```
## Final Project Submission

Please fill out:
* Student name: Norbu Tshering
* Student pace: Part-time
* Scheduled project review date/time: 22nd Dec, 2022
* Instructor name: Hardik Damentor
* Blog post URL: https://github.com/nicktofel/Project_1.git
```

In [1]:
```
# Your code here - remember to use markdown cells for comments as we
import pandas as pd
import numpy as np
import matplotlib
import matplotlib.pyplot as plt
import seaborn as sns
from scipy.stats import pearsonr
```

In [2]:
```
#loaded data into dataframes
df_title=pd.read_csv('zippedData/imdb.title.basics.csv.gz')
df_ratings=pd.read_csv('zippedData/imdb.title.ratings.csv.gz')
df_gross=pd.read_csv('zippedData/bom.movie_gross.csv.gz')
```

In [3]:
```
df_ratings.info()
df_ratings.head()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 73856 entries, 0 to 73855
Data columns (total 3 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   tconst         73856 non-null  object 
 1   averagerating  73856 non-null  float64
 2   numvotes       73856 non-null  int64  
dtypes: float64(1), int64(1), object(1)
memory usage: 1.7+ MB
```

Out[3]:

	tconst	averagerating	numvotes
0	tt10356526	8.3	31
1	tt10384606	8.9	559
2	tt1042974	6.4	20
3	tt1043726	4.2	50352
4	tt1060240	6.5	21

Factors to consider is a film's critical reception, as films with high ratings from critics tend to perform better at the box office

In [4]:
```
# Filter the ratings dataframe to include only films with at least
filtered_ratings = df_ratings[df_ratings['numvotes'] >= 1000]

filtered_ratings
```

Out[4]:

	tconst	averagerating	numvotes
3	tt1043726	4.2	50352
6	tt1094666	7.0	1613
10	tt1171222	5.1	8296
11	tt1174693	5.8	2381
12	tt1181840	7.0	5494
...	...	...	...
73763	tt8443704	7.5	1947
73771	tt8564902	4.7	5863
73772	tt8574252	7.1	1526
73792	tt8948790	9.0	1778
73831	tt9558612	3.7	4057

9617 rows × 3 columns

In [5]:
```
# Sort the ratings dataframe by averagerating in descending order
sorted_ratings = filtered_ratings.sort_values(by='averagerating', a
sorted_ratings.head()
```

Out[5]:

	tconst	averagerating	numvotes
63149	tt7131622	9.7	5600
54115	tt4131686	9.6	1339
27195	tt6058226	9.6	2604
12174	tt5963218	9.5	6509
4461	tt7738784	9.4	9629

Table show top 5 films with the highest average ratings with Genres

In [6]:
```
# Join the titles and ratings dataframes on tconst
top_5 = pd.merge(df_title, sorted_ratings, on='tconst')
```

In [7]:
```

# Merge the genre column with top_5 on tconst
df_merged = pd.merge(top_5, sorted_ratings, left_on='tconst', right_

# Display the top 5 films with strong critical acclaim
top_5[['tconst','primary_title','averagerating','genres']].sort_val


top_5.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 9617 entries, 0 to 9616
Data columns (total 8 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   tconst           9617 non-null   object 
 1   primary_title    9617 non-null   object 
 2   original_title   9617 non-null   object 
 3   start_year       9617 non-null   int64  
 4   runtime_minutes  9609 non-null   float64
 5   genres           9615 non-null   object 
 6   averagerating    9617 non-null   float64
 7   numvotes         9617 non-null   int64  
dtypes: float64(2), int64(2), object(4)
memory usage: 676.2+ KB
```

In [8]:
```
#convert to str and Split the str of listed genres on the comma
top_5['genres'] = top_5['genres'].apply(str)

top_5['genres'] = top_5['genres'].str.split(',')

#Break down the genres column into separate rows where each movie i

top_5 = (top_5
 .set_index(['tconst','primary_title',"averagerating"])['genres']
 .apply(pd.Series)
 .stack()
 .reset_index()
 .rename(columns={0:'genres'}))

top_5.head(5)
```

Out[8]:

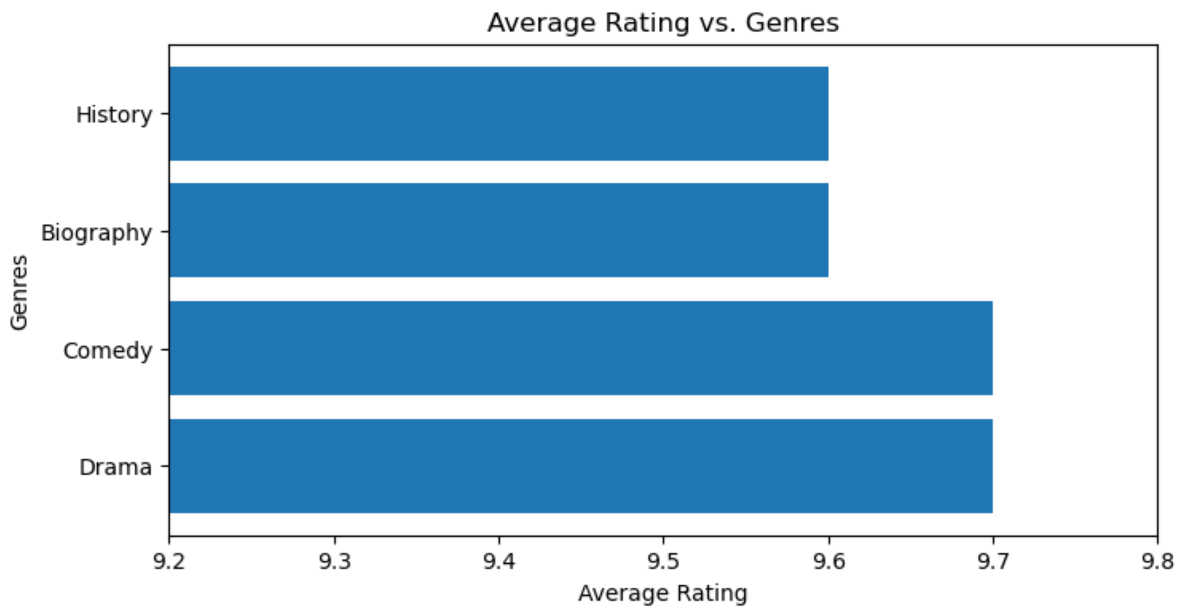
	tconst	primary_title	averagerating	level_3	genres
0	tt0069049	The Other Side of the Wind	6.9	0	Drama
1	tt0249516	Foodfight!	1.9	0	Action
2	tt0249516	Foodfight!	1.9	1	Animation
3	tt0249516	Foodfight!	1.9	2	Comedy
4	tt0293069	Dark Blood	6.6	0	Thriller

In [9]:
```
# Select the averagerating and genres columns
df_new = top_5[["averagerating", "genres"]].sort_values(by='average


df_new
```

Out[9]:

	averagerating	genres
20901	9.7	Drama
20900	9.7	Comedy
19585	9.6	Biography
15652	9.6	Biography
19587	9.6	History

In [10]:
```
# Set the figure size
plt.figure(figsize=(8, 4))

# Set the y-axis to be the genres column and the x-axis to be the a
# Set the width of the bars to be 0.5
plt.barh(df_new["genres"], df_new["averagerating"])

# Set the x-axis range to be from 9.2 to 9.8
plt.xlim(9.2,9.8)

# Add a title and labels to the x-axis and y-axis
plt.title("Average Rating vs. Genres")
plt.ylabel("Genres")
plt.xlabel("Average Rating")

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



In [11]:
```
# Rename title to primary_title
df_gross.rename(columns={'title':'primary_title'}, inplace=True)

df_gross.info()

df_gross.head()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3387 entries, 0 to 3386
Data columns (total 5 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   primary_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
```

Out[11]:

	primary_title	studio	domestic_gross	foreign_gross	year
0	Toy Story 3	BV	415000000.0	652000000	2010
1	Alice in Wonderland (2010)	BV	334200000.0	691300000	2010
2	Harry Potter and the Deathly Hallows Part 1	WB	296000000.0	664300000	2010
3	Inception	WB	292600000.0	535700000	2010
4	Shrek Forever After	P/DW	238700000.0	513900000	2010

In [12]:

```
# Replace 'nan' with null values (i.e., NaN) in the foreign_gross c
df_gross['foreign_gross'] = df_gross['foreign_gross'].replace('nan'

# Convert the foreign_gross column to a numeric data type
df_gross['foreign_gross'] = pd.to_numeric(df_gross['foreign_gross']

# Identify rows with null values in the foreign_gross column and se
null_mask = df_gross['foreign_gross'].isnull()
df_gross.loc[null_mask, 'foreign_gross'] = 0

# Create a new total_gross column by adding the domestic_gross and
df_gross['total_gross'] = df_gross['domestic_gross'] + df_gross['fo

# Display info & gross
df_gross.info()

df_gross.head()

df_title.info()
df_title.head()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3387 entries, 0 to 3386
Data columns (total 6 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   primary_title   3387 non-null   object 
 1   studio          3382 non-null   object 
 2   domestic_gross  3359 non-null   float64
 3   foreign_gross   3387 non-null   float64
 4   year            3387 non-null   int64  
 5   total_gross     3359 non-null   float64
dtypes: float64(3), int64(1), object(2)
memory usage: 158.9+ KB
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 146144 entries, 0 to 146143
Data columns (total 6 columns):
 #   Column           Non-Null Count   Dtype  
---  ------           --------------   -----  
 0   tconst           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
```

Out[12]:

	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	Ashad Ka Ek Din	2019	114.0	Biography,Drama

		Season				
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

In [13]:
```
#convert to str and Split the str of listed genres on the comma
df_title['genres'] = df_title['genres'].apply(str)

df_title['genres'] = df_title['genres'].str.split(',')

#Break down the genres column into separate rows where each movie i

df_title = (df_title
 .set_index(['tconst','primary_title','original_title','start_year'
 .apply(pd.Series)
 .stack()
 .reset_index()
 .rename(columns={0:'genres'}))

df_title.head()
```

Out[13]:

	tconst	primary_title	original_title	start_year	runtime_minutes	level_5	genres
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	0	Action
1	tt0063540	Sunghursh	Sunghursh	2013	175.0	1	Crime
2	tt0063540	Sunghursh	Sunghursh	2013	175.0	2	Drama
3	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	0	Biography
4	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	1	Drama

In [14]:
```
# Merge data frames on the tconst column
df_merged = pd.merge(df_ratings, df_title, on='tconst')


# Drop unnecessary column
df_ratings_title = df_merged.drop(columns=['original_title'])

df_ratings_title.head()
```

Out[14]:

	tconst	averagerating	numvotes	primary_title	start_year	runtime_minutes	level_5
0	tt10356526	8.3	31	Laiye Je Yaarian	2019	117.0	0
1	tt10384606	8.9	559	Borderless	2019	87.0	0
2	tt1042974	6.4	20	Just Inès	2010	90.0	0
3	tt1043726	4.2	50352	The Legend of Hercules	2014	99.0	0
4	tt1043726	4.2	50352	The Legend of Hercules	2014	99.0	1

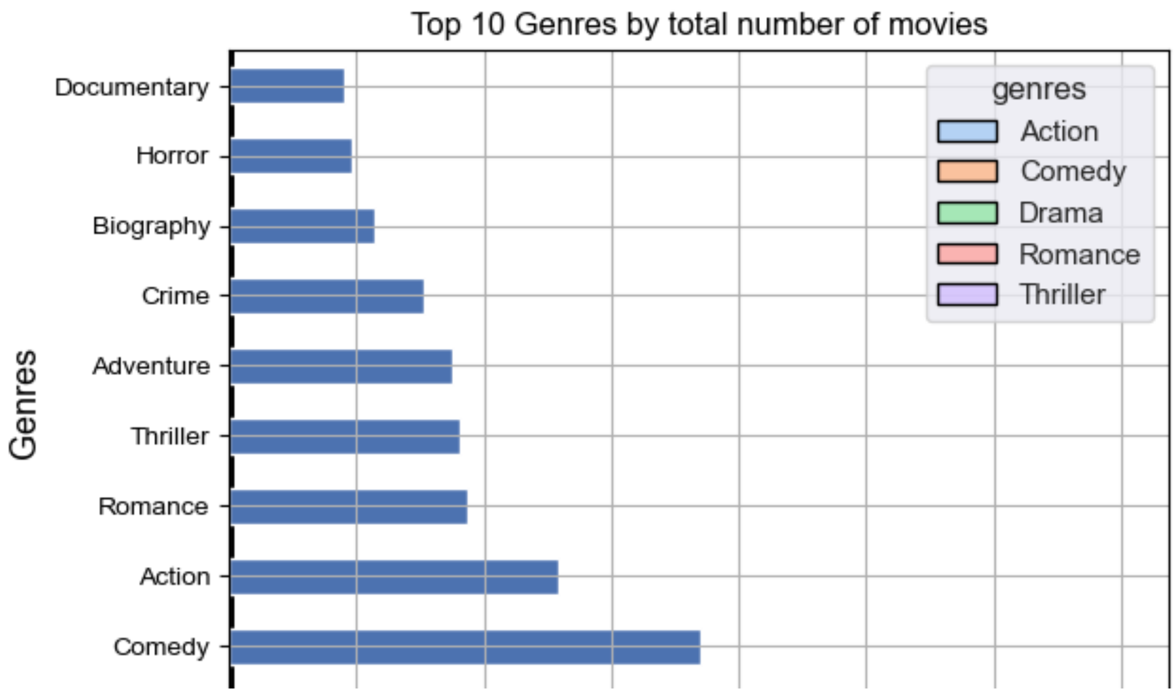
In [15]:
```
# Merge IMDb and Box Office Mojo data

movies = df_ratings_title.merge(df_gross, on="primary_title")

movies.head()

# Top 10 movie Genres based on ratings (released)

top_genres = movies.groupby('genres').size().sort_values(ascending=
top_genres.head(10)
```

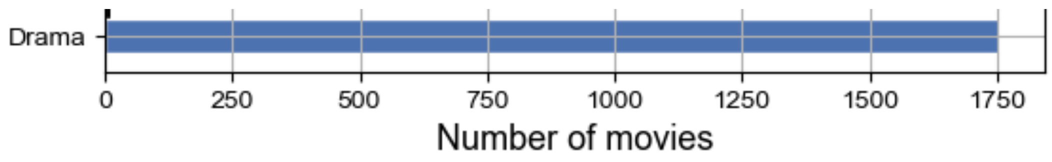
Out[15]:
```
genres
Drama          1756
Comedy          926
Action          646
Romance         468
Thriller        453
Adventure       439
Crime           382
Biography       285
Horror          240
Documentary     227
dtype: int64
```

In [16]:

```
#Divide genres in a subset for plotting
print(top_genres)
first_five = list(top_genres.index[:5])


#Create a DataFrame for each subset
top_five_df = movies[movies['genres'].isin(first_five)]


#Create a histogram for the first subset using Seaborn visualiztion
ax_one = sns.histplot(data = top_five_df, x = 'averagerating', hue =
ax_one.set_title("Top 5 Genres", size = 16)
ax_one.set_xlabel('Average User Rating', size=13)
ax_one.set_ylabel('Count of Movies', size = 13)
sns.set(rc={'figure.figsize':(16,8)})
sns.set_style()

top_genres.plot.barh(title='Top 10 Genres by total number of movies
plt.xlabel('Number of movies')
plt.ylabel('Genres')
plt.show()
```

```
genres
Drama          1756
Comedy          926
Action          646
Romance         468
Thriller        453
Adventure       439
Crime           382
Biography       285
Horror          240
Documentary     227
dtype: int64
```





In [17]:
```
movies.isnull().sum()

# Total NaN Values in percent %
movies.describe()

percentage_nan = movies.isnull().mean() * 100

percentage_nan
```

Out[17]:
```
tconst             0.000000
averagerating      0.000000
numvotes           0.000000
primary_title      0.000000
start_year         0.000000
runtime_minutes    0.930565
level_5            0.000000
genres             0.000000
studio             0.085898
domestic_gross     0.715820
foreign_gross      0.000000
year               0.000000
total_gross        0.715820
dtype: float64
```

Run-time Analysis to understand run time with movie gross

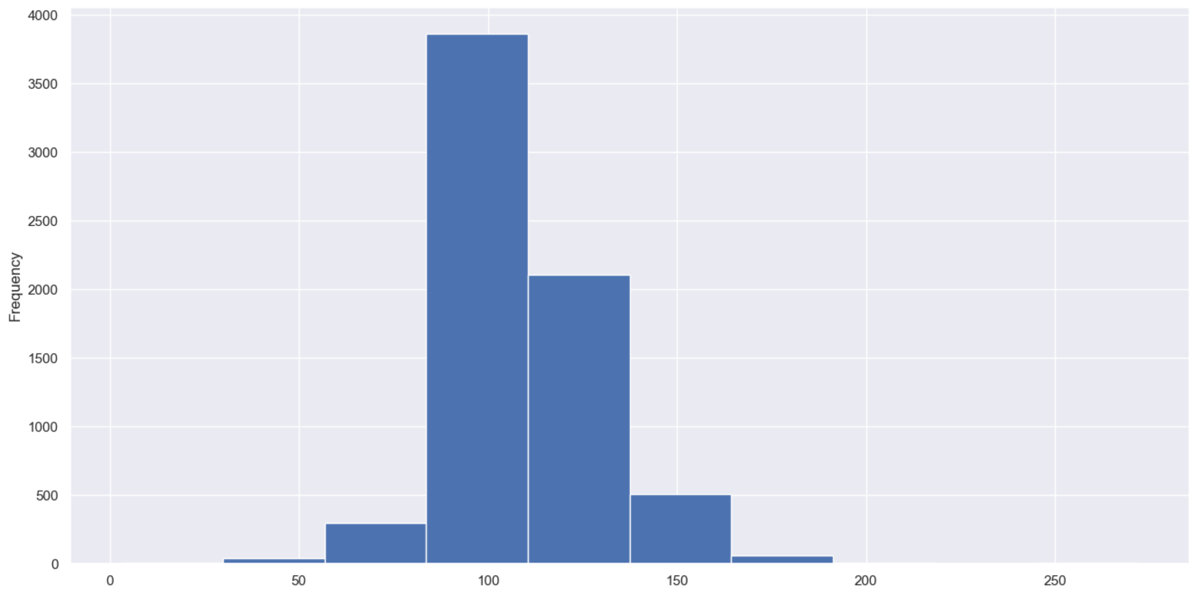
In [18]:
```
#Drop rows with missing or invalid data:
movies.dropna(inplace=True)

movies
```

Out[18]:

	tconst	averagerating	numvotes	primary_title	start_year	runtime_minutes	level_
0	tt1043726	4.2	50352	The Legend of Hercules	2014	99.0	0
1	tt1043726	4.2	50352	The Legend of Hercules	2014	99.0	1
2	tt1043726	4.2	50352	The Legend of Hercules	2014	99.0	2
3	tt1171222	5.1	8296	Baggage Claim	2013	96.0	0
7	tt1210166	7.6	326657	Moneyball	2011	133.0	0
...	...	...	...	...	...	...	..
6980	tt7008872	7.0	18768	Boy Erased	2018	115.0	0
6981	tt7008872	7.0	18768	Boy Erased	2018	115.0	1
6982	tt7048622	7.7	11168	The Insult	2017	113.0	0
6983	tt7048622	7.7	11168	The Insult	2017	113.0	1
6984	tt7048622	7.7	11168	The Insult	2017	113.0	2

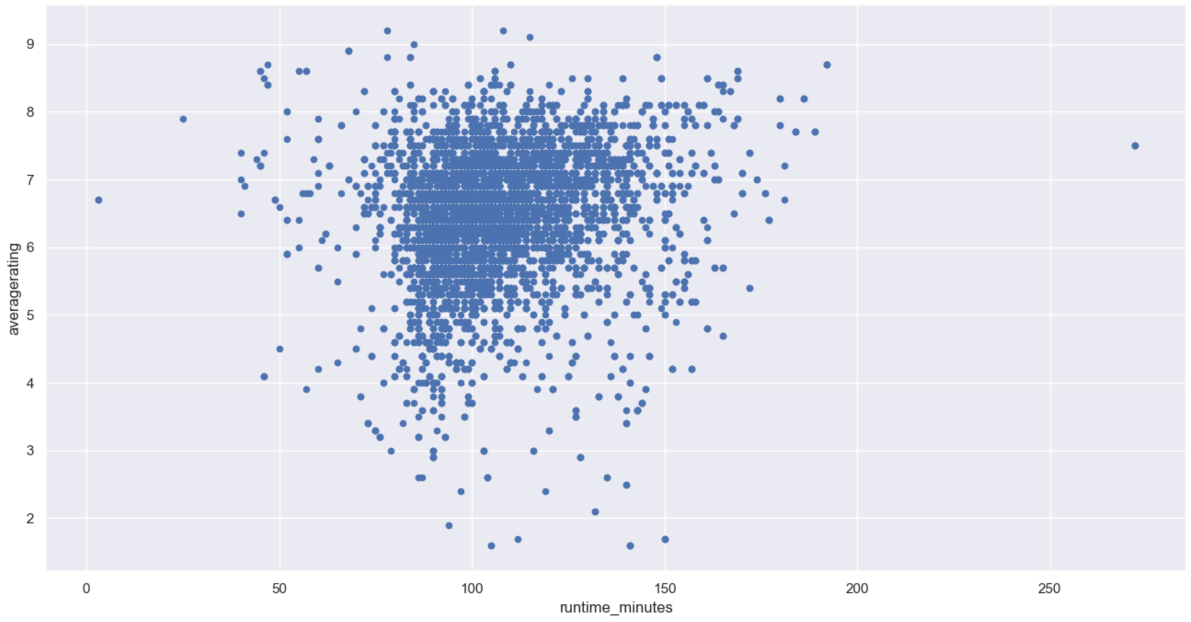
6867 rows × 13 columns

In [19]:
```
#Convert runtime and gross revenue to numerical data types:
movies['runtime_minutes'] = pd.to_numeric(movies['runtime_minutes']
movies['gross'] = pd.to_numeric(movies['total_gross'], errors='coer

movies['runtime_minutes'].plot.hist()
plt.show()
```



In [20]:
```
#Scatter Plot --relationship between runtime and average rating
movies.plot.scatter(x='runtime_minutes', y='averagerating')
plt.show()
```

```
*c* argument looks like a single numeric RGB or RGBA sequence, whi
ch should be avoided as value-mapping will have precedence in case
its length matches with *x* & *y*.  Please use the *color* keyword
-argument or provide a 2D array with a single row if you intend to
specify the same RGB or RGBA value for all points.
```



The lowest runtime value is 3 minutes.

The highest runtime value is 272 minutes. The runtime values between 3 and 87 minutes make up the first 11.11% of the data. The runtime values between 87 and 93 minutes make up the next 11.11% of the data. And so on.

In [21]:
```
percentiles = movies['runtime_minutes'].quantile(np.linspace(0, 1,
percentiles.describe()
```

Out[21]:
```
count     10.000000
mean     113.600000
std       65.912737
min        3.000000
25%       95.250000
50%      105.500000
75%      119.250000
max      272.000000
Name: runtime_minutes, dtype: float64
```

In [22]:
```
top_10_pct = movies[movies['runtime_minutes'] >= percentiles[1]]

top_10_pct
```

Out[22]:

	tconst	averagerating	numvotes	primary_title	start_year	runtime_minutes	level_5
3556	tt1236371	7.5	2928	Mysteries of Lisbon	2010	272.0	0
3557	tt1236371	7.5	2928	Mysteries of Lisbon	2010	272.0	1
3558	tt1236371	7.5	2928	Mysteries of Lisbon	2010	272.0	2

In [23]:
```
bottom_10_pct = movies[movies['runtime_minutes'] <= percentiles[0]]
bottom_10_pct
```

Out[23]:

	tconst	averagerating	numvotes	primary_title	start_year	runtime_minutes	level_5
1100	tt4597838	6.7	10	Limitless	2015	3.0	0
1101	tt4597838	6.7	10	Limitless	2015	3.0	1

In [24]:
```
median_runtime = movies['runtime_minutes'].median()

median_runtime
```

Out[24]:
```
106.0
```

In [25]:
```
mean_runtime = movies['runtime_minutes'].mean()
mean_runtime
```

Out[25]:
```
108.43745449250036
```

Conclusion

• Top Genres that have received highest ratings are Drama, Comedy, Biography and History Microsoft should invest in these genres as they have received highest ratings compared to other genres

• Based on Top 10 Genres and total number of movies produced under these genres Microsoft should also consider Action, Roman and Thrillers as well they these genres dominate numbers of movies produced

• With a median runtime of 105.0 and a mean runtime of 107.29, we can conclude the following about the runtime data:

Half of the movies in the data have a runtime of 105.0 minutes or less, and the other half have a runtime of 105.0 minutes or more. The average runtime of a movie in the data is 107.29 minutes. Using these values as a reference point, we can make recommendations about the success of movies with different runtimes. For example: Movies with a runtime close to 105.0 minutes (e.g., 100-110 minutes) might tend to be more successful, as they are close to the "typical" runtime of a movie in the data. Movies with a runtime significantly above or below 105.0 minutes (e.g., less than 90 minutes or more than 120 minutes) might be less successful, as they are outside the "typical" range of runtime for the data.