In [19]:
```
# Data manipulation and analysis
import pandas as pd
import numpy as np

# Visualization
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
from plotly.offline import init_notebook_mode, iplot, plot

# Machine Learning
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_absolute_error, mean_squared_error, r2_sco

# Ignore warnings
import warnings
warnings.filterwarnings('ignore')

# Enable inline plotting for matplotlib
%matplotlib inline
```

In [2]:
```
df = pd.read_csv("moovy.csv", encoding='latin1')
```

In [3]:
```
df.head()
```

Out[3]:

	Name	Year	Duration	Genre	Rating	Votes	Director	Actor 1	Actor 2
0		NaN	NaN	Drama	NaN	NaN	J.S. Randhawa	Manmauji	Birbal
1	#Gadhvi (He thought he was Gandhi)	(2019)	109 min	Drama	7.0	8	Gaurav Bakshi	Rasika Dugal	Vivek Ghamande
2	#Homecoming	(2021)	90 min	Drama, Musical	NaN	NaN	Soumyajit Majumdar	Sayani Gupta	Plabita Borthakur
3	#Yaaram	(2019)	110 min	Comedy, Romance	4.4	35	Ovais Khan	Prateik	Ishita Raj
4	...And Once Again	(2010)	105 min	Drama	NaN	NaN	Amol Palekar	Rajat Kapoor	Rituparna Sengupta

In [ ]:
```
```

In [5]:
```
df.columns
```

Out[5]:
```
Index(['Name', 'Year', 'Duration', 'Genre', 'Rating', 'Votes', 'Director',
       'Actor 1', 'Actor 2', 'Actor 3'],
      dtype='object')
```

In [6]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 15509 entries, 0 to 15508
Data columns (total 10 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   Name      15509 non-null  object 
 1   Year      14981 non-null  object 
 2   Duration  7240 non-null   object 
 3   Genre     13632 non-null  object 
 4   Rating    7919 non-null   float64
 5   Votes     7920 non-null   object 
 6   Director  14984 non-null  object 
 7   Actor 1   13892 non-null  object 
 8   Actor 2   13125 non-null  object 
 9   Actor 3   12365 non-null  object 
dtypes: float64(1), object(9)
memory usage: 1.2+ MB
```

In [7]:
```
def missing_values_percent(dataframe):
    missing_values = dataframe.isna().sum()
    percentage_missing = (missing_values / len(dataframe) * 100).round(2)

    result_movie = pd.DataFrame({'Missing Values': missing_values, 'Percent
    result_movie['Percentage'] = result_movie['Percentage'].astype(str) + '

    return result_movie


result = missing_values_percent(df)
result
```

Out[7]:

	Missing Values	Percentage
Name	0	0.0%
Year	528	3.4%
Duration	8269	53.32%
Genre	1877	12.1%
Rating	7590	48.94%
Votes	7589	48.93%
Director	525	3.39%
Actor 1	1617	10.43%
Actor 2	2384	15.37%
Actor 3	3144	20.27%

In [8]:
```
df.drop(['Actor 2' , 'Actor 3'], axis=1, inplace=True)
df.dropna(subset=['Duration'], inplace = True)
df = df[df.isnull().sum(axis=1).sort_values(ascending=False) <=5]
missing_values_percent(df)
```

Out[8]:

	Missing Values	Percentage
Name	0	0.0%
Year	125	1.73%
Duration	0	0.0%
Genre	187	2.58%
Rating	1389	19.19%
Votes	1389	19.19%
Director	14	0.19%
Actor 1	264	3.65%

In [9]:
```
df.dropna(subset=['Rating', 'Votes'], inplace=True)
director_description = df['Director'].describe()

director_counts = df['Director'].value_counts().sort_values(ascending=False
df['Director'].fillna('rajmouli', inplace=True)

genre_counts = df['Genre'].value_counts().sort_values(ascending=False)
df['Genre'].fillna('Action', inplace=True)

actor1_description = df['Actor 1'].describe()
df['Actor 1'].fillna('mahesh babu', inplace=True)

missing_values_df = pd.DataFrame({
    'Missing Values': df.isnull().sum(),
    'Percentage': (df.isnull().sum() / len(df) * 100).round(2)
})

df.tail()
```

Out[9]:

	Name	Year	Duration	Genre	Rating	Votes	Director	Actor 1
15493	Zubaan	(2015)	115 min	Drama	6.1	408	Mozez Singh	Vicky Kaushal
15494	Zubeidaa	(2001)	153 min	Biography, Drama, History	6.2	1,496	Shyam Benegal	Karisma Kapoor
15503	Zulm Ki Zanjeer	(1989)	125 min	Action, Crime, Drama	5.8	44	S.P. Muthuraman	Chiranjeevi
15505	Zulmi	(1999)	129 min	Action, Drama	4.5	655	Kuku Kohli	Akshay Kumar
15508	Zulm-O-Sitam	(1998)	130 min	Action, Drama	6.2	20	K.C. Bokadia	Dharmendra

In [10]:
```
missing_values_percent(df)
```

Out[10]:

	Missing Values	Percentage
Name	0	0.0%
Year	0	0.0%
Duration	0	0.0%
Genre	0	0.0%
Rating	0	0.0%
Votes	0	0.0%
Director	0	0.0%
Actor 1	0	0.0%

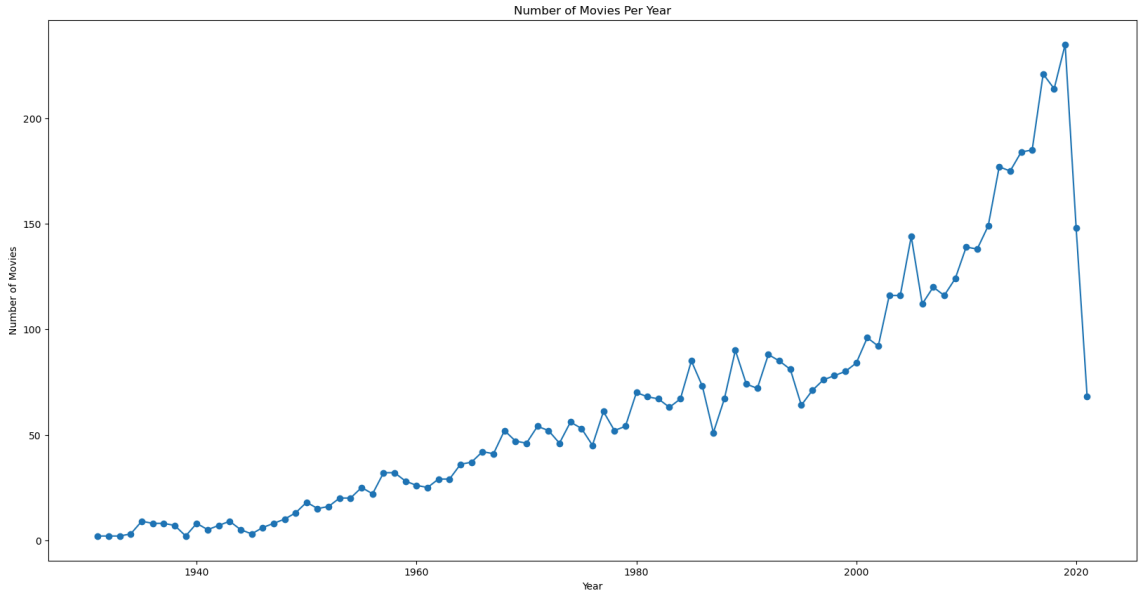
In [11]:
```
df['Year'] = df['Year'].str.replace(r'[()]', '', regex=True)
df['Duration'] = df['Duration'].str.replace(r' min', '', regex=True)
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 5851 entries, 1 to 15508
Data columns (total 8 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   Name      5851 non-null   object 
 1   Year      5851 non-null   object 
 2   Duration  5851 non-null   object 
 3   Genre     5851 non-null   object 
 4   Rating    5851 non-null   float64
 5   Votes     5851 non-null   object 
 6   Director  5851 non-null   object 
 7   Actor 1   5851 non-null   object 
dtypes: float64(1), object(7)
memory usage: 411.4+ KB
```

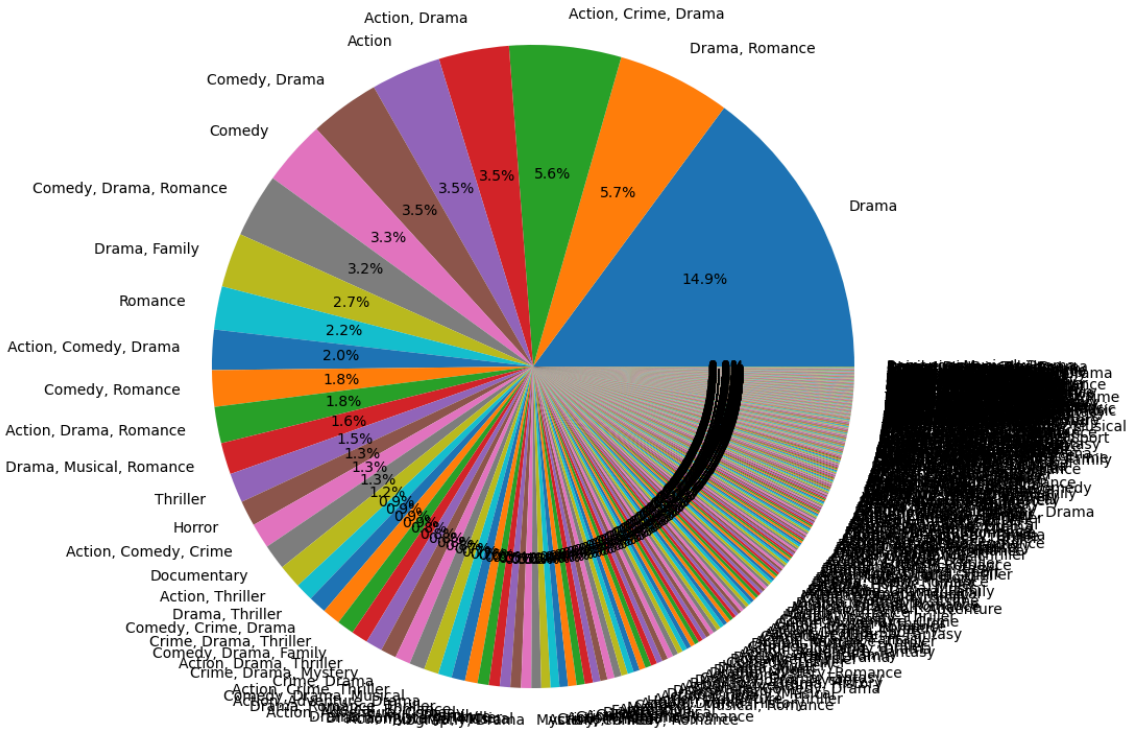
In [12]:
```
int_columns = ['Year', 'Duration']
df[int_columns] = df[int_columns].astype(int)
df['Votes'] = df['Votes'].str.replace(',', '').astype(int)
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 5851 entries, 1 to 15508
Data columns (total 8 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   Name      5851 non-null   object 
 1   Year      5851 non-null   int32  
 2   Duration  5851 non-null   int32  
 3   Genre     5851 non-null   object 
 4   Rating    5851 non-null   float64
 5   Votes     5851 non-null   int32  
 6   Director  5851 non-null   object 
 7   Actor 1   5851 non-null   object 
dtypes: float64(1), int32(3), object(4)
memory usage: 342.8+ KB
```

In [21]:
```
plt.figure(figsize=(20, 10))

year_counts = df['Year'].value_counts().sort_index()
years = year_counts.index

plt.plot(years, year_counts, marker='o' )

plt.title('Number of Movies Per Year')
plt.xlabel('Year')
plt.ylabel('Number of Movies')


plt.show()
```



In [14]:
```
label = df["Genre"].value_counts().index
sizes = df["Genre"].value_counts()
plt.figure(figsize = (10,10))
plt.pie(sizes, labels= label, startangle = 0 , shadow = False , autopct='%1
plt.show()
```



In [15]:
```
px.scatter(df,x='Rating',y='Votes',color='Rating',color_continuous_scale=px
```

In [ ]:
```
```

In [17]:
```
genre_mean_rating = df.groupby('Genre')['Rating'].transform('mean')
df['Genre_mean_rating'] = genre_mean_rating
```

In [18]:
```
df['Director_encoded'] = df.groupby('Director')['Rating'].transform('mean')
df['Actor_encoded'] = df.groupby('Actor 1')['Rating'].transform('mean')

# Define the features and target variable
features = ['Year', 'Votes', 'Duration', 'Genre_mean_rating', 'Director_enc
X = df[features]
y = df['Rating']

# Split the data into training and test sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, ra

# Initialize and train a Linear Regression model
lr = LinearRegression()
lr.fit(X_train, y_train)

# Make predictions on the test set
y_pred = lr.predict(X_test)

# Evaluate the model
mse = mean_squared_error(y_test, y_pred)
mae = mean_absolute_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)

# Print the evaluation metrics
print(f"Mean Squared Error: {mse:.4f}")
print(f"Mean Absolute Error: {mae:.4f}")
print(f"R2 Score: {r2:.4f}")
```

```
Mean Squared Error: 0.5138
Mean Absolute Error: 0.5127
R2 Score: 0.7238
```

In [ ]:
```

```