In [1]:
```
pip install pandas numpy matplotlib seaborn scikit-learn nltk xgboost
```

```
Requirement already satisfied: pandas in c:\users\dileep  v\anaconda3\lib\site-packages (2.2.3)
Requirement already satisfied: numpy in c:\users\dileep  v\anaconda3\lib\site-packages (1.26.4)
Requirement already satisfied: matplotlib in c:\users\dileep  v\anaconda3\lib\site-packages (3.10.1)
Requirement already satisfied: seaborn in c:\users\dileep  v\anaconda3\lib\site-packages (0.13.2)
Requirement already satisfied: scikit-learn in c:\users\dileep  v\anaconda3\lib\site-packages (1.2.2)
Requirement already satisfied: nltk in c:\users\dileep  v\anaconda3\lib\site-packages (3.8.1)
Requirement already satisfied: xgboost in c:\users\dileep  v\anaconda3\lib\site-packages (3.0.0)
Requirement already satisfied: python-dateutil>=2.8.2 in c:\users\dileep  v\anaconda3\lib\site-packages (from pandas) (2.9.0.po
st0)
Requirement already satisfied: pytz>=2020.1 in c:\users\dileep  v\anaconda3\lib\site-packages (from pandas) (2025.2)
Requirement already satisfied: tzdata>=2022.7 in c:\users\dileep  v\anaconda3\lib\site-packages (from pandas) (2025.2)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\dileep  v\anaconda3\lib\site-packages (from matplotlib) (1.2.0)
Requirement already satisfied: cycler>=0.10 in c:\users\dileep  v\anaconda3\lib\site-packages (from matplotlib) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\dileep  v\anaconda3\lib\site-packages (from matplotlib) (4.25.0)
Requirement already satisfied: kiwisolver>=1.3.1 in c:\users\dileep  v\anaconda3\lib\site-packages (from matplotlib) (1.4.4)
Requirement already satisfied: packaging>=20.0 in c:\users\dileep  v\anaconda3\lib\site-packages (from matplotlib) (24.2)
Requirement already satisfied: pillow>=8 in c:\users\dileep  v\anaconda3\lib\site-packages (from matplotlib) (10.4.0)
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\dileep  v\anaconda3\lib\site-packages (from matplotlib) (3.0.9)
Requirement already satisfied: scipy>=1.3.2 in c:\users\dileep  v\anaconda3\lib\site-packages (from scikit-learn) (1.11.4)
Requirement already satisfied: joblib>=1.1.1 in c:\users\dileep  v\anaconda3\lib\site-packages (from scikit-learn) (1.2.0)
Requirement already satisfied: threadpoolctl>=2.0.0 in c:\users\dileep  v\anaconda3\lib\site-packages (from scikit-learn) (2.2.
0)
Requirement already satisfied: click in c:\users\dileep  v\anaconda3\lib\site-packages (from nltk) (8.1.8)
Requirement already satisfied: regex>=2021.8.3 in c:\users\dileep  v\anaconda3\lib\site-packages (from nltk) (2023.10.3)
Requirement already satisfied: tqdm in c:\users\dileep  v\anaconda3\lib\site-packages (from nltk) (4.65.0)
Requirement already satisfied: six>=1.5 in c:\users\dileep  v\anaconda3\lib\site-packages (from python-dateutil>=2.8.2->pandas)
(1.17.0)
Requirement already satisfied: colorama in c:\users\dileep  v\anaconda3\lib\site-packages (from click->nltk) (0.4.6)
Note: you may need to restart the kernel to use updated packages.
```

Importing libraries

In [2]:
```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import classification_report, confusion_matrix, accuracy_score

import nltk
import re
nltk.download('stopwords')
from nltk.corpus import stopwords
```

```
[nltk_data] Downloading package stopwords to C:\Users\DILEEP
[nltk_data]     V\AppData\Roaming\nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
```

Load The Dataset

In [3]:
```python
pd.set_option("display.max_columns",None)
```

In [4]:
```python
df=pd.read_csv("C:\\Users\\DILEEP  V\\OneDrive\\Desktop\\Data_Science_Projects\\Movie Genre Data Science Project\\movie_genr
```

In [5]:
```
# top 5 rows
df.head()
```

Out[5]:

	Title	Year	Director	Duration	Rating	Votes	Description	Language	Country	Budget_USD	BoxOffice_USD	Genre	Production_Company	Content
0	Winds of Fate 4	1980	R. Lee	167	4.1	182425	A touching love story with heartwarming moments.	Spanish	China	39979615	179936008	Romance	DreamWorks	
1	Firestorm 11	2014	S. Chen	166	4.1	449351	A fast-paced thriller with intense action scenes.	Korean	China	116404774	802121619	Action	Netflix	
2	Silent Echo 2	2016	A. Khan	170	4.1	363328	A fast-paced thriller with intense action scenes.	Korean	Japan	166261330	225526871	Action	Pixar	
3	City Lights 4	1982	L. Zhang	170	9.9	62371	An emotional journey exploring complex charact...	Japanese	Japan	28861315	69813738	Drama	Netflix	
4	Broken Truth 1	1990	L. Zhang	91	5.3	4600	An imaginative world filled with magic and won...	Korean	USA	43890403	375136716	Fantasy	Studio Ghibli	

In [6]:
```
# bottom 5 rows
df.tail()
```

Out[6]:

	Title	Year	Director	Duration	Rating	Votes	Description	Language	Country	Budget_USD	BoxOffice_USD	Genre	Production_Company	Cor
49995	Ocean Call 20	2013	T. Johnson	149	6.8	340904	A touching love story with heartwarming moments.	English	UK	62456512	3291117	Romance	Yash Raj Films	
49996	Ocean Call 13	2001	M. Brown	166	7.6	214228	A spine-chilling tale that evokes fear and dread.	Japanese	South Korea	33239921	465759764	Horror	Netflix	
49997	Last Mission 15	2017	J. Smith	158	9.2	251931	A light-hearted comedy that guarantees laughter.	Korean	South Korea	79589169	820566917	Comedy	Paramount Pictures	
49998	Firestorm 11	1992	J. Smith	166	7.2	487956	A spine-chilling tale that evokes fear and dread.	Mandarin	South Korea	179834680	131779818	Horror	Amazon Studios	
49999	Silent Echo 12	2009	P. Adams	117	4.3	392762	An imaginative world filled with magic and won...	Spanish	France	45434366	957562425	Fantasy	Sony Pictures	

In [7]:
```
# dataset information
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 50000 entries, 0 to 49999
Data columns (total 17 columns):
 #   Column              Non-Null Count  Dtype  
---  ------              --------------  -----  
 0   Title               50000 non-null  object 
 1   Year                50000 non-null  int64  
 2   Director            50000 non-null  object 
 3   Duration            50000 non-null  int64  
 4   Rating              50000 non-null  float64
 5   Votes               50000 non-null  int64  
 6   Description         50000 non-null  object 
 7   Language            50000 non-null  object 
 8   Country             50000 non-null  object 
 9   Budget_USD          50000 non-null  int64  
 10  BoxOffice_USD       50000 non-null  int64  
 11  Genre               50000 non-null  object 
 12  Production_Company  50000 non-null  object 
 13  Content_Rating      50000 non-null  object 
 14  Lead_Actor          50000 non-null  object 
 15  Num_Awards          50000 non-null  int64  
 16  Critic_Reviews      50000 non-null  int64  
dtypes: float64(1), int64(7), object(9)
memory usage: 6.5+ MB
```

In [8]:
```
# dataset statistical info
df.describe()
```

Out[8]:

	Year	Duration	Rating	Votes	Budget_USD	BoxOffice_USD	Num_Awards	Critic_Reviews
count	50000.000000	50000.00000	50000.000000	50000.000000	5.000000e+04	5.000000e+04	50000.000000	50000.000000
mean	2001.562620	130.07312	6.926472	249699.050540	9.179143e+07	5.176063e+08	9.964440	500.176380
std	12.722539	29.11097	1.698758	144314.043032	5.823888e+07	2.880283e+08	6.066303	289.971792
min	1980.000000	80.00000	4.000000	516.000000	1.135566e+06	3.291117e+06	0.000000	0.000000
25%	1991.000000	105.00000	5.500000	124531.500000	4.389040e+07	2.590329e+08	5.000000	248.000000
50%	2002.000000	130.00000	6.900000	248582.000000	8.062480e+07	5.109973e+08	10.000000	500.000000
75%	2013.000000	155.00000	8.400000	374833.500000	1.475557e+08	7.704129e+08	15.000000	751.000000
max	2023.000000	180.00000	9.900000	499984.000000	1.984445e+08	9.925159e+08	20.000000	1000.000000

In [9]:
```
df.describe(include="all")
```

Out[9]:

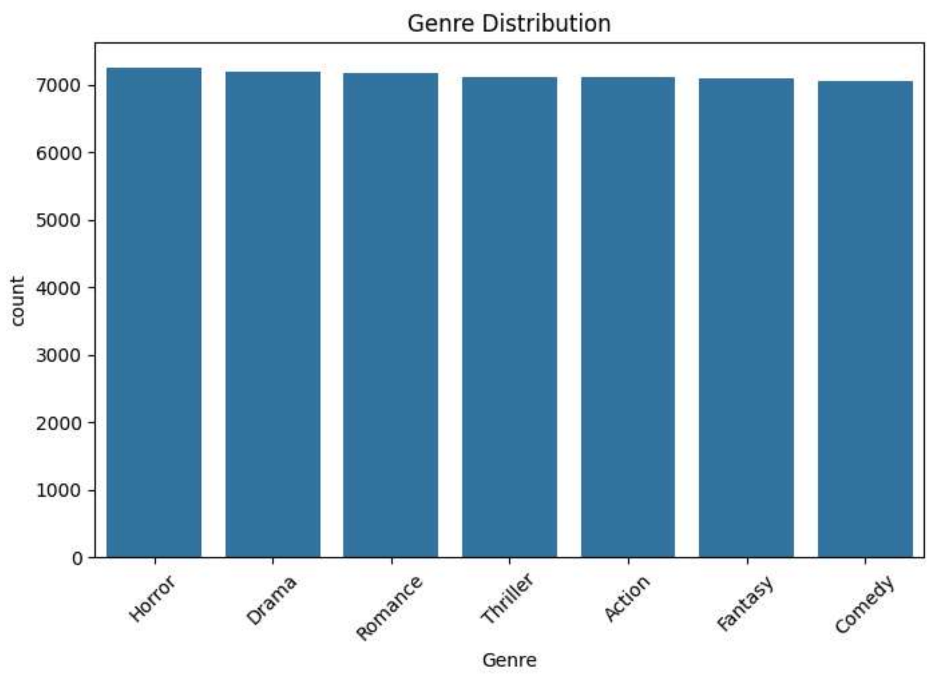
	Title	Year	Director	Duration	Rating	Votes	Description	Language	Country	Budget_USD	BoxOffice_USD	Genre	Produ
count	50000	50000.000000	50000	50000.00000	50000.000000	50000.000000	50000	50000	50000	5.000000e+04	5.000000e+04	50000	
unique	260	NaN	10	NaN	NaN	NaN	7	7	7	NaN	NaN	7	
top	Winds of Fate 6	NaN	N. Roy	NaN	NaN	NaN	A spine-chilling tale that evokes fear and dread.	Spanish	South Korea	NaN	NaN	Horror	
freq	233	NaN	5141	NaN	NaN	NaN	7260	7243	7224	NaN	NaN	7260	
mean	NaN	2001.562620	NaN	130.07312	6.926472	249699.050540	NaN	NaN	NaN	9.179143e+07	5.176063e+08	NaN	
std	NaN	12.722539	NaN	29.11097	1.698758	144314.043032	NaN	NaN	NaN	5.823888e+07	2.880283e+08	NaN	
min	NaN	1980.000000	NaN	80.00000	4.000000	516.000000	NaN	NaN	NaN	1.135566e+06	3.291117e+06	NaN	
25%	NaN	1991.000000	NaN	105.00000	5.500000	124531.500000	NaN	NaN	NaN	4.389040e+07	2.590329e+08	NaN	
50%	NaN	2002.000000	NaN	130.00000	6.900000	248582.000000	NaN	NaN	NaN	8.062480e+07	5.109973e+08	NaN	
75%	NaN	2013.000000	NaN	155.00000	8.400000	374833.500000	NaN	NaN	NaN	1.475557e+08	7.704129e+08	NaN	
max	NaN	2023.000000	NaN	180.00000	9.900000	499984.000000	NaN	NaN	NaN	1.984445e+08	9.925159e+08	NaN	

In [10]:
```python
# checking for non-null values
df.isnull().sum()
```

Out[10]:
```
Title                 0
Year                  0
Director              0
Duration              0
Rating                0
Votes                 0
Description           0
Language              0
Country               0
Budget_USD            0
BoxOffice_USD         0
Genre                 0
Production_Company    0
Content_Rating        0
Lead_Actor            0
Num_Awards            0
Critic_Reviews        0
dtype: int64
```

Exploratory DataAnalysis

In [11]:
```python
# Genre distribution
plt.figure(figsize=(8,5))
sns.countplot(data=df, x='Genre', order=df['Genre'].value_counts().index)
plt.title("Genre Distribution")
plt.xticks(rotation=45)
plt.show()
```



DataCleaning

Text Cleaning:

In [12]:
```python
def clean_text(text):
    text = str(text).lower()
    text = re.sub(r'[^a-zA-Z\s]', '', text)  # Remove special characters
    tokens = text.split()
    tokens = [word for word in tokens if word not in stopwords.words('english')]
    return ' '.join(tokens)

# Apply to a text column (assuming 'Description' is present)
df['Cleaned_Description'] = df['Description'].apply(clean_text)
```

Encode Target Variable

In [13]:
```
le = LabelEncoder()
df['Genre_encoded'] = le.fit_transform(df['Genre'])
```

TF-IDF Vectorization

In [14]:
```
tfidf = TfidfVectorizer(max_features=5000)
X_text = tfidf.fit_transform(df['Cleaned_Description']).toarray()
```

Train-Test Split

In [15]:
```
X = X_text  # You can also combine structured data if available
y = df['Genre_encoded']

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

Model Training (Random Forest)

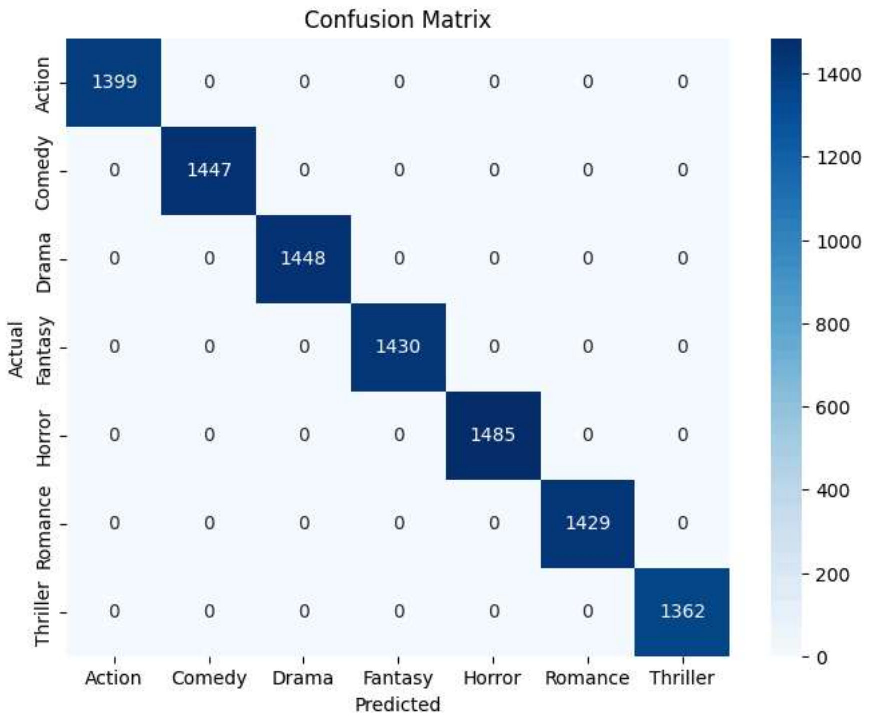
In [16]:
```
model = RandomForestClassifier(n_estimators=100, random_state=42)
model.fit(X_train, y_train)
```

Out[16]:
```
▾        RandomForestClassifier
RandomForestClassifier(random_state=42)
```

Model Evaluation

In [17]:
```python
y_pred = model.predict(X_test)

print("Accuracy:", accuracy_score(y_test, y_pred))
print("Classification Report:\n", classification_report(y_test, y_pred, target_names=le.classes_))

# Confusion Matrix
plt.figure(figsize=(8,6))
sns.heatmap(confusion_matrix(y_test, y_pred), annot=True, fmt='d', xticklabels=le.classes_, yticklabels=le.classes_, cmap='B
plt.title("Confusion Matrix")
plt.xlabel("Predicted")
plt.ylabel("Actual")
plt.show()
```

```
Accuracy: 1.0
Classification Report:
               precision    recall  f1-score   support

      Action       1.00      1.00      1.00      1399
      Comedy       1.00      1.00      1.00      1447
       Drama       1.00      1.00      1.00      1448
     Fantasy       1.00      1.00      1.00      1430
      Horror       1.00      1.00      1.00      1485
     Romance       1.00      1.00      1.00      1429
    Thriller       1.00      1.00      1.00      1362

    accuracy                           1.00     10000
   macro avg       1.00      1.00      1.00     10000
weighted avg       1.00      1.00      1.00     10000
```



Save Model

In [18]:
```python
import joblib
joblib.dump(model, "movie_genre_classifier.pkl")
joblib.dump(tfidf, "tfidf_vectorizer.pkl")
joblib.dump(le, "label_encoder.pkl")
```

Out[18]:
```
['label_encoder.pkl']
```