```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import kagglehub
%matplotlib inline
```

```
/Users/mohid/Documents/Data
Science/env/lib/python3.12/site-packages/tqdm/auto.py:21: TqdmWarning:
IProgress not found. Please update jupyter and ipywidgets. See
https://ipywidgets.readthedocs.io/en/stable/user_install.html
  from .autonotebook import tqdm as notebook_tqdm
```

```
path = kagglehub.dataset_download("shivamb/netflix-shows")

print("Path to dataset files:", path)
```

```
Path to dataset files:
/Users/mohid/.cache/kagglehub/datasets/shivamb/netflix-shows/versions/
5
```

```
df =pd.read_csv('/Users/mohid/Documents/Data
Science/netflix_titles.csv')
df.head(10)
```

```
  show_id     type                                 title  \
0      s1    Movie              Dick Johnson Is Dead
1      s2  TV Show                      Blood & Water
2      s3  TV Show                          Ganglands
3      s4  TV Show              Jailbirds New Orleans
4      s5  TV Show                       Kota Factory
5      s6  TV Show                      Midnight Mass
6      s7    Movie  My Little Pony: A New Generation
7      s8    Movie                               Sankofa
8      s9  TV Show     The Great British Baking Show
9     s10    Movie                        The Starling

                         director  \
0                 Kirsten Johnson
1                             NaN
2                 Julien Leclercq
3                             NaN
4                             NaN
5                   Mike Flanagan
6  Robert Cullen, José Luis Ucha
7                    Haile Gerima
8                 Andy Devonshire
9                  Theodore Melfi

                                                cast  \
```

```
0                                                     NaN
1  Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...
2  Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...
3                                                     NaN
4  Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...
5  Kate Siegel, Zach Gilford, Hamish Linklater, H...
6  Vanessa Hudgens, Kimiko Glenn, James Marsden, ...
7  Kofi Ghanaba, Oyafunmike Ogunlano, Alexandra D...
8  Mel Giedroyc, Sue Perkins, Mary Berry, Paul Ho...
9  Melissa McCarthy, Chris O'Dowd, Kevin Kline, T...

                                              country
date_added  \
0                                       United States  September 25,
2021
1                                        South Africa  September 24,
2021
2                                                 NaN  September 24,
2021
3                                                 NaN  September 24,
2021
4                                               India  September 24,
2021
5                                                 NaN  September 24,
2021
6                                                 NaN  September 24,
2021
7  United States, Ghana, Burkina Faso, United Kin...  September 24,
2021
8                                      United Kingdom  September 24,
2021
9                                       United States  September 24,
2021

   release_year rating   duration  \
0          2020  PG-13     90 min
1          2021  TV-MA  2 Seasons
2          2021  TV-MA   1 Season
3          2021  TV-MA   1 Season
4          2021  TV-MA  2 Seasons
5          2021  TV-MA   1 Season
6          2021     PG     91 min
7          1993  TV-MA    125 min
8          2021  TV-14  9 Seasons
9          2021  PG-13    104 min

                                          listed_in  \
0                                       Documentaries
1    International TV Shows, TV Dramas, TV Mysteries
2  Crime TV Shows, International TV Shows, TV Act...
```

```
3                               Docuseries, Reality TV
4  International TV Shows, Romantic TV Shows, TV ...
5                 TV Dramas, TV Horror, TV Mysteries
6                            Children & Family Movies
7   Dramas, Independent Movies, International Movies
8                        British TV Shows, Reality TV
9                                   Comedies, Dramas

                                           description
0  As her father nears the end of his life, filmm...
1  After crossing paths at a party, a Cape Town t...
2  To protect his family from a powerful drug lor...
3  Feuds, flirtations and toilet talk go down amo...
4  In a city of coaching centers known to train I...
5  The arrival of a charismatic young priest brin...
6  Equestria's divided. But a bright-eyed hero be...
7  On a photo shoot in Ghana, an American model s...
8  A talented batch of amateur bakers face off in...
9  A woman adjusting to life after a loss contend...
```

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

```
show_id            0
type               0
title              0
director        2634
cast             825
country          831
date_added        10
release_year       0
rating             4
duration           3
listed_in          0
description        0
dtype: int64
```

```
common_Ratings = df['rating'].value_counts().mod
common_Ratings
```

```
<bound method Series.mod of rating
TV-MA       3207
TV-14       2160
TV-PG        863
R            799
PG-13        490
TV-Y7        334
TV-Y         307
PG           287
TV-G         220
NR            80
```

```
G              41
TV-Y7-FV        6
NC-17           3
UR              3
74 min          1
84 min          1
66 min          1
Name: count, dtype: int64>
```

Netflix Movies & TV Shows (Descriptive Analysis)

Overview

- Total Movies and TV Shows

```
print(df['type'].unique() )
TV_shows = df[df['type'] == 'TV Show']
Movies = df[df['type'] == 'Movie']
print("Total TV Shows: ", len(TV_shows))
print("Total Movies: ", len(Movies))
```

```
['Movie' 'TV Show']
Total TV Shows:  2676
Total Movies:  6131
```

- Average duration of movies

```
Movies['duration_minutes'] = Movies['duration'].str.extract('(\
d+)').astype(float)
average_duration = Movies['duration_minutes'].mean()
print(f"Average Movie Duration: {average_duration:.2f} minutes")
```

```
Average Movie Duration: 99.58 minutes
```

```
<>:1: SyntaxWarning: invalid escape sequence '\d'
<>:1: SyntaxWarning: invalid escape sequence '\d'
/var/folders/54/s3hwjrbj3v70q48n9t89g9hc0000gn/T/ipykernel_1645/170794
9947.py:1: SyntaxWarning: invalid escape sequence '\d'
  Movies['duration_minutes'] = Movies['duration'].str.extract('(\
d+)').astype(float)
/var/folders/54/s3hwjrbj3v70q48n9t89g9hc0000gn/T/ipykernel_1645/170794
9947.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead
```

```
See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  Movies['duration_minutes'] = Movies['duration'].str.extract('(\
d+)').astype(float)
```

- Most common ratings

Rating Distribution by Country and Type

The following visualization shows how Netflix content ratings are distributed across the **top 4 countries** with the most titles: **United States, India, United Kingdom**, and **Canada**.

Each subplot corresponds to a country and displays rating counts split by **content type** (Movie vs TV Show). This helps compare how different regions categorize their content in terms of age appropriateness.

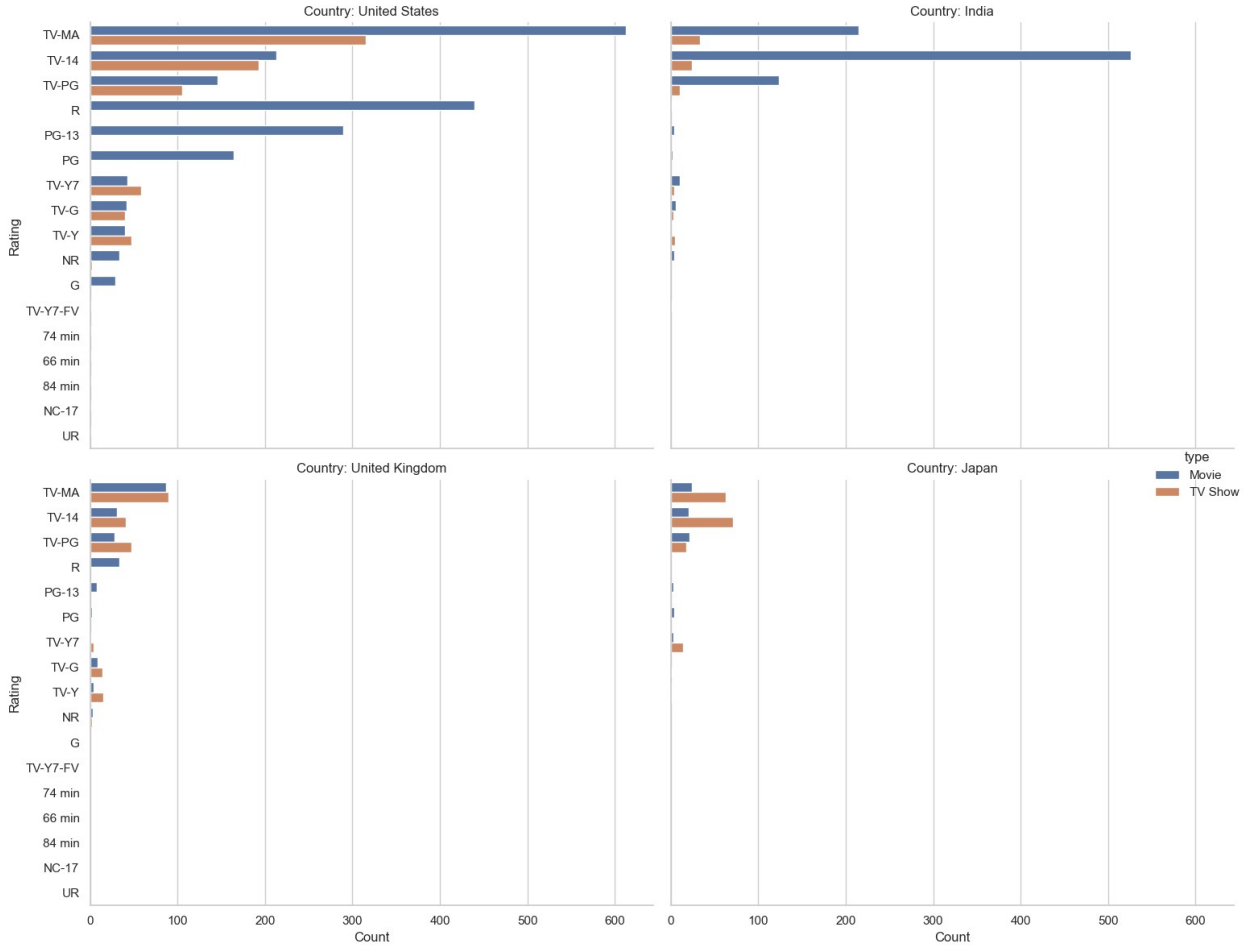
Key Insights:

- **TV-MA** is the dominant rating in most countries, especially the United States.
- **India** shows a notable presence of both **TV-14** and **TV-MA**, with a clear majority being Movies.
- The **United Kingdom** and **Canada** show relatively balanced distributions between Movies and TV Shows.
- The range of ratings is broader in the **United States**, suggesting more diverse content for different audiences.

This analysis highlights regional differences in how Netflix content is rated and the type of content most common in each region.

```
top_countries = df['country'].value_counts().head(4).index

subset = df[df['country'].isin(top_countries)]

order = subset['rating'].value_counts().index

sns.set(style="whitegrid")
g = sns.catplot(
    data=subset,
    kind="count",
    y="rating",
    order=order,
    hue="type",
    col="country",
    col_wrap=2,
    height=6,
    aspect=1.2
)

g.set_titles("Country: {col_name}")
```

```
g.set_axis_labels("Count", "Rating")
plt.tight_layout()
plt.show()
```



Time-Based Analysis

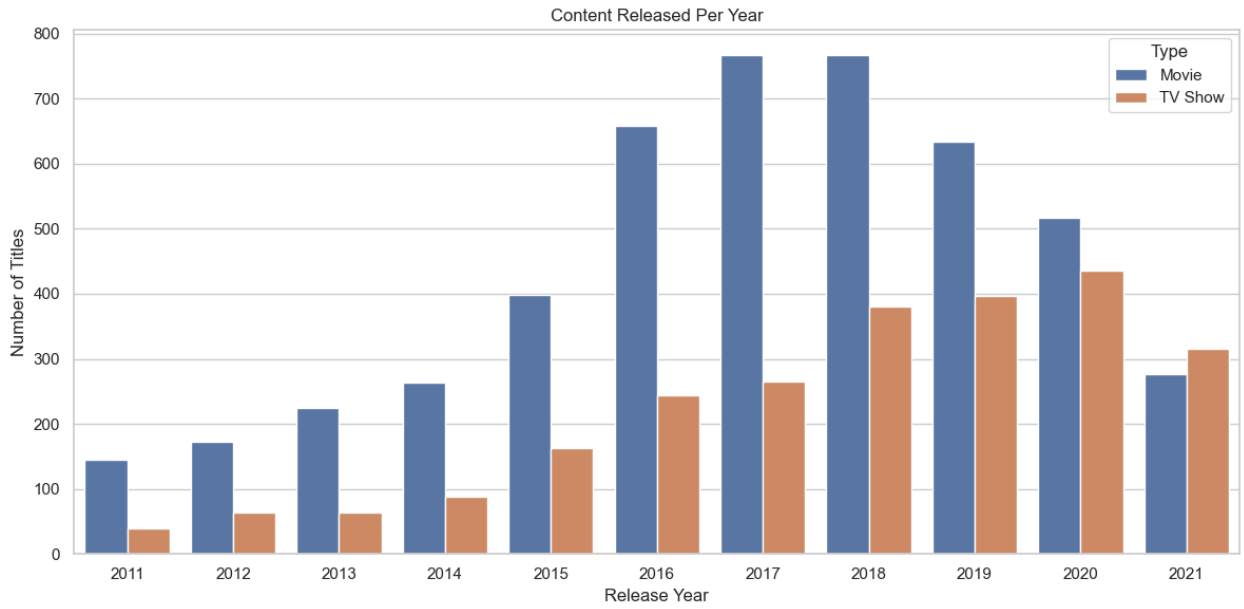
Understanding how Netflix has added content over time helps uncover trends in platform strategy, seasonal preferences, and user engagement.

1. Content Added Per Year

We visualized the total number of titles (Movies + TV Shows) added each year. This helps identify growth patterns and Netflix's content expansion phases.
Insight: Significant growth observed post-2015, with a content surge around 2018–2020.

```
content_PerYear = df[['release_year', 'type',
'title']].groupby(['release_year',
'type']).count().reset_index().sort_values(by='release_year')
usefulData = content_PerYear.tail(22)
plt.figure(figsize=(12, 6))
```

```
sns.barplot(data=usefulData, x='release_year', y='title', hue='type')
plt.title('Content Released Per Year')
plt.xlabel('Release Year')
plt.ylabel('Number of Titles')
plt.legend(title='Type')
plt.tight_layout()
plt.show()
```



2. Most Active Year for Content Addition

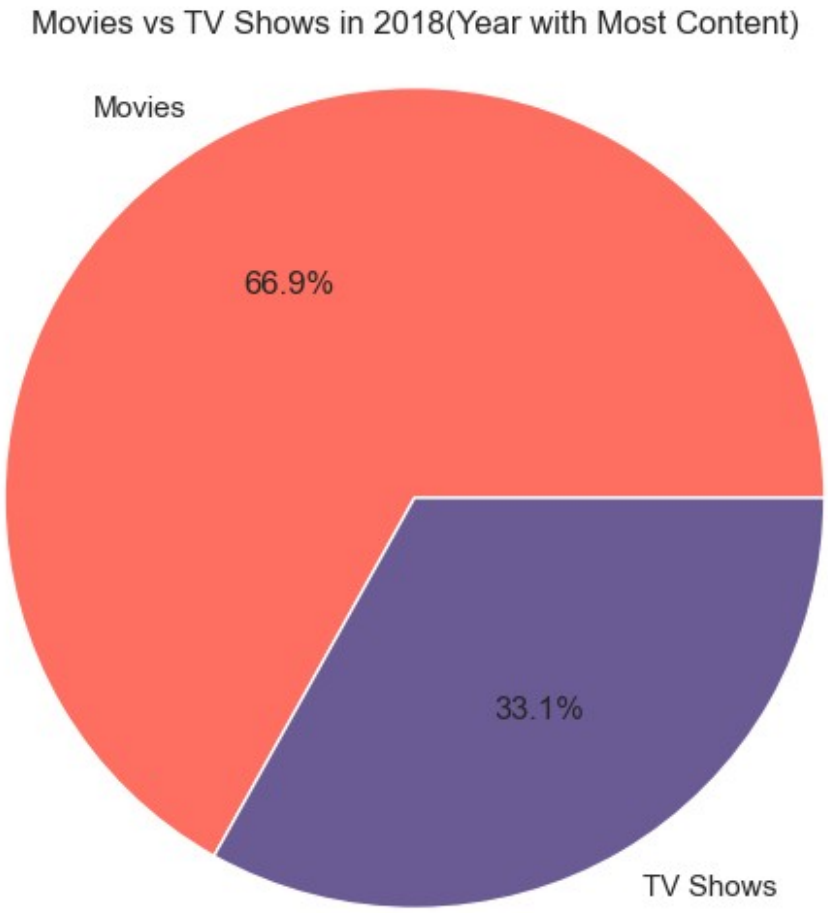
By identifying the year with the highest number of releases, we highlighted Netflix's peak publishing year.

```
MaxContentYear = df['release_year'].value_counts().idxmax()
year_data = df[df['release_year'] == MaxContentYear]

movie_count = year_data[year_data['type'] == 'Movie'].shape[0]
tv_count = year_data[year_data['type'] == 'TV Show'].shape[0]
total = movie_count + tv_count

print(f"The year with the most content is: {MaxContentYear} with
{total} titles — including {movie_count} Movies and {tv_count} TV
Shows.")
```

```
The year with the most content is: 2018 with 1147 titles — including
767 Movies and 380 TV Shows.
```

Insight: The year **`[Year]`** had the most titles added, indicating a major content push.

```
labels = ['Movies', 'TV Shows']
sizes = [movie_count, tv_count]
colors = ['#FF6F61', '#6B5B95']

plt.figure(figsize=(6,6))
plt.pie(
    sizes,
    labels=labels,
    autopct='%1.1f%%',
    colors=colors,
    wedgeprops={'edgecolor': 'white'}
)
plt.title(f"Movies vs TV Shows in {MaxContentYear}(Year with Most
Content)")
plt.axis('equal')
plt.show()
```



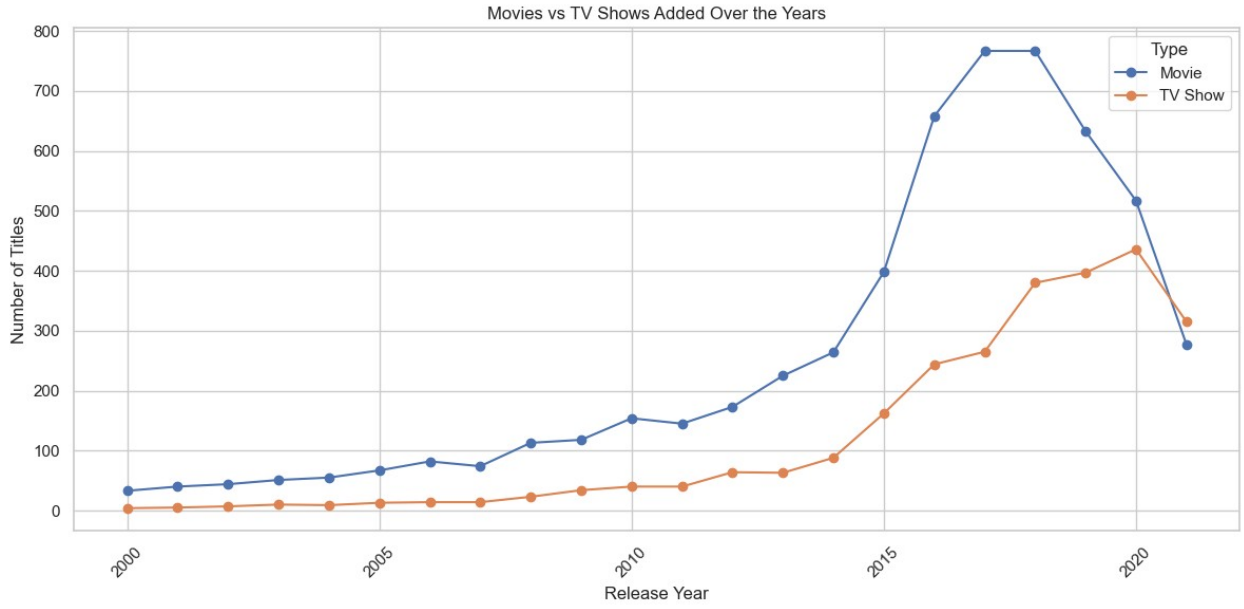
3. Movies vs TV Shows Over Time

Using a grouped line/bar chart, we tracked how Netflix's focus shifted between Movies and TV Shows over the years.

```
grouped = df.groupby(['release_year',
'type']).size().reset_index(name='count')
pivot_df = grouped.pivot(index='release_year', columns='type',
values='count').fillna(0).tail(22)
```

Insight: While Movies dominated in earlier years, TV Shows have been steadily rising in recent years — showing a strategic balance shift.

```
pivot_df.plot(kind='line', marker='o', figsize=(12,6))
plt.title("Movies vs TV Shows Added Over the Years")
plt.xlabel("Release Year")
plt.ylabel("Number of Titles")
plt.xticks(rotation=45)
plt.legend(title="Type")
plt.grid(True)
plt.tight_layout()
plt.show()
```



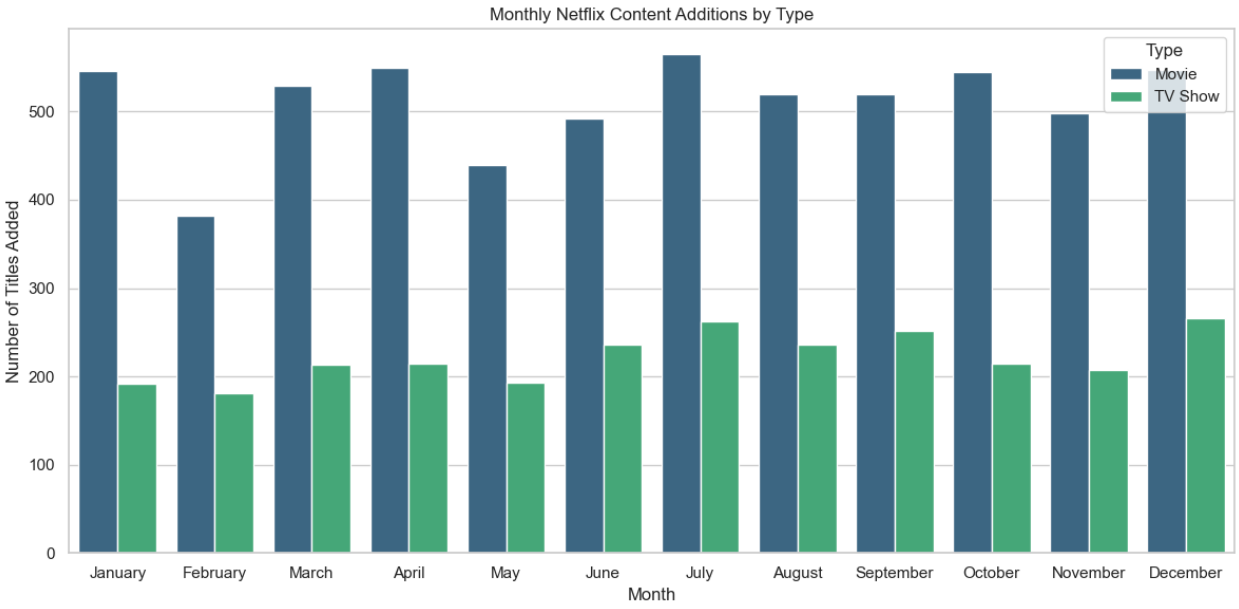
4. Month-wise Release Trend

We analyzed seasonal patterns by extracting the `month_added` from the `date_added` column.

- **Bar Chart:** Shows which months generally have the most content added.

```
df['date_added'] = df['date_added'].astype(str).str.strip()
df['date_added'] = pd.to_datetime(df['date_added'], errors='coerce')
```

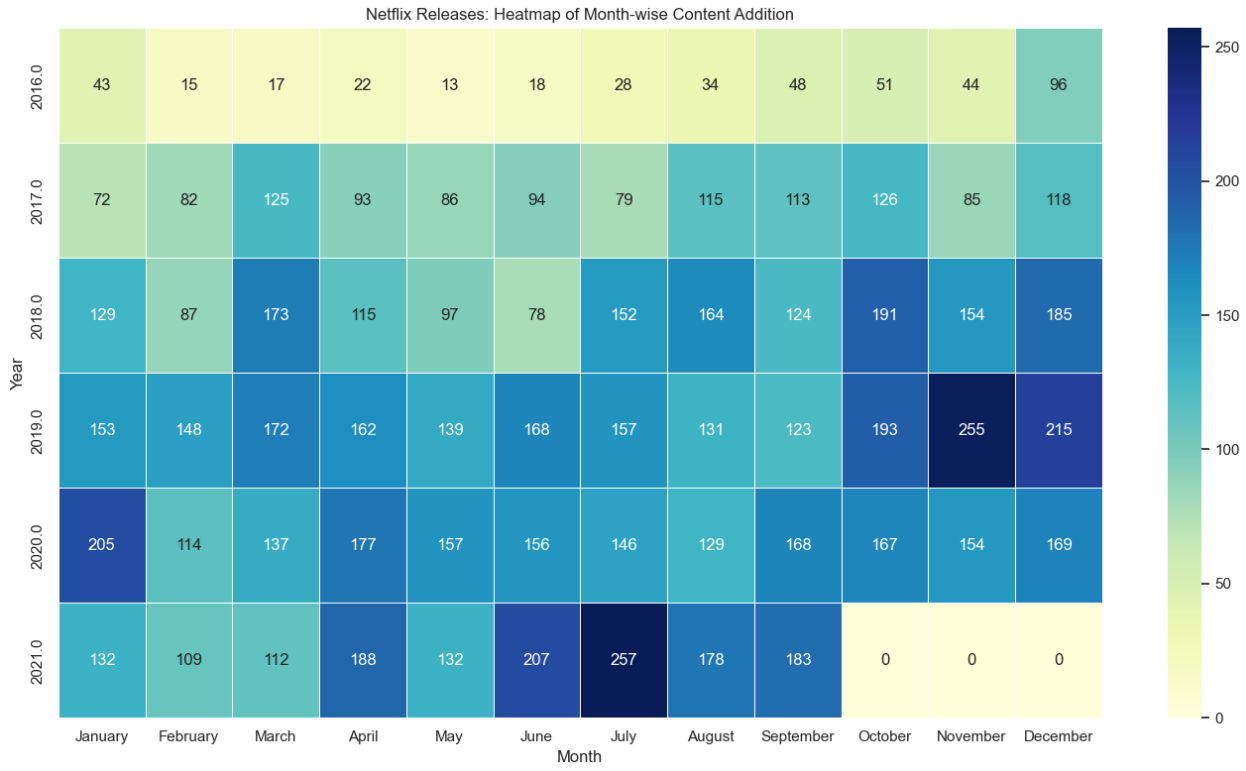
```
df['month_added'] = df['date_added'].dt.month_name()
df['year_added'] = df['date_added'].dt.year

month_order = ['January', 'February', 'March', 'April', 'May', 'June',
               'July', 'August', 'September', 'October', 'November',
'December']

monthly_counts = df['month_added'].value_counts().reindex(month_order)

plt.figure(figsize=(12,6))
sns.countplot(
    data=df,
    x='month_added',
    hue='type',
    order=month_order,
    palette='viridis'
)

plt.title("Monthly Netflix Content Additions by Type")
plt.xlabel("Month")
plt.ylabel("Number of Titles Added")
plt.legend(title='Type')
plt.tight_layout()
plt.show()
```



- **Heatmap:** Reveals release volume trends across both **months** and **years**.

Insight: December and July tend to have spikes — possibly due to holidays and summer breaks. Some months consistently show lower release activity.

```
heatmap_data = df.groupby(['year_added',
'month_added']).size().unstack(fill_value=0).tail(6)

heatmap_data = heatmap_data[month_order]

plt.figure(figsize=(14, 8))
sns.heatmap(heatmap_data, cmap="YlGnBu", linewidths=0.5, annot=True,
fmt='d')
plt.title("Netflix Releases: Heatmap of Month-wise Content Addition")
plt.xlabel("Month")
plt.ylabel("Year")
plt.tight_layout()
plt.show()
```



Conclusion:

This time-based analysis highlights Netflix's evolving content strategy. It shows not only how much content was added, but also when — providing valuable insights into release timing, seasonal marketing, and content planning.

🌍 Geographic & 👥 People-Centric Analysis

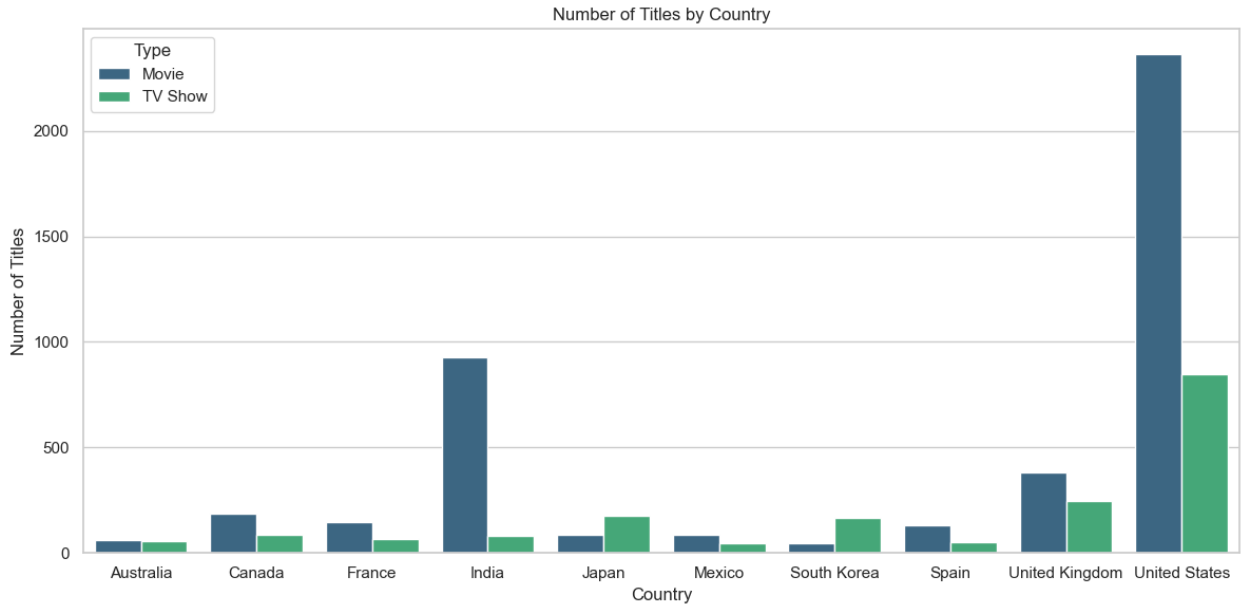
🌍 Geographic Analysis

🔟 Top 10 Producing Countries

- Dropped rows with missing `country` or `type` values.
- Extracted the **first listed country** for consistency.
- Identified the **top 10 countries** with the most content.
- Grouped by `country` and `type` to see the distribution of **Movies vs TV Shows**.
- **Visualization:** A bar chart showing content count by country, separated by type using `hue`.

```
df_country = df.dropna(subset=['country', 'type'])
df_country['country'] = df_country['country'].str.split(',').str[0]
top_countries = df_country['country'].value_counts().head(10).index
df_country = df_country.groupby(['country',
'type']).size().reset_index(name='count')
df_country = df_country[df_country['country'].isin(top_countries)]

plt.figure(figsize=(12, 6))
sns.barplot(
    data=df_country,
    x='country',
    y='count',
    hue='type',
    palette='viridis'
)
plt.title("Number of Titles by Country")
plt.xlabel("Country")
plt.ylabel("Number of Titles")
plt.legend(title='Type')
plt.tight_layout()
plt.show()
```

```
/var/folders/54/s3hwjrbj3v70q48n9t89g9hc0000gn/T/
ipykernel_1645/1318691866.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df_country['country'] = df_country['country'].str.split(',').str[0]
```



Most Popular Genres by Country

- Cleaned the `listed_in` column to extract the **primary genre**.
- Focused on the **top 10 genres** and **top 5 countries**.
- Grouped by genre and country to show regional preferences.
- **Visualization:** A heatmap to show which genres are most popular in each country.

```
df_genre = df.dropna(subset=['listed_in','country'])
df_genre['listed_in'] = df_genre['listed_in'].str.split(',').str[0]
top_genres = df_genre['listed_in'].value_counts().head(10).index
df_genre = df_genre[df_genre['listed_in'].isin(top_genres)]
df_genre['country'] = df_genre['country'].str.split(',').str[0]
Top_countries = df_genre['country'].value_counts().head(5).index
df_genre = df_genre[df_genre['country'].isin(Top_countries)]
df_genre = df_genre.groupby(['listed_in',
'country']).size().reset_index(name='count')

plt.figure(figsize=(14, 8))
sns.heatmap(
    df_genre.pivot(index='listed_in', columns='country',
values='count'),
    cmap='YlGnBu',
    annot=True,
    fmt='d',
    linewidths=0.5
)
plt.title("Heatmap of Genres by Country")
plt.xlabel("Country")
plt.ylabel("Genre")
plt.tight_layout()
plt.show()
```

```
/var/folders/54/s3hwjrbj3v70q48n9t89g9hc0000gn/T/
ipykernel_1645/3854286807.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df_genre['listed_in'] = df_genre['listed_in'].str.split(',').str[0]
```

🎭 People-Centric Analysis

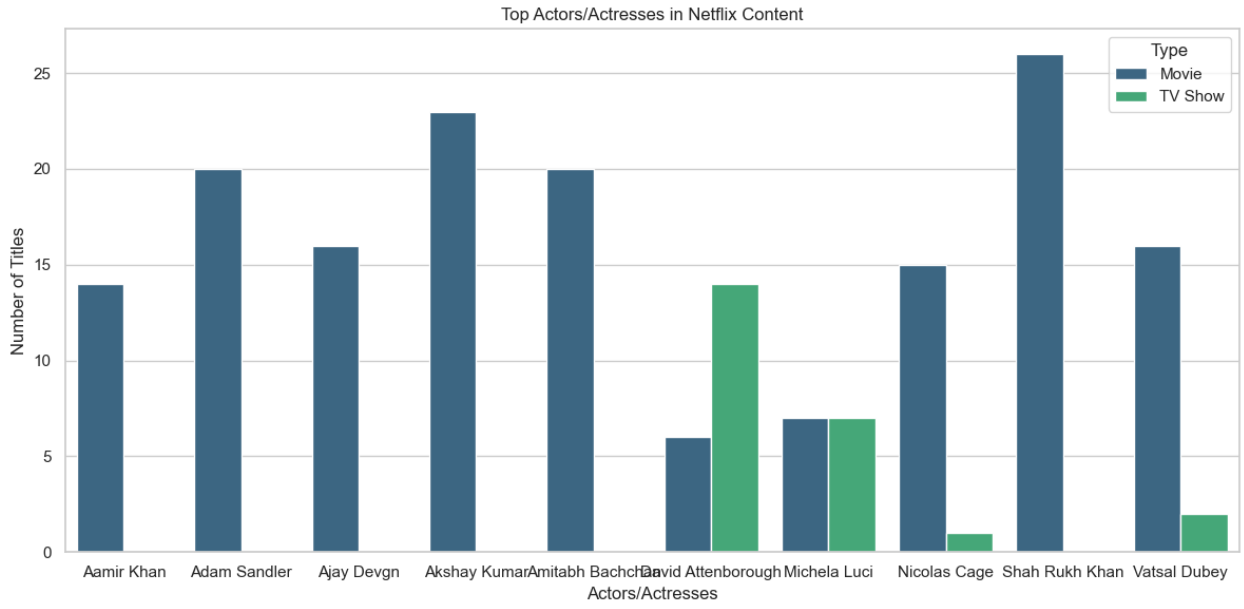
🎬 Top 10 Directors with Most Titles

- Extracted the first listed director.
- Identified the **top 10 directors** based on title count.
- Grouped by `director` and `type` to differentiate between Movies and TV Shows.
- **Visualization:** A bar chart showing content count for each top director by type.

```
df_cast = df.dropna(subset=['cast'])
df_cast['cast'] = df_cast['cast'].str.split(',').str[0]
top_cast = df_cast['cast'].value_counts().head(10).index
df_cast = df_cast[df_cast['cast'].isin(top_cast)]
df_cast = df_cast.groupby(['cast',
'type']).size().reset_index(name='count')

plt.figure(figsize=(12, 6))
```

```
sns.barplot(
    data=df_cast,
    x='cast',
    y='count',
    hue='type',
    palette='viridis'
)
plt.title("Top Actors/Actresses in Netflix Content")
plt.xlabel("Actors/Actresses")
plt.ylabel("Number of Titles")
plt.legend(title='Type')
plt.tight_layout()
plt.show()
```

```
/var/folders/54/s3hwjrbj3v70q48n9t89g9hc0000gn/T/
ipykernel_1645/2079978701.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df_cast['cast'] = df_cast['cast'].str.split(',').str[0]
```

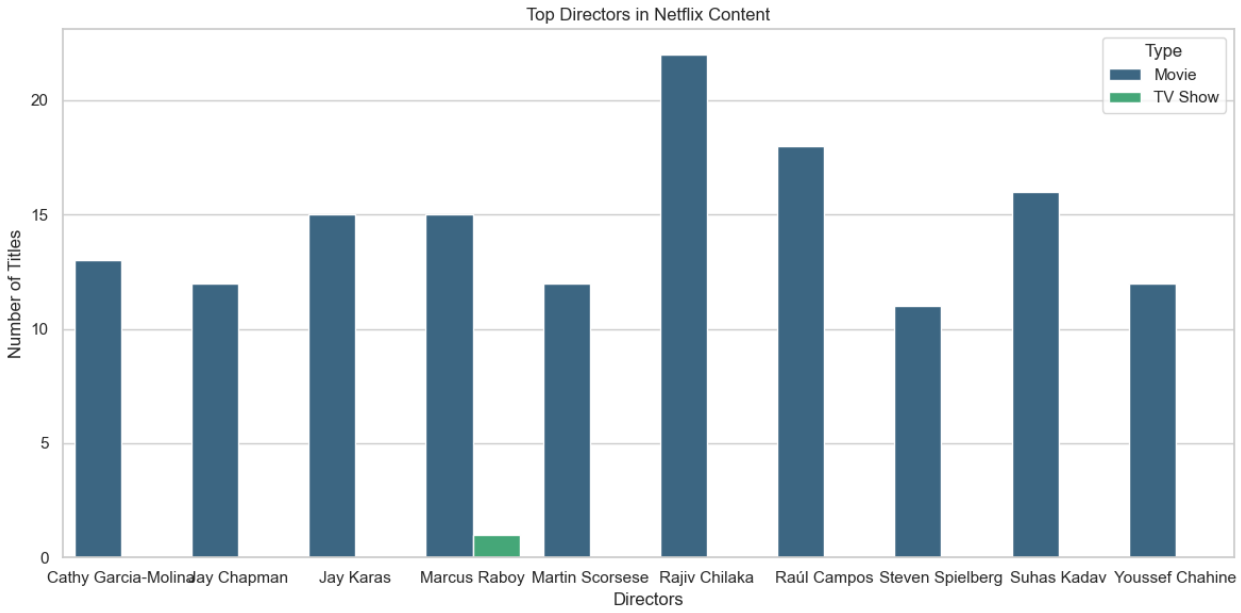


Most Frequent Actors/Actresses

- Extracted the first actor/actress listed in the `cast` column.
- Identified the **top 10 most frequent actors** on Netflix.
- Grouped by actor and content type.
- **Visualization:** A bar chart highlighting the most featured actors and their involvement in Movies vs TV Shows.

```
df_director = df.dropna(subset=['director'])
df_director['director'] =
df_director['director'].str.split(',').str[0]
top_directors = df_director['director'].value_counts().head(10).index
df_director = df_director[df_director['director'].isin(top_directors)]
df_director = df_director.groupby(['director',
'type']).size().reset_index(name='count')

plt.figure(figsize=(12, 6))
sns.barplot(
    data=df_director,
    x='director',
    y='count',
    hue='type',
    palette='viridis'
)
plt.title("Top Directors in Netflix Content")
plt.xlabel("Directors")
plt.ylabel("Number of Titles")
plt.legend(title='Type')
plt.tight_layout()
plt.show()
```

```
/var/folders/54/s3hwjrbj3v70q48n9t89g9hc0000gn/T/
ipykernel_1645/1765839173.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df_director['director'] =
df_director['director'].str.split(',').str[0]
```



Content Genre Analysis

Top 10 Most Common Genres

I analyzed the `listed_in` column to identify the top 10 most frequently appearing genres across Netflix content. These genres highlight the platform's most dominant content categories based on volume.

```
genre = df_genre['listed_in'].value_counts().head(10).index
genre = df_genre['listed_in'].value_counts().head(10).index.tolist()

print('---------------\n',"Top 10 Genres:  ",'\n---------------')

i = 0
for g in genre:
    i+=1
    print(i ,'|', g)
```

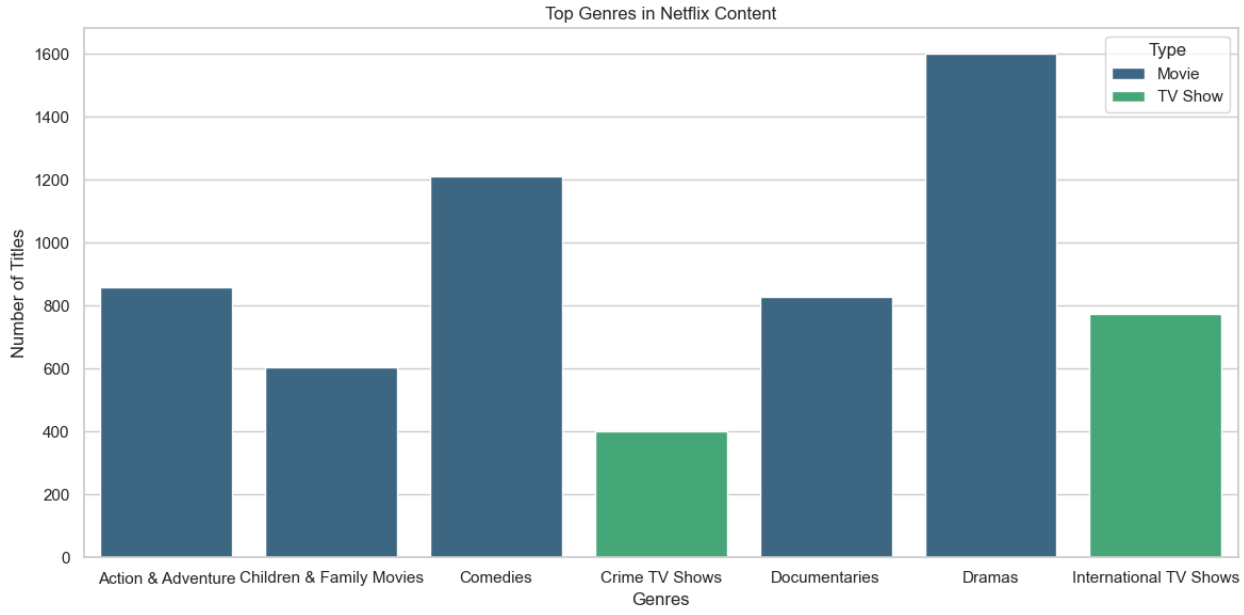
```
---------------
 Top 10 Genres:
---------------
1 | Action & Adventure
2 | Children & Family Movies
3 | Comedies
4 | Crime TV Shows
5 | Documentaries
6 | Dramas
7 | Horror Movies
8 | International TV Shows
```

```
9 | Kids' TV
10 | Stand-Up Comedy
```

Genre Distribution in Movies vs TV Shows

A bar chart was created to show the distribution of top genres separately for Movies and TV Shows. This helps reveal how certain genres (e.g., Drama, Comedy) vary in popularity depending on content type.

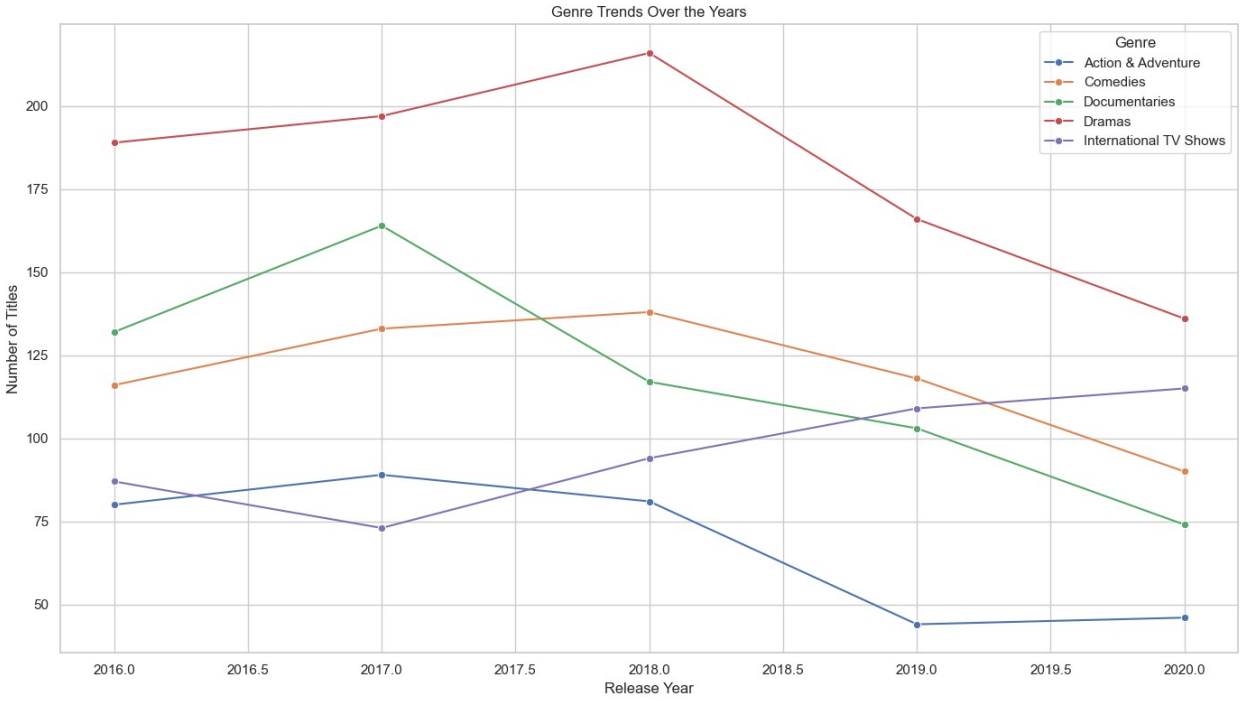
```
t_genre = df.dropna(subset=['listed_in','type'])
t_genre['listed_in'] = t_genre['listed_in'].str.split(',').str[0]
top_genres = t_genre['listed_in'].value_counts().head(7).index
t_genre = t_genre[t_genre['listed_in'].isin(top_genres)]
t_genre = t_genre.groupby(['listed_in',
'type']).size().reset_index(name='count')

plt.figure(figsize=(12, 6))
sns.barplot(
    data=t_genre,
    x='listed_in',
    y='count',
    hue='type',
    palette='viridis'
)
plt.title("Top Genres in Netflix Content")
plt.xlabel("Genres")
plt.ylabel("Number of Titles")
plt.legend(title='Type')
plt.tight_layout()
plt.show()
```



Genre Trends Over the Years

I have tracked the popularity of the top 5 genres across the most recent 5 years using a line plot. This temporal trend shows which genres are gaining traction and which are declining over time.

```
genre_trend = df.dropna(subset=['listed_in', 'release_year'])
genre_trend['listed_in'] =
genre_trend['listed_in'].str.split(',').str[0]
top_genres = genre_trend['listed_in'].value_counts().head(5).index
genre_trend = genre_trend[genre_trend['listed_in'].isin(top_genres)]
last5_years =
genre_trend['release_year'].value_counts().sort_values(ascending=False
).head(5).index
genre_trend =
genre_trend[genre_trend['release_year'].isin(last5_years)]
genre_trend = genre_trend.groupby(['release_year',
'listed_in']).size().reset_index(name='count')

plt.figure(figsize=(14, 8))
sns.lineplot(
    data=genre_trend,
    x='release_year',
    y='count',
    hue='listed_in',
    marker='o'
)
plt.title("Genre Trends Over the Years")
plt.xlabel("Release Year")
plt.ylabel("Number of Titles")
plt.legend(title='Genre')
plt.grid(True)
plt.tight_layout()
plt.show()
```



 Completed: Genre Identification, Type-wise Comparison, and Yearly Trend Analysis

Project Summary: Netflix Movies & TV Shows Analysis

This exploratory data analysis (EDA) project dives deep into Netflix's global content catalog to uncover hidden insights about trends, patterns, and content diversity. The key areas explored include:

Descriptive Analysis

- Overview of content types (Movies vs TV Shows)
- Null value and duplicate handling
- Release year distribution and title trends

Time-Based Analysis

- Content added over the years and by months
- Seasonality trends in content uploads
- Yearly comparison of Movies vs TV Shows

Geographic Analysis

- Top 10 countries producing Netflix content
- Type-wise distribution (Movie/TV) by country
- Heatmap of genre preferences by country

People-Centric Analysis

- Top directors and most frequent actors/actresses
- Most collaborative cast members
- Type-wise distribution of director/actor contributions

Genre Analysis

- Top genres across all content
- Genre-wise comparison between Movies and TV Shows
- Yearly genre trends for the past 5 years

Insights & Learnings

- Netflix content is heavily dominated by Movies
- The USA leads in content production, followed by India and the UK
- Drama, Comedy, and Documentaries are the most consistent genres
- Notable names like Rajiv Chilaka and Anupam Kher appear frequently in the dataset

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Tools Used: Python, Pandas, Matplotlib, Seaborn
Skills Applied: Data cleaning, grouping, aggregation, visualization, trend analysis

Project Status: Completed
Next Steps *(Optional)*: Extend to recommendation systems, sentiment analysis of descriptions, or integration with IMDb/Rotten Tomatoes data.
