In [19]:
```
import pandas as pd
import numpy as np
import seaborn as sns
from matplotlib import pyplot as plt
import plotly.graph_objects as go
import plotly.express as px
from collections import namedtuple
from IPython.display import display
```

In [36]:
```
df = pd.read_csv(r'C:\Users\hp\Desktop\CodSoft\movie.csv', encoding='latin1')
df.head()
```

Out[36]:

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

In [37]:
```
print('INFO:',"\n")
print(df.info(),"\n\n\n\n\n")
print('summary of the dataframe:',"\n",df.describe,"\n\n\n\n\n")
print('nunique:',"\n",df['Genre'].nunique(),"\n\n\n\n\n")
print('unique:',"\n",df['Year'].unique(),"\n\n\n\n\n")
print('Rating.unique:',"\n",df.Rating.unique(),"\n\n\n\n\n")
print('unique:',"\n",df['Duration'].unique(),"\n\n\n\n\n")
print("groupby(['Genre']':","\n",df.groupby(['Genre']).count(),"\n\n\n\n\n")
print("value_counts:","\n",df["Director"].value_counts().head(6),"\n\n\n\n\n")
print('isnull().any():',"\n",df.isnull().any(),"\n\n\n\n\n")
```

```
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
None
```

```
summary of the dataframe:
 <bound method NDFrame.describe of                                      Name    Year
Duration            Genre  \
0                                          NaN      NaN            Drama
1      #Gadhvi (He thought he was Gandhi)  (2019)  109 min            Drama
2                            #Homecoming  (2021)   90 min   Drama, Musical
3                                #Yaaram  (2019)  110 min  Comedy, Romance
4                      ...And Once Again  (2010)  105 min            Drama
...                                  ...     ...      ...              ...
15504                Zulm Ko Jala Doonga  (1988)      NaN           Action
15505                             Zulmi  (1999)  129 min    Action, Drama
15506                         Zulmi Raj  (2005)      NaN           Action
15507                     Zulmi Shikari  (1988)      NaN           Action
15508                       Zulm-O-Sitam  (1998)  130 min    Action, Drama

       Rating Votes            Director           Actor 1             Actor 2  \
0         NaN   NaN       J.S. Randhawa          Manmauji              Birbal
1         7.0     8       Gaurav Bakshi      Rasika Dugal      Vivek Ghamande
2         NaN   NaN  Soumyajit Majumdar      Sayani Gupta   Plabita Borthakur
3         4.4    35          Ovais Khan           Prateik          Ishita Raj
4         NaN   NaN        Amol Palekar      Rajat Kapoor  Rituparna Sengupta
...       ...   ...                 ...               ...                 ...
15504     4.6    11       Mahendra Shah  Naseeruddin Shah       Sumeet Saigal
15505     4.5   655          Kuku Kohli      Akshay Kumar      Twinkle Khanna
15506     NaN   NaN          Kiran Thej   Sangeeta Tiwari                 NaN
15507     NaN   NaN                 NaN               NaN                 NaN
15508     6.2    20        K.C. Bokadia        Dharmendra          Jaya Prada

               Actor 3
0      Rajendra Bhatia
1        Arvind Jangid
2           Roy Angana
3      Siddhant Kapoor
4          Antara Mali
...                ...
```

```
15504    Suparna Anand
15505      Aruna Irani
15506              NaN
15507              NaN
15508      Arjun Sarja

[15509 rows x 10 columns]>
```

```
nunique:
 485
```

```
unique:
 [nan '(2019)' '(2021)' '(2010)' '(1997)' '(2005)' '(2008)' '(2012)'
 '(2014)' '(2004)' '(2016)' '(1991)' '(1990)' '(2018)' '(1987)' '(1948)'
 '(1958)' '(2017)' '(2020)' '(2009)' '(2002)' '(1993)' '(1946)' '(1994)'
 '(2007)' '(2013)' '(2003)' '(1998)' '(1979)' '(1951)' '(1956)' '(1974)'
 '(2015)' '(2006)' '(1981)' '(1985)' '(2011)' '(2001)' '(1967)' '(1988)'
 '(1995)' '(1959)' '(1996)' '(1970)' '(1976)' '(2000)' '(1999)' '(1973)'
 '(1968)' '(1943)' '(1953)' '(1986)' '(1983)' '(1989)' '(1982)' '(1977)'
 '(1957)' '(1950)' '(1992)' '(1969)' '(1975)' '(1947)' '(1972)' '(1971)'
 '(1935)' '(1978)' '(1960)' '(1944)' '(1963)' '(1940)' '(1984)' '(1934)'
 '(1955)' '(1936)' '(1980)' '(1966)' '(1949)' '(1962)' '(1964)' '(1952)'
 '(1933)' '(1942)' '(1939)' '(1954)' '(1945)' '(1961)' '(1965)' '(1938)'
 '(1941)' '(1931)' '(1937)' '(2022)' '(1932)' '(1923)' '(1915)' '(1928)'
 '(1922)' '(1917)' '(1913)' '(1930)' '(1926)' '(1914)' '(1924)']
```

```
Rating.unique:
 [ nan  7.   4.4  4.7  7.4  5.6  4.   6.2  5.9  6.5  5.7  6.3  7.2  6.6
  7.3  7.1  6.9  3.5  5.   4.5  6.4  4.1  4.8  8.1  5.5  6.8  6.1  7.7
  5.1  7.6  3.1  3.3  7.8  8.4  5.2  4.3  5.8  4.6  7.5  6.7  3.6  3.9
  5.4  4.2  5.3  3.4  3.   8.   6.   3.8  7.9  2.7  4.9  2.4  3.7  3.2
  2.5  2.8  2.6  2.9  8.2  8.7  8.3  9.3  8.8  2.1  2.3  8.5  8.6  9.
  9.6  1.7  9.1  2.   1.4  8.9  1.9  9.4  9.7  1.8  9.2  1.6 10.   2.2
  1.1]
```

```
unique:
 [nan '109 min' '90 min' '110 min' '105 min' '147 min' '142 min' '59 min'
 '82 min' '116 min' '96 min' '120 min' '161 min' '166 min' '102 min'
 '87 min' '132 min' '66 min' '146 min' '112 min' '168 min' '158 min'
 '126 min' '94 min' '138 min' '124 min' '144 min' '157 min' '136 min'
 '107 min' '113 min' '80 min' '122 min' '149 min' '148 min' '130 min'
 '121 min' '188 min' '115 min' '103 min' '114 min' '170 min' '100 min'
 '99 min' '140 min' '128 min' '93 min' '125 min' '145 min' '75 min'
 '111 min' '134 min' '85 min' '104 min' '92 min' '137 min' '127 min'
```

```
 '150 min' '119 min' '135 min' '86 min' '76 min' '70 min' '72 min'
 '151 min' '95 min' '52 min' '89 min' '143 min' '177 min' '117 min'
 '123 min' '154 min' '88 min' '175 min' '153 min' '78 min' '139 min'
 '133 min' '101 min' '180 min' '60 min' '46 min' '164 min' '162 min'
 '171 min' '160 min' '152 min' '62 min' '163 min' '165 min' '141 min'
 '210 min' '129 min' '156 min' '240 min' '172 min' '155 min' '118 min'
 '167 min' '106 min' '193 min' '57 min' '108 min' '45 min' '195 min'
 '174 min' '81 min' '178 min' '58 min' '184 min' '97 min' '98 min'
 '131 min' '176 min' '169 min' '77 min' '91 min' '84 min' '173 min'
 '74 min' '67 min' '181 min' '300 min' '79 min' '65 min' '48 min'
 '183 min' '159 min' '83 min' '68 min' '49 min' '201 min' '64 min'
 '186 min' '50 min' '69 min' '207 min' '55 min' '61 min' '185 min'
 '187 min' '216 min' '63 min' '54 min' '198 min' '51 min' '71 min'
 '73 min' '218 min' '191 min' '321 min' '199 min' '53 min' '56 min'
 '179 min' '47 min' '206 min' '190 min' '211 min' '247 min' '213 min'
 '223 min' '2 min' '189 min' '224 min' '202 min' '255 min' '197 min'
 '182 min' '214 min' '208 min' '21 min' '200 min' '192 min' '37 min'
 '261 min' '238 min' '204 min' '235 min' '298 min' '217 min' '250 min']
```

```
groupby(['Genre']':
```

| Genre | Name | Year | Duration | Rating | Votes | Director |
|---|---|---|---|---|---|---|
| Action | 1289 | 1265 | 262 | 417 | 417 | 1249 |
| Action, Adventure | 41 | 41 | 17 | 24 | 24 | 41 |
| Action, Adventure, Biography | 1 | 1 | 1 | 1 | 1 | 1 |
| Action, Adventure, Comedy | 42 | 41 | 37 | 40 | 40 | 42 |
| Action, Adventure, Crime | 19 | 19 | 11 | 16 | 16 | 19 |
| ... | ... | ... | ... | ... | ... | ... |
| Thriller, Action | 2 | 2 | 1 | 1 | 1 | 2 |
| Thriller, Musical, Mystery | 1 | 1 | 1 | 1 | 1 | 1 |
| Thriller, Mystery | 3 | 3 | 2 | 3 | 3 | 3 |
| Thriller, Mystery, Family | 1 | 1 | 1 | 1 | 1 | 1 |
| War | 8 | 5 | 4 | 3 | 3 | 8 |

| Genre | Actor 1 | Actor 2 | Actor 3 |
|---|---|---|---|
| Action | 1207 | 1124 | 1005 |
| Action, Adventure | 40 | 39 | 39 |
| Action, Adventure, Biography | 1 | 1 | 1 |
| Action, Adventure, Comedy | 42 | 42 | 42 |
| Action, Adventure, Crime | 19 | 19 | 19 |
| ... | ... | ... | ... |
| Thriller, Action | 2 | 2 | 2 |
| Thriller, Musical, Mystery | 1 | 1 | 1 |
| Thriller, Mystery | 3 | 3 | 3 |
| Thriller, Mystery, Family | 1 | 1 | 1 |
| War | 8 | 7 | 7 |

```
[485 rows x 9 columns]
```

```
value_counts:
 Director
```

```
Jayant Desai       58
Kanti Shah         57
Babubhai Mistry    50
Mahesh Bhatt       48
Master Bhagwan     47
Nanabhai Bhatt     46
Name: count, dtype: int64
```

```
isnull().any():
 Name        False
Year         True
Duration     True
Genre        True
Rating       True
Votes        True
Director     True
Actor 1      True
Actor 2      True
Actor 3      True
dtype: bool
```

In [38]:
```
df['Duration'] = df['Duration'].str.replace('min', '').apply(pd.to_numeric)
df["Votes"] = df["Votes"].replace("$5.16M", 516)
df["Votes"] = pd.to_numeric(df['Votes'].str.replace(',', ''))

# Dropping null values
df.dropna(subset=['Year'], inplace=True)
df.dropna(subset=['Genre'], inplace=True)

# Replacing Null Values ....
df['Rating'].fillna(df['Rating'].mode().max(), inplace=True)
df['Duration'].fillna(df['Duration'].mean(), inplace=True)
df['Votes'].fillna(df['Votes'].mean(), inplace=True)
df.dropna(subset=['Director', 'Actor 1', 'Actor 2', 'Actor 3', 'Genre'], inplace=True)
```

In [39]:
```
#Checking Null Values again for confirmation.
print('Null Values in Year Column',df['Year'].isnull().sum())
print('Null Values in Genre Column',df['Genre'].isnull().sum())
```

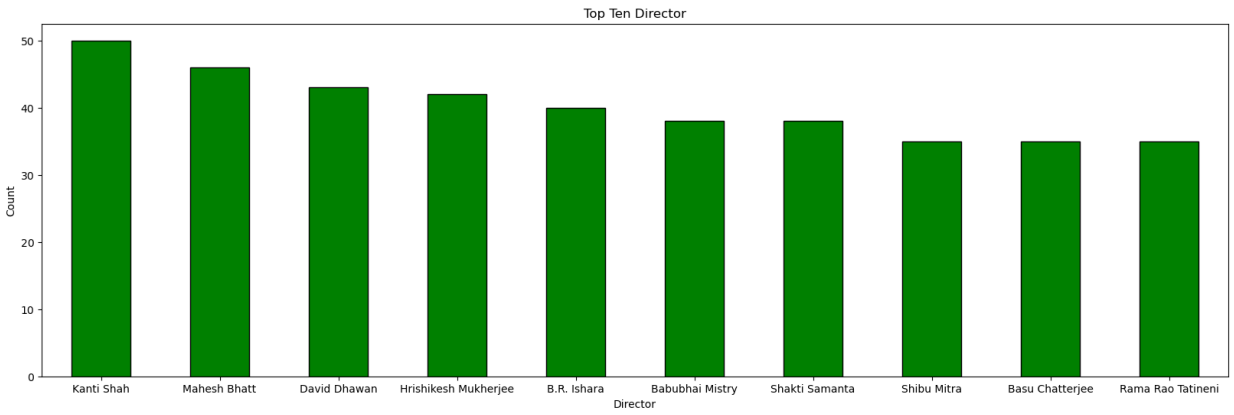
```
Null Values in Year Column 0
Null Values in Genre Column 0
```

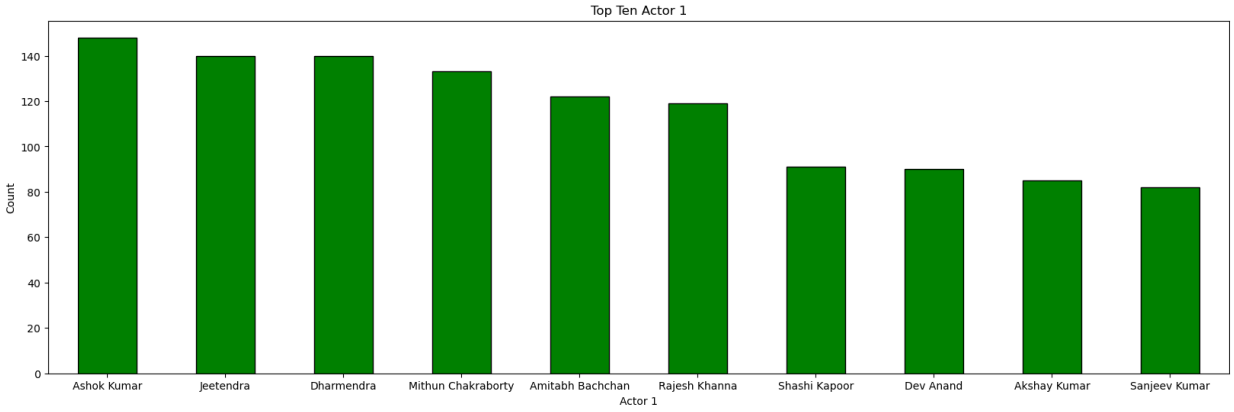
In [53]:
```
def Talents(column):
    global dfa
    df[column].value_counts().sort_values(ascending=False)[:10].plot(kind="bar", figsi
    plt.xticks(rotation=0)
    plt.title("Top Ten {}".format(column))
    plt.xlabel(column)
    plt.ylabel("Count")
    plt.show()
```

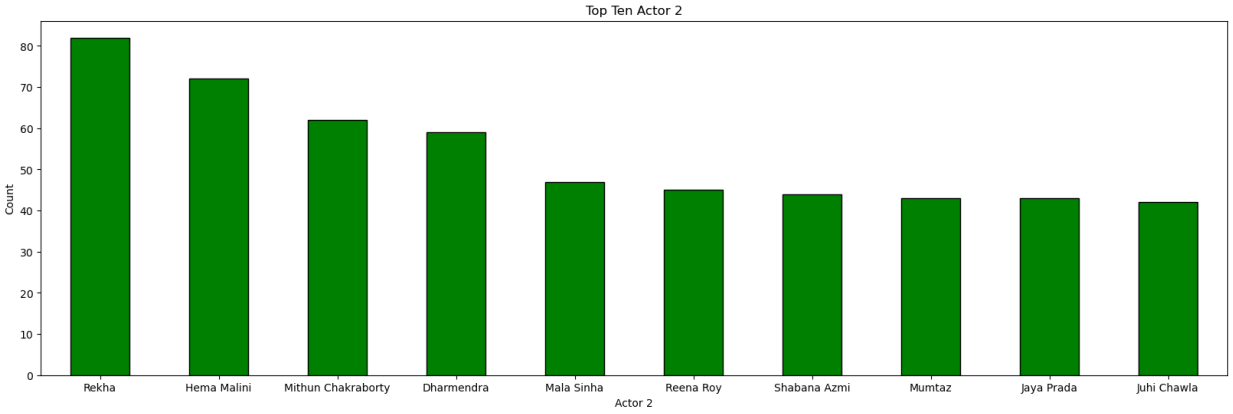
In [54]:
```
def Histo(column):
    global df
    plt.figure(figsize=(20,6))
    plt.hist(df[column], edgecolor="k",color="yellow")
    plt.xticks(rotation=0)
    plt.title("Histogram of {}".format(column))
    plt.xlabel(column)
    plt.ylabel("Frequency")
    plt.show()
```

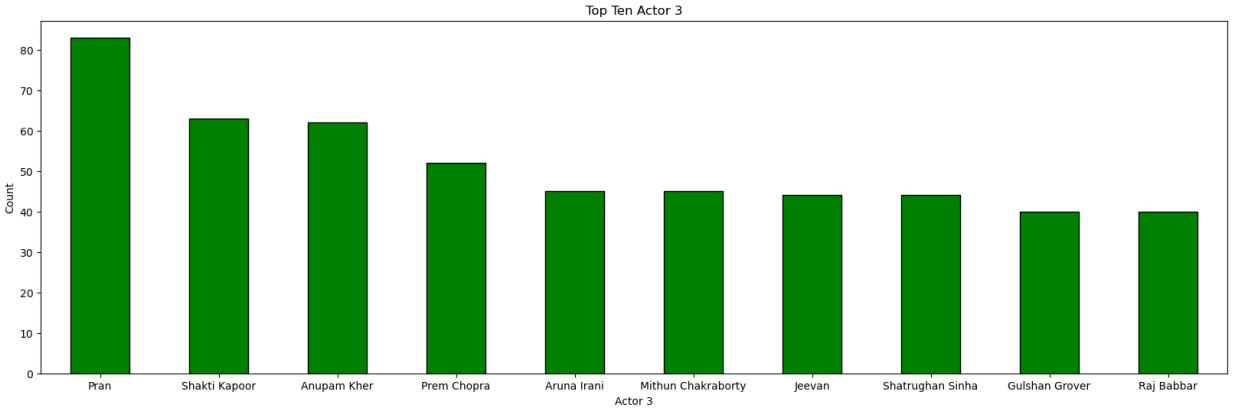
In [55]:
```
def Scatter(x, y, c=None):
    global df
    plt.figure(figsize=(20,6))
    plt.scatter(df[x], df[y], edgecolor="k", c=c ,color="Red")
    plt.xticks(rotation=0)
    plt.title("Scatter plot X:{} / Y:{}".format(x, y))
    plt.xlabel(x)
    plt.ylabel(y)
    plt.show()
```

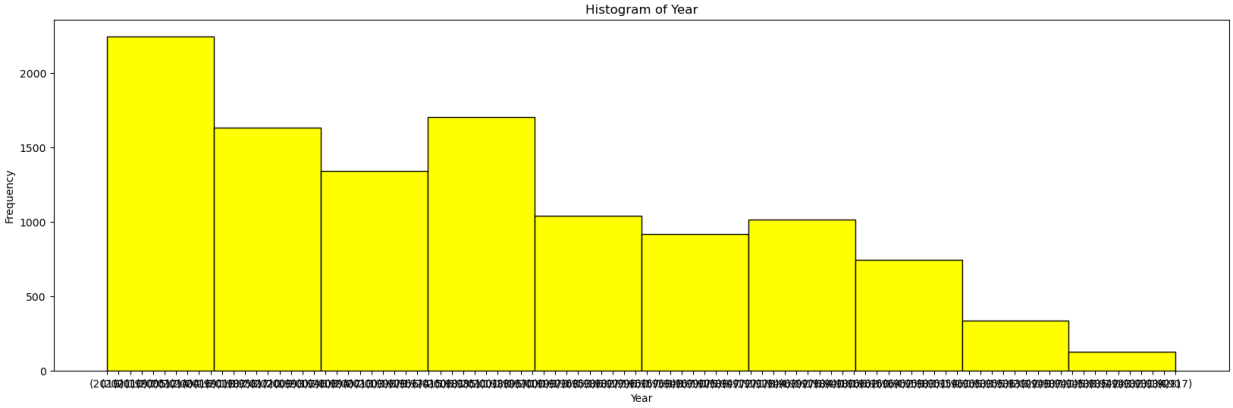
In [56]:
```
Talents("Director")
Talents("Actor 1")
Talents("Actor 2")
Talents("Actor 3")
Histo("Year")
Histo("Duration")
Histo("Votes")
Histo("Rating")
```

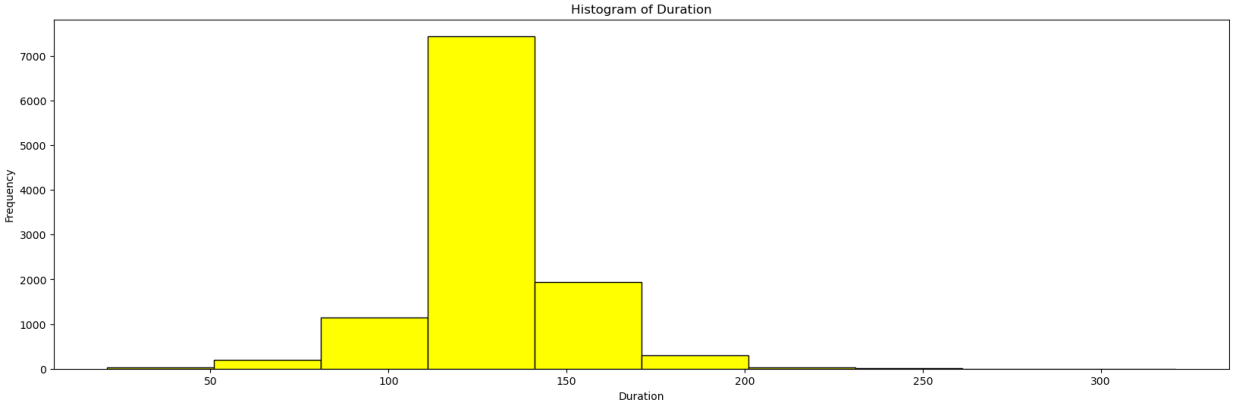


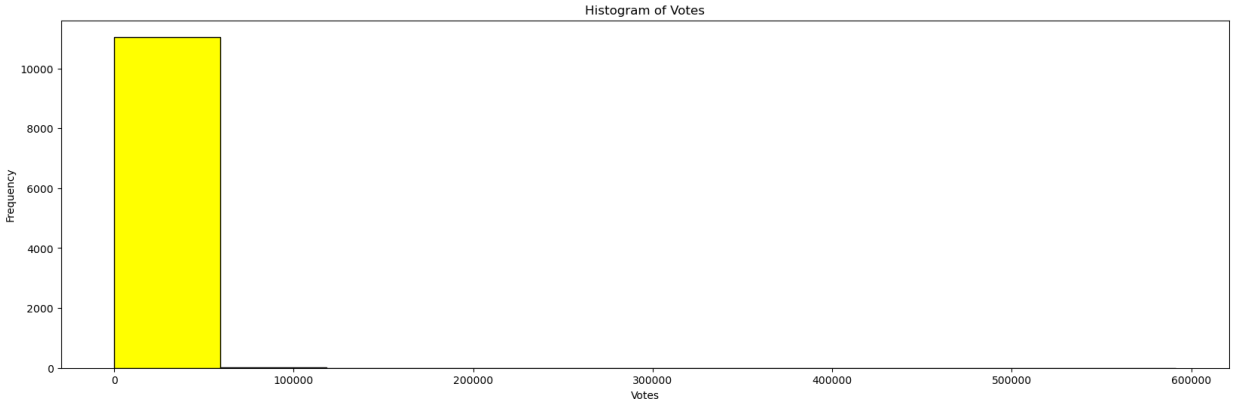



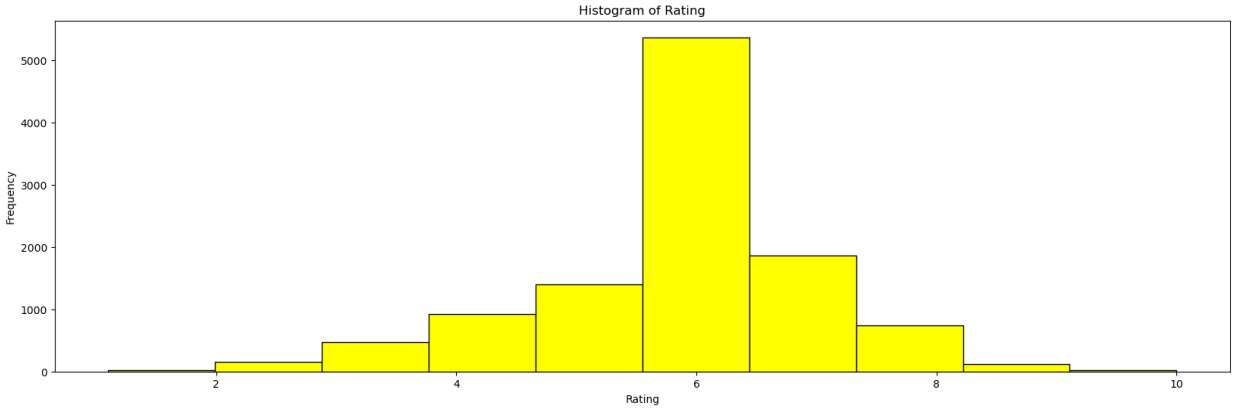

Top Ten Actor 2
Count
Rekha
Hema Malini
Mithun Chakraborty
Dharmendra
Mala Sinha
Reena Roy
Shabana Azmi
Mumtaz
Jaya Prada
Juhi Chawla
Actor 2


Top Ten Actor 3
Count
Pran
Shakti Kapoor
Anupam Kher
Prem Chopra
Aruna Irani
Mithun Chakraborty
Jeevan
Shatrughan Sinha
Gulshan Grover
Raj Babbar
Actor 3


Histogram of Year
Frequency
Year


Histogram of Duration
Frequency
Duration

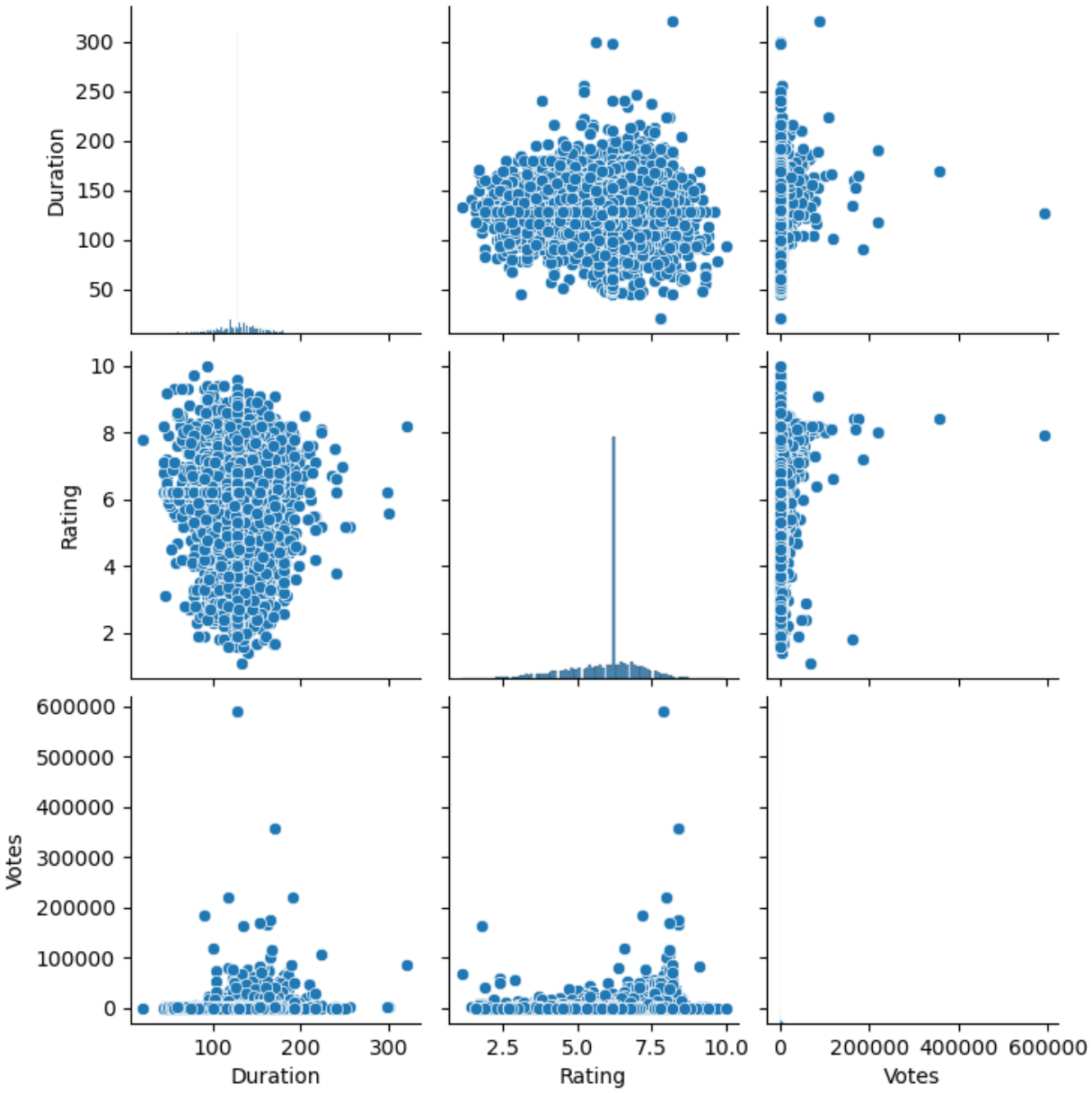



In [71]:
```
import seaborn as sns

sns.pairplot(df)
numeric_columns = df.select_dtypes(include=['float64', 'int64']).columns
correlation_matrix = df[numeric_columns].corr(method='spearman')
```

```
C:\Users\hp\anaconda3\Lib\site-packages\seaborn\axisgrid.py:118: UserWarning: The fig
ure layout has changed to tight
  self._figure.tight_layout(*args, **kwargs)
```




In [29]:
```
non_numeric_columns = df.select_dtypes(exclude=['float64', 'int64']).columns
print(non_numeric_columns)
```

```
Index(['Name', 'Year', 'Genre', 'Director', 'Actor 1', 'Actor 2', 'Actor 3'], dtype
='object')
```

In [30]:
```
numeric_columns = df.select_dtypes(include=['float64', 'int64']).columns
correlation_matrix = df[numeric_columns].corr(method='spearman')
print(df.columns)
```

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

In [31]:
```
df.dropna(subset=['Director', 'Actor 1', 'Actor 2', 'Actor 3', 'Genre'], inplace=True)
(round(df.isnull().sum()/df.isnull().count(), 4)*100).sort_values(ascending=False)
```

Out[31]:
```
Name        0.0
Year        0.0
Duration    0.0
Genre       0.0
Rating      0.0
Votes       0.0
Director    0.0
Actor 1     0.0
Actor 2     0.0
Actor 3     0.0
dtype: float64
```

In [32]:
```
print(df.columns)
```

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

In [33]:
```
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import mean_squared_error, mean_absolute_error, r2_score

# Assuming 'df' is your DataFrame

# Extracting the numeric part from the 'Year' column
df['Year'] = df['Year'].str.extract('(\d+)').astype(float)

# Encoding categorical variables based on mean ratings
actor1_encoding_map = df.groupby('Actor 1').agg({'Rating': 'mean'}).to_dict()['Rating'
actor2_encoding_map = df.groupby('Actor 2').agg({'Rating': 'mean'}).to_dict()['Rating'
actor3_encoding_map = df.groupby('Actor 3').agg({'Rating': 'mean'}).to_dict()['Rating'
director_encoding_map = df.groupby('Director').agg({'Rating': 'mean'}).to_dict()['Rati
genre_encoding_map = df.groupby('Genre').agg({'Rating': 'mean'}).to_dict()['Rating']

df['actor1_encoded'] = round(df['Actor 1'].map(actor1_encoding_map), 1)
df['actor2_encoded'] = round(df['Actor 2'].map(actor2_encoding_map), 1)
df['actor3_encoded'] = round(df['Actor 3'].map(actor3_encoding_map), 1)
df['director_encoded'] = round(df['Director'].map(director_encoding_map), 1)
df['genre_encoded'] = round(df['Genre'].map(genre_encoding_map), 1)

# Drop original categorical columns
df.drop(['Actor 1', 'Actor 2', 'Actor 3', 'Director', 'Genre'], axis=1, inplace=True)

# Define features and target variable
X = df[['Year', 'Duration', 'Votes', 'actor1_encoded', 'actor2_encoded', 'actor3_encoc
y = df['Rating']

# Split data into train and test sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=

# Model Building - Linear Regression
lr = LinearRegression()
lr.fit(X_train, y_train)
lr_pred = lr.predict(X_test)

# Model Building - Random Forest Regressor
rf = RandomForestRegressor()
```

```
rf.fit(X_train, y_train)
rf_pred = rf.predict(X_test)
```

In [34]:
```
# Evaluate Linear Regression
print('Linear Regression Metrics:')
print('Mean Squared Error:', mean_squared_error(y_test, lr_pred))
print('Mean Absolute Error:', mean_absolute_error(y_test, lr_pred))
print('R2 Score:', r2_score(y_test, lr_pred))

# Evaluate Random Forest Regressor
print('\nRandom Forest Regressor Metrics:')
print('Mean Squared Error:', mean_squared_error(y_test, rf_pred))
print('Mean Absolute Error:', mean_absolute_error(y_test, rf_pred))
print('R2 Score:', r2_score(y_test, rf_pred))
```

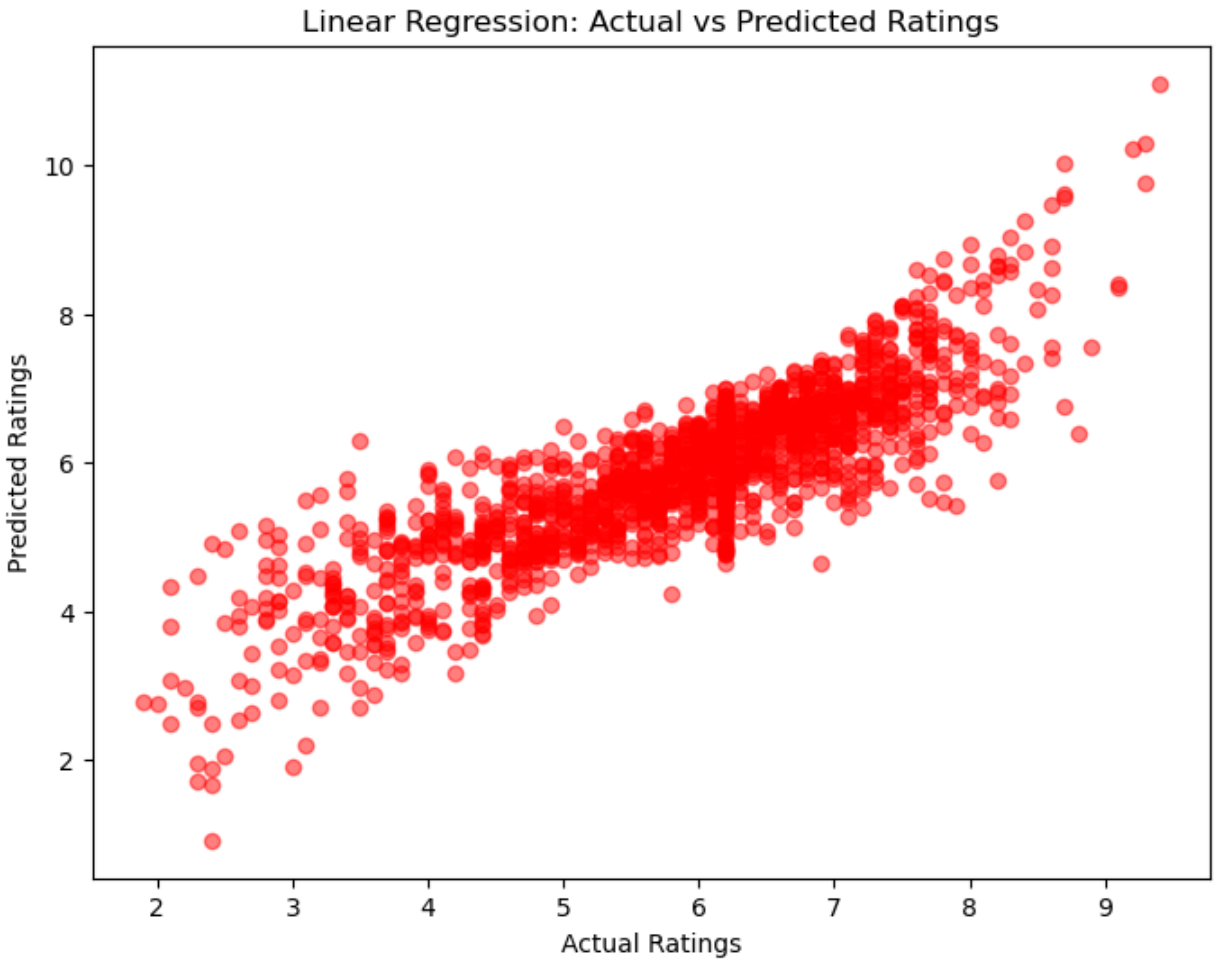
```
Linear Regression Metrics:
Mean Squared Error: 0.36662604478335015
Mean Absolute Error: 0.429982500634565
R2 Score: 0.7225086563365917

Random Forest Regressor Metrics:
Mean Squared Error: 0.26381437962128046
Mean Absolute Error: 0.30081605049594823
R2 Score: 0.8003245876268903
```

In [73]:
```
import matplotlib.pyplot as plt

# Scatter plot for Linear Regression predictions
plt.figure(figsize=(8, 6))
plt.scatter(y_test, lr_pred, alpha=0.5 , color='red')
plt.title('Linear Regression: Actual vs Predicted Ratings')
plt.xlabel('Actual Ratings')
plt.ylabel('Predicted Ratings')
plt.show()

# Scatter plot for Random Forest Regressor predictions
plt.figure(figsize=(8, 6))
plt.scatter(y_test, rf_pred, alpha=0.5 , color='purple')
plt.title('Random Forest Regressor: Actual vs Predicted Ratings')
plt.xlabel('Actual Ratings')
plt.ylabel('Predicted Ratings')
plt.show()
```


Linear Regression: Actual vs Predicted Ratings
Predicted Ratings
Actual Ratings
2
4
6
8
10
2
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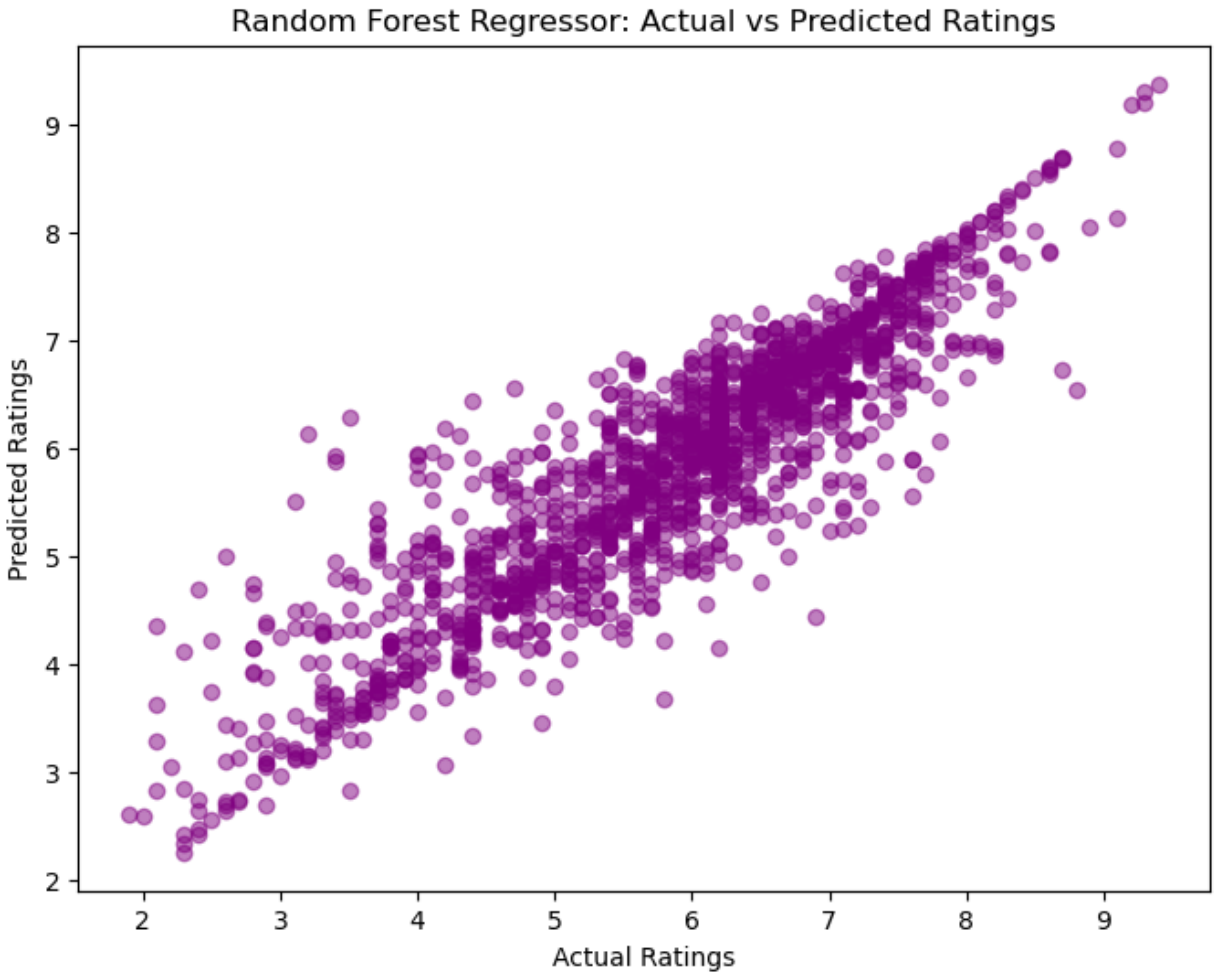
Random Forest Regressor: Actual vs Predicted Ratings
Predicted Ratings
Actual Ratings
2
3
4
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6
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In [ ]:

In [ ]: