Introduction

This report presents a comprehensive analysis of Netflix content data, combining two datasets (netflix_main.csv and netflix_ratings.csv) to create a unified dataset for exploration. It aims to explore and analyze various aspects of Netflix content including popular movies, top genres across the globe and insights into TV shows using python for data visualization. This project delves into the extensive dataset provided by Netflix to uncover trends patterns and interesting findings. In today digital era, streaming platforms like Netflix have revolutionized the entertainment industry providing users with a vast library of movies and TV shows at their fingertips.

Through this project we delve into the rich dataset provided by Netflix aiming to answer key research questions such as;

- What factors are most strongly associated with high viewer engagement on Netflix, as measured by viewer rating and the number of ratings a title receives?
    - Using Correlation Analysis, the correlations between numerical features (Release_Year) and the target variables (Rating_Count) are calculated.
- How has the composition and origin of Netflix's catalog evolved over time, indicating a shift from a content aggregator to a global original content producer?
    - With Time Series Analysis, the number of titles added per month/quarter over time are plotted. The key inflection points (e.g., a surge in additions corresponding to international launches) are identified.
    - Using the Globalization Analysis, the increasing diversity of countries in the Country field over time and the growth of non-English language content are tracked, correlating it with the push for international Original productions.
- How does Netflix's content acquisition and production strategy differ between movies and TV shows, as reflected by genre, target audience (rating), and geographical origin?

Importing Libraries

In [1]:
```
# Importing the necessary libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

Data Loading & Exploration

In [2]:
```
# Reading the two datasets
df1 = pd.read_csv("netflix_main.csv")
df2 = pd.read_csv("netflix_ratings.csv")

# Merging the two datasets
netflix_df = df1.merge(df2, on='show_id', how='inner')
netflix_df.head()
```

Out[2]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	dura
0	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	September 24, 2021	2021	TV-MA	Sea
1	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	NaN	September 24, 2021	2021	TV-MA	1 Se
2	s4	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	September 24, 2021	2021	TV-MA	1 Se
3	s5	TV Show	Kota Factory	NaN	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	September 24, 2021	2021	TV-MA	Sea
4	s6	TV Show	Midnight Mass	Mike Flanagan	Kate Siegel, Zach Gilford, Hamish Linklater, H...	NaN	September 24, 2021	2021	TV-MA	1 Se

Data Structure

In [4]:
```
# Dataset columns
netflix_df.columns

# Formatting the Column names
netflix_df.columns = netflix_df.columns.str.title()
```

In [5]:
```
# The number of rows and columns
netflix_df.shape
```

Out[5]:
```
(7715, 14)
```

In [7]:
```
# Dataset Description
netflix_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 7715 entries, 0 to 7714
Data columns (total 14 columns):
 #   Column         Non-Null Count  Dtype 
---  ------         --------------  ----- 
 0   Show_Id        7715 non-null   object
 1   Type           7715 non-null   object
 2   Title          7715 non-null   object
 3   Director       5409 non-null   object
 4   Cast           6983 non-null   object
 5   Country        6993 non-null   object
 6   Date_Added     7706 non-null   object
 7   Release_Year   7715 non-null   int64 
 8   Rating         7712 non-null   object
 9   Duration       7713 non-null   object
 10  Listed_In      7715 non-null   object
 11  Description    7715 non-null   object
 12  Viewer_Rating  7715 non-null   object
 13  Rating_Count   7715 non-null   int64 
dtypes: int64(2), object(12)
memory usage: 904.1+ KB
```

In [8]:
```
# unique values
netflix_df.nunique()
```

Out[8]:
```
Show_Id          7715
Type                2
Title            7715
Director         4066
Cast             6754
Country           685
Date_Added       1640
Release_Year       74
Rating             16
Duration          215
Listed_In         502
Description      7692
Viewer_Rating     228
Rating_Count     5238
dtype: int64
```

Data Cleaning and Wrangling

In [9]:
```
# Missing Values
netflix_df.isna().sum()
```

Out[9]:
```
Show_Id            0
Type               0
Title              0
Director        2306
Cast             732
Country          722
Date_Added         9
Release_Year       0
Rating             3
Duration           2
Listed_In          0
Description        0
Viewer_Rating      0
Rating_Count       0
dtype: int64
```

In [10]:
```
# Fill the Nan Values in columns Director, Cast and Country
netflix_df['Director'] = netflix_df['Director'].ffill()
netflix_df['Cast'] = netflix_df['Cast'].fillna('Unknown')
netflix_df['Country'] = netflix_df['Country'].ffill()
```

In [11]:
```
# Drop the nan values in columns Date_Added, Duration, and Rating
netflix_df = netflix_df.dropna(subset=['Date_Added', 'Duration', 'Rating'])
```

In [12]:
```
# Duplicate Values
netflix_df.duplicated().sum()
```

Out[12]:
```
0
```

In [13]:
```
# Formatting the date and year columns
netflix_df["Date_Added"] = pd.to_datetime(netflix_df['Date_Added'])
```

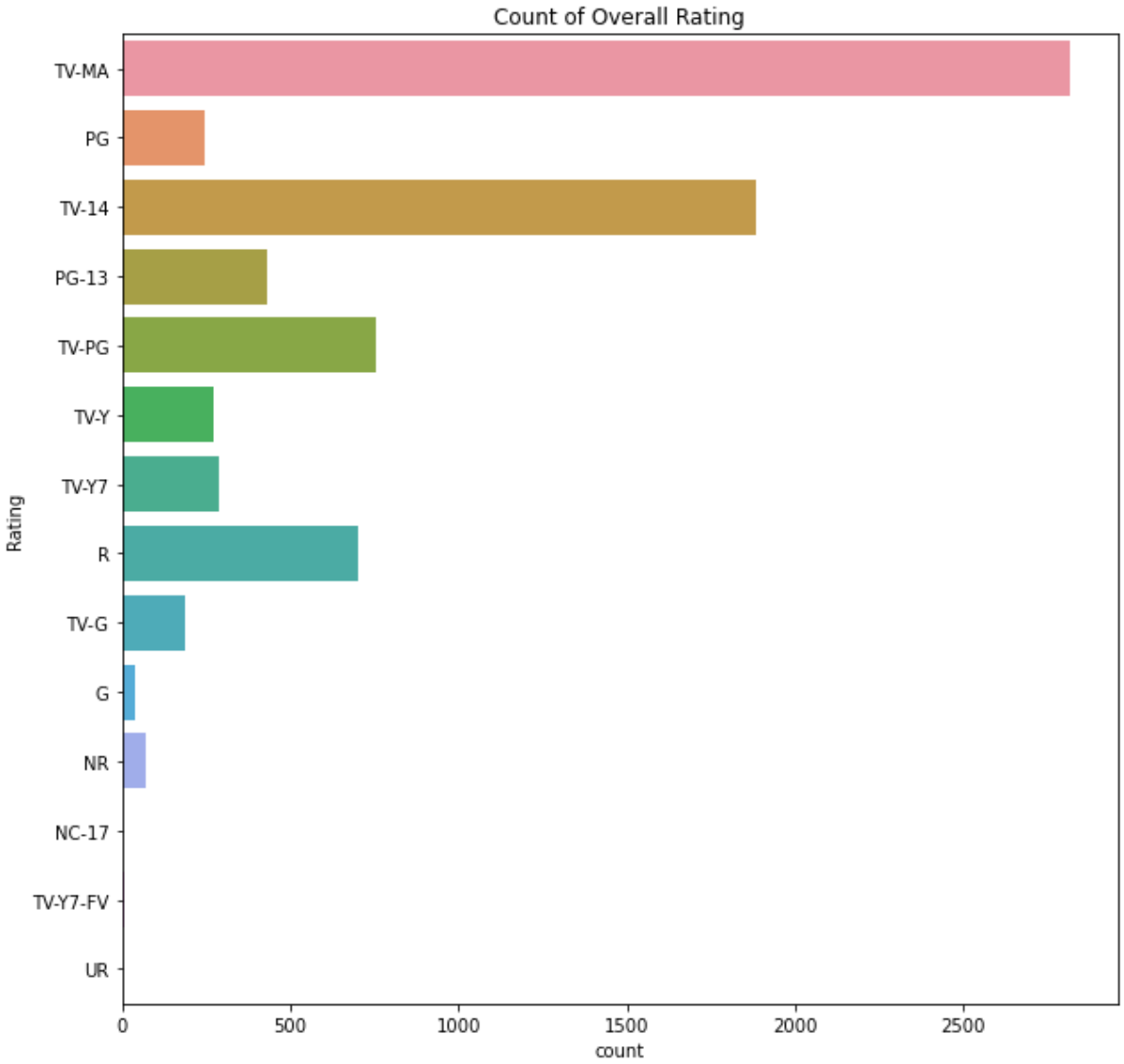
Data Analysis & Visualization

In [14]:
```
netflix_df.describe()
```

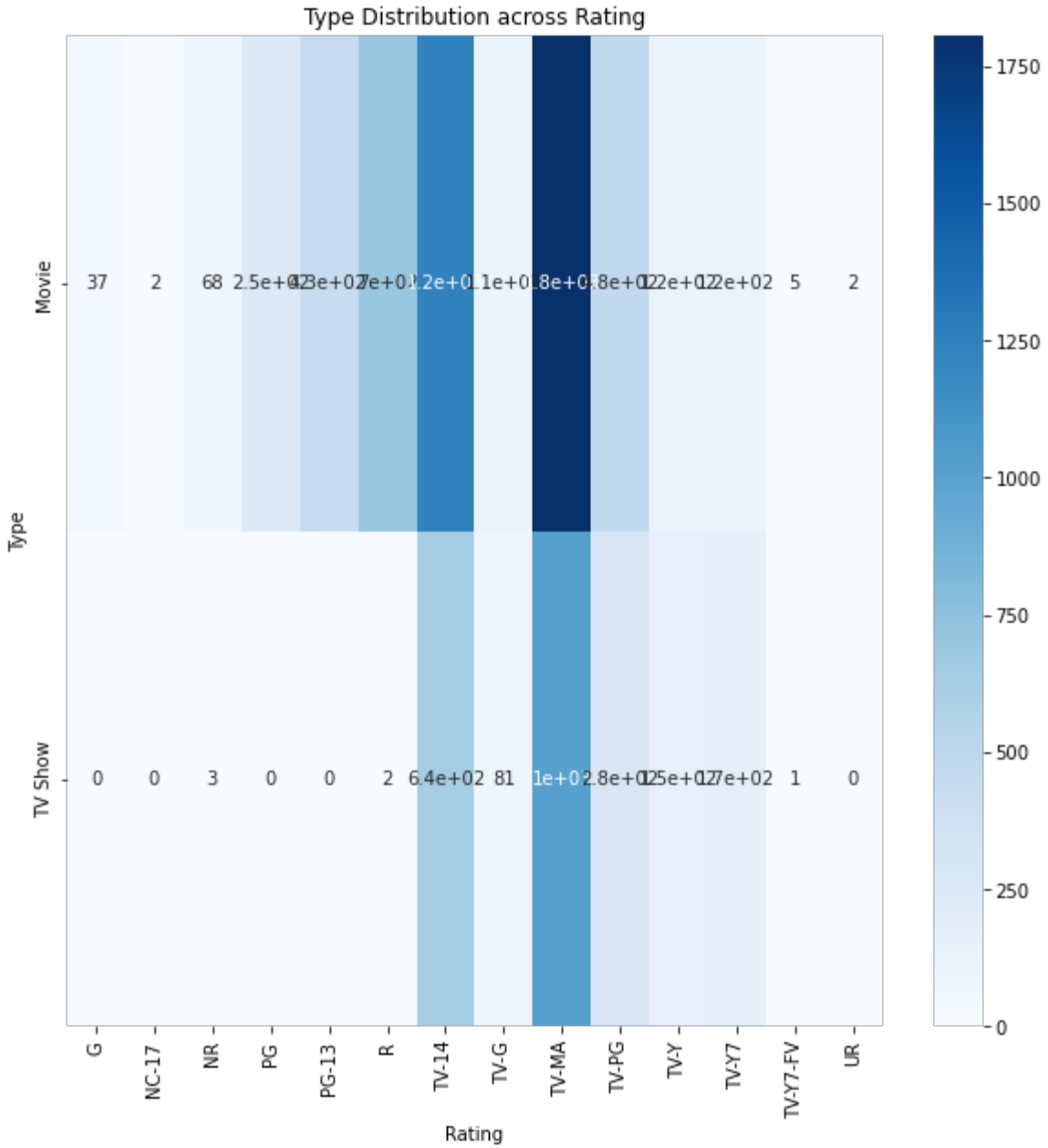
Out[14]:

	Release_Year	Rating_Count
count	7701.000000	7701.000000
mean	2014.167121	4975.353590
std	8.868856	6365.196239
min	1925.000000	46.000000
25%	2013.000000	1514.000000
50%	2017.000000	2964.000000
75%	2019.000000	5914.000000
max	2021.000000	101956.000000

In [15]:
```
# plot of the proportion of the overall rating
sns.countplot(y = 'Rating', data=netflix_df)
plt.title('Count of Overall Rating')
fig = plt.gcf()
fig.set_size_inches(10,10)
plt.show()
```



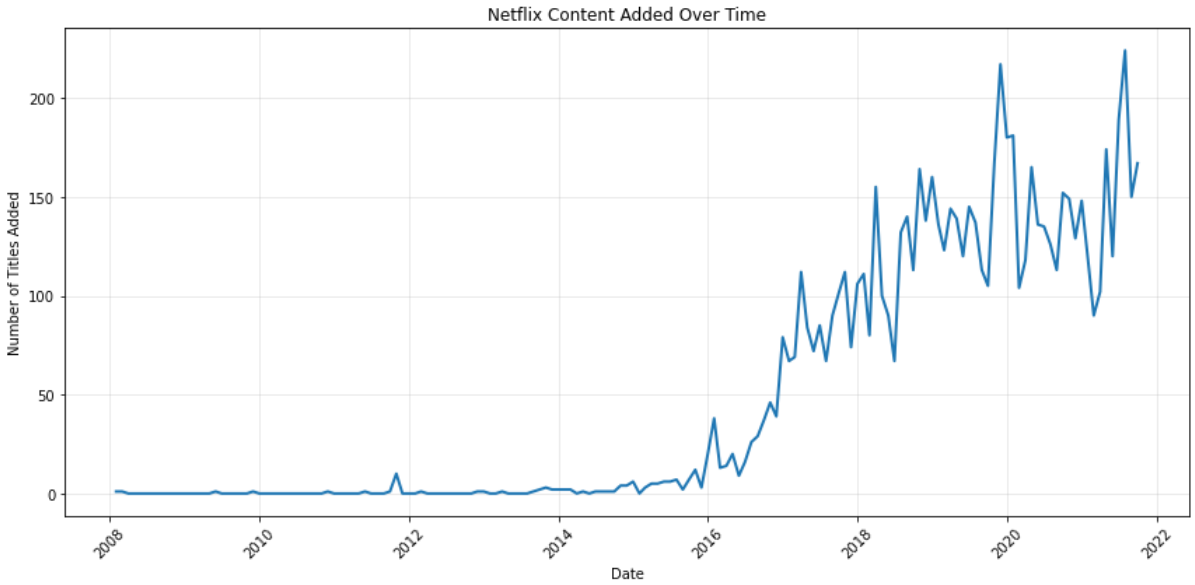
In [16]:
```
# Distribution of type across rating
ct = pd.crosstab(netflix_df['Type'], netflix_df['Rating'])
sns.heatmap(ct, annot=True, cmap='Blues')
plt.title('Type Distribution across Rating')
fig = plt.gcf()
fig.set_size_inches(10,10)
plt.show()
```



Time Series Analysis

In [17]:
```
monthly_additions = netflix_df.groupby(pd.Grouper(key='Date_Added', freq='M')).size

# Create the plot
plt.figure(figsize=(12, 6))
plt.plot(monthly_additions.index, monthly_additions.values, linewidth=2)
plt.title('Netflix Content Added Over Time')
plt.xlabel('Date')
plt.ylabel('Number of Titles Added')
plt.grid(True, alpha=0.3)
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



In [18]:
```
# Print some basic statistics
print(f"Total titles in dataset: {len(netflix_df)}")
print(f"Time period covered: {monthly_additions.index.min()} to {monthly_additions.
print(f"Average titles added per month: {monthly_additions.mean():.1f}")
print(f"Busiest month: {monthly_additions.idxmax()} with {monthly_additions.max()}
```

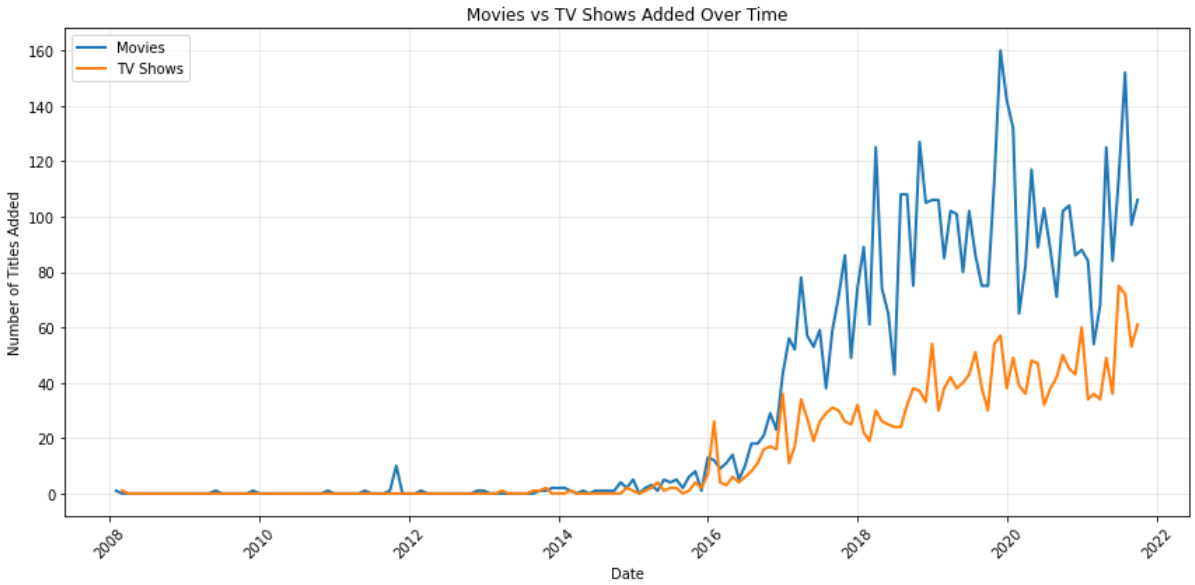
```
Total titles in dataset: 7701
Time period covered: 2008-01-31 00:00:00 to 2021-09-30 00:00:00
Average titles added per month: 46.7
Busiest month: 2021-07-31 00:00:00 with 224 titles
```

Movies vs TV Shows over Time

In [19]:
```
# Separate Movies and TV Shows
netflix_df['Type'] = netflix_df['Type'].str.upper()  # Standardize case

# Count by month for each type
monthly_movies = netflix_df[netflix_df['Type'] == 'MOVIE'].groupby(
pd.Grouper(key='Date_Added', freq='M')).size()
monthly_tv = netflix_df[netflix_df['Type'] == 'TV SHOW'].groupby(
pd.Grouper(key='Date_Added', freq='M')).size()
```

In [20]:
```
# Plot both
plt.figure(figsize=(12, 6))
plt.plot(monthly_movies.index, monthly_movies.values, label='Movies', linewidth=2)
plt.plot(monthly_tv.index, monthly_tv.values, label='TV Shows', linewidth=2)
plt.title('Movies vs TV Shows Added Over Time')
plt.xlabel('Date')
plt.ylabel('Number of Titles Added')
plt.legend()
plt.grid(True, alpha=0.3)
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



Correlation Analysis

In [21]:
```
# First, let's see what numerical columns we have
print("Numerical columns available:")
print(netflix_df.select_dtypes(include=['int64', 'float64']).columns.tolist())
```

```
Numerical columns available:
['Release_Year', 'Rating_Count']
```

In [22]:
```
# Select only numerical columns for correlation
numerical_df = netflix_df.select_dtypes(include=['int64', 'float64'])

# Calculate correlation matrix
correlation_matrix = numerical_df.corr()

print("CORRELATION MATRIX:")
print(correlation_matrix)
```

```
CORRELATION MATRIX:
              Release_Year  Rating_Count
Release_Year      1.000000      0.006275
Rating_Count      0.006275      1.000000
```

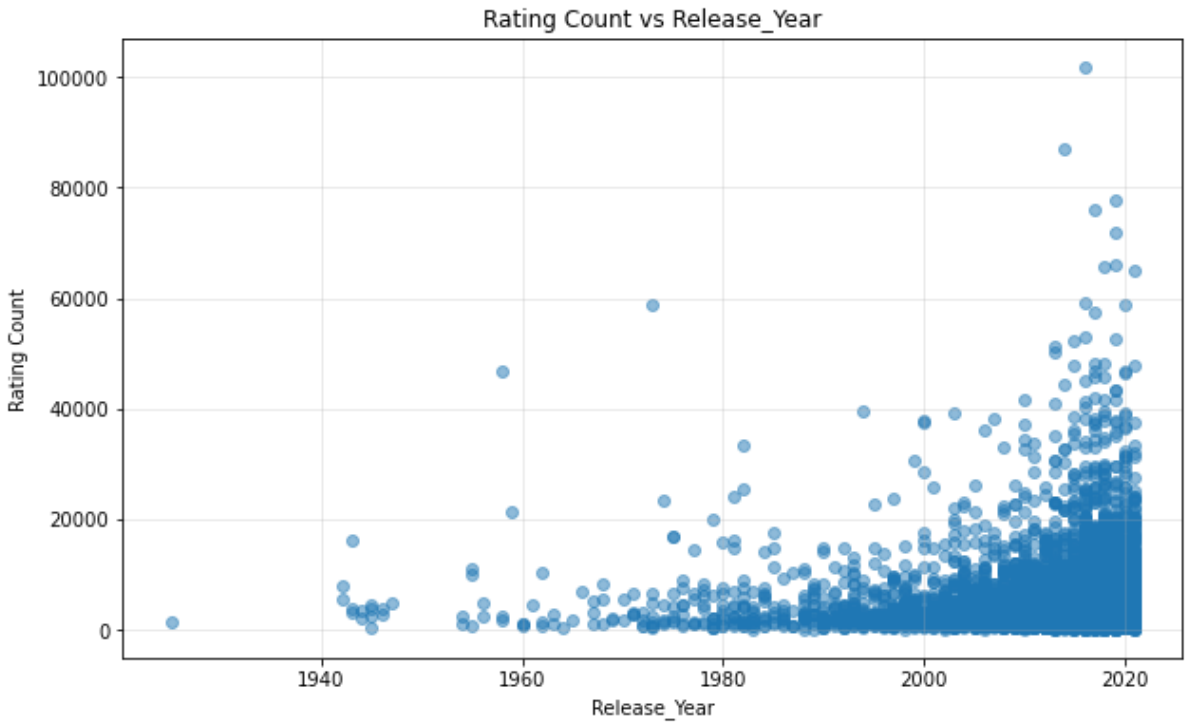
In [23]:
```
# Let's look at correlations with rating count specifically
print("\nCORRELATIONS WITH RATING COUNT:")
rating_correlations = correlation_matrix['Rating_Count'].sort_values(ascending=Fals
print(rating_correlations)

# Simple scatter plot to visualize the strongest correlation
plt.figure(figsize=(10, 6))

# Find the feature most correlated with Rating (excluding itself)
strongest_corr = rating_correlations.index[1]  # index[0] is Viewer_Rating itself

plt.scatter(netflix_df[strongest_corr], netflix_df['Rating_Count'], alpha=0.5)
plt.xlabel(strongest_corr)
plt.ylabel('Rating Count')
plt.title(f'Rating Count vs {strongest_corr}')
plt.grid(True, alpha=0.3)
plt.show()
```

```
CORRELATIONS WITH RATING COUNT:
Rating_Count    1.000000
Release_Year    0.006275
Name: Rating_Count, dtype: float64
```

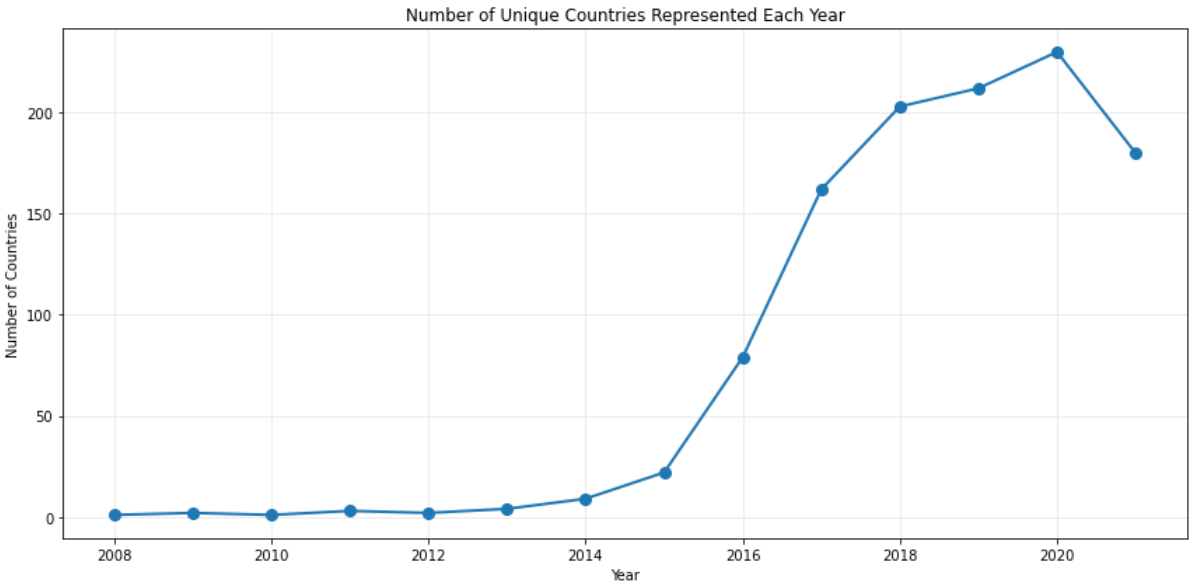


Global Analysis

In [24]:
```
# Track Country diversity overtime
# Count unique countries by year
netflix_df['Year_Added'] = netflix_df['Date_Added'].dt.year
countries_by_year = netflix_df.groupby('Year_Added')['Country'].nunique()

# Plot the results
plt.figure(figsize=(12, 6))
countries_by_year.plot(kind='line', marker='o', linewidth=2, markersize=8)
plt.title('Number of Unique Countries Represented Each Year')
plt.xlabel('Year')
plt.ylabel('Number of Countries')
plt.grid(True, alpha=0.3)
plt.tight_layout()
plt.show()

print("Countries represented by year:")
print(countries_by_year)
```



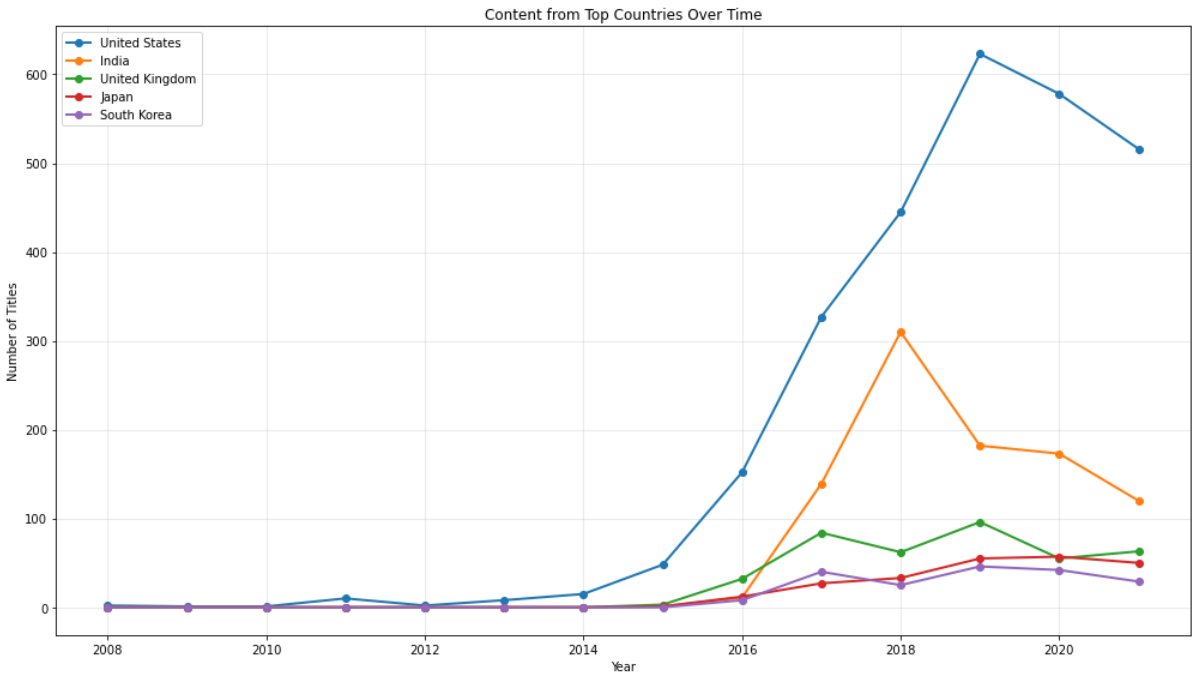

```
Countries represented by year:
Year_Added
2008      1
2009      2
2010      1
2011      3
2012      2
2013      4
2014      9
2015     22
2016     79
2017    162
2018    203
2019    212
2020    230
2021    180
Name: Country, dtype: int64
```

In [25]:
```
# Track top 5 countries over time
top_countries = netflix_df['Country'].value_counts().head(5).index.tolist()

# Create a pivot table showing count of content from top countries by year
country_trends = netflix_df[netflix_df['Country'].isin(top_countries)].pivot_table(
    index='Year_Added',
    columns='Country',
    values='Show_Id',
    aggfunc='count'
).fillna(0)

# Plot the trends
plt.figure(figsize=(14, 8))
for country in top_countries:
    plt.plot(country_trends.index, country_trends[country], label=country, linewidt

plt.title('Content from Top Countries Over Time')
plt.xlabel('Year')
plt.ylabel('Number of Titles')
plt.legend()
plt.grid(True, alpha=0.3)
plt.tight_layout()
plt.show()
```

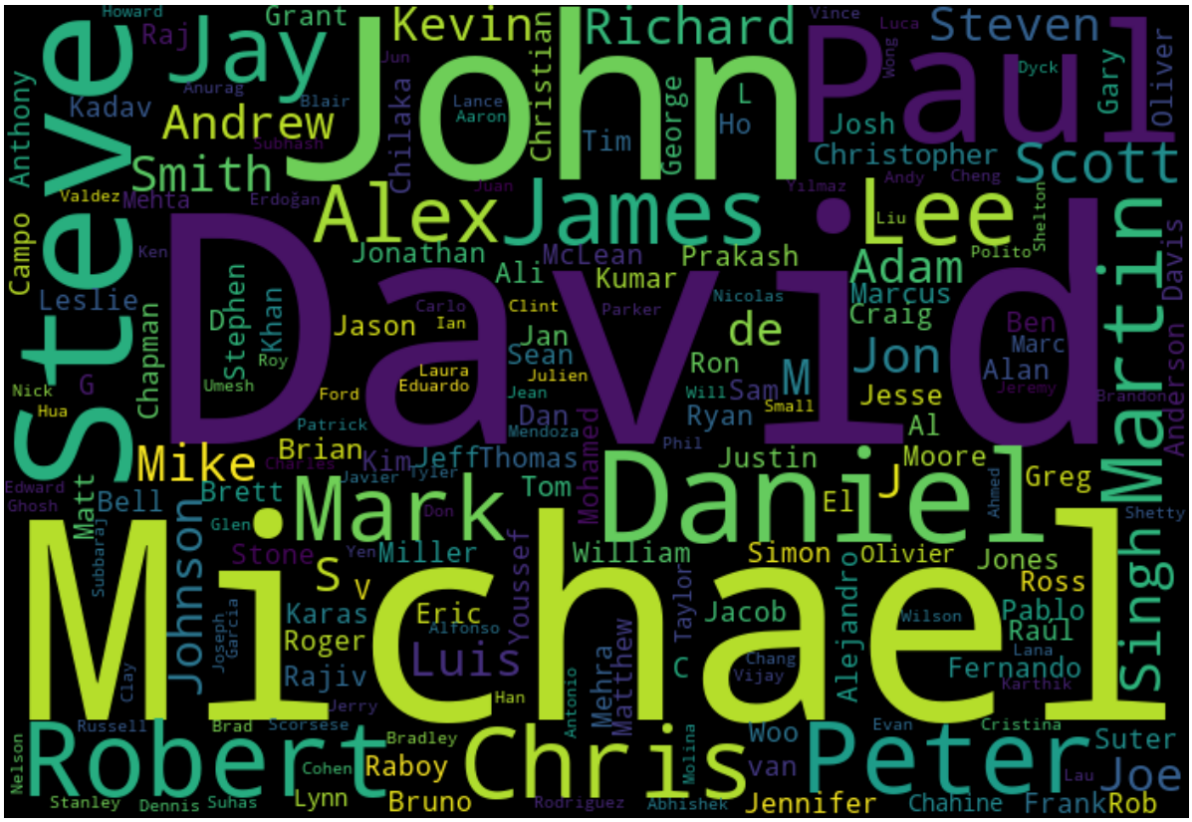


Netflix Directors WordCloud Analysis

In [26]:
```
from wordcloud import WordCloud
```

In [27]:
```
# Analyzing the distribution of Directorsin Netflix Titles
df = ','.join(map(str, netflix_df['Director'].values))
stopwords = ['Re', 'Fwd', '3A_']
wrd = WordCloud(background_color='black', width=700, height=480, margin=0, collocat
for sw in stopwords:
    wrd.stopwords.add(sw)
    wordcloud = wrd.generate(df)

plt.figure(figsize=(25,15))
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis("off")
plt.margins(x=0, y=0)
```



Genre Analysis

In [29]:
```
# Cluster based on genres (simplified approach)
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.cluster import KMeans

# Create binary features for top genres
top_genres = ['Drama', 'Comedy', 'Action', 'Documentary', 'International', 'Romance

# Create genre flags
for genre in top_genres:
    netflix_df[f'Genre_{genre}'] = netflix_df['Listed_In'].str.contains(genre, na=F

# Select genre columns for clustering
genre_columns = [f'Genre_{genre}' for genre in top_genres]
genre_features = netflix_df[genre_columns].dropna()

# Apply clustering
kmeans_genres = KMeans(n_clusters=4, random_state=42)
genre_clusters = kmeans_genres.fit_predict(genre_features)

# Add to dataframe
netflix_df['Genre_Cluster'] = genre_clusters

# Analyze what each genre cluster represents
cluster_genre_profiles = netflix_df.groupby('Genre_Cluster')[genre_columns].mean()

print("Genre Cluster Profiles (average genre presence):")
cluster_genre_profiles.round(2)
```

```
Genre Cluster Profiles (average genre presence):
```

Out[29]:

Genre_Cluster	Genre_Drama	Genre_Comedy	Genre_Action	Genre_Documentary	Genre_Internationa
0	1.0	0.00	0.08	0.0	1
1	0.0	0.11	0.12	0.0	0
2	0.0	0.01	0.15	0.0	1
3	1.0	0.00	0.11	0.0	0

Key Findings

- Most of the content on Netflix is made for older teens and adults. Ratings like TV-MA, TV-14, and R are the most common. When we look at the difference between movies and TV shows, we see that there are simply more movies than TV shows in these mature categories. This means that Netflix's large collection of movies is a big reason why its library feels so focused on an adult audience.
- The growth trajectory of Netflix's content library shows a distinct pattern. Netflix started by slowly adding new shows and movies. Then, for a while, it added a huge number of new titles each year. Recently, it has slowed down this rapid growth, which suggests it's now focusing more on the quality of its new content rather than just the quantity. Also, we found that older movies and shows are just as popular as new ones based on how many ratings they get. This means people still watch and enjoy the older content in Netflix's library.
- Netflix has been adding shows and movies from more and more countries over the years, making its library very global. However, in 2021, it started adding content from 180 countries only. This suggests a change in strategy instead of trying to get content from everywhere, Netflix might now be focusing on a few key regions. The top countries for Netflix content are the United States, India, the United Kingdom, Canada, and Spain. This shows that while English-language content is still the base, India has become a very important market for them.
- An examination of directors featured on the platform reveals that a relatively small group of individuals is associated with a large number of titles. Prominent first names such as Michael, John, Paul, David, Robert, and Peter are among the most frequently listed, suggesting a concentration of prolific creators within the industry who are well-represented on Netflix.
- A cluster analysis of the content catalog successfully identified four distinct thematic groupings, providing a data-driven view of Netflix's content pillars:
    - Cluster 1: Action/Comedy Content - A core segment blending high-energy and humorous narratives.
    - Cluster 2: International Drama Content - Highlighting the depth and diversity of non-English language storytelling.
    - Cluster 3: International Action Content - Focusing on action-oriented titles from outside the dominant markets.
    - Cluster 4: Drama Content - Representing a broad category of character and story-driven narratives, likely forming the backbone of the catalog.

Conclusion

This Netflix analysis paints a picture of a mature, global streaming service that has successfully transitioned from rapid growth to strategic optimization. Netflix's catalog is predominantly composed of mature-audience content, with a strong foundation in the U.S. and other key Western markets, but with a clear, albeit recently refined, global expansion strategy. The content itself can be naturally categorized into a few major thematic clusters, with a mix of domestic and international focus. The stabilization of content growth and the 2021 pullback in country representation suggest a new phase of strategic prioritization for the Netflix company.

Recommendation

- Given the dominance of TV-MA, TV-14, and R ratings, continued investment in high-quality, original content for these demographics is crucial to maintain subscriber engagement.
- While broad international expansion has slowed, targeted investments in regions with high growth potential (e.g., India, East Asia) and strategic partnerships with prolific creators in existing strongholds (e.g., Spain, UK) could yield high returns.

References

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- Lotz, A. D. (2021). Netflix and Streaming Video: The Business of Subscriber-Funded Video on Demand. Polity Press.
- Statista. (2023). Number of Netflix Paying Subscribers Worldwide.