Name = Harsh Yadav

Roll No - 1240259025

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
df = pd.read_csv('netflix.csv',lineterminator = '\n')
```

In [3]:
```
df.head()
```

Out[3]:

	show_id	type	title	director	cast	country	date_added	release_
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	September 25, 2021	
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	September 24, 2021	
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	NaN	September 24, 2021	
3	s4	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	September 24, 2021	
4	s5	TV Show	Kota Factory	NaN	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	September 24, 2021	

In [4]:
```
df.duplicated().sum()
```

Out[4]: np.int64(0)

In [5]:
```
df.describe()
```

Out[5]:

	release_year
count	8807.000000
mean	2014.180198
std	8.819312
min	1925.000000
25%	2013.000000
50%	2017.000000
75%	2019.000000
max	2021.000000

Data Preprocessing

In [6]:
```
df.isnull().sum()
```

Out[6]:
```
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
```

In [7]:
```
print("Missing values before cleaning:\n", df.isnull().sum())
```

```
Missing values before cleaning:
 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
```

In [8]:
```
df['date_added'] = pd.to_datetime(df['date_added'], errors='coerce')
```

In [9]:
```
df['year_added'] = df['date_added'].dt.year
df['month_added'] = df['date_added'].dt.month_name()
```

In [10]:
```
df[['duration_value', 'duration_type']] = df['duration'].str.extract(r'(\d+)\s
df['duration_value'] = pd.to_numeric(df['duration_value'], errors='coerce')
```

In [11]:
```
df.drop_duplicates(inplace=True)
```

In [12]:
```
text_cols = ['type', 'title', 'director', 'country', 'rating', 'listed_in', 'd
for col in text_cols:
    df[col] = df[col].astype(str).str.strip().str.lower()
```

In [13]:
```
print("\nAfter Cleaning:\n", df.info())
print("\nSample data:\n", df.head())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8807 entries, 0 to 8806
Data columns (total 16 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   show_id         8807 non-null   object
 1   type            8807 non-null   object
 2   title           8807 non-null   object
 3   director        8807 non-null   object
 4   cast            7982 non-null   object
 5   country         8807 non-null   object
 6   date_added      8709 non-null   datetime64[ns]
 7   release_year    8807 non-null   int64
 8   rating          8807 non-null   object
 9   duration        8804 non-null   object
 10  listed_in       8807 non-null   object
 11  description     8807 non-null   object
 12  year_added      8709 non-null   float64
 13  month_added     8709 non-null   object
 14  duration_value  8804 non-null   float64
 15  duration_type   8804 non-null   object
dtypes: datetime64[ns](1), float64(2), int64(1), object(12)
memory usage: 1.1+ MB

After Cleaning:
 None

Sample data:
   show_id     type                  title         director  \
0      s1    movie   dick johnson is dead  kirsten johnson
1      s2  tv show          blood & water              nan
2      s3  tv show              ganglands  julien leclercq
3      s4  tv show  jailbirds new orleans              nan
4      s5  tv show           kota factory              nan

                                                cast        country  \
0                                                NaN  united states
1  Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...   south africa
2  Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...            nan
3                                                NaN            nan
4  Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...          india

  date_added  release_year rating   duration  \
0 2021-09-25          2020  pg-13     90 min
1 2021-09-24          2021  tv-ma  2 Seasons
2 2021-09-24          2021  tv-ma   1 Season
3 2021-09-24          2021  tv-ma   1 Season
4 2021-09-24          2021  tv-ma  2 Seasons

                                          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 ...

                                          description  year_added month_added  \
0  as her father nears the end of his life, filmm...      2021.0   September
1  after crossing paths at a party, a cape town t...      2021.0   September
2  to protect his family from a powerful drug lor...      2021.0   September
3  feuds, flirtations and toilet talk go down amo...      2021.0   September
4  in a city of coaching centers known to train i...      2021.0   September

   duration_value duration_type
0            90.0          min
1             2.0      Seasons
2             1.0       Season
3             1.0       Season
4             2.0      Seasons
```

In [14]:
```
df.to_csv("netflix_cleaned.csv", index=False)
print("\n✅ Cleaned dataset saved as 'netflix_cleaned.csv'")
```

```
✅ Cleaned dataset saved as 'netflix_cleaned.csv'
```

Business-Oriented Analysis Questions

1. What is the ratio of Movies vs TV Shows on Netflix?

In [15]:
```
df.columns = df.columns.str.strip().str.lower()
```

In [16]:
```
type_counts = df['type'].value_counts()
```

In [17]:
```
print("📊 Count of each type:")
print(type_counts)
```

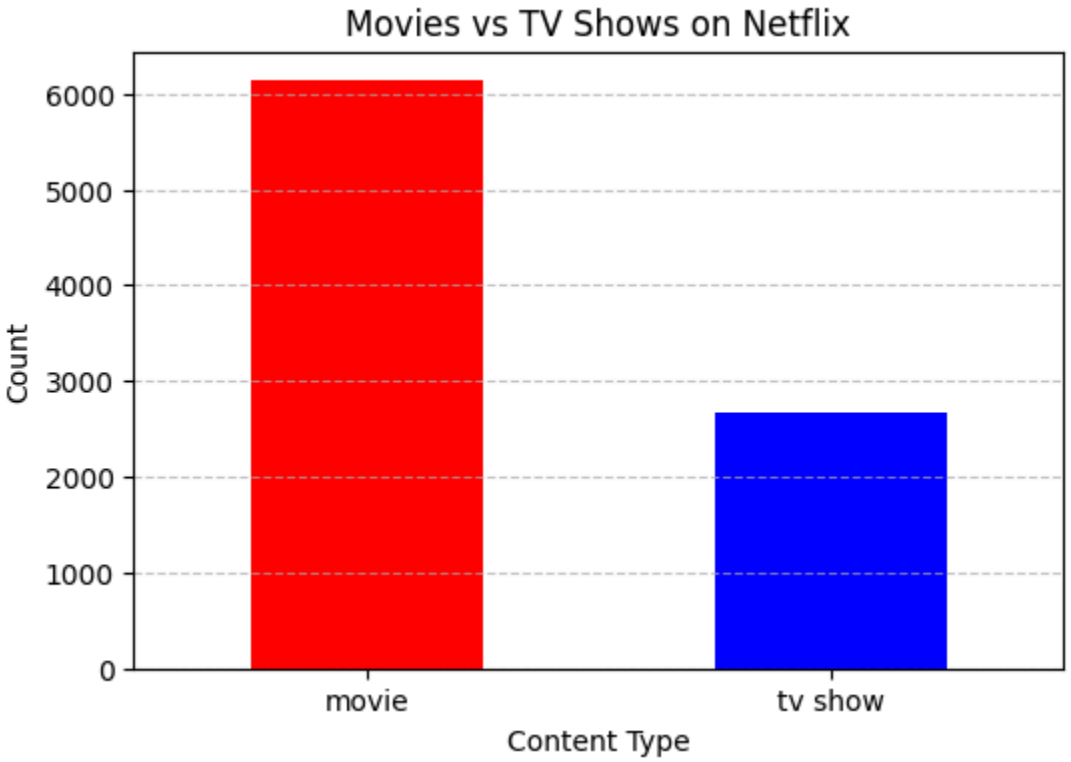
```
📊 Count of each type:
type
movie      6131
tv show    2676
Name: count, dtype: int64
```

In [18]:
```
ratio = type_counts['movie'] / type_counts['tv show']
print(f"\n🎥 Movie : 📺 TV Show Ratio = {ratio:.2f} : 1")
```

```
🎥 Movie : 📺 TV Show Ratio = 2.29 : 1
```

In [19]:
```
plt.figure(figsize=(6,4))
type_counts.plot(kind='bar', color=['red', 'blue'])
plt.title("Movies vs TV Shows on Netflix")
plt.xlabel("Content Type")
plt.ylabel("Count")
plt.xticks(rotation=0)
```

```
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```



Q.2 Which genres are most popular on Netflix globally?

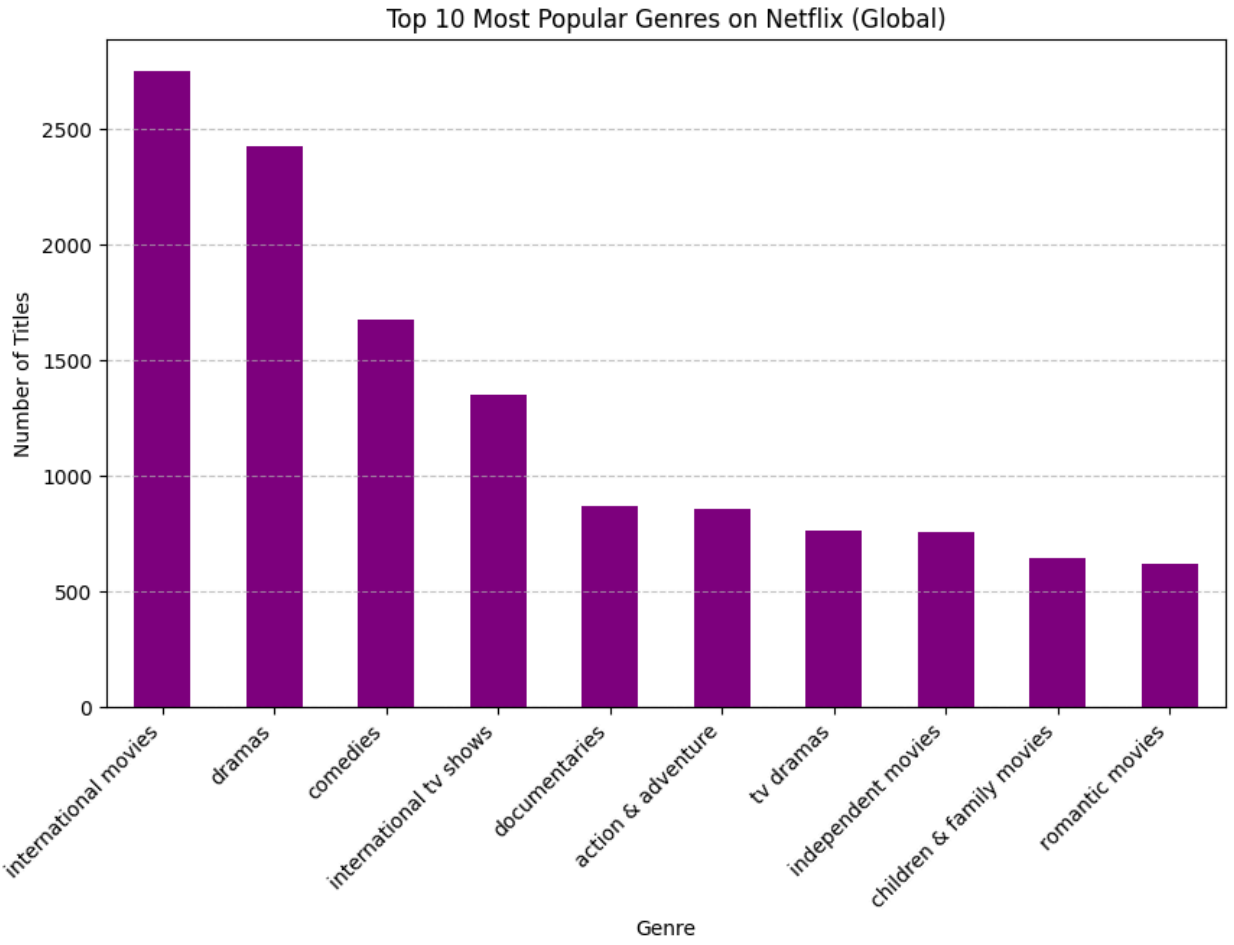
In [20]:
```
genre_counts = df['listed_in'].str.split(',').explode().str.strip().value_cour
```

In [21]:
```
print("🎬 Top 10 Most Popular Genres on Netflix:")
print(genre_counts.head(10))
```

```
🎬 Top 10 Most Popular Genres on Netflix:
listed_in
international movies        2752
dramas                      2427
comedies                    1674
international tv shows      1351
documentaries                869
action & adventure           859
tv dramas                    763
independent movies           756
children & family movies     641
romantic movies              616
Name: count, dtype: int64
```

In [22]:
```
plt.figure(figsize=(10,6))
genre_counts.head(10).plot(kind='bar', color='purple')
```

```
plt.title("Top 10 Most Popular Genres on Netflix (Global)")
plt.xlabel("Genre")
plt.ylabel("Number of Titles")
plt.xticks(rotation=45, ha='right')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```

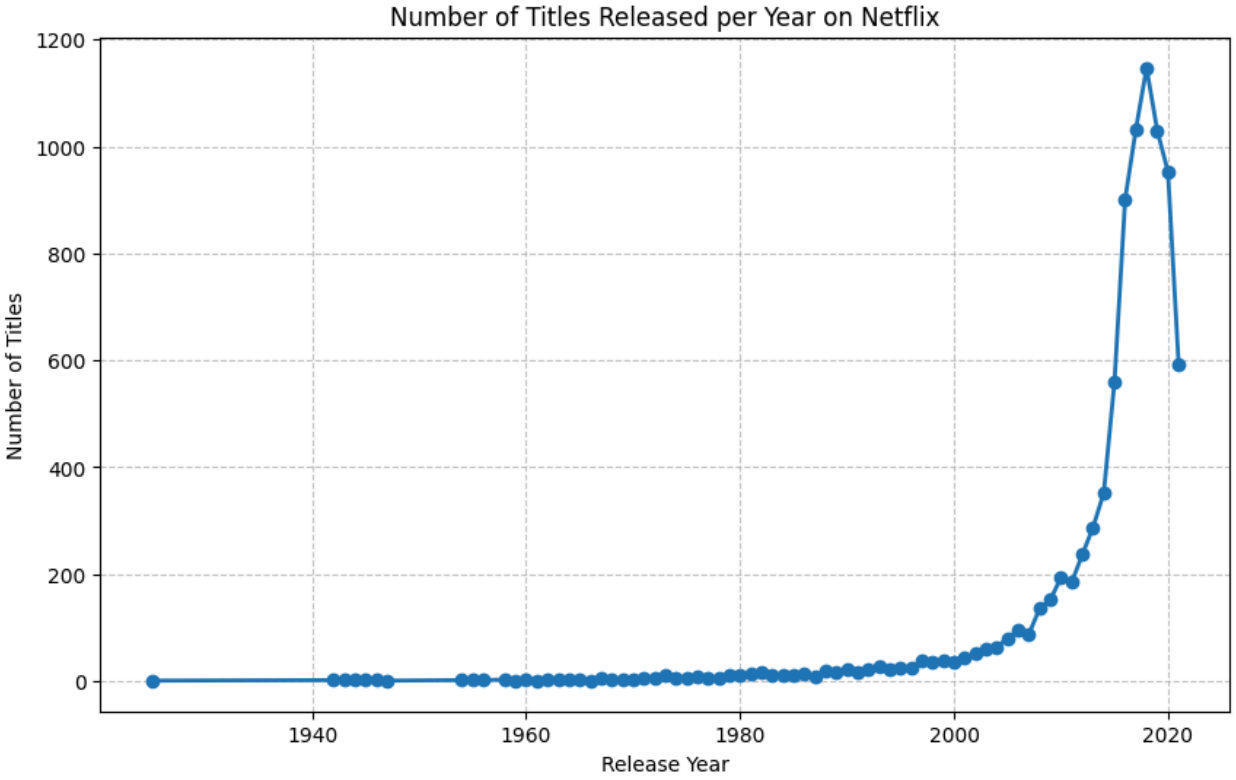


Q.3 Which years saw the highest release of content on Netflix?

In [23]:
```
df['release_year'] = pd.to_numeric(df['release_year'], errors='coerce')


yearly_counts = df['release_year'].value_counts().sort_index()


print("📅 Top 10 Years with Most Netflix Releases:")
print(yearly_counts.sort_values(ascending=False).head(10))


plt.figure(figsize=(10,6))
yearly_counts.plot(kind='line', marker='o', linewidth=2)
```

```
plt.title("Number of Titles Released per Year on Netflix")
plt.xlabel("Release Year")
plt.ylabel("Number of Titles")
plt.grid(True, linestyle='--', alpha=0.7)
plt.show()
```

```
📅 Top 10 Years with Most Netflix Releases:
release_year
2018    1147
2017    1032
2019    1030
2020     953
2016     902
2021     592
2015     560
2014     352
2013     288
2012     237
Name: count, dtype: int64
```



4. Which countries produce the most Netflix content?

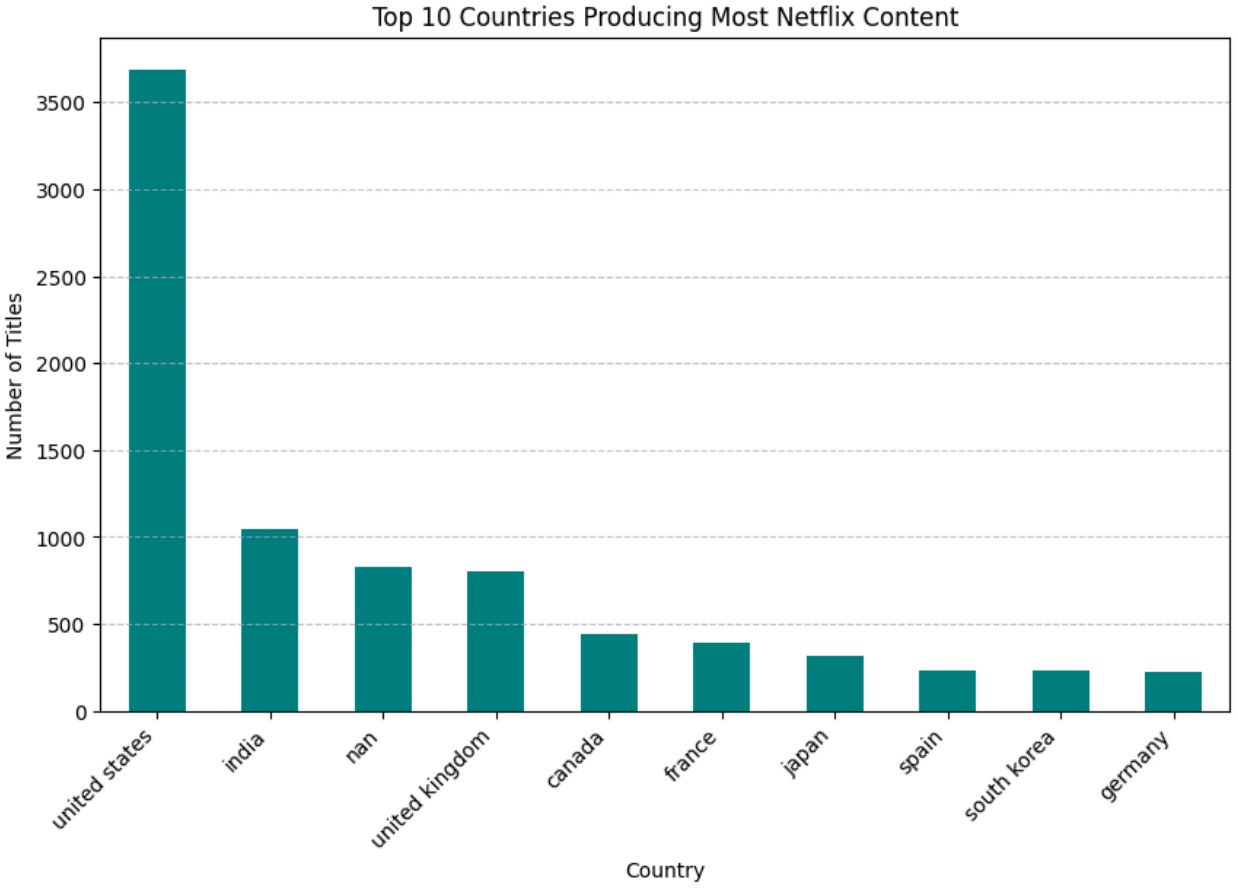
In [24]:
```
df.columns = df.columns.str.strip().str.lower()
```

In [25]:
```
country_counts = df['country'].str.split(',').explode().str.strip().value_cour
```

In [26]:
```
print("🌎 Top 10 Content-Producing Countries on Netflix:")
print(country_counts.head(10))
```

```
🌎 Top 10 Content-Producing Countries on Netflix:
country
united states     3690
india             1046
nan                831
united kingdom     806
canada             445
france             393
japan              318
spain              232
south korea        231
germany            226
Name: count, dtype: int64
```

In [27]:
```
plt.figure(figsize=(10,6))
country_counts.head(10).plot(kind='bar', color='teal')
plt.title("Top 10 Countries Producing Most Netflix Content")
plt.xlabel("Country")
plt.ylabel("Number of Titles")
plt.xticks(rotation=45, ha='right')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```



Q 5. How has the trend of adding new content evolved year by year?

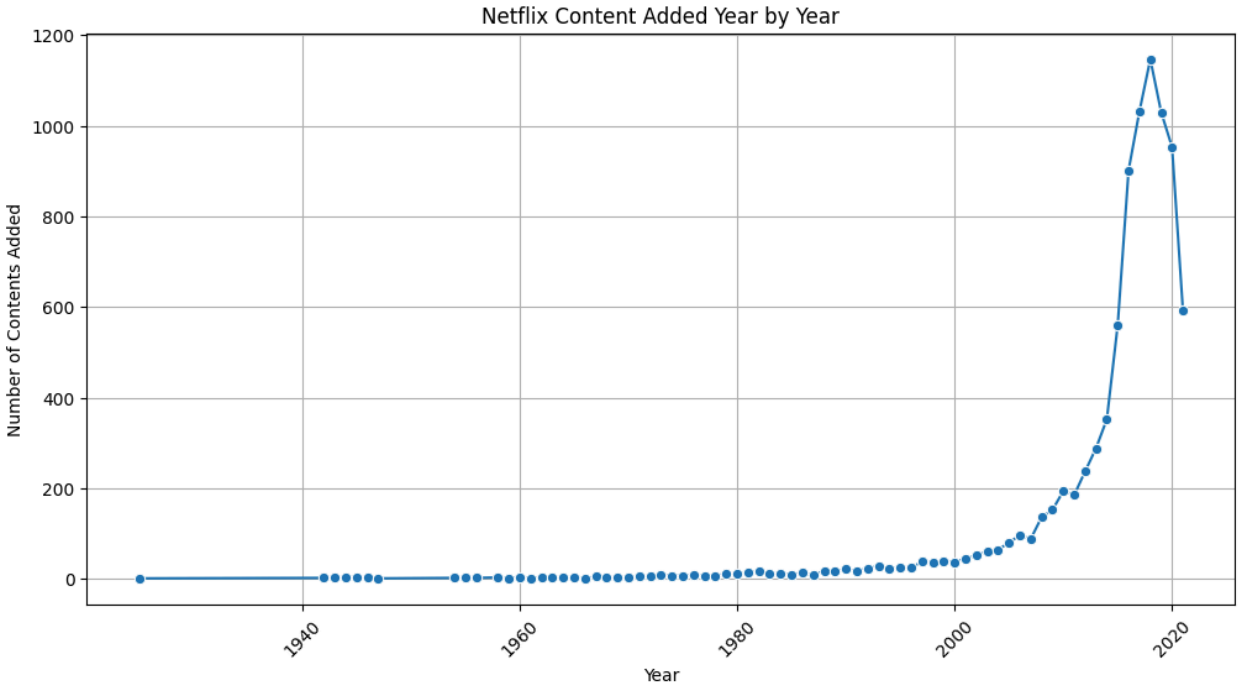
In [28]:
```
df['release_year'] = pd.to_numeric(df['release_year'], errors='coerce')
```

In [29]:
```
df = df.dropna(subset=['release_year'])
```

In [30]:
```
yearly_trend = df.groupby('release_year').size().reset_index(name='content_cou
```

In [31]:
```
yearly_trend = yearly_trend.sort_values('release_year')
```

In [32]:
```
plt.figure(figsize=(12,6))
sns.lineplot(data=yearly_trend, x='release_year', y='content_count', marker='c
plt.title("Netflix Content Added Year by Year")
plt.xlabel("Year")
plt.ylabel("Number of Contents Added")
plt.xticks(rotation=45)
plt.grid(True)
plt.show()
```

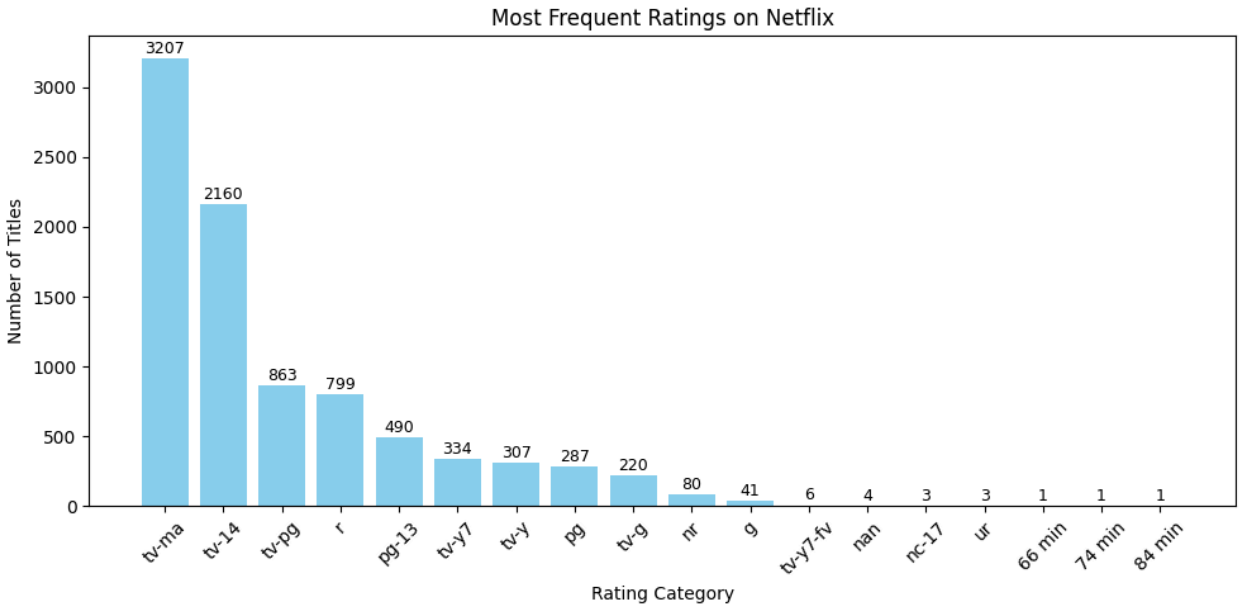


2. User Demographics & Targeting

6. Which ratings (e.g., TV-MA, PG, etc.) are most frequent on Netflix?

In [33]:
```
df = df.dropna(subset=['rating'])
rating_counts = df['rating'].value_counts()
print("Most Frequent Ratings on Netflix:\n")
print(rating_counts.head(10))
plt.figure(figsize=(10,5))
bars = plt.bar(rating_counts.index, rating_counts.values, color='skyblue')
plt.title("Most Frequent Ratings on Netflix")
plt.xlabel("Rating Category")
plt.ylabel("Number of Titles")
for bar in bars:
    yval = bar.get_height()
    plt.text(bar.get_x() + bar.get_width()/2, yval + 10, int(yval),
             ha='center', va='bottom', fontsize=9)

plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```

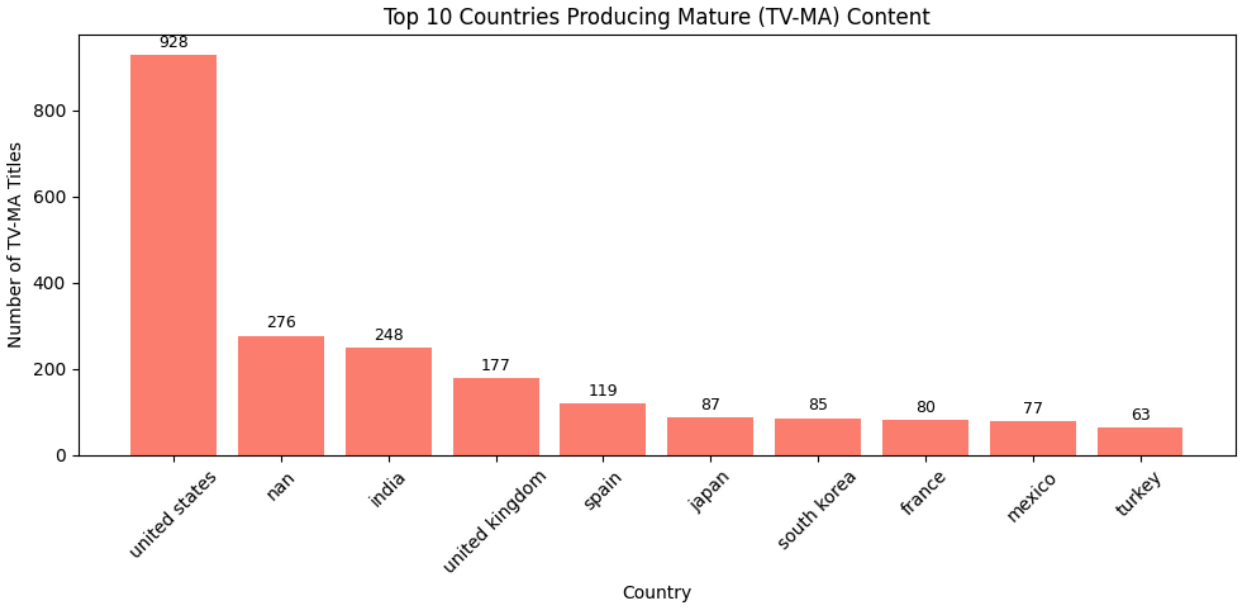
```
Most Frequent Ratings on Netflix:

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
Name: count, dtype: int64
```



Q 7. Do some countries tend to produce more mature content (TV-MA)?

In [34]:
```
mature = df[df['rating'] == 'tv-ma']

# Count how many TV-MA titles each country has
country_mature_counts = mature['country'].value_counts().head(10)

# Display top 10 countries producing most mature content
print("Top 10 Countries Producing Mature (TV-MA) Content:\n")
print(country_mature_counts)

# Plot the data
plt.figure(figsize=(10,5))
bars = plt.bar(country_mature_counts.index, country_mature_counts.values, colo
plt.title("Top 10 Countries Producing Mature (TV-MA) Content")
plt.xlabel("Country")
plt.ylabel("Number of TV-MA Titles")

# Add value labels on top of bars
for bar in bars:
    yval = bar.get_height()
    plt.text(bar.get_x() + bar.get_width()/2, yval + 10, int(yval),
             ha='center', va='bottom', fontsize=9)

plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```

```
Top 10 Countries Producing Mature (TV-MA) Content:

country
united states     928
nan               276
india             248
united kingdom    177
spain             119
japan              87
south korea        85
france             80
mexico             77
turkey             63
Name: count, dtype: int64
```

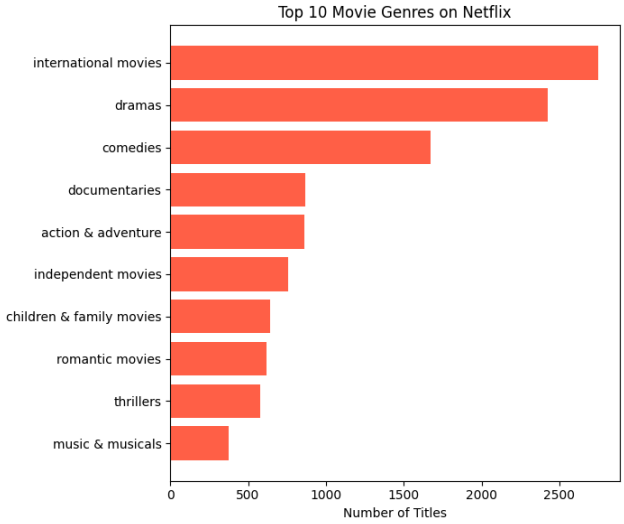


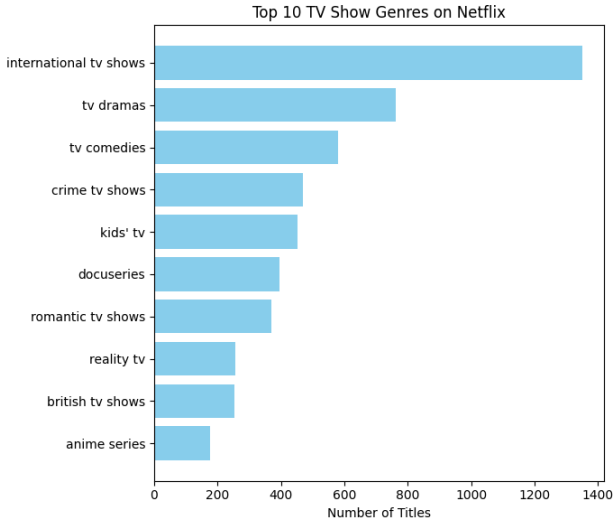
Q 8. Which genres are more associated with TV Shows vs Movies?

In [35]:
```
df = df.dropna(subset=['type', 'listed_in'])

# Split multiple genres into separate rows
df_expanded = df.assign(genre=df['listed_in'].str.split(',')).explode('genre')
df_expanded['genre'] = df_expanded['genre'].str.strip()

# Count top 10 genres for Movies and TV Shows separately
movie_genres = df_expanded[df_expanded['type'] == 'movie']['genre'].value_coun
tvshow_genres = df_expanded[df_expanded['type'] == 'tv show']['genre'].value_c

# --- Print output ---
print("\nTop 10 Genres for Movies:\n", movie_genres)
print("\nTop 10 Genres for TV Shows:\n", tvshow_genres)
```

```python
# --- Plot both side-by-side ---
plt.figure(figsize=(14,6))

# Movies
plt.subplot(1,2,1)
plt.barh(movie_genres.index[::-1], movie_genres.values[::-1], color='tomato')
plt.title('Top 10 Movie Genres on Netflix')
plt.xlabel('Number of Titles')

# TV Shows
plt.subplot(1,2,2)
plt.barh(tvshow_genres.index[::-1], tvshow_genres.values[::-1], color='skyblue
plt.title('Top 10 TV Show Genres on Netflix')
plt.xlabel('Number of Titles')

plt.tight_layout()
plt.show()
```

```
Top 10 Genres for Movies:
 genre
international movies        2752
dramas                      2427
comedies                    1674
documentaries                869
action & adventure           859
independent movies           756
children & family movies     641
romantic movies              616
thrillers                    577
music & musicals             375
Name: count, dtype: int64

Top 10 Genres for TV Shows:
 genre
international tv shows    1351
tv dramas                  763
tv comedies                581
crime tv shows             470
kids' tv                   451
docuseries                 395
romantic tv shows          370
reality tv                 255
british tv shows           253
anime series               176
Name: count, dtype: int64
```



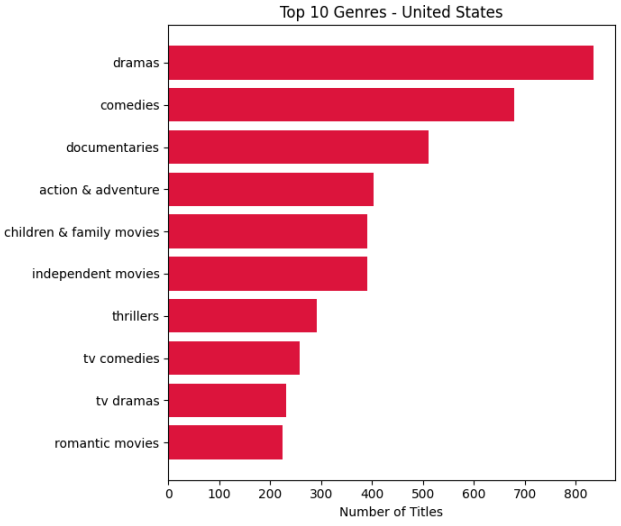


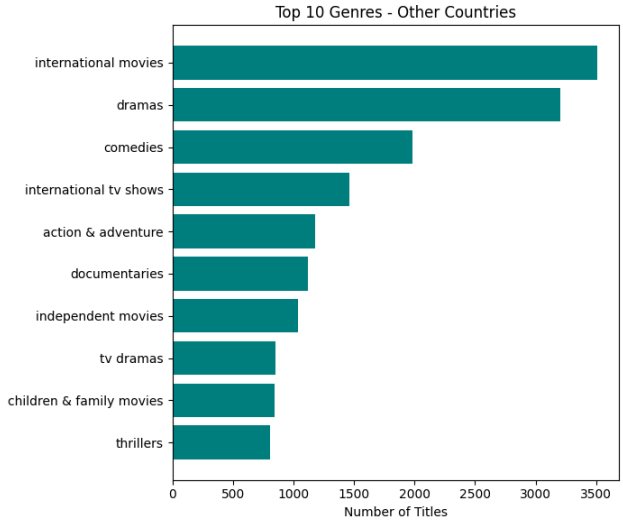
Q 9. Which genres dominate the U.S. vs other countries?

In [36]:
```
df = df.dropna(subset=['country', 'listed_in'])

# Split multiple countries and genres
df_expanded = df.assign(country=df['country'].str.split(','), genre=df['listed
df_expanded = df_expanded.explode('country').explode('genre')
df_expanded['country'] = df_expanded['country'].str.strip()
df_expanded['genre'] = df_expanded['genre'].str.strip()


# --- Separate U.S. and Non-U.S. ---
us_data = df_expanded[df_expanded['country'] == 'united states']
non_us_data = df_expanded[df_expanded['country'] != 'United States']

# --- Count top genres ---
us_genres = us_data['genre'].value_counts().head(10)
non_us_genres = non_us_data['genre'].value_counts().head(10)

# --- Print top genres ---
print("Top 10 Genres in the United States:\n", us_genres)
print("\nTop 10 Genres in Other Countries:\n", non_us_genres)

# --- Plot comparison ---
plt.figure(figsize=(14,6))

# U.S.
plt.subplot(1,2,1)
plt.barh(us_genres.index[::-1], us_genres.values[::-1], color='crimson')
plt.title('Top 10 Genres - United States')
plt.xlabel('Number of Titles')

# Non-U.S.
```

```
plt.subplot(1,2,2)
plt.barh(non_us_genres.index[::-1], non_us_genres.values[::-1], color='teal')
plt.title('Top 10 Genres - Other Countries')
plt.xlabel('Number of Titles')

plt.tight_layout()
plt.show()
```

```
Top 10 Genres in the United States:
 genre
dramas                        835
comedies                      680
documentaries                 512
action & adventure            404
children & family movies      390
independent movies            390
thrillers                     292
tv comedies                   258
tv dramas                     232
romantic movies               225
Name: count, dtype: int64

Top 10 Genres in Other Countries:
 genre
international movies         3513
dramas                       3202
comedies                     1981
international tv shows       1465
action & adventure           1182
documentaries                1118
independent movies           1040
tv dramas                     852
children & family movies      845
thrillers                     806
Name: count, dtype: int64
```

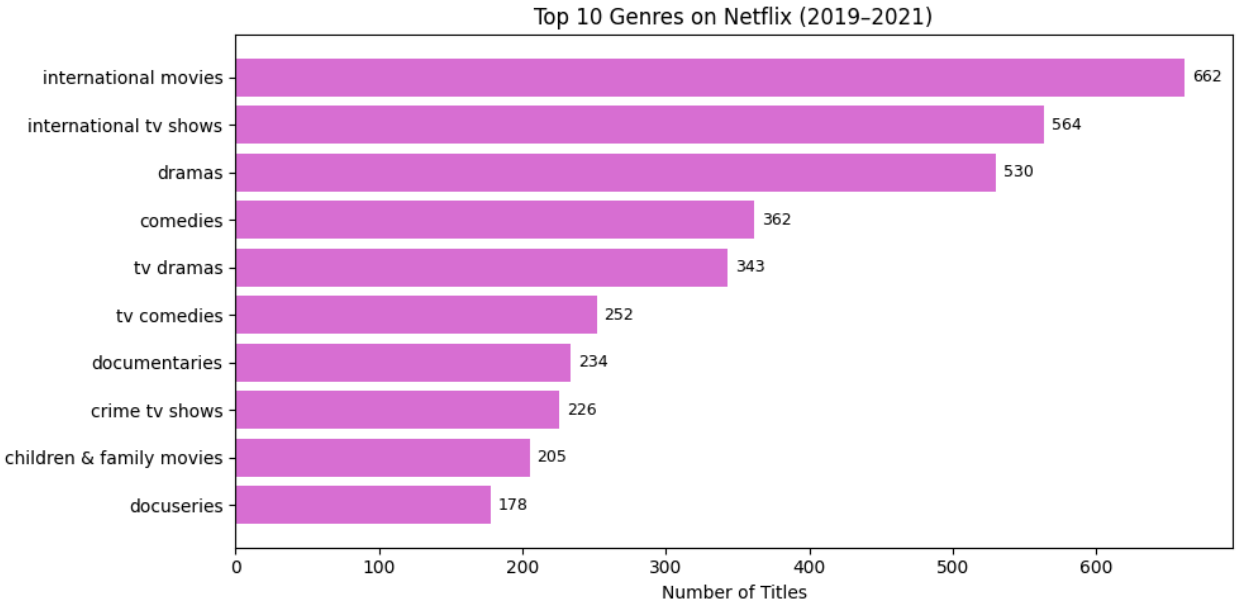




10. What genres are most popular in the last 3 years?

In [37]:
```
df = df.dropna(subset=['release_year', 'listed_in'])

# Convert year to numeric (if not already)
df['release_year'] = pd.to_numeric(df['release_year'], errors='coerce')

# Define recent years (last 3 years from the latest year in dataset)
latest_year = df['release_year'].max()
recent_years = [latest_year - 2, latest_year - 1, latest_year]

print(f"\nAnalyzing popular genres for the last 3 years: {recent_years}\n")

# Filter data for those years
recent_df = df[df['release_year'].isin(recent_years)]

# Split multiple genres into separate rows
recent_expanded = recent_df.assign(genre=recent_df['listed_in'].str.split(','))
recent_expanded['genre'] = recent_expanded['genre'].str.strip()

# Count top 10 genres
top_recent_genres = recent_expanded['genre'].value_counts().head(10)

# Display results
print("Top 10 Genres in the Last 3 Years:\n", top_recent_genres)

# --- Plot ---
plt.figure(figsize=(10,5))
bars = plt.barh(top_recent_genres.index[::-1], top_recent_genres.values[::-1],
plt.title(f"Top 10 Genres on Netflix ({recent_years[0]}–{latest_year})")
plt.xlabel("Number of Titles")

# Add value labels
for bar in bars:
    yval = bar.get_width()
    plt.text(yval + 5, bar.get_y() + bar.get_height()/2, int(yval),
             va='center', fontsize=9)

plt.tight_layout()
plt.show()
```

```
Analyzing popular genres for the last 3 years: [np.int64(2019), np.int64(2020),
np.int64(2021)]

Top 10 Genres in the Last 3 Years:
 genre
international movies        662
international tv shows      564
dramas                      530
comedies                    362
tv dramas                   343
tv comedies                 252
documentaries               234
crime tv shows              226
children & family movies    205
docuseries                  178
Name: count, dtype: int64
```

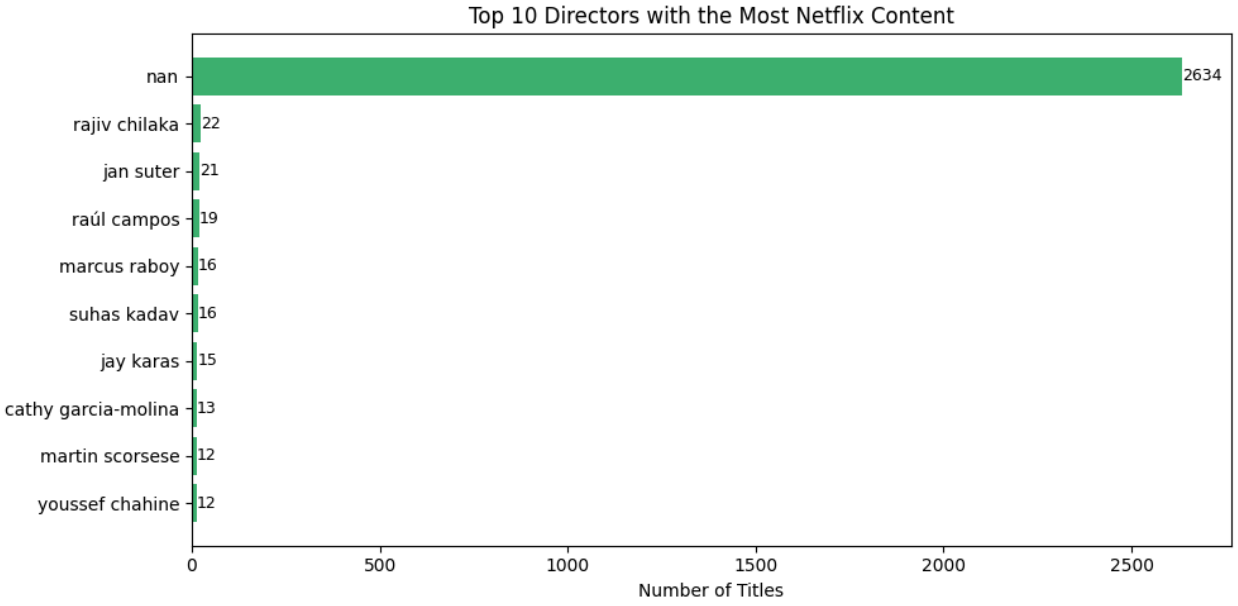


Q 11. Who are the top 10 directors with the most Netflix content?

In [38]:
```
df = df.dropna(subset=['director'])

# Split multiple directors if listed together
df_expanded = df.assign(director=df['director'].str.split(',')).explode('direc
df_expanded['director'] = df_expanded['director'].str.strip()

# Count top 10 directors by number of titles
top_directors = df_expanded['director'].value_counts().head(10)

# Display results
print("Top 10 Directors with the Most Netflix Content:\n")
print(top_directors)
```

```
# --- Plot ---
plt.figure(figsize=(10,5))
bars = plt.barh(top_directors.index[::-1], top_directors.values[::-1], color='
plt.title("Top 10 Directors with the Most Netflix Content")
plt.xlabel("Number of Titles")

# Add value labels
for bar in bars:
    xval = bar.get_width()
    plt.text(xval + 1, bar.get_y() + bar.get_height()/2, int(xval),
             va='center', fontsize=9)

plt.tight_layout()
plt.show()
```

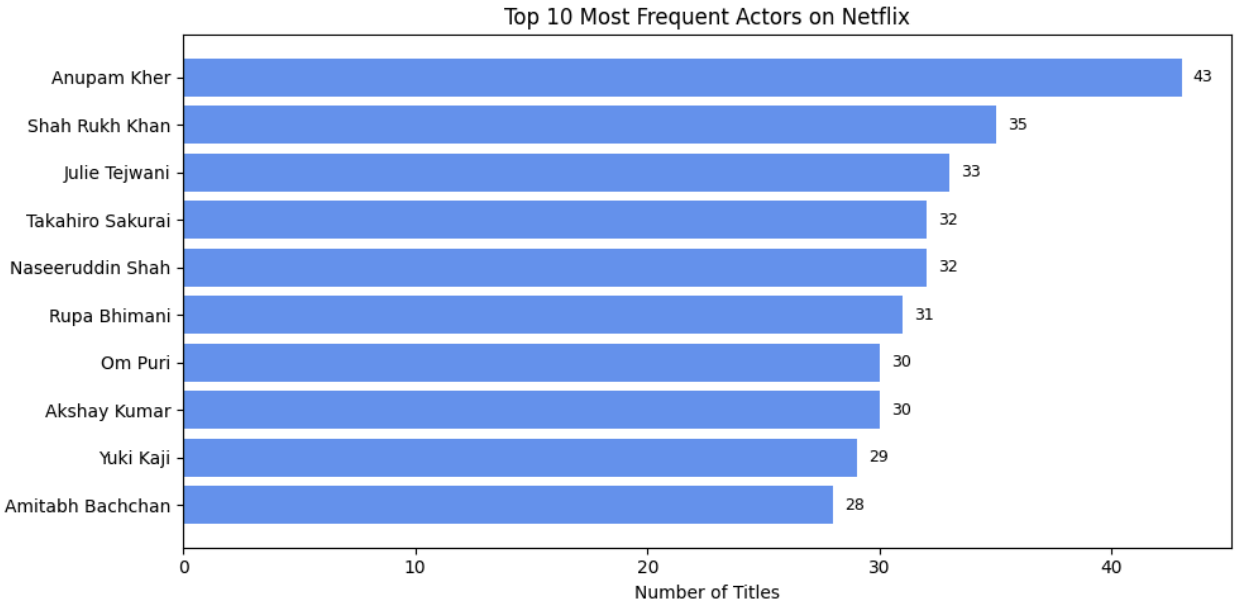
```
Top 10 Directors with the Most Netflix Content:

director
nan                   2634
rajiv chilaka           22
jan suter               21
raúl campos             19
marcus raboy            16
suhas kadav             16
jay karas               15
cathy garcia-molina     13
martin scorsese         12
youssef chahine         12
Name: count, dtype: int64
```



Q12. Which actors appear most frequently in Netflix shows?

In [39]:
```
df = df.dropna(subset=['cast'])

# Split multiple actors from a single cell
df_expanded = df.assign(actor=df['cast'].str.split(',')).explode('actor')
df_expanded['actor'] = df_expanded['actor'].str.strip()

# Count top 10 most frequent actors
top_actors = df_expanded['actor'].value_counts().head(10)

# Display results
print("Top 10 Most Frequent Actors on Netflix:\n")
print(top_actors)

# --- Plot ---
plt.figure(figsize=(10,5))
bars = plt.barh(top_actors.index[::-1], top_actors.values[::-1], color='cornfl
plt.title("Top 10 Most Frequent Actors on Netflix")
plt.xlabel("Number of Titles")

# Add value labels
for bar in bars:
    xval = bar.get_width()
    plt.text(xval + 0.5, bar.get_y() + bar.get_height()/2, int(xval),
             va='center', fontsize=9)

plt.tight_layout()
plt.show()
```

```
Top 10 Most Frequent Actors on Netflix:

actor
Anupam Kher          43
Shah Rukh Khan       35
Julie Tejwani        33
Takahiro Sakurai     32
Naseeruddin Shah     32
Rupa Bhimani         31
Om Puri              30
Akshay Kumar         30
Yuki Kaji            29
Amitabh Bachchan     28
Name: count, dtype: int64
```



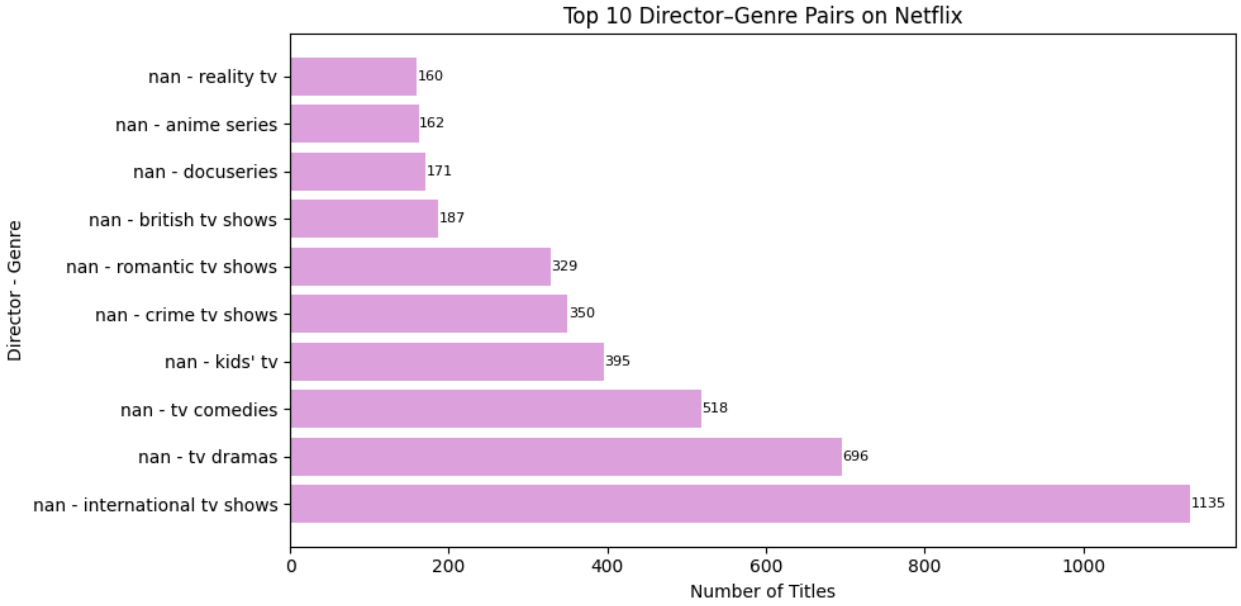
Q 13. Which director-genre pairs are most frequent?

In [40]:

```
#df = df.dropna(subset=['director', 'listed_in'])

# Split multiple directors and genres into separate rows
df_expanded = df.assign(
    director=df['director'].str.split(','),
    genre=df['listed_in'].str.split(',')
).explode('director').explode('genre')

# Clean text (remove extra spaces)
df_expanded['director'] = df_expanded['director'].str.strip()
df_expanded['genre'] = df_expanded['genre'].str.strip()

# Count the most common director-genre pairs
pair_counts = df_expanded.groupby(['director', 'genre']).size().reset_index(na
top_pairs = pair_counts.sort_values(by='count', ascending=False).head(10)

# Display the results
print("Top 10 Director–Genre Pairs on Netflix:\n")
print(top_pairs)

# --- Plot ---
plt.figure(figsize=(10,5))
bars = plt.barh(top_pairs['director'] + ' - ' + top_pairs['genre'], top_pairs[
plt.title("Top 10 Director–Genre Pairs on Netflix")
plt.xlabel("Number of Titles")
plt.ylabel("Director - Genre")

# Add value labels
for bar in bars:
```

```
    xval = bar.get_width()
    plt.text(xval + 0.5, bar.get_y() + bar.get_height()/2, int(xval),
             va='center', fontsize=8)

plt.tight_layout()
plt.show()
```

```
Top 10 Director–Genre Pairs on Netflix:

     director                    genre  count
7136      nan  international tv shows   1135
7155      nan                tv dramas    696
7154      nan              tv comedies    518
7137      nan                 kids' tv    395
7129      nan           crime tv shows    350
7144      nan        romantic tv shows    329
7125      nan         british tv shows    187
7131      nan               docuseries    171
7124      nan             anime series    162
7142      nan               reality tv    160
```



Q 14. How many titles have unknown directors or cast members?

In [41]:
```
print(df[df['director'] == 'nan'].shape)
print(df[df['cast'] == 'nan'].shape)
```

```
(2282, 16)
(0, 16)
```

Q 17. Is there a trend in movie durations over the years?

In [42]:
```
movies = df[df['type'] == 'movie']

# Ensure duration_value column is numeric
movies['duration_value'] = pd.to_numeric(movies['duration_value'], errors='coe

# Calculate average duration
average_duration = movies['duration_value'].mean()

print("🎬 Netflix Movie Duration Analysis\n")
print(f"Total Movies: {len(movies)}")
print(f"Average Movie Duration: {average_duration:.2f} minutes")
```

```
🎬 Netflix Movie Duration Analysis

Total Movies: 5656
Average Movie Duration: 101.36 minutes
C:\Users\yvhar\AppData\Local\Temp\ipykernel_21172\4271525048.py:4: SettingWithC
opyWarning:
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/sta
ble/user_guide/indexing.html#returning-a-view-versus-a-copy
  movies['duration_value'] = pd.to_numeric(movies['duration_value'], errors='co
erce')
```

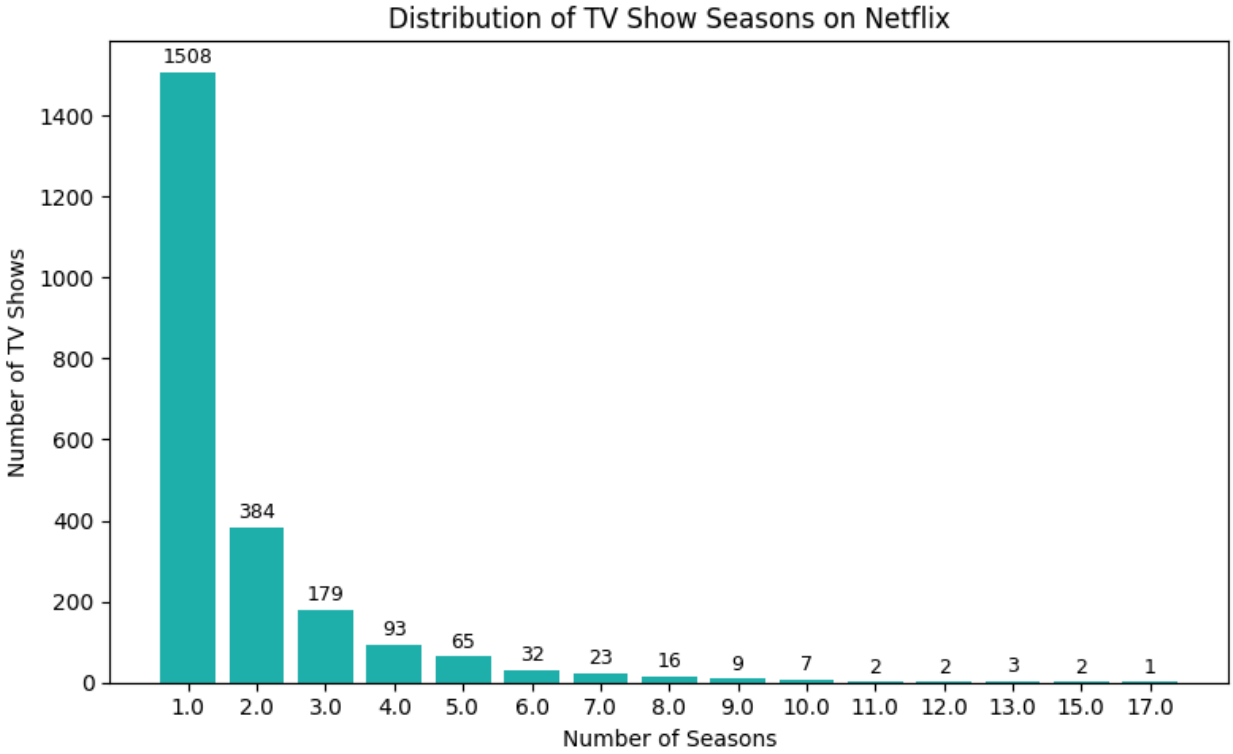
Q 16. What’s the most common number of seasons for TV shows?

In [43]:
```
tv_shows = df[df['type'] == 'tv show']

# Convert the duration_value column to numeric (it represents seasons for TV S
tv_shows['duration_value'] = pd.to_numeric(tv_shows['duration_value'], errors=

# Find the most common number of seasons
most_common_seasons = tv_shows['duration_value'].mode()[0]

# Count frequency of each season count
season_counts = tv_shows['duration_value'].value_counts().sort_index()

print("📺 Netflix TV Show Seasons Analysis\n")
print(f"Total TV Shows: {len(tv_shows)}")
print(f"Most Common Number of Seasons: {most_common_seasons}")

# --- Plot ---
```

```
plt.figure(figsize=(8,5))
bars = plt.bar(season_counts.index.astype(str), season_counts.values, color='l
plt.title("Distribution of TV Show Seasons on Netflix")
plt.xlabel("Number of Seasons")
plt.ylabel("Number of TV Shows")

# Add value labels
for bar in bars:
    yval = bar.get_height()
    plt.text(bar.get_x() + bar.get_width()/2, yval + 10, int(yval),
             ha='center', va='bottom', fontsize=9)

plt.tight_layout()
plt.show()
```

```
📺 Netflix TV Show Seasons Analysis

Total TV Shows: 2326
Most Common Number of Seasons: 1.0
```

```
C:\Users\yvhar\AppData\Local\Temp\ipykernel_21172\647722933.py:4: SettingWithCo
pyWarning:
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/sta
ble/user_guide/indexing.html#returning-a-view-versus-a-copy
  tv_shows['duration_value'] = pd.to_numeric(tv_shows['duration_value'], error
s='coerce')
```

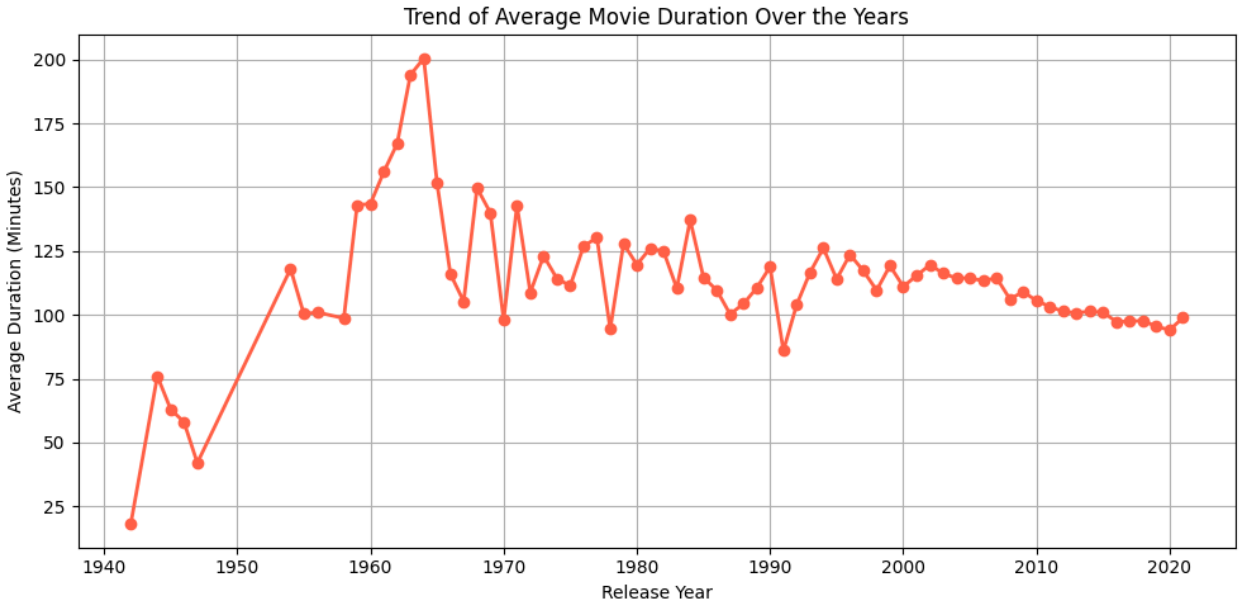


Q 17. Is there a trend in movie durations over the years?

In [44]:
```
movies = df[df['type'] == 'movie']

# Ensure numeric duration and year
movies['duration_value'] = pd.to_numeric(movies['duration_value'], errors='coe
movies['release_year'] = pd.to_numeric(movies['release_year'], errors='coerce'

# Group by release year and calculate average duration
duration_trend = movies.groupby('release_year')['duration_value'].mean().dropr

# Display results
print("🎬 Average Movie Duration by Year:\n")
print(duration_trend.tail(10))  # Show last 10 years

# --- Plot the trend ---
plt.figure(figsize=(10,5))
plt.plot(duration_trend.index, duration_trend.values, color='tomato', marker='
plt.title("Trend of Average Movie Duration Over the Years")
plt.xlabel("Release Year")
plt.ylabel("Average Duration (Minutes)")
plt.grid(True)
plt.tight_layout()
plt.show()
```

```
C:\Users\yvhar\AppData\Local\Temp\ipykernel_21172\209925979.py:4: SettingWithCo
pyWarning:
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/sta
ble/user_guide/indexing.html#returning-a-view-versus-a-copy
  movies['duration_value'] = pd.to_numeric(movies['duration_value'], errors='co
erce')
C:\Users\yvhar\AppData\Local\Temp\ipykernel_21172\209925979.py:5: SettingWithCo
pyWarning:
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/sta
ble/user_guide/indexing.html#returning-a-view-versus-a-copy
  movies['release_year'] = pd.to_numeric(movies['release_year'], errors='coerc
e')
```

```
🎬 Average Movie Duration by Year:

release_year
2012    101.351190
2013    100.716346
2014    101.389558
2015    100.922865
2016     97.346939
2017     97.438519
2018     97.763610
2019     95.395062
2020     94.125532
2021     98.840164
Name: duration_value, dtype: float64
```

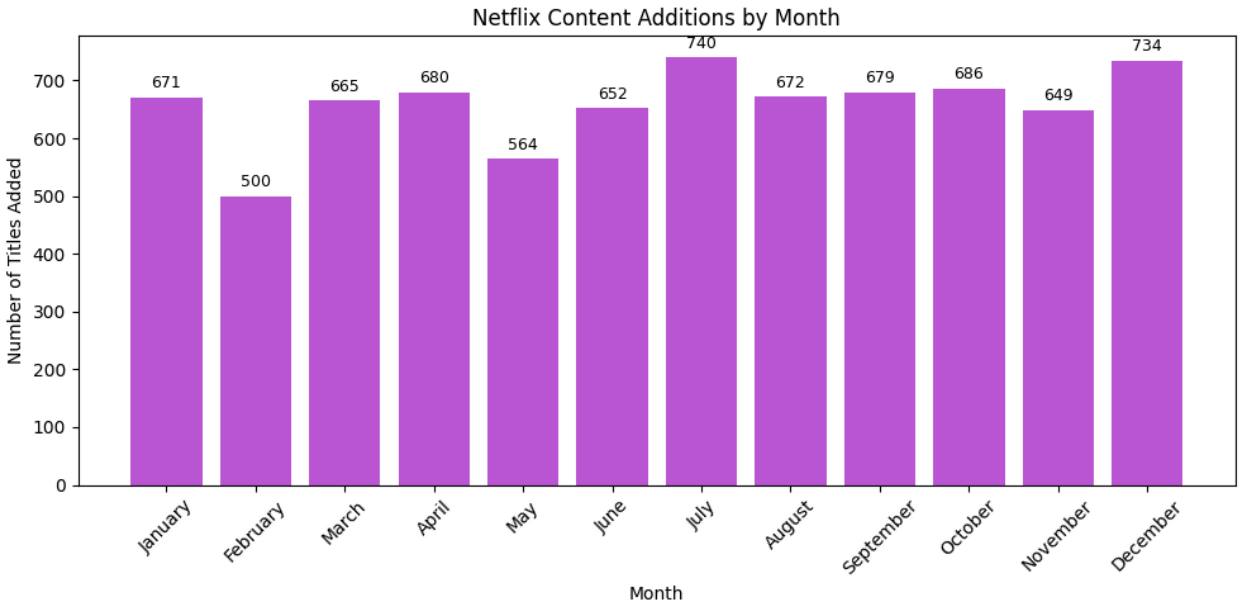


Q 18.In which months does Netflix add the most content?

In [45]:
```
df = df.dropna(subset=['date_added'])

# Convert 'date_added' to datetime
df['date_added'] = pd.to_datetime(df['date_added'], errors='coerce')

# Extract month number and month name
df['month_added'] = df['date_added'].dt.month
df['month_name'] = df['date_added'].dt.month_name()

# Count how many titles were added per month
month_counts = df['month_name'].value_counts().reindex([
    'January', 'February', 'March', 'April', 'May', 'June',
    'July', 'August', 'September', 'October', 'November', 'December'
])
```

```python

# Display result
print("📅 Number of Titles Added Per Month:\n")
print(month_counts.dropna())

# --- Plot ---
plt.figure(figsize=(10,5))
bars = plt.bar(month_counts.index, month_counts.values, color='mediumorchid')
plt.title("Netflix Content Additions by Month")
plt.xlabel("Month")
plt.ylabel("Number of Titles Added")
plt.xticks(rotation=45)

# Add value labels
for bar in bars:
    yval = bar.get_height()
    if not pd.isna(yval):
        plt.text(bar.get_x() + bar.get_width()/2, yval + 10, int(yval),
                 ha='center', va='bottom', fontsize=9)

plt.tight_layout()
plt.show()
```

```
📅 Number of Titles Added Per Month:

month_name
January      671
February     500
March        665
April        680
May          564
June         652
July         740
August       672
September    679
October      686
November     649
December     734
Name: count, dtype: int64
```

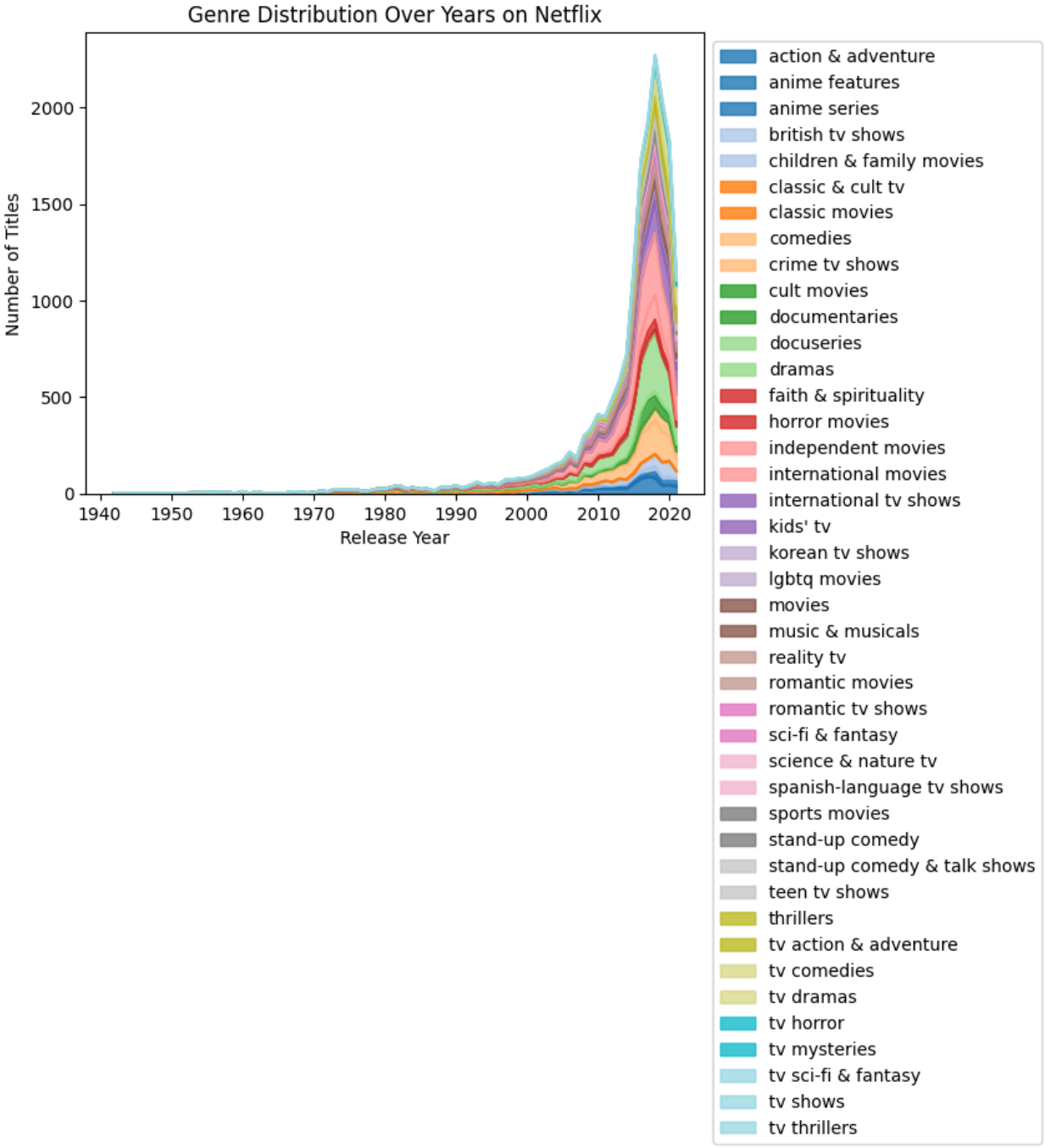


Q 19. How does the genre distribution vary across different years?

In [46]:
```
df = df.dropna(subset=['release_year', 'listed_in'])

# Convert release_year to numeric
df['release_year'] = pd.to_numeric(df['release_year'], errors='coerce')

# Split multiple genres into separate rows
df_expanded = df.assign(genre=df['listed_in'].str.split(',')).explode('genre')
df_expanded['genre'] = df_expanded['genre'].str.strip()

# Group by release_year and genre, then count
genre_year_counts = df_expanded.groupby(['release_year', 'genre']).size().rese

# Pivot table for plotting
genre_pivot = genre_year_counts.pivot(index='release_year', columns='genre', v

# Plot stacked area chart
plt.figure(figsize=(14,6))
genre_pivot.plot(kind='area', stacked=True, cmap='tab20', alpha=0.8)
plt.title("Genre Distribution Over Years on Netflix")
plt.xlabel("Release Year")
plt.ylabel("Number of Titles")
plt.legend(loc='upper left', bbox_to_anchor=(1.0, 1))
plt.tight_layout()
plt.show()
```

```
C:\Users\yvhar\AppData\Local\Temp\ipykernel_21172\611689491.py:23: UserWarning:
Tight layout not applied. The bottom and top margins cannot be made large enoug
h to accommodate all Axes decorations.
  plt.tight_layout()
```

```
<Figure size 1400x600 with 0 Axes>
```



Q 20. Which countries produce the most content in each genre?

In [48]:
```
df = df.dropna(subset=['country', 'listed_in'])

# Split multiple countries and genres into separate rows
df_expanded = df.assign(
    country=df['country'].str.split(','),
```

```
    genre=df['listed_in'].str.split(',')
).explode('country').explode('genre')

# Clean whitespace
df_expanded['country'] = df_expanded['country'].str.strip()
df_expanded['genre'] = df_expanded['genre'].str.strip()

# Group by genre and country, then count titles
genre_country_counts = df_expanded.groupby(['genre', 'country']).size().reset_

# For each genre, get the country with the most content
top_countries_per_genre = genre_country_counts.sort_values('count', ascending=

# Display results
print("Top Country Producing Content in Each Genre:\n")
print(top_countries_per_genre[['genre', 'country', 'count']])
```

Top Country Producing Content in Each Genre:

	genre	country	count
0	action & adventure	united states	403
1	anime features	japan	60
2	anime series	japan	138
3	british tv shows	united kingdom	177
4	children & family movies	united states	381
5	classic & cult tv	united states	11
6	classic movies	united states	74
7	comedies	united states	679
8	crime tv shows	united states	101
9	cult movies	united states	51
10	documentaries	united states	267
11	docuseries	united states	81
12	dramas	united states	832
13	faith & spirituality	united states	40
14	horror movies	united states	199
15	independent movies	united states	390
16	international movies	india	848
17	international tv shows	nan	191
18	kids' tv	united states	201
19	korean tv shows	south korea	126
20	lgbtq movies	united states	51
21	movies	united states	21
22	music & musicals	united states	130
23	reality tv	united states	80
24	romantic movies	united states	225
25	romantic tv shows	south korea	77
26	sci-fi & fantasy	united states	179
27	science & nature tv	united states	29
28	spanish-language tv shows	mexico	46
29	sports movies	united states	91
30	stand-up comedy	united states	215
31	stand-up comedy & talk shows	united states	27
32	teen tv shows	united states	30
33	thrillers	united states	292
34	tv action & adventure	united states	88
35	tv comedies	united states	237
36	tv dramas	united states	215
37	tv horror	united states	35
38	tv mysteries	united states	46
39	tv sci-fi & fantasy	united states	57
40	tv shows	nan	6
41	tv thrillers	united states	25

In [ ]: