517
genre_ids            2477
id                  25497
original_language      76
original_title      24835
popularity           7425
release_date         3433
title               24688
vote_average           91
vote_count           1693
dtype: int64
```

In [50]:
```
df3.describe()
```

Out[50]:

	Unnamed: 0	id	popularity	vote_average	vote_count
count	26517.00000	26517.000000	26517.000000	26517.000000	26517.000000
mean	13258.00000	295050.153260	3.130912	5.991281	194.224837
std	7654.94288	153661.615648	4.355229	1.852946	960.961095
min	0.00000	27.000000	0.600000	0.000000	1.000000
25%	6629.00000	157851.000000	0.600000	5.000000	2.000000
50%	13258.00000	309581.000000	1.374000	6.000000	5.000000
75%	19887.00000	419542.000000	3.694000	7.000000	28.000000
max	26516.00000	608444.000000	80.773000	10.000000	22186.000000

In [51]:
```
df3.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 26517 entries, 0 to 26516
Data columns (total 10 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   Unnamed: 0         26517 non-null  int64  
 1   genre_ids          26517 non-null  object 
 2   id                 26517 non-null  int64  
 3   original_language  26517 non-null  object 
 4   original_title     26517 non-null  object 
 5   popularity         26517 non-null  float64
 6   release_date       26517 non-null  object 
 7   title              26517 non-null  object 
 8   vote_average       26517 non-null  float64
 9   vote_count         26517 non-null  int64  
dtypes: float64(2), int64(3), object(5)
memory usage: 2.0+ MB
```

How many movies were released in each year and what was there production budget?

In [52]:
```
# extract the year from the release_date column
df3['year'] = pd.DatetimeIndex(df3['release_date']).year

# group the data by year and count the number of movies produced each year
movies_per_year = df3.groupby('year').size()

# print the result
movies_per_year
```

Out[52]:
```
year
1930       1
1933       1
1936       1
1939       1
1946       1
         ...
2016    3192
2017    3145
2018    2587
2019      63
2020       1
Length: 66, dtype: int64
```

In [53]:
```
df3.shape
```

Out[53]:
```
(26517, 11)
```

In [54]:
```
# read the csv files
df1=pd.read_csv("cleaned_csv_file.csv")

# convert the release_date column in both data frames to datetime format
df1['release_date'] = pd.to_datetime(df1['release_date'])
df3['release_date'] = pd.to_datetime(df3['release_date'])

# extract the year from the release_date column in both data frames
df1['year'] = df1['release_date'].dt.year
df3['year'] = df3['release_date'].dt.year

# merge the two data frames on the year and movie columns
merged_df = pd.merge(df1, df3, how='inner', left_on=['year', 'movie'], right_o
n=['year', 'title'])

# group the data by year and sum the production_budget column
budget_by_year = merged_df.groupby('year')['production_budget'].sum()

# group the data by year and count the number of movies released each year
movies_by_year = merged_df.groupby('year').size()

# create a new data frame with the two series
result = pd.concat([budget_by_year, movies_by_year], axis=1)
result.columns = ['production_budget', 'num_movies']

# print the result
print(result)
```

year	production_budget	num_movies
1946	2100000	1
1968	10500000	1
1976	1800000	1
1977	20000000	1
1979	32000000	1
1980	33500000	2
1982	45500000	4
1984	45000000	2
1985	1500000	1
1986	83800000	4
1988	43000000	3
1991	200000000	2
1992	8000000	1
1994	79300000	1
1995	205000000	6
1996	75000000	2
1997	205000000	3
1998	185000000	2
1999	192000000	3
2000	91000000	2
2001	40000000	1
2002	110000000	2
2004	421200000	5
2005	22000000	1
2006	79000000	2
2007	130000000	1
2008	202500000	3
2009	465000000	2
2010	7454637650	187
2011	7674675000	193
2012	7570811173	176
2013	8124072000	189
2014	7614860000	198
2015	9058600000	242
2016	9789780000	216
2017	9339092000	168
2018	6069300000	125
2019	55660000	4

the year 2009 to2019 there was an upward trend in the number of movies produced,

in 2019they were four movies that had similar title in both the df3 and df1 and there production budget was 55660000

4. DATASET = rt.reviews.tsv

In [56]:
```
# Reading the data
df4=pd.read_csv('.data/rt.reviews.tsv',sep='\t', encoding='latin-1')
df4
```

Out[56]:

	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
2	3	... life lived in a bubble in financial dealin...	NaN	fresh	Sean Axmaker	0	Stream on Demand	January 4, 2018
3	3	Continuing along a line introduced in last yea...	NaN	fresh	Daniel Kasman	0	MUBI	November 16, 2017
4	3	... a perverse twist on neorealism...	NaN	fresh	NaN	0	Cinema Scope	October 12, 2017
...	...	...	...	...	...	...	...	...
54427	2000	The real charm of this trifle is the deadpan c...	NaN	fresh	Laura Sinagra	1	Village Voice	September 24, 2002
54428	2000	NaN	1/5	rotten	Michael Szymanski	0	Zap2it.com	September 21, 2005
54429	2000	NaN	2/5	rotten	Emanuel Levy	0	EmanuelLevy.Com	July 17, 2005
54430	2000	NaN	2.5/5	rotten	Christopher Null	0	Filmcritic.com	September 7, 2003
54431	2000	NaN	3/5	fresh	Nicolas Lacroix	0	Showbizz.net	November 12, 2002

54432 rows × 8 columns

sorting

Data preprocessing to understand the shape and arrangement of the dataset

In [57]:
```
df4.sort_values(by='top_critic', ascending =False)
```

Out[57]:

	id	review	rating	fresh	critic	top_critic	publisher	date
9798	376	The movie doesn't really want to be all that h...	2/4	rotten	Roger Ebert	1	At the Movies	January 1, 2000
45456	1704	Cumberbatch nails it. If only the film did, too.	4/5	fresh	Bill Goodykoontz	1	Arizona Republic	December 11, 2014
45454	1704	The actors save the day.	3/4	fresh	Michael Phillips	1	Chicago Tribune	December 11, 2014
45453	1704	The Imitation Game" leaves Turing's essential ...	3/4	fresh	Ann Hornaday	1	Washington Post	December 11, 2014
45452	1704	This watchable biopic focuses on the Enigma pr...	NaN	fresh	J. R. Jones	1	Chicago Reader	December 11, 2014
...	...	...	...	...	...	...	...	...
20620	830	clever, consistently funny and unexpectedly po...	4/5	fresh	James Sanford	0	Kalamazoo Gazette	July 29, 2002
20625	830	The Wedding Banquet wins fans with its sunny d...	3.5/5	fresh	Marjorie Baumgarten	0	Austin Chronicle	January 1, 2000
20626	830	I just never found myself caring quite enough.	5/10	rotten	Scott Renshaw	0	rec.arts.movies.reviews	January 1, 2000
20627	830	This is an enjoyable film, though perhaps not ...	NaN	fresh	Mark R. Leeper	0	rec.arts.movies.reviews	January 1, 2000
54431	2000	NaN	3/5	fresh	Nicolas Lacroix	0	Showbizz.net	November 12, 2002

54432 rows × 8 columns

In [58]:
```
df4.duplicated().sum()
```

Out[58]: 9

In [59]:
```
df4.shape
```

Out[59]:
```
(54432, 8)
```

In [60]:
```
df4.head()
```

Out[60]:

	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
2	3	... life lived in a bubble in financial dealin...	NaN	fresh	Sean Axmaker	0	Stream on Demand	January 4, 2018
3	3	Continuing along a line introduced in last yea...	NaN	fresh	Daniel Kasman	0	MUBI	November 16, 2017
4	3	... a perverse twist on neorealism...	NaN	fresh	NaN	0	Cinema Scope	October 12, 2017

In [61]:
```
df4.tail()
```

Out[61]:

	id	review	rating	fresh	critic	top_critic	publisher	date
54427	2000	The real charm of this trifle is the deadpan c...	NaN	fresh	Laura Sinagra	1	Village Voice	September 24, 2002
54428	2000	NaN	1/5	rotten	Michael Szymanski	0	Zap2it.com	September 21, 2005
54429	2000	NaN	2/5	rotten	Emanuel Levy	0	EmanuelLevy.Com	July 17, 2005
54430	2000	NaN	2.5/5	rotten	Christopher Null	0	Filmcritic.com	September 7, 2003
54431	2000	NaN	3/5	fresh	Nicolas Lacroix	0	Showbizz.net	November 12, 2002

In [62]:
```
df4.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 54432 entries, 0 to 54431
Data columns (total 8 columns):
 #   Column      Non-Null Count  Dtype 
---  ------      --------------  ----- 
 0   id          54432 non-null  int64 
 1   review      48869 non-null  object
 2   rating      40915 non-null  object
 3   fresh       54432 non-null  object
 4   critic      51710 non-null  object
 5   top_critic  54432 non-null  int64 
 6   publisher   54123 non-null  object
 7   date        54432 non-null  object
dtypes: int64(2), object(6)
memory usage: 3.3+ MB
```

In [64]:
```
#numerical data descriptive analysis
df4.describe()
```

Out[64]:

	id	top_critic
count	54432.000000	54432.000000
mean	1045.706882	0.240594
std	586.657046	0.427448
min	3.000000	0.000000
25%	542.000000	0.000000
50%	1083.000000	0.000000
75%	1541.000000	0.000000
max	2000.000000	1.000000

In [65]:
```
#unique count colunm
df4.nunique()
```

Out[65]:
```
id            1135
review       48682
rating         186
fresh            2
critic        3496
top_critic       2
publisher     1281
date          5963
dtype: int64
```

In [66]:
```
#to get null value count for each column
df4.isna().sum()
```

Out[66]:
```
id               0
review        5563
rating       13517
fresh            0
critic        2722
top_critic       0
publisher      309
date             0
dtype: int64
```

In [67]:
```
#drop the NAN colunm
df4 = df4.dropna()
df4
```

Out[67]:

	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
6	3	Quickly grows repetitive and tiresome, meander...	C	rotten	Eric D. Snider	0	EricDSnider.com	July 17, 2013
7	3	Cronenberg is not a director to be daunted by ...	2/5	rotten	Matt Kelemen	0	Las Vegas CityLife	April 21, 2013
11	3	While not one of Cronenberg's stronger films, ...	B-	fresh	Emanuel Levy	0	EmanuelLevy.Com	February 3, 2013
12	3	Robert Pattinson works mighty hard to make Cos...	2/4	rotten	Christian Toto	0	Big Hollywood	January 15, 2013
...	...	...	...	...	...	...	...	...
54419	2000	Sleek, shallow, but frequently amusing.	2.5/4	fresh	Gene Seymour	1	Newsday	September 27, 2002
54420	2000	The spaniel-eyed Jean Reno infuses Hubert with...	3/4	fresh	Megan Turner	1	New York Post	September 27, 2002
54421	2000	Manages to be somewhat well-acted, not badly a...	1.5/4	rotten	Bob Strauss	0	Los Angeles Daily News	September 27, 2002
54422	2000	Arguably the best script that Besson has writt...	3.5/5	fresh	Wade Major	0	Boxoffice Magazine	September 27, 2002
54424	2000	Dawdles and drags when it should pop; it doesn...	1.5/5	rotten	Manohla Dargis	1	Los Angeles Times	September 26, 2002

33988 rows × 8 columns

5. DATASET = rt.movie_info.tsv

In [69]:
```
df5=pd.read_csv('.data/rt.movie_info.tsv',sep='\t', encoding='latin-1')
df5
```

Out[69]:

	id	synopsis	rating	genre	director	writer	theat
0	1	This gritty, fast-paced, and innovative police...	R	Action and Adventure|Classics|Drama	William Friedkin	Ernest Tidyman	Oct
1	3	New York City, not-too-distant-future: Eric Pa...	R	Drama|Science Fiction and Fantasy	David Cronenberg	David Cronenberg|Don DeLillo	
2	5	Illeana Douglas delivers a superb performance ...	R	Drama|Musical and Performing Arts	Allison Anders	Allison Anders	
3	6	Michael Douglas runs afoul of a treacherous su...	R	Drama|Mystery and Suspense	Barry Levinson	Paul Attanasio|Michael Crichton	Dec
4	7	NaN	NR	Drama|Romance	Rodney Bennett	Giles Cooper	
...	...	...	...	...	...	...	
1555	1996	Forget terrorists or hijackers -- there's a ha...	R	Action and Adventure|Horror|Mystery and Suspense	NaN	NaN	
1556	1997	The popular Saturday Night Live sketch was exp...	PG	Comedy|Science Fiction and Fantasy	Steve Barron	Terry Turner|Tom Davis|Dan Aykroyd|Bonnie Turner	Jul 2
1557	1998	Based on a novel by Richard Powell, when the l...	G	Classics|Comedy|Drama|Musical and Performing Arts	Gordon Douglas	NaN	Jan
1558	1999	The Sandlot is a coming-of-age story about a g...	PG	Comedy|Drama|Kids and Family|Sports and Fitness	David Mickey Evans	David Mickey Evans|Robert Gunter	Apr
1559	2000	Suspended from the force, Paris cop Hubert is ...	R	Action and Adventure|Art House and Internation...	NaN	Luc Besson	

1560 rows × 12 columns

In [70]:
```
df5.duplicated().sum()
```

Out[70]:
```
0
```

In [71]:
```
df5.isna().sum()
```

Out[71]:
```
id                0
synopsis         62
rating            3
genre             8
director        199
writer          449
theater_date    359
dvd_date        359
currency       1220
box_office     1220
runtime          30
studio         1066
dtype: int64
```

In [72]:
```
df5=df5.dropna()
df5
```

Out[72]:

	id	synopsis	rating	genre	director	writer	theater_
1	3	New York City, not-too-distant-future: Eric Pa...	R	Drama|Science Fiction and Fantasy	David Cronenberg	David Cronenberg|Don DeLillo	Aug 2
6	10	Some cast and crew from NBC's highly acclaimed...	PG-13	Comedy	Jake Kasdan	Mike White	Jan 11, 2
7	13	Stewart Kane, an Irishman living in the Austra...	R	Drama	Ray Lawrence	Raymond Carver|Beatrix Christian	Apr 27, 2
15	22	Two-time Academy Award Winner Kevin Spacey giv...	R	Comedy|Drama|Mystery and Suspense	George Hickenlooper	Norman Snider	Dec 17, 2
18	25	From ancient Japan's most enduring tale, the e...	PG-13	Action and Adventure|Drama|Science Fiction and...	Carl Erik Rinsch	Chris Morgan|Hossein Amini	Dec 25, 2
...	...	...	...	...	...	...	
1530	1968	This holiday season, acclaimed filmmaker Camer...	PG	Comedy|Drama	Cameron Crowe	Aline Brosh McKenna|Cameron Crowe	Dec 23, 2
1537	1976	Embrace of the Serpent features the encounter,...	NR	Action and Adventure|Art House and International	Ciro Guerra	Ciro Guerra|Jacques Toulemonde Vidal	Feb 17, 2
1541	1980	A band of renegades on the run in outer space ...	PG-13	Action and Adventure|Science Fiction and Fantasy	Joss Whedon	Joss Whedon	Sep 2
1542	1981	Money, Fame and the Knowledge of English. In I...	NR	Comedy|Drama	Gauri Shinde	Gauri Shinde	Oct 5, 2
1545	1985	A woman who joins the undead against her will ...	R	Horror|Mystery and Suspense	Sebastian Gutierrez	Sebastian Gutierrez	Jun 1, 2

235 rows × 12 columns

In [73]:
```
df5.head()
```

Out[73]:

	id	synopsis	rating	genre	director	writer	theater_date	d
1	3	New York City, not-too-distant-future: Eric Pa...	R	Drama|Science Fiction and Fantasy	David Cronenberg	David Cronenberg|Don DeLillo	Aug 17, 2012	
6	10	Some cast and crew from NBC's highly acclaimed...	PG-13	Comedy	Jake Kasdan	Mike White	Jan 11, 2002	
7	13	Stewart Kane, an Irishman living in the Austra...	R	Drama	Ray Lawrence	Raymond Carver|Beatrix Christian	Apr 27, 2006	
15	22	Two-time Academy Award Winner Kevin Spacey giv...	R	Comedy|Drama|Mystery and Suspense	George Hickenlooper	Norman Snider	Dec 17, 2010	
18	25	From ancient Japan's most enduring tale, the e...	PG-13	Action and Adventure|Drama|Science Fiction and...	Carl Erik Rinsch	Chris Morgan|Hossein Amini	Dec 25, 2013	

In [74]:
```
df5.tail()
```

Out[74]:

	id	synopsis	rating	genre	director	writer	theater_date	dvd
1530	1968	This holiday season, acclaimed filmmaker Camer...	PG	Comedy|Drama	Cameron Crowe	Aline Brosh McKenna|Cameron Crowe	Dec 23, 2011	
1537	1976	Embrace of the Serpent features the encounter,...	NR	Action and Adventure|Art House and International	Ciro Guerra	Ciro Guerra|Jacques Toulemonde Vidal	Feb 17, 2016	Ju
1541	1980	A band of renegades on the run in outer space ...	PG-13	Action and Adventure|Science Fiction and Fantasy	Joss Whedon	Joss Whedon	Sep 30, 2005	D
1542	1981	Money, Fame and the Knowledge of English. In I...	NR	Comedy|Drama	Gauri Shinde	Gauri Shinde	Oct 5, 2012	N
1545	1985	A woman who joins the undead against her will ...	R	Horror|Mystery and Suspense	Sebastian Gutierrez	Sebastian Gutierrez	Jun 1, 2007	

In [75]:
```
df5.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 235 entries, 1 to 1545
Data columns (total 12 columns):
 #   Column        Non-Null Count  Dtype 
---  ------        --------------  ----- 
 0   id            235 non-null    int64 
 1   synopsis      235 non-null    object
 2   rating        235 non-null    object
 3   genre         235 non-null    object
 4   director      235 non-null    object
 5   writer        235 non-null    object
 6   theater_date  235 non-null    object
 7   dvd_date      235 non-null    object
 8   currency      235 non-null    object
 9   box_office    235 non-null    object
 10  runtime       235 non-null    object
 11  studio        235 non-null    object
dtypes: int64(1), object(11)
memory usage: 23.9+ KB
```

In [76]:
```
df5.sort_values(by='genre', ascending =True)
```

Out[76]:

	id	synopsis	rating	genre	director	writer
271	357	Planet 51 is a galactic-sized animated alien a...	PG	Action and Adventure|Animation|Comedy|Kids and...	Jorge Blanco	Joe Stillman
633	816	Two mismatched wolves embark on a cross-countr...	PG	Action and Adventure|Animation|Comedy|Kids and...	Anthony Bell|Ben Gluck|Benjamin Gluck	Steve Moore|Chris Denk
370	482	Take out the trash, eat your broccoli-who need...	PG	Action and Adventure|Animation|Comedy|Science ...	Simon Wells	Simon Wells|Wendy Wells
1238	1601	Rango is a sheltered chameleon living as an or...	PG	Action and Adventure|Animation|Kids and Family	Gore Verbinski	John Logan
1145	1475	A young robot with incredible powers, super st...	PG	Action and Adventure|Animation|Kids and Family...	David Bowers	Timothy Hyde Harris|David Bowers|Timothy Harris
...	...	...	...	...	...	...
524	686	Set in a dystopic present where vigilant gargo...	PG-13	Horror|Mystery and Suspense|Science Fiction an...	Stuart Beattie	Stuart Beattie
479	626	Popular bogeymen Jason Voorhees terrorizes a g...	R	Horror|Mystery and Suspense|Science Fiction an...	James Isaac	Todd Farmer
1208	1554	The movie chronicles the adventures of a young...	G	Kids and Family|Musical and Performing Arts	Britt Allcroft	Britt Allcroft
1117	1442	Youthful wizard Harry Potter returns to the sc...	PG	Kids and Family|Science Fiction and Fantasy	Chris Columbus	Steve Kloves
1001	1295	"Maleficent" explores the untold story of Disn...	PG	Science Fiction and Fantasy	Robert Stromberg	Linda Woolverton

235 rows × 12 columns

In [77]:
```
df5.nunique()
```

Out[77]:
```
id              235
synopsis        235
rating            6
genre            76
director        217
writer          232
theater_date    209
dvd_date        210
currency          1
box_office      235
runtime          69
studio          101
dtype: int64
```

there are 76 unique genre in the dataset above

In [78]:
```
# count the occurrences of each unique value in the column
value_counts = df5['genre'].value_counts()

# select the value(s) with the highest occurrence
highest_occurrence = value_counts.idxmax()

# count the total number of occurrences of the highest occurring value
total_count = value_counts[highest_occurrence]

print("Total number of highest occurring values:", total_count)
```

```
Total number of highest occurring values: 33
```

In [79]:
```
df5
```

Out[79]:

	id	synopsis	rating	genre	director	writer	theater_
1	3	New York City, not-too-distant-future: Eric Pa...	R	Drama|Science Fiction and Fantasy	David Cronenberg	David Cronenberg|Don DeLillo	Aug 2
6	10	Some cast and crew from NBC's highly acclaimed...	PG-13	Comedy	Jake Kasdan	Mike White	Jan 11, 2
7	13	Stewart Kane, an Irishman living in the Austra...	R	Drama	Ray Lawrence	Raymond Carver|Beatrix Christian	Apr 27, 2
15	22	Two-time Academy Award Winner Kevin Spacey giv...	R	Comedy|Drama|Mystery and Suspense	George Hickenlooper	Norman Snider	Dec 17, 2
18	25	From ancient Japan's most enduring tale, the e...	PG-13	Action and Adventure|Drama|Science Fiction and...	Carl Erik Rinsch	Chris Morgan|Hossein Amini	Dec 25, 2
...	...	...	...	...	...	...	
1530	1968	This holiday season, acclaimed filmmaker Camer...	PG	Comedy|Drama	Cameron Crowe	Aline Brosh McKenna|Cameron Crowe	Dec 23, 2
1537	1976	Embrace of the Serpent features the encounter,...	NR	Action and Adventure|Art House and International	Ciro Guerra	Ciro Guerra|Jacques Toulemonde Vidal	Feb 17, 2
1541	1980	A band of renegades on the run in outer space ...	PG-13	Action and Adventure|Science Fiction and Fantasy	Joss Whedon	Joss Whedon	Sep 2
1542	1981	Money, Fame and the Knowledge of English. In I...	NR	Comedy|Drama	Gauri Shinde	Gauri Shinde	Oct 5, 2
1545	1985	A woman who joins the undead against her will ...	R	Horror|Mystery and Suspense	Sebastian Gutierrez	Sebastian Gutierrez	Jun 1, 2

235 rows × 12 columns

6. DATASET = im.db

In [87]:
```
import sqlite3
import pandas as pd
```

In [101]:
```
conn = sqlite3.connect('.data/im.db/im.db')
conn
```

Out[101]:
```
<sqlite3.Connection at 0x1e5a2e7ee40>
```

In [104]:
```
df6 = pd.read_sql("""SELECT name FROM sqlite_master WHERE type = 'table';""",
conn)
df6
```

Out[104]:

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

From the question provided we were told to focus on movie_basic and movie_rating to get our analysis. this means we have to read the database using sqlite and then use the pandas read_sql function to get a dataframe object called df7.

In [105]:
```
df7=pd.read_sql("SELECT * FROM movie_basics;", conn)
df7
```

Out[105]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama
3	tt0069204	Sabse Bada Sukh	Sabse Bada Sukh	2018	NaN	Comedy,Drama
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy
...	...	...	...	...	...	...
146139	tt9916538	Kuambil Lagi Hatiku	Kuambil Lagi Hatiku	2019	123.0	Drama
146140	tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	Rodolpho Teóphilo - O Legado de um Pioneiro	2015	NaN	Documentary
146141	tt9916706	Dankyavar Danka	Dankyavar Danka	2013	NaN	Comedy
146142	tt9916730	6 Gunn	6 Gunn	2017	116.0	None
146143	tt9916754	Chico Albuquerque - Revelações	Chico Albuquerque - Revelações	2013	NaN	Documentary

146144 rows × 6 columns

understanding the dataset

In [106]:
```
df7.head()
```

Out[106]:

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

from the above dataset the observation is the primary title and original title are slightly different in some rows. the above table has six columns

In [107]:
```
df7.tail()
```

Out[107]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres
146139	tt9916538	Kuambil Lagi Hatiku	Kuambil Lagi Hatiku	2019	123.0	Drama
146140	tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	Rodolpho Teóphilo - O Legado de um Pioneiro	2015	NaN	Documentary
146141	tt9916706	Dankyavar Danka	Dankyavar Danka	2013	NaN	Comedy
146142	tt9916730	6 Gunn	6 Gunn	2017	116.0	None
146143	tt9916754	Chico Albuquerque - Revelações	Chico Albuquerque - Revelações	2013	NaN	Documentary

In [108]:
```
df7.describe()
```

Out[108]:

	start_year	runtime_minutes
count	146144.000000	114405.000000
mean	2014.621798	86.187247
std	2.733583	166.360590
min	2010.000000	1.000000
25%	2012.000000	70.000000
50%	2015.000000	87.000000
75%	2017.000000	99.000000
max	2115.000000	51420.000000

In [109]:
```
df7.shape
```

Out[109]:
```
(146144, 6)
```

observation of the table above shows that the data set has 146144 rows and 6columns hence gives a better analyze of the data

In [110]:
```
df7.isna().sum()
```

Out[110]:
```
movie_id              0
primary_title         0
original_title       21
start_year            0
runtime_minutes    31739
genres              5408
dtype: int64
```

the table above indicates that the runtime minutes and genres has alot of missing values/entries

In [111]:
```
df7.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 146144 entries, 0 to 146143
Data columns (total 6 columns):
 #   Column           Non-Null Count   Dtype  
---  ------           --------------   -----  
 0   movie_id         146144 non-null  object 
 1   primary_title    146144 non-null  object 
 2   original_title   146123 non-null  object 
 3   start_year       146144 non-null  int64  
 4   runtime_minutes  114405 non-null  float64
 5   genres           140736 non-null  object 
dtypes: float64(1), int64(1), object(4)
memory usage: 6.7+ MB
```

it shows the data type it has, the number of objects and intergers in the data

In [112]:
```
df7.duplicated().sum()
```

Out[112]:
```
0
```

the observation shows there are no duplicate in the dataframe

In [113]:
```
df7.nunique()
```

Out[113]:
```
movie_id           146144
primary_title      136071
original_title     137773
start_year             19
runtime_minutes       367
genres               1085
dtype: int64
```

DATA ANALYSIS

1. From the data understanding and preparation the business question we are trying to answer is which movie genre has the highest worldwide_gross sales

In [120]:
```
# read in the two dataframes
df1=pd.read_csv("cleaned_csv_file.csv")

# merge the dataframes on movie and primary_title columns
merged_df = pd.merge(df7[['movie_id', 'primary_title', 'genres']], df1[['movie', 'worldwide_gross']],
                     left_on='primary_title', right_on='movie')

# group the merged dataframe by genres and aggregate the worldwide_gross column by sum
genre_gross_df = merged_df.groupby('genres')['worldwide_gross'].sum().reset_index()

# sort the genre_gross dataframe in descending order of worldwide_gross
genre_gross_df = genre_gross_df.sort_values(by='worldwide_gross', ascending=False)

print(genre_gross_df)
```

```
                         genres  worldwide_gross
14      Action,Adventure,Sci-Fi      34749552015
79   Adventure,Animation,Comedy      27486160147
255                       Drama      21284849192
231                 Documentary      17430057076
9      Action,Adventure,Fantasy      14024491016
..                           ...              ...
246          Documentary,Horror                0
321              Horror,Musical                0
310               Family,Sci-Fi                0
251  Documentary,Sport,Thriller                0
150   Biography,Documentary,War                0

[345 rows x 2 columns]
```

In [121]:
```
genre_gross_df.head()
```

Out[121]:

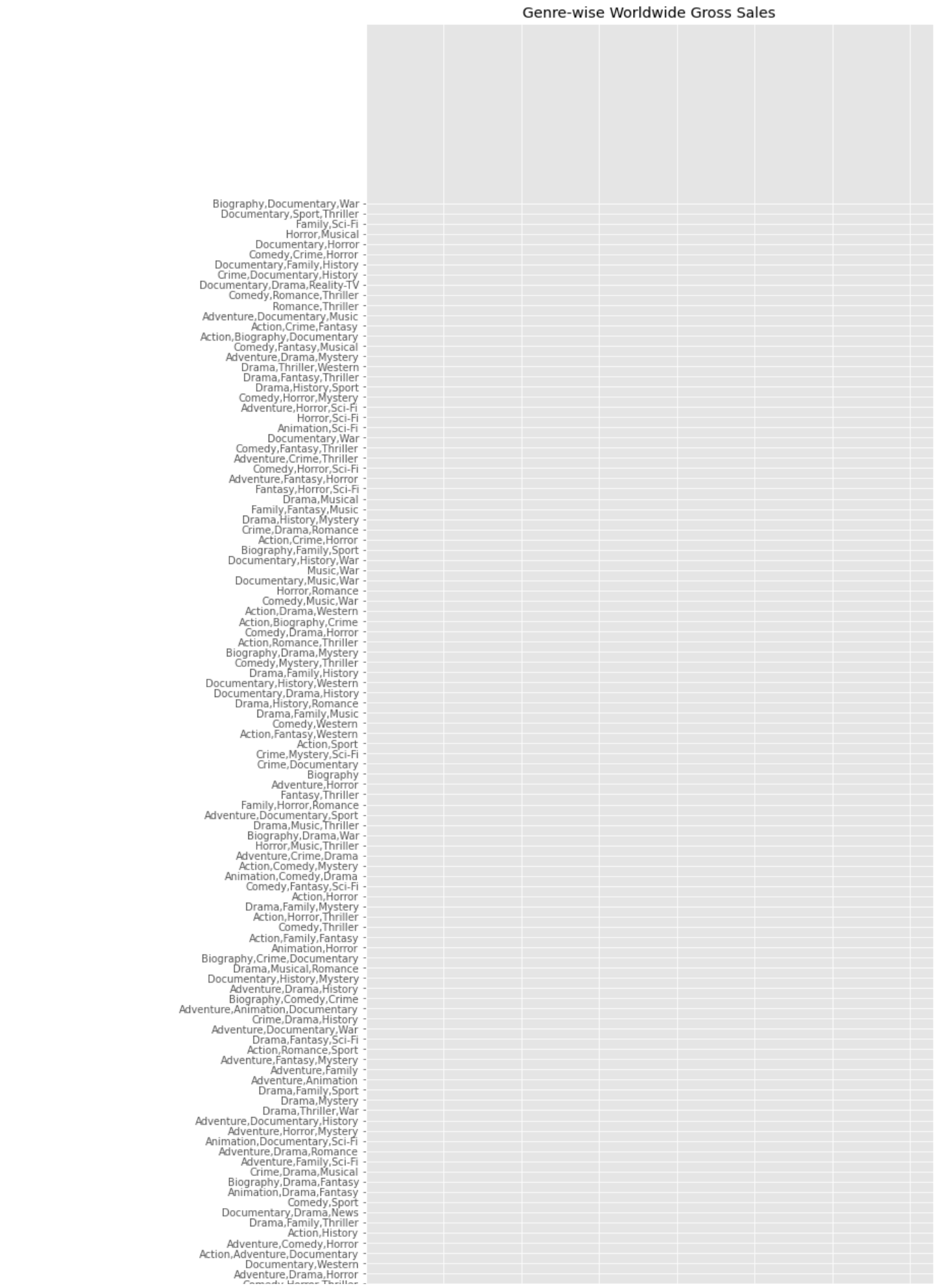
	genres	worldwide_gross
14	Action,Adventure,Sci-Fi	34749552015
79	Adventure,Animation,Comedy	27486160147
255	Drama	21284849192
231	Documentary	17430057076
9	Action,Adventure,Fantasy	14024491016

From the above we can recommend that new microsoft studio can invest in the following genres;

1. Action,Adventure,Sci-Fi
2.Adventure,Animation,Comedy
3.Drama
4.Documentary,
5. Action,Adventure,Fantasy

because they have avery high worldwide_gross sales as evidence from the data analysis done in the cell above

In [122]:
```
import matplotlib.pyplot as plt

# set the plot style
plt.style.use('ggplot')

# create the plot
fig, ax = plt.subplots(figsize=(10, 70))
ax.barh(genre_gross_df['genres'], genre_gross_df['worldwide_gross'])
ax.set_xlabel('Worldwide Gross Sales')
ax.set_ylabel('Genres')
ax.set_title('Genre-wise Worldwide Gross Sales')

plt.show()
```


Genre-wise Worldwide Gross Sales
Biography,Documentary,War
Documentary,Sport,Thriller
Family,Sci-Fi
Horror,Musical
Documentary,Horror
Comedy,Crime,Horror
Documentary,Family,History
Crime,Documentary,History
Documentary,Drama,Reality-TV
Comedy,Romance,Thriller
Romance,Thriller
Adventure,Documentary,Music
Action,Crime,Fantasy
Action,Biography,Documentary
Comedy,Fantasy,Musical
Adventure,Drama,Mystery
Drama,Thriller,Western
Drama,Fantasy,Thriller
Drama,History,Sport
Comedy,Horror,Mystery
Adventure,Horror,Sci-Fi
Horror,Sci-Fi
Animation,Sci-Fi
Documentary,War
Comedy,Fantasy,Thriller
Adventure,Crime,Thriller
Comedy,Horror,Sci-Fi
Adventure,Fantasy,Horror
Fantasy,Horror,Sci-Fi
Drama,Musical
Family,Fantasy,Music
Drama,History,Mystery
Crime,Drama,Romance
Action,Crime,Horror
Biography,Family,Sport
Documentary,History,War
Music,War
Documentary,Music,War
Horror,Romance
Comedy,Music,War
Action,Drama,Western
Action,Biography,Crime
Comedy,Drama,Horror
Action,Romance,Thriller
Biography,Drama,Mystery
Comedy,Mystery,Thriller
Drama,Family,History
Documentary,History,Western
Documentary,Drama,History
Drama,History,Romance
Drama,Family,Music
Comedy,Western
Action,Fantasy,Western
Action,Sport
Crime,Mystery,Sci-Fi
Crime,Documentary
Biography
Adventure,Horror
Fantasy,Thriller
Family,Horror,Romance
Adventure,Documentary,Sport
Drama,Music,Thriller
Biography,Drama,War
Horror,Music,Thriller
Adventure,Crime,Drama
Action,Comedy,Mystery
Animation,Comedy,Drama
Comedy,Fantasy,Sci-Fi
Action,Horror
Drama,Family,Mystery
Action,Horror,Thriller
Comedy,Thriller
Action,Family,Fantasy
Animation,Horror
Biography,Crime,Documentary
Drama,Musical,Romance
Documentary,History,Mystery
Adventure,Drama,History
Biography,Comedy,Crime
Adventure,Animation,Documentary
Crime,Drama,History
Adventure,Documentary,War
Drama,Fantasy,Sci-Fi
Action,Romance,Sport
Adventure,Fantasy,Mystery
Adventure,Family
Adventure,Animation
Drama,Family,Sport
Drama,Mystery
Drama,Thriller,War
Adventure,Documentary,History
Adventure,Horror,Mystery
Animation,Documentary,Sci-Fi
Adventure,Drama,Romance
Adventure,Family,Sci-Fi
Crime,Drama,Musical
Biography,Drama,Fantasy
Animation,Drama,Fantasy
Comedy,Sport
Documentary,Drama,News
Drama,Family,Thriller
Action,History
Adventure,Comedy,Horror
Action,Adventure,Documentary
Documentary,Western
Adventure,Drama,Horror

it is a sorted fro
the highest sale

2. From tl
question
domestic

In [123]:

Out[123]:

	title	popularity	movie	domestic_gross
0	How to Train Your Dragon	28.734	How to Train Your Dragon	217581232
1	Iron Man 2	28.515	Iron Man 2	312433331
2	Toy Story	28.005	Toy Story	191796233
3	Toy Story	28.005	Toy Story	191796233
4	Inception	27.920	Inception	292576195
...	...	...	...	...
2380	The Box	0.600	The Box	15051977
2381	The Box	0.600	The Box	15051977
2382	Enough	0.719	Enough	39177215
2383	Undiscovered	0.600	Undiscovered	1069318
2384	Jaws	0.600	Jaws	260000000

2385 rows × 4 columns

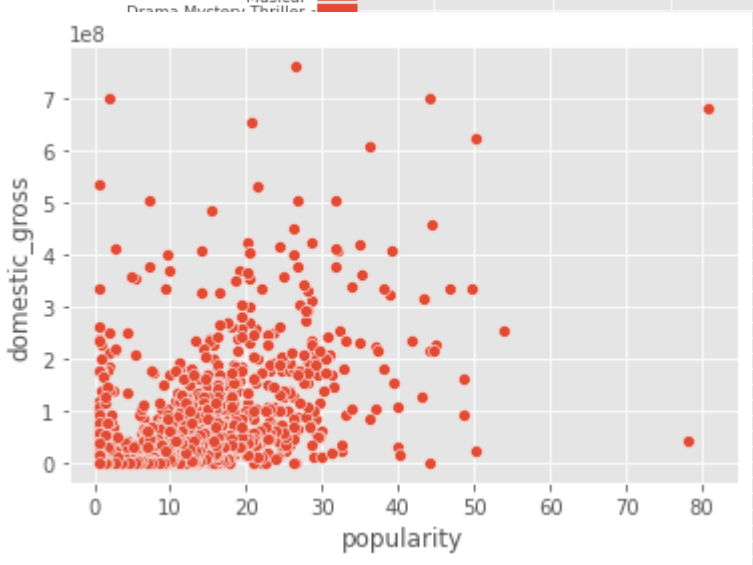
In [124]:

Out[124]:

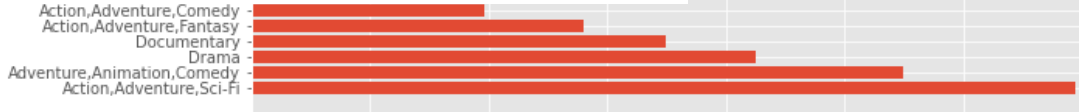
	title	popularity	movie	domestic_gross
0	How to Train Your Dragon	28.734	How to Train Your Dragon	217581232
1	Iron Man 2	28.515	Iron Man 2	312433331
2	Toy Story	28.005	Toy Story	191796233
3	Toy Story	28.005	Toy Story	191796233
4	Inception	27.920	Inception	292576195
...	...	...	...	...
95	Cats & Dogs: The Revenge of Kitty Galore	10.544	Cats & Dogs: The Revenge of Kitty Galore	43585753
96	The Fighter	10.395	The Fighter	93617009
97	The Tourist	10.307	The Tourist	67631157
98	Killers	10.221	Killers	47059963
99	You Again	10.208	You Again	25702053

100 rows × 4 columns

In [125]:



In [126]:




```
Correlation between popularity and domestic gross: 0.5360018432725122
```

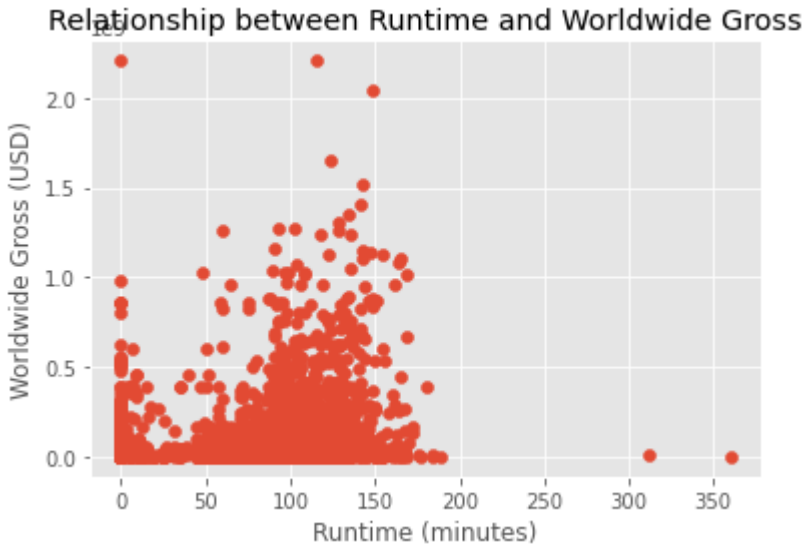
From the results
close to one me
i recommend that microsoft new movies studios focus on intensive marketing so as to boost there popularity which in turn create a +1 correlation between popularity and domestic gross.

3. From the data understanding and preparation the business question we are trying to answer is does runtime in minutes of movie title have an impact on worldwide_gross

In [127]:
```
# merge the two dataframes on the 'movie' and 'original_title' columns
merged_df = pd.merge(df7, df1, left_on='original_title', right_on='movie')

# select only the columns you need
merged_df = merged_df[['original_title', 'runtime_minutes', 'domestic_gross',
'worldwide_gross']]

# check for null values
merged_df.isnull().sum()

# fill in null values with 0
merged_df = merged_df.fillna(0)

# calculate correlation between runtime_minutes and worldwide_gross
corr = merged_df['runtime_minutes'].corr(merged_df['worldwide_gross'])
print(corr)
```

```
0.14336738851372544
```

In [128]:
```
import matplotlib.pyplot as plt

# plot a scatter plot of runtime_minutes vs worldwide_gross
plt.scatter(merged_df['runtime_minutes'], merged_df['worldwide_gross'])
plt.xlabel('Runtime (minutes)')
plt.ylabel('Worldwide Gross (USD)')
plt.title('Relationship between Runtime and Worldwide Gross')
plt.show()
```



because the correlation is too low,the runtime has minimal or no impact on sales hence no need to give recommendations

In [129]:
```
# read in the one dataframes
df0=pd.read_csv("movies_with_ROI.csv")
df0
```

Out[129]:

	release_date	movie	production_budget	domestic_gross	worldwide_gross	RO
0	Dec 18, 2009	Avatar	425000000	760507625	2776345279	553.25771
1	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875	154.66728
2	Jun 7, 2019	Dark Phoenix	350000000	42762350	149762350	-57.21075
3	May 1, 2015	Avengers: Age of Ultron	330600000	459005868	1403013963	324.38413
4	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747	315.36963
...	...	...	...	...	...	.
5777	Dec 31, 2018	Red 11	7000	0	0	-100.00000
5778	Apr 2, 1999	Following	6000	48482	240495	3908.25000
5779	Jul 13, 2005	Return to the Land of Wonders	5000	1338	1338	-73.24000
5780	Sep 29, 2015	A Plague So Pleasant	1400	0	0	-100.00000
5781	Aug 5, 2005	My Date With Drew	1100	181041	181041	16358.27272

5782 rows × 6 columns

4.From the data understanding and preparation, the business question we are trying to answer is to find the Return on investment(ROI) for several genres across the years.

In [130]:
```
# merge the data frames on the 'movie' and 'original_title' columns
merged_df = pd.merge(df0[['movie','release_date' ,'ROI']],
                     df7[['original_title', 'genres']],
                     left_on='movie', right_on='original_title',
                     how='inner')
merged_df
```

Out[130]:

	movie	release_date	ROI	original_title	genres
0	Pirates of the Caribbean: On Stranger Tides	May 20, 2011	154.667286	Pirates of the Caribbean: On Stranger Tides	Action,Adventure,Fantasy
1	Dark Phoenix	Jun 7, 2019	-57.210757	Dark Phoenix	Action,Adventure,Sci-Fi
2	Avengers: Age of Ultron	May 1, 2015	324.384139	Avengers: Age of Ultron	Action,Adventure,Sci-Fi
3	Avengers: Infinity War	Apr 27, 2018	582.711400	Avengers: Infinity War	Action,Adventure,Sci-Fi
4	Justice League	Nov 17, 2017	118.648403	Justice League	Action,Adventure,Fantasy
...	...	...	...	...	...
3532	Cure	Jul 6, 2001	845.960000	Cure	None
3533	Bang	Apr 1, 1996	-94.730000	Bang	None
3534	Newlyweds	Jan 13, 2012	-49.066667	Newlyweds	Comedy,Drama
3535	Red 11	Dec 31, 2018	-100.000000	Red 11	Horror,Sci-Fi,Thriller
3536	A Plague So Pleasant	Sep 29, 2015	-100.000000	A Plague So Pleasant	Drama,Horror,Thriller

3537 rows × 5 columns

In [131]:
```
plt.figure(figsize=(12, 6))
# create a scatter plot of ROI by genre and year
sns.scatterplot(x='release_date', y='ROI', data=merged_df, alpha=1 )

# set the x-axis label to 'Year'
plt.xlabel('Year')

# set the y-axis label to 'ROI'
plt.ylabel('ROI')

# show the plot
plt.show()
```