NETFLIX MOVIE DATA ANALYSIS PROJECT:

- Q1. What is the most frequent genre of movies released on Netflix?
- Q2. What genres have highest votes?
- Q3. Which movie got the highest popularity? What's its genre?
- Q4. What movie got the lowest popularity? What's its genre?
- Q5. Which year has the most filmed movies?

In [7]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [8]:
```
df=pd.read_csv('mymoviedb.csv',lineterminator='\n')
```

In [9]:
```
df.head()
```

Out[9]:

	Release_Date	Title	Overview	Popularity	Vote_Count	Vote_Average	Original_Language	Genre	
0	2021-12-15	Spider-Man: No Way Home	Peter Parker is unmasked and no longer able to...	5083.954	8940	8.3	en	Action, Adventure, Science Fiction	https://image.tmdb.org/t/p/origi
1	2022-03-01	The Batman	In his second year of fighting crime, Batman u...	3827.658	1151	8.1	en	Crime, Mystery, Thriller	https://image.tmdb.org/t/p/origir

2	2022-02-25	No Exit	Stranded at a rest stop in the mountains durin...	2618.087	122	6.3	en	Thriller	https://image.tmdb.org/t/p/origina
3	2021-11-24	Encanto	The tale of an extraordinary family, the Madri...	2402.201	5076	7.7	en	Animation, Comedy, Family, Fantasy	https://image.tmdb.org/t/p/origin
4	2021-12-22	The King's Man	As a collection of history's worst tyrants and...	1895.511	1793	7.0	en	Action, Adventure, Thriller, War	https://image.tmdb.org/t/p/origina

In [10]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9827 entries, 0 to 9826
Data columns (total 9 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   Release_Date       9827 non-null   object 
 1   Title              9827 non-null   object 
 2   Overview           9827 non-null   object 
 3   Popularity         9827 non-null   float64
 4   Vote_Count         9827 non-null   int64  
 5   Vote_Average       9827 non-null   float64
 6   Original_Language  9827 non-null   object 
 7   Genre              9827 non-null   object 
 8   Poster_Url         9827 non-null   object 
dtypes: float64(2), int64(1), object(6)
memory usage: 691.1+ KB
```

```
In [11]: df['Genre'].head()
```

```
Out[11]: 0     Action, Adventure, Science Fiction
         1               Crime, Mystery, Thriller
         2                               Thriller
         3     Animation, Comedy, Family, Fantasy
         4       Action, Adventure, Thriller, War
         Name: Genre, dtype: object
```

```
In [17]: df.duplicated().sum()
```

```
Out[17]: 0
```

```
In [19]: df.describe()
```

Out[19]:

	Popularity	Vote_Count	Vote_Average
count	9827.000000	9827.000000	9827.000000
mean	40.326088	1392.805536	6.439534
std	108.873998	2611.206907	1.129759
min	13.354000	0.000000	0.000000
25%	16.128500	146.000000	5.900000
50%	21.199000	444.000000	6.500000
75%	35.191500	1376.000000	7.100000
max	5083.954000	31077.000000	10.000000

Exploratory Summary:

- We have a daatset of 9827 rows and 9 columns
- Our dataset looks a bit tide with no NaNs and duplicated values
- Release date column needs to be casted to date time with extracting year only

- Colums : overview, original language and poster url are not useful and need to be dropped to make the dataset look tidier
- There is noticeable outliers in popularity column
- Vote_Average better be categorised for proper result
- Genre column has comma seperated values and white spaces that need to be handled and casted into category. Exploration summary

In [22]:
```
df['Release_Date']=pd.to_datetime(df['Release_Date'])
print(df['Release_Date'].dtypes)
```

```
datetime64[ns]
```

In [24]:
```
df['Release_Date']=df['Release_Date'].dt.year
print(df['Release_Date'].dtypes)
```

```
int32
```

In [26]:
```
df.head()
```

Out[26]:

	Release_Date	Title	Overview	Popularity	Vote_Count	Vote_Average	Original_Language	Genre	
0	2021	Spider-Man: No Way Home	Peter Parker is unmasked and no longer able to...	5083.954	8940	8.3	en	Action, Adventure, Science Fiction	https://image.tmdb.org/t/p/origi
1	2022	The Batman	In his second year of fighting crime, Batman u...	3827.658	1151	8.1	en	Crime, Mystery, Thriller	https://image.tmdb.org/t/p/origir
2	2022	No Exit	Stranded at a rest stop in the mountains durin...	2618.087	122	6.3	en	Thriller	https://image.tmdb.org/t/p/origina

3	2021	Encanto	The tale of an extraordinary family, the Madri...	2402.201	5076	7.7	en	Animation, Comedy, Family, Fantasy	https://image.tmdb.org/t/p/origin
4	2021	The King's Man	As a collection of history's worst tyrants and...	1895.511	1793	7.0	en	Action, Adventure, Thriller, War	https://image.tmdb.org/t/p/origina

Dropping Columns

```
In [29]: cols=['Overview','Original_Language','Poster_Url']
```

```
In [31]: df.drop(cols, axis=1, inplace=True)
         df.columns
```

```
Out[31]: Index(['Release_Date', 'Title', 'Popularity', 'Vote_Count', 'Vote_Average',
                'Genre'],
               dtype='object')
```

```
In [33]: df.head()
```

Out[33]:

	Release_Date	Title	Popularity	Vote_Count	Vote_Average	Genre
0	2021	Spider-Man: No Way Home	5083.954	8940	8.3	Action, Adventure, Science Fiction
1	2022	The Batman	3827.658	1151	8.1	Crime, Mystery, Thriller
2	2022	No Exit	2618.087	122	6.3	Thriller
3	2021	Encanto	2402.201	5076	7.7	Animation, Comedy, Family, Fantasy
4	2021	The King's Man	1895.511	1793	7.0	Action, Adventure, Thriller, War

Categorize The Vote_Average column

We are categorizing the Vote_Average column into four labels namely: popular, average, below_average, not_popular using categorize_col() function.

```
In [36]: def categorize_col(df,col,labels):
             edges=[df[col].describe()['min'],
                    df[col].describe()['25%'],
                    df[col].describe()['50%'],
                    df[col].describe()['75%'],
                    df[col].describe()['max']]
             df[col]=pd.cut(df[col],edges,labels=labels,duplicates='drop')
             return df
```

```
In [38]: labels=['Not_Popular','Below_Average','Average','Popular']
         categorize_col(df,'Vote_Average',labels)
         df['Vote_Average'].unique()
```

```
Out[38]: ['Popular', 'Below_Average', 'Average', 'Not_Popular', NaN]
         Categories (4, object): ['Not_Popular' < 'Below_Average' < 'Average' < 'Popular']
```

```
In [40]: df.head()
```

Out[40]:

	Release_Date	Title	Popularity	Vote_Count	Vote_Average	Genre
0	2021	Spider-Man: No Way Home	5083.954	8940	Popular	Action, Adventure, Science Fiction
1	2022	The Batman	3827.658	1151	Popular	Crime, Mystery, Thriller
2	2022	No Exit	2618.087	122	Below_Average	Thriller
3	2021	Encanto	2402.201	5076	Popular	Animation, Comedy, Family, Fantasy
4	2021	The King's Man	1895.511	1793	Average	Action, Adventure, Thriller, War

```
In [42]: df['Vote_Average'].value_counts()
```

Out[42]:
```
Vote_Average
Not_Popular      2467
Popular          2450
Average          2412
Below_Average    2398
Name: count, dtype: int64
```

In [44]:
```
df.dropna(inplace=True)
df.isna().sum()
```

Out[44]:
```
Release_Date    0
Title           0
Popularity      0
Vote_Count      0
Vote_Average    0
Genre           0
dtype: int64
```

In [46]:
```
df.head()
```

Out[46]:

	Release_Date	Title	Popularity	Vote_Count	Vote_Average	Genre
0	2021	Spider-Man: No Way Home	5083.954	8940	Popular	Action, Adventure, Science Fiction
1	2022	The Batman	3827.658	1151	Popular	Crime, Mystery, Thriller
2	2022	No Exit	2618.087	122	Below_Average	Thriller
3	2021	Encanto	2402.201	5076	Popular	Animation, Comedy, Family, Fantasy
4	2021	The King's Man	1895.511	1793	Average	Action, Adventure, Thriller, War

We will now split the Genre column into one Genre per row.

In [49]:
```
df['Genre']=df['Genre'].str.split(', ')
df=df.explode('Genre').reset_index(drop=True)
df.head()
```

Out[49]:

	Release_Date	Title	Popularity	Vote_Count	Vote_Average	Genre
0	2021	Spider-Man: No Way Home	5083.954	8940	Popular	Action
1	2021	Spider-Man: No Way Home	5083.954	8940	Popular	Adventure
2	2021	Spider-Man: No Way Home	5083.954	8940	Popular	Science Fiction
3	2022	The Batman	3827.658	1151	Popular	Crime
4	2022	The Batman	3827.658	1151	Popular	Mystery

Casting column Genre into Category

In [52]:
```
df['Genre']=df['Genre'].astype('category')
df['Genre'].dtypes
```

Out[52]:
```
CategoricalDtype(categories=['Action', 'Adventure', 'Animation', 'Comedy', 'Crime',
                  'Documentary', 'Drama', 'Family', 'Fantasy', 'History',
                  'Horror', 'Music', 'Mystery', 'Romance', 'Science Fiction',
                  'TV Movie', 'Thriller', 'War', 'Western'],
, ordered=False, categories_dtype=object)
```

In [54]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 25552 entries, 0 to 25551
Data columns (total 6 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   Release_Date  25552 non-null  int32
 1   Title         25552 non-null  object
 2   Popularity    25552 non-null  float64
 3   Vote_Count    25552 non-null  int64
 4   Vote_Average  25552 non-null  category
 5   Genre         25552 non-null  category
dtypes: category(2), float64(1), int32(1), int64(1), object(1)
memory usage: 749.6+ KB
```

```
In [56]: df.nunique()
```

```
Out[56]: Release_Date      100
         Title            9415
         Popularity       8088
         Vote_Count       3265
         Vote_Average        4
         Genre              19
         dtype: int64
```

```
In [58]: df.head()
```

Out[58]:

	Release_Date	Title	Popularity	Vote_Count	Vote_Average	Genre
0	2021	Spider-Man: No Way Home	5083.954	8940	Popular	Action
1	2021	Spider-Man: No Way Home	5083.954	8940	Popular	Adventure
2	2021	Spider-Man: No Way Home	5083.954	8940	Popular	Science Fiction
3	2022	The Batman	3827.658	1151	Popular	Crime
4	2022	The Batman	3827.658	1151	Popular	Mystery

Data Visualisation

```
In [61]: sns.set_style('whitegrid')
```

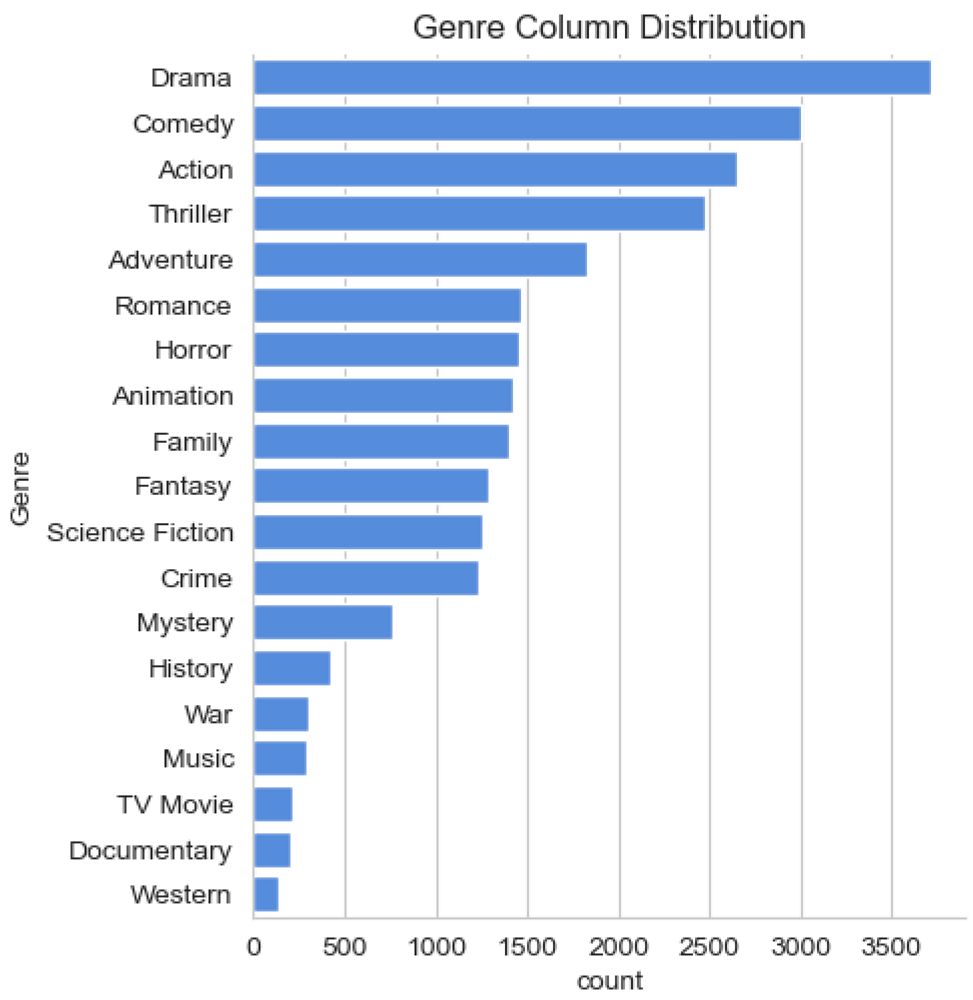
What is the most frequent genre of movies released on Netflix?

```
In [64]: df['Genre'].describe()
```

```
Out[64]: count      25552
         unique        19
         top        Drama
```

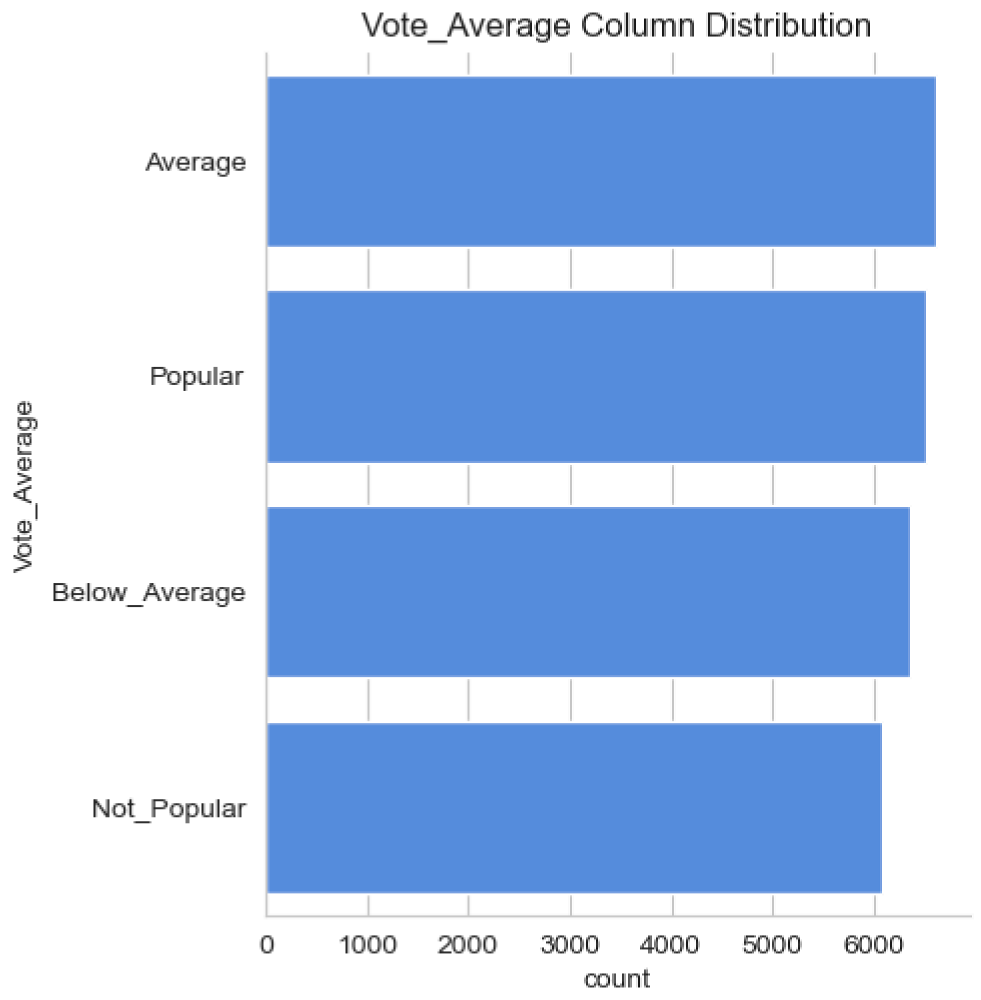
```
freq        3715
Name: Genre, dtype: object
```

In [66]:
```
sns.catplot(y='Genre',data=df,kind='count',
            order=df['Genre'].value_counts().index,
            color='#4287f5')
plt.title("Genre Column Distribution")
plt.show()
```



What Genres have highest votes?

In [69]:
```
sns.catplot(y='Vote_Average',data=df,kind='count',
            order=df['Vote_Average'].value_counts().index,
            color='#4287f5')
plt.title('Vote_Average Column Distribution')
plt.show()
```



Which movie got the highest popularity? What's its genre?

In [72]:
```
df.head(2)
```

Out[72]:

	Release_Date	Title	Popularity	Vote_Count	Vote_Average	Genre
0	2021	Spider-Man: No Way Home	5083.954	8940	Popular	Action
1	2021	Spider-Man: No Way Home	5083.954	8940	Popular	Adventure

In [74]:
```
df[df['Popularity']==df['Popularity'].max()]
```

Out[74]:

	Release_Date	Title	Popularity	Vote_Count	Vote_Average	Genre
0	2021	Spider-Man: No Way Home	5083.954	8940	Popular	Action
1	2021	Spider-Man: No Way Home	5083.954	8940	Popular	Adventure
2	2021	Spider-Man: No Way Home	5083.954	8940	Popular	Science Fiction

What movie got the lowest popularity? What's its genre?

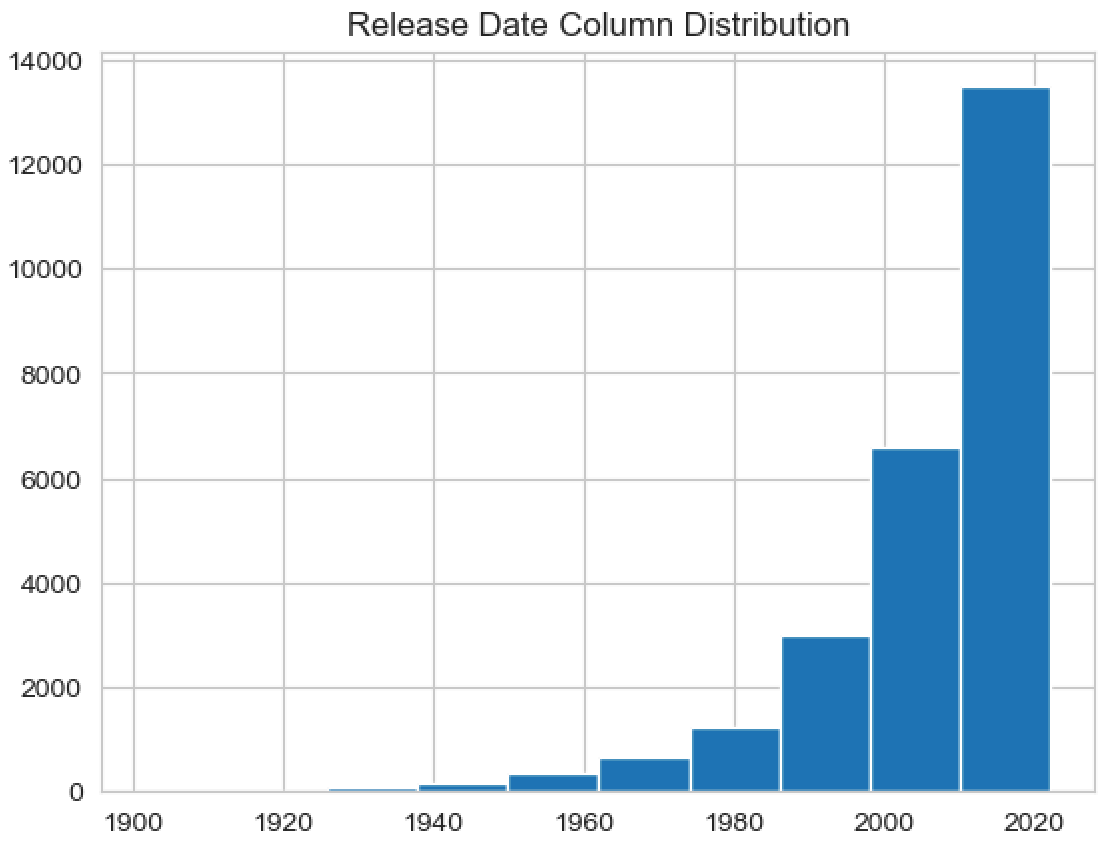
In [77]:
```
df[df['Popularity']==df['Popularity'].min()]
```

Out[77]:

	Release_Date	Title	Popularity	Vote_Count	Vote_Average	Genre
25546	2021	The United States vs. Billie Holiday	13.354	152	Average	Music
25547	2021	The United States vs. Billie Holiday	13.354	152	Average	Drama
25548	2021	The United States vs. Billie Holiday	13.354	152	Average	History
25549	1984	Threads	13.354	186	Popular	War
25550	1984	Threads	13.354	186	Popular	Drama
25551	1984	Threads	13.354	186	Popular	Science Fiction

Which year has the most filmed movies?

```
In [80]: df['Release_Date'].hist()
         plt.title('Release Date Column Distribution')
         plt.show()
```



SUMMARY:

Q1: What is the most frequent genre in the dataset?

- Drama genre is the most frequent genre in our dataset and has appeared more than 14% of the times among 19 other genres.

Q2: What genres has highest votes?

- We have 25.5% of our dataset with popular vote (6520 rows). Drama again gets the highest popularity among fans by having more than 18.5% of movies' popularities.

Q3: What movie got the highest popularity? What’s its genre?

- Spider-Man: No Way Home has the highest popularity rate in our dataset and it has genres of Action, Adventure, and Science Fiction.

Q3 (again): What movie got the lowest popularity? What’s its genre?

- The United States, Thread has the lowest popularity rate in our dataset and it has genres of Music, Drama, War, Sci-Fi, and History.

Q4: Which year has the most filmed movies?

- Year 2020 has the highest filming rate in our dataset.

In [83]:
```
df['is_popular'] = df['Vote_Average'].apply(lambda x: 1 if x == 'Popular' else 0)
```

In [85]:
```
df = pd.get_dummies(df, columns=['Genre'], drop_first=True)
```

In [87]:
```
from sklearn.model_selection import train_test_split
X = df.drop(['Title', 'Vote_Average', 'is_popular'], axis=1)
y = df['is_popular']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=42)
```

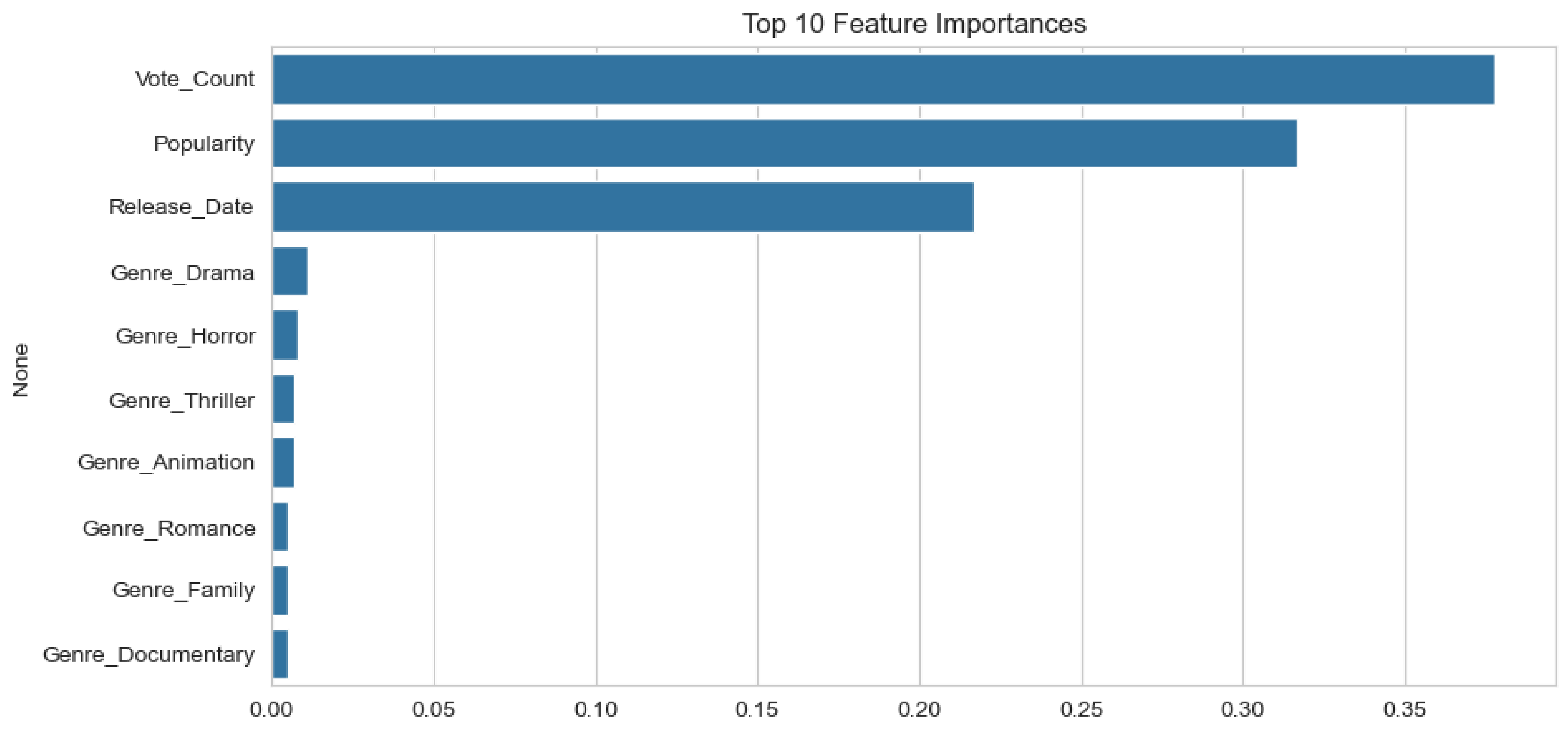
In [89]:
```
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import classification_report, accuracy_score, confusion_matrix
model = RandomForestClassifier()
model.fit(X_train, y_train)
y_pred = model.predict(X_test)
# Evaluation
print("Accuracy:", accuracy_score(y_test, y_pred))
print("Confusion Matrix:\n", confusion_matrix(y_test, y_pred))
print("Classification Report:\n", classification_report(y_test, y_pred))
```

```
Accuracy: 0.7912861987998956
Confusion Matrix:
 [[5333  426]
 [1174  733]]
Classification Report:
               precision    recall  f1-score   support

           0       0.82      0.93      0.87      5759
           1       0.63      0.38      0.48      1907

    accuracy                           0.79      7666
   macro avg       0.73      0.66      0.67      7666
weighted avg       0.77      0.79      0.77      7666
```

In [91]:
```
import matplotlib.pyplot as plt
import seaborn as sns
feature_importance = pd.Series(model.feature_importances_, index=X.columns)
top_features = feature_importance.sort_values(ascending=False).head(10)
plt.figure(figsize=(10,5))
sns.barplot(x=top_features.values, y=top_features.index)
plt.title("Top 10 Feature Importances")
plt.show()
```

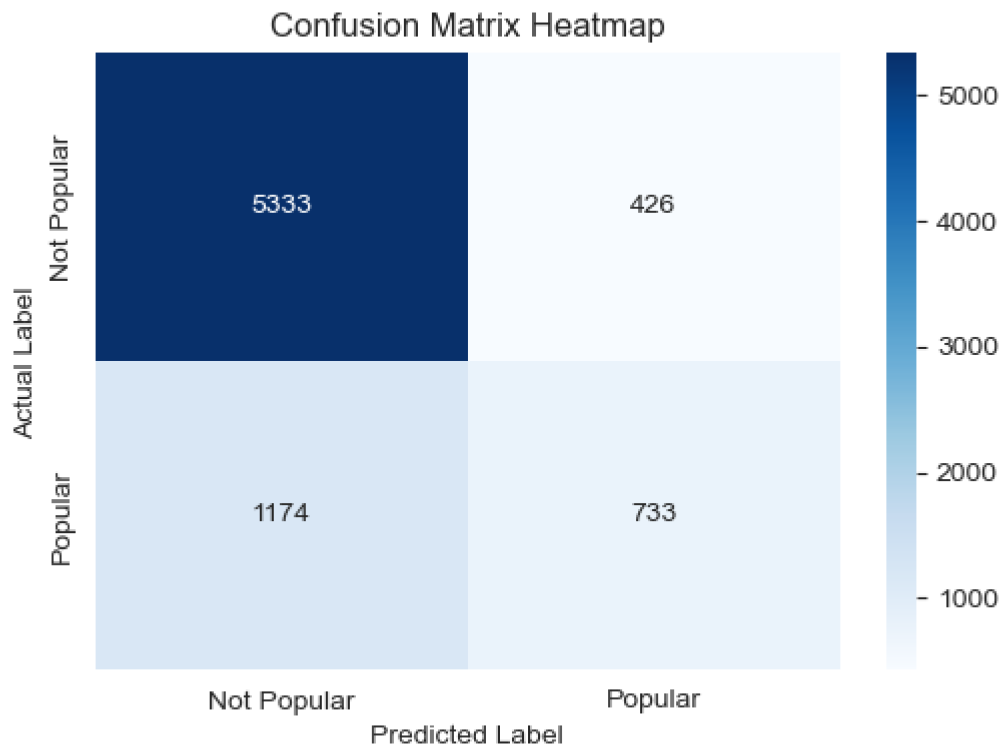


```
In [93]: y_test
         y_pred
```

```
Out[93]: array([0, 0, 1, ..., 0, 0, 0])
```

```
In [95]: import seaborn as sns
         import matplotlib.pyplot as plt
         from sklearn.metrics import confusion_matrix
         cm = confusion_matrix(y_test, y_pred)
         plt.figure(figsize=(6,4))
         sns.heatmap(cm, annot=True, fmt='d', cmap='Blues',
                     xticklabels=['Not Popular', 'Popular'],
                     yticklabels=['Not Popular', 'Popular'])
```

```
plt.xlabel('Predicted Label')
plt.ylabel('Actual Label')
plt.title('Confusion Matrix Heatmap')
plt.show()
```



In [97]:
```
def predict_popularity(model, release_year, vote_count, popularity_score, genre_dict, feature_columns):
    input_data = {
        'Release_Date': release_year,
        'Vote_Count': vote_count,
        'Popularity': popularity_score
    }
    for col in feature_columns:
        if col.startswith('Genre_'):
            input_data[col] = genre_dict.get(col, 0)
    df_input = pd.DataFrame([input_data])
    df_input = df_input[feature_columns]
    pred = model.predict(df_input)[0]
    return "HIT" if pred == 1 else "FLOP"
```

In [101…
```
predict_popularity(
    model,
    release_year=2023,
    vote_count=7000,
    popularity_score=2500,
    genre_dict={'Genre_Action': 1, 'Genre_Thriller': 1},
    feature_columns=X_train.columns
)
```

Out[101…
```
'HIT'
```

In [103…
```
predict_popularity(
    model,
    release_year=2020,
    vote_count=350,
    popularity_score=420,
    genre_dict={'Genre_Drama': 1},
    feature_columns=X_train.columns
)
```

Out[103…
```
'FLOP'
```

CONCLUSION

In this project, we performed an end-to-end data analysis and prediction on Netflix movies using a dataset of over 9,415 titles. The objective was to explore patterns in movie features and build a machine learning model to predict whether a movie would be a HIT or a FLOP, based on key attributes.

- Drama was the most frequent genre.
- 2020 had the highest number of movie releases.
- Spider-Man: No Way Home had the highest popularity score.
- Vote Count and Popularity Score were strong indicators of a movie's success.

ML :

- A Random Forest Classifier was trained using features such as Release Year, Vote Count, Popularity, and one-hot encoded Genres.
- The model achieved strong performance on the test set and was able to classify movies into Hit or Flop.

This project demonstrates the practical application of data science from cleaning and exploring real-world data to building a predictive model and interpreting results. The model can serve as a foundational tool for making data-driven decisions in the entertainment industry, such as content investment or promotional targeting.