## Python Project - Correlation in Python

In this project I will be working in Python to find correlations between variables.

Project dataset used kaggle Movie Industry

```
# Importing libarires

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

# Jupyter magic command (only works in Jupyter)
%matplotlib inline

# Set plot style and figure size
plt.style.use('ggplot')
plt.rcParams['figure.figsize'] = (12, 8)

# adjusts the configurataion of thr plots we will create
```

```
# Read the data

df = pd.read_csv (r"C:\Users\shaik\OneDrive\Desktop\Project complted\Project 4 -Python Project\movies.csv")
```

```
# let's look at the data


df = df[sorted(df.columns)]
df.head()
```

| | budget | company | country | director | genre | gross | name | rating | released | runtime | score | star | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 19000000.0 | Warner Bros. | United Kingdom | Stanley Kubrick | Drama | 46998772.0 | The Shining | R | June 13, 1980 (United States) | 146.0 | 8.4 | Jack Nicholson | 927 |
| **1** | 4500000.0 | Columbia Pictures | United States | Randal Kleiser | Adventure | 58853106.0 | The Blue Lagoon | R | July 2, 1980 (United States) | 104.0 | 5.8 | Brooke Shields | 65 |
| **2** | 18000000.0 | Lucasfilm | United States | Irvin Kershner | Action | 538375067.0 | Star Wars: Episode V - The Empire Strikes Back | PG | June 20, 1980 (United States) | 124.0 | 8.7 | Mark Hamill | 1200 |

```
# let see if we have missing data

df.isnull().sum()
```

```
budget      2171
company       17
country        3
director       0
genre          0
gross        189
name           0
rating        77
released       2
runtime        4
score          3
star           1
votes          3
writer         3
year           0
dtype: int64
```

```
df = df.dropna(subset=['runtime', 'company', 'released', 'score', 'votes', 'writer', 'star', 'country'])
```

```
df['budget'] = df['budget'].fillna(df['budget'].mean())
df['gross'] = df['gross'].fillna(df['gross'].mean())
```

```
df['rating'] = df['rating'].fillna(df['rating'].mode()[0])
```

```
df.dtypes
```

```
budget      float64
company      object
country      object
director     object
genre        object
gross       float64
name         object
rating       object
released     object
runtime     float64
score       float64
star         object
votes       float64
writer       object
year          int64
dtype: object
```

```
# changing data type
df['budget'] = df['budget'].astype('int64')
df['gross'] = df['gross'].astype('int64')
```

```
df.dtypes
```

```
budget        int64
company      object
country      object
director     object
genre        object
gross         int64
name         object
rating       object
released     object
runtime     float64
score       float64
star         object
votes       float64
writer       object
year          int64
dtype: object
```

```
df['released']
```

```
0          June 13, 1980 (United States)
1           July 2, 1980 (United States)
2          June 20, 1980 (United States)
3           July 2, 1980 (United States)
4          July 25, 1980 (United States)
                       ...
7658    February 7, 2020 (United States)
7659       March 3, 2020 (United States)
7660    November 5, 2020 (United States)
7664    February 7, 2020 (United States)
7667     August 19, 2020 (United States)
Name: released, Length: 7643, dtype: object
```

```
# Step 1: Remove the country part
df['released_clean'] = df['released'].str.replace(r"\s*\(.*\)", "", regex=True)
df = df.drop(columns =['released'])
df = df.rename(columns={'released_clean': 'released'})
```

```
df.head()
```

| | budget | company | country | director | genre | gross | name | rating | runtime | score | star | votes | writ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 19000000 | Warner Bros. | United Kingdom | Stanley Kubrick | Drama | 46998772 | The Shining | R | 146.0 | 8.4 | Jack Nicholson | 927000.0 | Steph Ki |
| **1** | 4500000 | Columbia Pictures | United States | Randal Kleiser | Adventure | 58853106 | The Blue Lagoon | R | 104.0 | 5.8 | Brooke Shields | 65000.0 | Henry I Ve Stacpoo |
| **2** | 18000000 | Lucasfilm | United States | Irvin Kershner | Action | 538375067 | Star Wars: Episode V - The Empire Strikes Back | PG | 124.0 | 8.7 | Mark Hamill | 1200000.0 | Lei Brack |
| **3** | 3500000 | Paramount Pictures | United States | Jim Abrahams | Comedy | 83453539 | Airplane! | PG | 88.0 | 7.7 | Robert Hays | 221000.0 | J Abrahar |

```
#create correct year column
df['year_correct'] = df['released'].astype(str).str[-4:]
```

```
#df = df.sort_values(by=['gross'], inplace=False, ascending=False)
```

```
#df = df[sorted(df.columns)]
```

```
df.head()
```

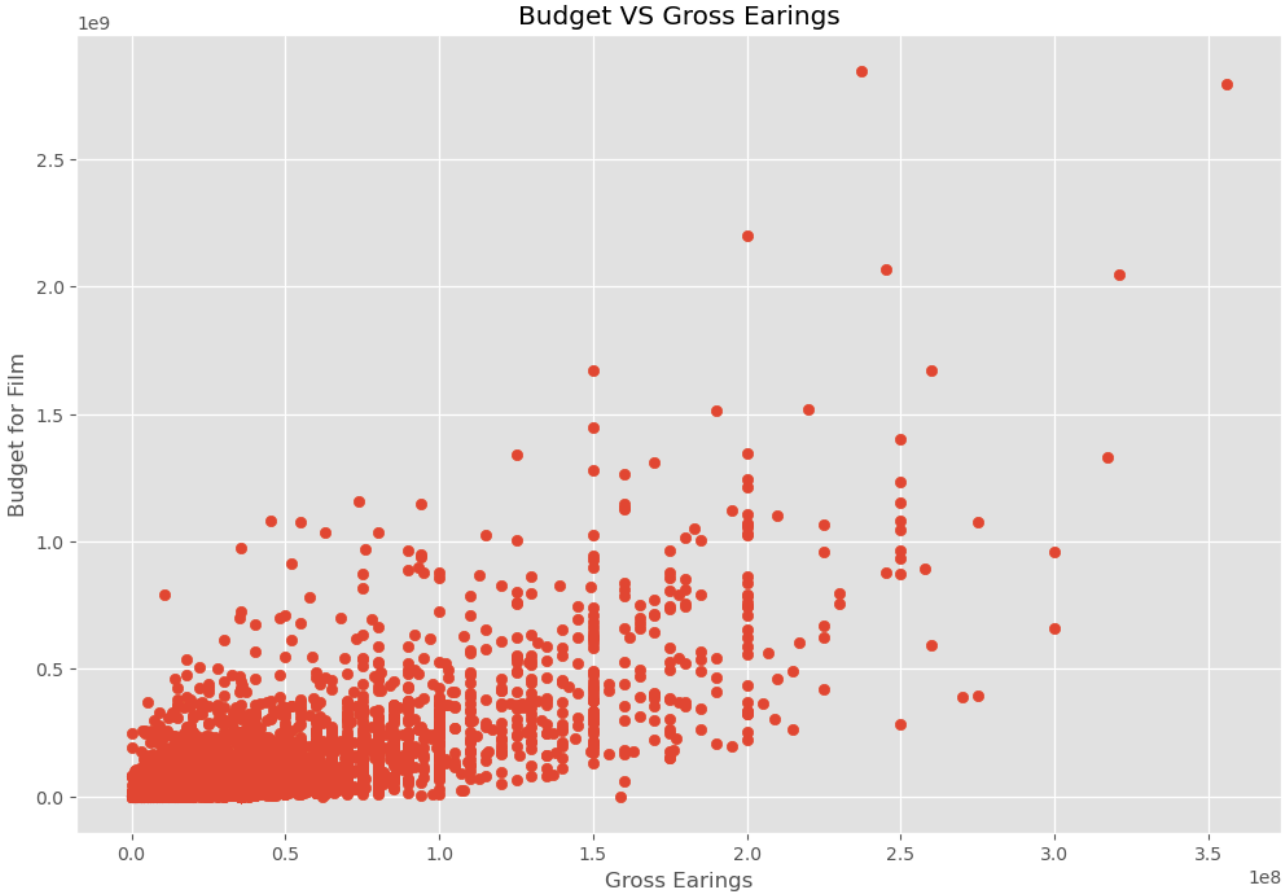
| | budget | company | country | director | genre | gross | name | rating | runtime | score | star | votes | writ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 19000000 | Warner Bros. | United Kingdom | Stanley Kubrick | Drama | 46998772 | The Shining | R | 146.0 | 8.4 | Jack Nicholson | 927000.0 | Steph Ki |
| **1** | 4500000 | Columbia Pictures | United States | Randal Kleiser | Adventure | 58853106 | The Blue Lagoon | R | 104.0 | 5.8 | Brooke Shields | 65000.0 | Henry I Ve Stacpoo |
| **2** | 18000000 | Lucasfilm | United States | Irvin Kershner | Action | 538375067 | Star Wars: Episode V - The Empire Strikes Back | PG | 124.0 | 8.7 | Mark Hamill | 1200000.0 | Lei Brack |
| **3** | 3500000 | Paramount Pictures | United States | Jim Abrahams | Comedy | 83453539 | Airplane! | PG | 88.0 | 7.7 | Robert Hays | 221000.0 | J Abrahar |
| | | Orion | United | Harold | | | | | | | Chevy | | Bri |

```
#pd.set_option('display.max_rows', None)
```

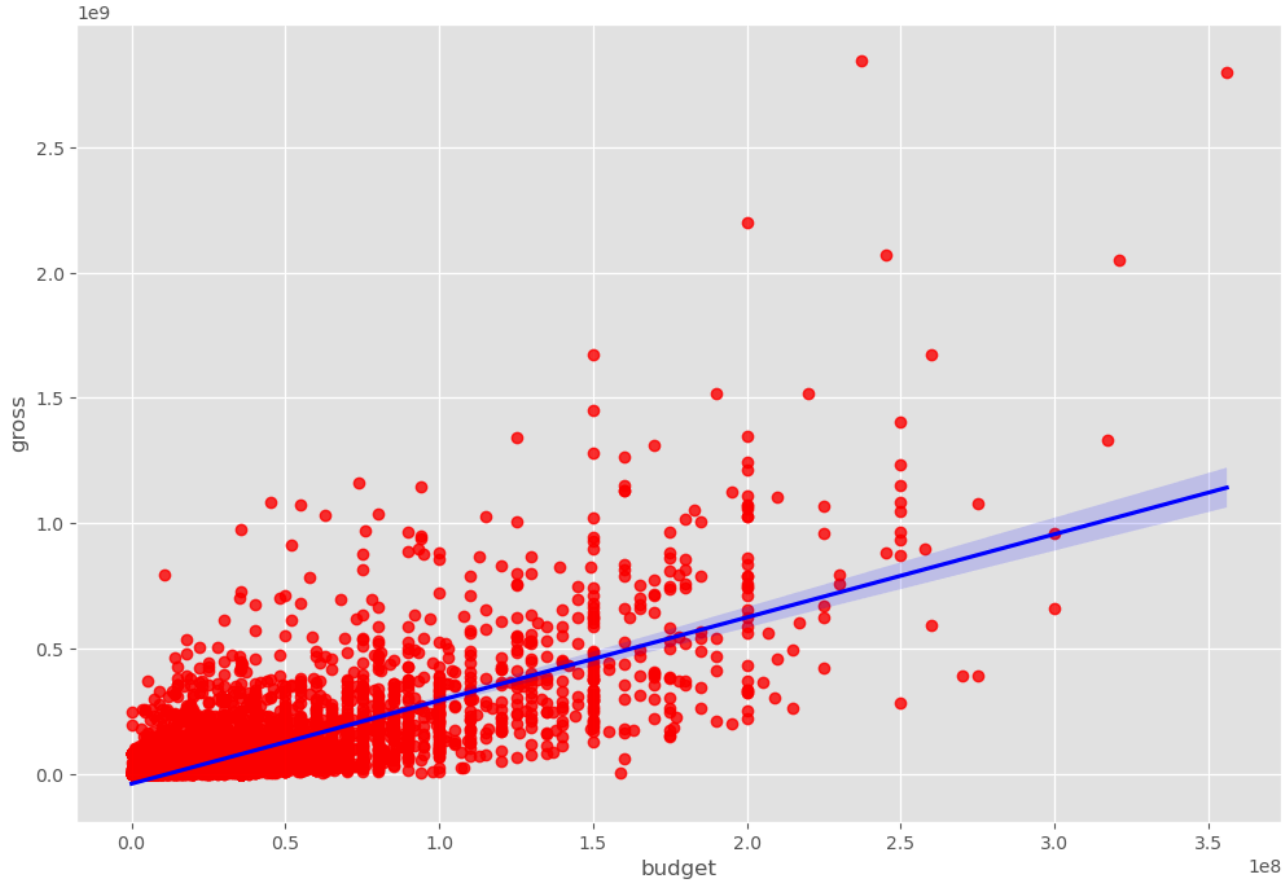
```
#df['company'].drop_duplicates().sort_values(ascending=False)
```

```
#budget hight correlation
# company will have a high correlation
# this is what i think look at the data
```

```
# Scatter plot with budget vs gross

plt.scatter(x=df['budget'], y=df['gross'])
plt.title('Budget VS Gross Earings')
plt.xlabel('Gross Earings')
plt.ylabel('Budget for Film')
plt.show()
```



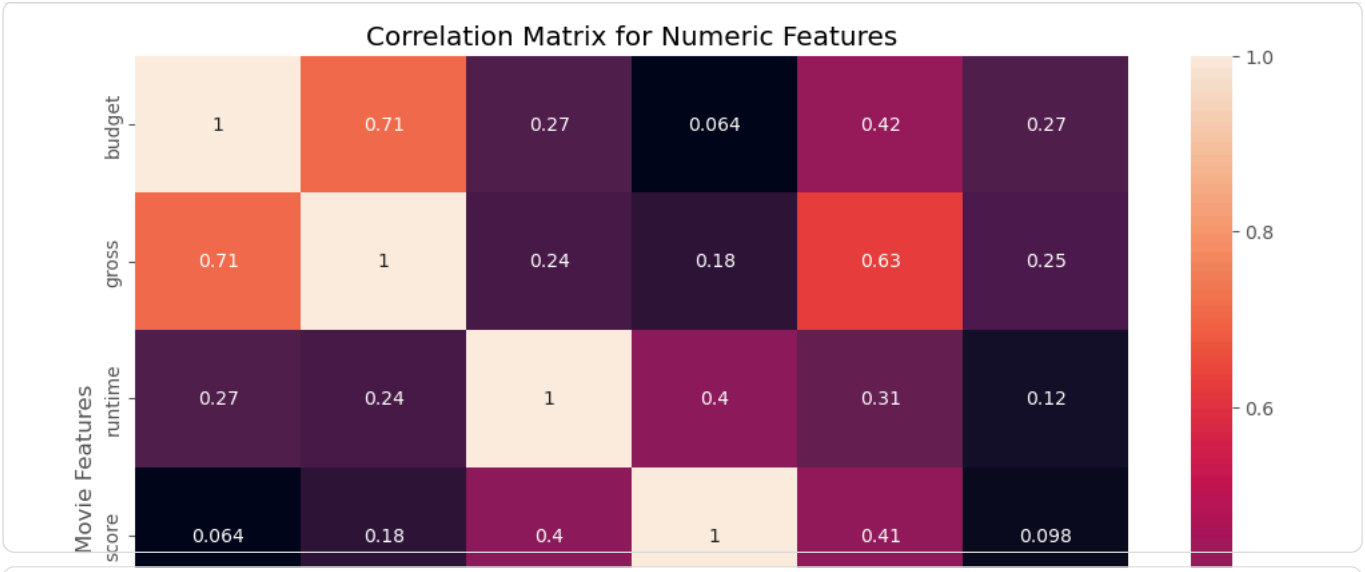

```
# plot budget vs gross using seaborn

sns.regplot(
    x='budget',
    y='gross',
    data=df,
    scatter_kws={"color": "red"},
    line_kws={"color": "blue"}
)
plt.show()
```




```
# lets look at correlation

#df.corr() # pearson, kendall, spearman
df.corr(numeric_only=True)
```

| | budget | gross | runtime | score | votes | year |
|---|---|---|---|---|---|---|
| **budget** | 1.000000 | 0.711538 | 0.265068 | 0.064176 | 0.420751 | 0.267135 |
| **gross** | 0.711538 | 1.000000 | 0.241290 | 0.182861 | 0.628735 | 0.252422 |
| **runtime** | 0.265068 | 0.241290 | 1.000000 | 0.399965 | 0.308907 | 0.119789 |
| **score** | 0.064176 | 0.182861 | 0.399965 | 1.000000 | 0.409432 | 0.098278 |
| **votes** | 0.420751 | 0.628735 | 0.308907 | 0.409432 | 1.000000 | 0.223353 |
| **year** | 0.267135 | 0.252422 | 0.119789 | 0.098278 | 0.223353 | 1.000000 |

```
correlation_matrix = df.corr(numeric_only=True)

sns.heatmap(correlation_matrix, annot=True)
plt.xlabel
plt.title('Correlation Matrix for Numeric Features')
plt.xlabel('Movie Features')
plt.ylabel('Movie Features')

plt.show()
```




```
# looks at company
df.head()
```

| | budget | company | country | director | genre | gross | name | rating | runtime | score | star | votes | writ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 19000000 | Warner Bros. | United Kingdom | Stanley Kubrick | Drama | 46998772 | The Shining | R | 146.0 | 8.4 | Jack Nicholson | 927000.0 | Steph Ki |
| 1 | 4500000 | Columbia Pictures | United States | Randal Kleiser | Adventure | 58853106 | The Blue Lagoon | R | 104.0 | 5.8 | Brooke Shields | 65000.0 | Henry D Ve Stacpoo |
| 2 | 18000000 | Lucasfilm | United States | Irvin Kershner | Action | 538375067 | Star Wars: Episode V - The Empire Strikes Back | PG | 124.0 | 8.7 | Mark Hamill | 1200000.0 | Lei Brack |
| 3 | 3500000 | Paramount Pictures | United States | Jim Abrahams | Comedy | 83453539 | Airplane! | PG | 88.0 | 7.7 | Robert Hays | 221000.0 | J Abrahar |
| | | Orion | United | Harold | | | | | | | Chevy | | Bri |

```
# converting object to int
df_numerized = df
for col_name in df_numerized.columns:
    if(df_numerized[col_name].dtype == 'object'):
        df_numerized[col_name] = df_numerized[col_name].astype('category')
        df_numerized[col_name] = df_numerized[col_name].cat.codes
df_numerized
```

| | budget | company | country | director | genre | gross | name | rating | runtime | score | star | votes | writer | year | relea |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 19000000 | 2312 | 54 | 2577 | 6 | 46998772 | 6566 | 6 | 146.0 | 8.4 | 1041 | 927000.0 | 3999 | 1980 | 1 |
| **1** | 4500000 | 727 | 55 | 2260 | 1 | 58853106 | 5555 | 6 | 104.0 | 5.8 | 325 | 65000.0 | 1628 | 1980 | 1 |
| **2** | 18000000 | 1533 | 55 | 1109 | 0 | 538375067 | 5126 | 4 | 124.0 | 8.7 | 1737 | 1200000.0 | 2558 | 1980 | 1 |
| **3** | 3500000 | 1805 | 55 | 1297 | 4 | 83453539 | 285 | 4 | 88.0 | 7.7 | 2236 | 221000.0 | 1994 | 1980 | 1 |
| **4** | 6000000 | 1770 | 55 | 1052 | 4 | 39846344 | 1026 | 6 | 98.0 | 7.3 | 408 | 108000.0 | 518 | 1980 | 1 |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| **7658** | 5000 | 1741 | 55 | 1761 | 6 | 78614324 | 797 | 6 | 78.0 | 6.6 | 527 | 35.0 | 1065 | 2020 | |
| **7659** | 35651716 | 1985 | 55 | 1605 | 9 | 13266 | 2648 | 3 | 87.0 | 3.4 | 1526 | 447.0 | 2457 | 2020 | 1 |
| **7660** | 35651716 | 83 | 55 | 2579 | 4 | 78614324 | 337 | 6 | 90.0 | 7.1 | 194 | 14.0 | 3976 | 2020 | 2 |
| **7664** | 35651716 | 535 | 55 | 773 | 4 | 78614324 | 1676 | 6 | 90.0 | 4.7 | 1878 | 36.0 | 2605 | 2020 | |
| **7667** | 35651716 | 1780 | 44 | 2156 | 9 | 78614324 | 5376 | 6 | 102.0 | 5.7 | 2452 | 7.0 | 3330 | 2020 | |

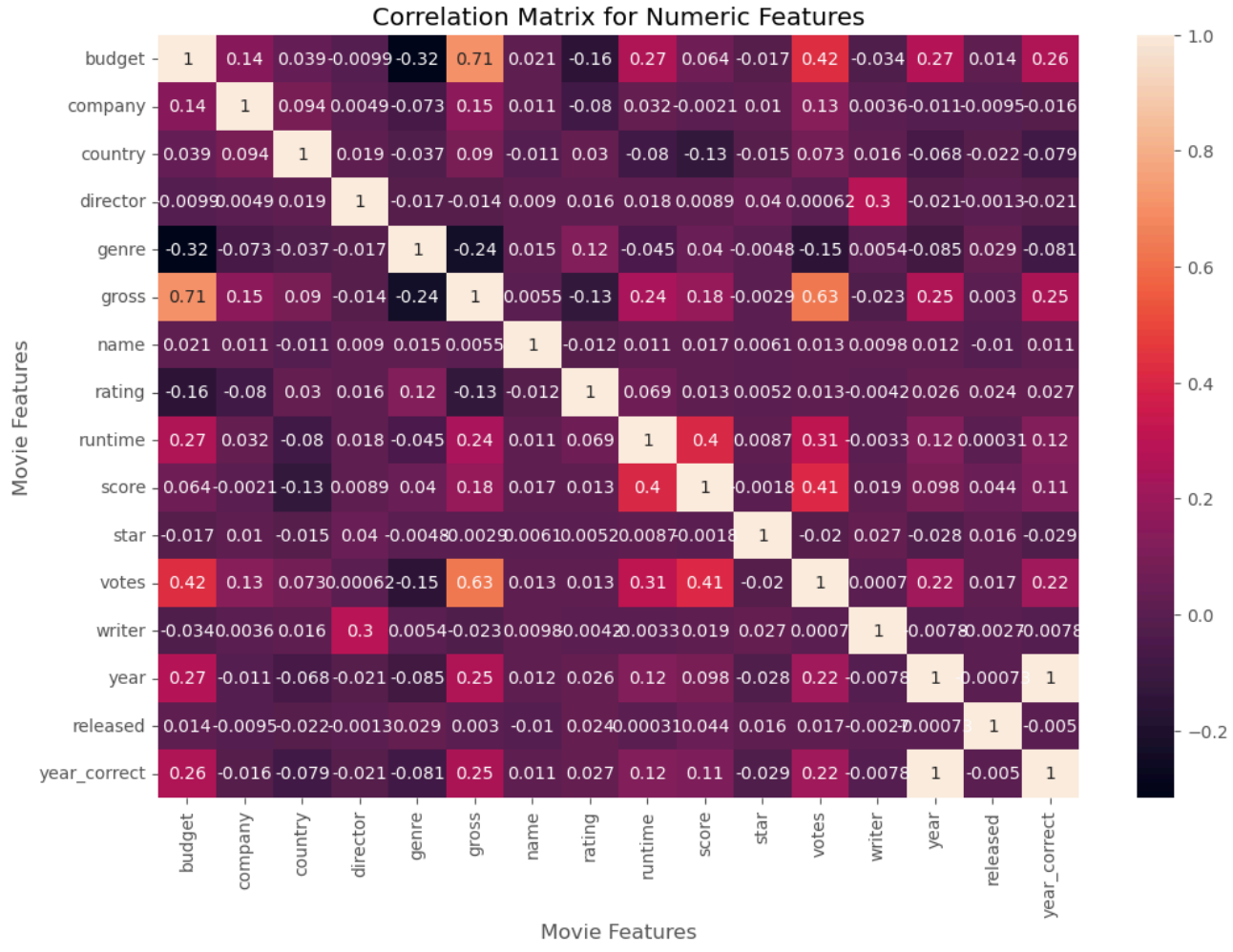
7643 rows × 16 columns

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 7643 entries, 0 to 7667
Data columns (total 16 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   budget        7643 non-null   int64
```

```
 1   company       7643 non-null   int16
 2   country       7643 non-null   int8
 3   director      7643 non-null   int16
 4   genre         7643 non-null   int8
 5   gross         7643 non-null   int64
 6   name          7643 non-null   int16
 7   rating        7643 non-null   int8
 8   runtime       7643 non-null   float64
 9   score         7643 non-null   float64
 10  star          7643 non-null   int16
 11  votes         7643 non-null   float64
 12  writer        7643 non-null   int16
 13  year          7643 non-null   int64
 14  released      7643 non-null   int16
 15  year_correct  7643 non-null   int8
dtypes: float64(3), int16(6), int64(3), int8(4)
memory usage: 537.4 KB
```

```
correlation_matrix = df_numerized.corr(numeric_only=True)

sns.heatmap(correlation_matrix, annot=True)
plt.xlabel
plt.title('Correlation Matrix for Numeric Features')
plt.xlabel('Movie Features')
plt.ylabel('Movie Features')

plt.show()
```




```
df_numerized.corr()
```

| | budget | company | country | director | genre | gross | name | rating | runtime | score | star | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **budget** | 1.000000 | 0.143732 | 0.038695 | -0.009921 | -0.315621 | 0.711538 | 0.020787 | -0.156808 | 0.265068 | 0.064176 | -0.017418 | 0.4 |
| **company** | 0.143732 | 1.000000 | 0.093813 | 0.004879 | -0.072765 | 0.152373 | 0.010557 | -0.080289 | 0.031965 | -0.002070 | 0.010235 | 0.1 |
| **country** | 0.038695 | 0.093813 | 1.000000 | 0.019410 | -0.036919 | 0.090476 | -0.011042 | 0.030110 | -0.080025 | -0.133115 | -0.014582 | 0.0 |
| **director** | -0.009921 | 0.004879 | 0.019410 | 1.000000 | -0.016630 | -0.014389 | 0.008970 | 0.016048 | 0.017980 | 0.008872 | 0.039811 | 0.0 |
| **genre** | -0.315621 | -0.072765 | -0.036919 | -0.016630 | 1.000000 | -0.237932 | 0.015231 | 0.120671 | -0.045087 | 0.039793 | -0.004816 | -0.1 |
| **gross** | 0.711538 | 0.152373 | 0.090476 | -0.014389 | -0.237932 | 1.000000 | 0.005513 | -0.130516 | 0.241290 | 0.182861 | -0.002937 | 0.6 |
| **name** | 0.020787 | 0.010557 | -0.011042 | 0.008970 | 0.015231 | 0.005513 | 1.000000 | -0.012432 | 0.010673 | 0.016603 | 0.006140 | 0.0 |
| **rating** | -0.156808 | -0.080289 | 0.030110 | 0.016048 | 0.120671 | -0.130516 | -0.012432 | 1.000000 | 0.068676 | 0.013400 | 0.005230 | 0.0 |
| **runtime** | 0.265068 | 0.031965 | -0.080025 | 0.017980 | -0.045087 | 0.241290 | 0.010673 | 0.068676 | 1.000000 | 0.399965 | 0.008732 | 0.3 |
| **score** | 0.064176 | -0.002070 | -0.133115 | 0.008872 | 0.039793 | 0.182861 | 0.016603 | 0.013400 | 0.399965 | 1.000000 | -0.001797 | 0.4 |
| **released** | 0.014326 | -0.009460 | -0.021793 | -0.001343 | 0.029310 | 0.003005 | -0.010381 | 0.023619 | 0.000305 | 0.043849 | 0.016486 | 0.0 |
| **year_correct** | 0.261050 | -0.015863 | -0.079083 | -0.021014 | -0.080926 | 0.245780 | 0.011333 | 0.026699 | 0.119595 | 0.106108 | -0.028759 | 0.2 |

```
correlation_mat = df_numerized.corr()

corr_pairs= correlation_mat.unstack()

corr_pairs
```

```
budget        budget          1.000000
              company         0.143732
              country         0.038695
              director       -0.009921
              genre          -0.315621
                                ...
year_correct  votes           0.218802
              writer         -0.007840
              year            0.997401
              released       -0.005010
              year_correct    1.000000
Length: 256, dtype: float64
```

```
sorted_pairs = corr_pairs.sort_values()
```