Netflix-Dataset@Dhanureddy

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1 Netflix data set exploration

Netflix is one of the most popular media and video streaming platforms. They have over 10000 movies or tv shows available on their platform, as of mid-2021, they have over 222M Subscribers globally. This tabular dataset consists of listings of all the movies and tv shows available on Netflix, along with details such as - cast, directors, ratings, release year, duration, etc.

Business problem

Netflix wants to know which type of shows/movies to produce and how they can grow the business in different countries.*italicized text*

[ ]:
```
import pandas as pd
import numpy as np

import matplotlib.pyplot as plt
import seaborn as sns
```

[ ]:
```
df = pd.read_csv('netflix.csv')
```

Finding Shape and datatypes of the DataFrame

[ ]:
```
df.shape
```

[ ]:
```
(8807, 12)
```

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8807 entries, 0 to 8806
Data columns (total 12 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      6173 non-null   object
 4   cast          7982 non-null   object
 5   country       7976 non-null   object
 6   date_added    8797 non-null   object
 7   release_year  8807 non-null   int64
 8   rating        8803 non-null   object
 9   duration      8804 non-null   object
 10  listed_in     8807 non-null   object
 11  description   8807 non-null   object
dtypes: int64(1), object(11)
memory usage: 825.8+ KB
```

1. As you can see the Netflix dataset has initial rows amounting to 8807 in total and columns amounting to 12.
2. In total six columns have some amount of Null values ('director', 'cast', 'country', date_added', 'rating', 'duration',)
3. And as you can observe 'release_year' was the only 'int-type' column and rest of others are string/object datatypes.

—> Below are the codes for splitting the strings inside various categorical columns

[ ]:
```
title_df = df["title"]
```

[ ]:
```
country_df = df['country']
```

[ ]:
```
cast_df = df['cast']
```

[ ]:
```
director_df = df['director']
```

[ ]:
```
rating_df = df['rating']
```

[ ]:
```
listed_in_df = df['listed_in']
```

[ ]:
```
def split_cast_names(inp):
  return str(inp).split(', ')
```

[ ]:
```
df['country'] = country_df.apply(split_cast_names)
```

[ ]:
```
df['cast']= cast_df.apply(split_cast_names)
```

[ ]:
```
df['director']= director_df.apply(split_cast_names)
```

[ ]:
```
df['rating'] = rating_df.apply(split_cast_names)
```

[ ]:
```
df['listed_in'] = listed_in_df.apply(split_cast_names)
```

1. When we observe the entire dataset, we can come to the conclusion that **various columns in the dataset** have mutliple **string values** which needed to be splitted into various individual rows to ascertain proper results and it is utmost for reliable data analysis

—> Below is the DataFrame showing the result of split and that of how every string in each row of each column formed as a list

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

```
[ ]:   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]

                                                    cast          country  \
    0                                              [nan]  [United States]
    1  [Ama Qamata, Khosi Ngema, Gail Mabalane, Thaba…   [South Africa]
    2  [Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nab…            [nan]

               date_added  release_year   rating   duration  \
    0  September 25, 2021          2020  [PG-13]     90 min
    1  September 24, 2021          2021  [TV-MA]  2 Seasons
    2  September 24, 2021          2021  [TV-MA]   1 Season

                                               listed_in  \
    0                                    [Documentaries]
    1  [International TV Shows, TV Dramas, TV Mysteries]
    2  [Crime TV Shows, International TV Shows, TV Ac…

                                             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…
```

—> After splitting, now we used **explode function** to make sure that each individual string of each column occupies each row; thus number of rows gets drastically increased to a staggering number of 201991.

```
[ ]: df = df.explode('country')
```

```
[ ]: df = df.explode('cast')
```

```
[ ]: df = df.explode('director')
```

```
[ ]: df = df.explode('listed_in')
```

```
[ ]: df = df.explode('rating')
```

```
[ ]: df
```

```
[ ]:      show_id     type                 title          director  \
    0         s1    Movie  Dick Johnson Is Dead  Kirsten Johnson
    1         s2  TV Show         Blood & Water              nan
    1         s2  TV Show         Blood & Water              nan
```

```
1         s2  TV Show         Blood & Water             nan
1         s2  TV Show         Blood & Water             nan
…       …     …                  …              …
8806   s8807    Movie                Zubaan      Mozez Singh
8806   s8807    Movie                Zubaan      Mozez Singh
8806   s8807    Movie                Zubaan      Mozez Singh
8806   s8807    Movie                Zubaan      Mozez Singh
8806   s8807    Movie                Zubaan      Mozez Singh

                       cast        country          date_added  release_year  \
0                       nan  United States  September 25, 2021          2020
1                Ama Qamata   South Africa  September 24, 2021          2021
1                Ama Qamata   South Africa  September 24, 2021          2021
1                Ama Qamata   South Africa  September 24, 2021          2021
1               Khosi Ngema   South Africa  September 24, 2021          2021
…                    …             …                  …            …
8806         Anita Shabdish          India       March 2, 2019          2015
8806         Anita Shabdish          India       March 2, 2019          2015
8806  Chittaranjan Tripathy          India       March 2, 2019          2015
8806  Chittaranjan Tripathy          India       March 2, 2019          2015
8806  Chittaranjan Tripathy          India       March 2, 2019          2015

     rating   duration               listed_in  \
0     PG-13     90 min           Documentaries
1     TV-MA  2 Seasons  International TV Shows
1     TV-MA  2 Seasons               TV Dramas
1     TV-MA  2 Seasons            TV Mysteries
1     TV-MA  2 Seasons  International TV Shows
…     …         …                   …
8806  TV-14    111 min    International Movies
8806  TV-14    111 min        Music & Musicals
8806  TV-14    111 min                  Dramas
8806  TV-14    111 min    International Movies
8806  TV-14    111 min        Music & Musicals

                                            description
0     As her father nears the end of his life, filmm…
1     After crossing paths at a party, a Cape Town t…
1     After crossing paths at a party, a Cape Town t…
1     After crossing paths at a party, a Cape Town t…
1     After crossing paths at a party, a Cape Town t…
…                                                   …
8806  A scrappy but poor boy worms his way into a ty…
8806  A scrappy but poor boy worms his way into a ty…
8806  A scrappy but poor boy worms his way into a ty…
8806  A scrappy but poor boy worms his way into a ty…
8806  A scrappy but poor boy worms his way into a ty…
```

```
[201991 rows x 12 columns]
```

—> Below is the DataFrame Replacing nan values of each column to 'NaN'.

```
[ ]: df.replace('nan', np.NaN, inplace = True)
```

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

```
[ ]:   show_id     type                 title          director         cast  \
    0       s1    Movie  Dick Johnson Is Dead  Kirsten Johnson          NaN
    1       s2  TV Show         Blood & Water              NaN   Ama Qamata
    1       s2  TV Show         Blood & Water              NaN   Ama Qamata

             country          date_added  release_year rating   duration  \
    0  United States  September 25, 2021          2020  PG-13     90 min
    1   South Africa  September 24, 2021          2021  TV-MA  2 Seasons
    1   South Africa  September 24, 2021          2021  TV-MA  2 Seasons

                   listed_in                                         description
    0          Documentaries  As her father nears the end of his life, filmm…
    1 International TV Shows  After crossing paths at a party, a Cape Town t…
    1               TV Dramas  After crossing paths at a party, a Cape Town t…
```

—> Using fillna() to fill NaN values with corresponding values according to each type of column.

```
[ ]: df['director'] = df['director'].fillna('unknown director')
```

```
[ ]: df['cast'] = df['cast'].fillna('unknown cast')
```

```
[ ]: df['country'] = df['country'].fillna('unknown country')
```

```
[ ]: df['rating'] = df['rating'].fillna('unknown rating')
```

```
[ ]: df['date_added'] = df['date_added'].fillna(0)
```

```
[ ]: df['duration']= df['duration'].fillna('0')
```

—> DataFrame showing all replaced values for NaN types in each column

```
[ ]: df.head(5)
```

```
[ ]:   show_id     type                 title           director          cast  \
    0       s1    Movie  Dick Johnson Is Dead   Kirsten Johnson  unknown cast
    1       s2  TV Show         Blood & Water  unknown director    Ama Qamata
    1       s2  TV Show         Blood & Water  unknown director    Ama Qamata
    1       s2  TV Show         Blood & Water  unknown director    Ama Qamata
    1       s2  TV Show         Blood & Water  unknown director   Khosi Ngema
```

```
        country          date_added  release_year rating   duration  \
0  United States  September 25, 2021          2020  PG-13     90 min
1   South Africa  September 24, 2021          2021  TV-MA  2 Seasons
1   South Africa  September 24, 2021          2021  TV-MA  2 Seasons
1   South Africa  September 24, 2021          2021  TV-MA  2 Seasons
1   South Africa  September 24, 2021          2021  TV-MA  2 Seasons

                listed_in                                        description
0           Documentaries  As her father nears the end of his life, filmm…
1  International TV Shows  After crossing paths at a party, a Cape Town t…
1               TV Dramas  After crossing paths at a party, a Cape Town t…
1            TV Mysteries  After crossing paths at a party, a Cape Town t…
1  International TV Shows  After crossing paths at a party, a Cape Town t…
```

Summary : Till now, we have expolored the initial phases of the dataset, cleaned the outliners and adjusted columns with NaN valeus and splitted the grouped string values of each column into multiple rows.

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««««————————————————————————————»»»»

1. Count of categorical columns using non-graphical analysis.

(i) title counts

[ ]:
```python
No_of_unique_titles = df['title'].nunique()
No_of_unique_titles
```

[ ]:
```
8807
```

[ ]:
```python
Number_of_unique_movies = df[df['type'] == 'Movie']['title'].nunique()
Number_of_unique_movies
```

[ ]:
```
6131
```

[ ]:
```python
Number_of_unique_TVShows = df[df['type'] == 'TV Show']['title'].nunique()
Number_of_unique_TVShows
```

[ ]:
```
2676
```

(ii) director counts

[ ]:
```python
No_of_unique_directors = df[df['director'] != 'unknown director']['director'].
 ↪nunique()
No_of_unique_directors
```

[ ]:
```
4993
```

(iii) cast counts

```
[ ]: No_of_unique_actors = df[df['cast'] != 'unknown cast']['cast'].nunique()
     No_of_unique_actors
```

```
[ ]: 36439
```

(iv) country counts

```
[ ]: No_of_unique_countries = df[df['country'] != 'unknown country']['country'].
       ↪nunique()
     No_of_unique_countries
```

```
[ ]: 127
```

(v) rating counts

```
[ ]: No_of_unique_ratings = df[df['rating'] != 'unknown country']['rating'].nunique()
     No_of_unique_ratings
```

```
[ ]: 18
```

(vi) listed_in counts

```
[ ]: No_of_unique_genres = df['listed_in'].nunique()
     No_of_unique_genres
```

```
[ ]: 42
```

««««——————————————————————»»»»

2. Most Movies/TVshows produced grouping under different countries.

(Movies vs TV shows)

(i) Count of Total movies produced grouping under different countries including NaN values marked as 'unknown country'

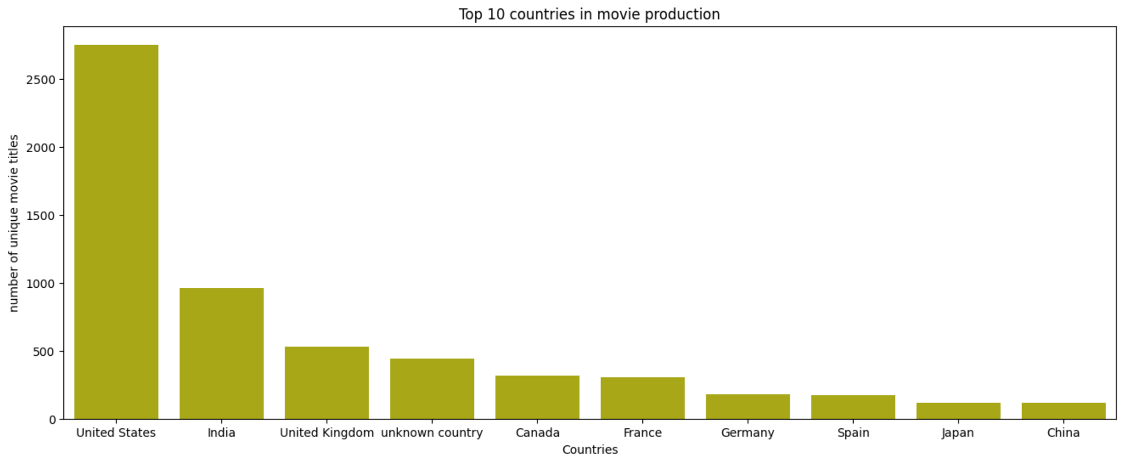
```
[ ]: top_10_countries_in_movies_production = df[df['type'] == 'Movie'].
       ↪groupby('country')['title'].nunique()
     top_10_countries_in_movies_production = top_10_countries_in_movies_production.
       ↪sort_values(ascending = False).head(10)
     top_10_countries_in_movies_production = top_10_countries_in_movies_production.
       ↪reset_index()
     top_10_countries_in_movies_production
```

```
[ ]:             country  title
     0     United States   2751
     1             India    962
     2    United Kingdom    532
```

```
3  unknown country    440
4           Canada    319
5           France    303
6          Germany    182
7            Spain    171
8            Japan    119
9            China    114
```

Graphical representation of Top 10 countries in movie production

[ ]:
```
plt.figure(figsize = (16,6))
sns.barplot(data = top_10_countries_in_movies_production, x = 'country', y =␣
  ↪'title', color = 'y')
plt.title('Top 10 countries in movie production')
plt.xlabel('Countries')
plt.ylabel('number of unique movie titles')
plt.show()
```



(ii) Count of Total shows produced grouping under different countries including NaN values marked as 'unknown country'

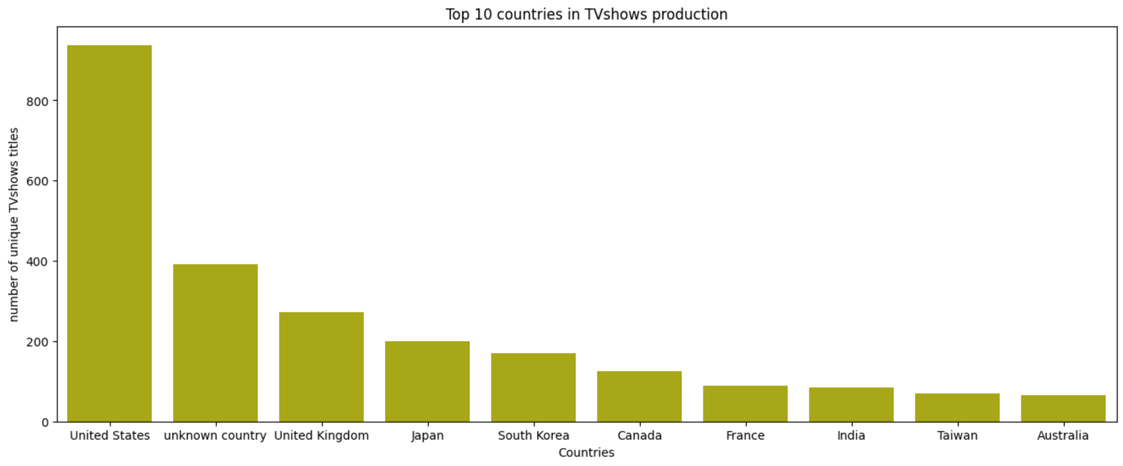
[ ]:
```
top_10_countries_in_shows_production = df[df['type'] == 'TV Show'].
  ↪groupby('country')['title'].nunique()
top_10_countries_in_shows_production = top_10_countries_in_shows_production.
  ↪sort_values(ascending = False).head(10)
top_10_countries_in_shows_production = top_10_countries_in_shows_production.
  ↪reset_index()
top_10_countries_in_shows_production
```

[ ]:
```
         country  title
0  United States    938
```

```
1  unknown country    391
2   United Kingdom    272
3            Japan    199
4      South Korea    170
5           Canada    126
6           France     90
7            India     84
8           Taiwan     70
9        Australia     66
```

Graphical representation of Top 10 countries in TVshows production

[ ]:
```
plt.figure(figsize = (16,6))
sns.barplot(data = top_10_countries_in_shows_production, x = 'country', y =␣
 ↪'title', color = 'y')
plt.title('Top 10 countries in TVshows production')
plt.xlabel('Countries')
plt.ylabel('number of unique TVshows titles')
plt.show()
```



—> "Unknown countries" values are not considered.

Insight : (Movies) As you can observe in the graph for Top 10 countries with movies production; 'United states' which stood at the top alone contributes approx 44.8 % of total movies hosted on Netflix. And the next countries 'India' and then 'United kingdom' together have a combined share of 24.3 %. Now, summing all the three countries, we get a total combined percentage of 69.1 % of total movie production, which is almost 20 percent above the half of production.

(TV Shows) Looking at the graph of Tvshows, we can observe that 'United states' (35%) and 'United kingdom'(10%) again occupied the first and second position asusual, but the third place is now occupied by Japan(7.43 %). Even the fourth place occupied by 'Korea'(6.35 %) is also very promising in future growth rate for TVshows production in their country. Thus, combined contribution of all top four countries in TVshows is almost 58.78%

Recommendation: Focussing on both US and UK is of utmost priority as they occupied the top spots in the Netflix hosting platform as highest contributors for most number of movies and TVshows and then emerging markets like ‘India for movies and ’Japan & Korea’ for Tvshows are also pretty great options for growth and diversty.

««««——————————————————————————————»»»»

3. How was number of Movies/TVshows releases changed over time since past 30 years?

(i) Change of Number of Movies releases through time

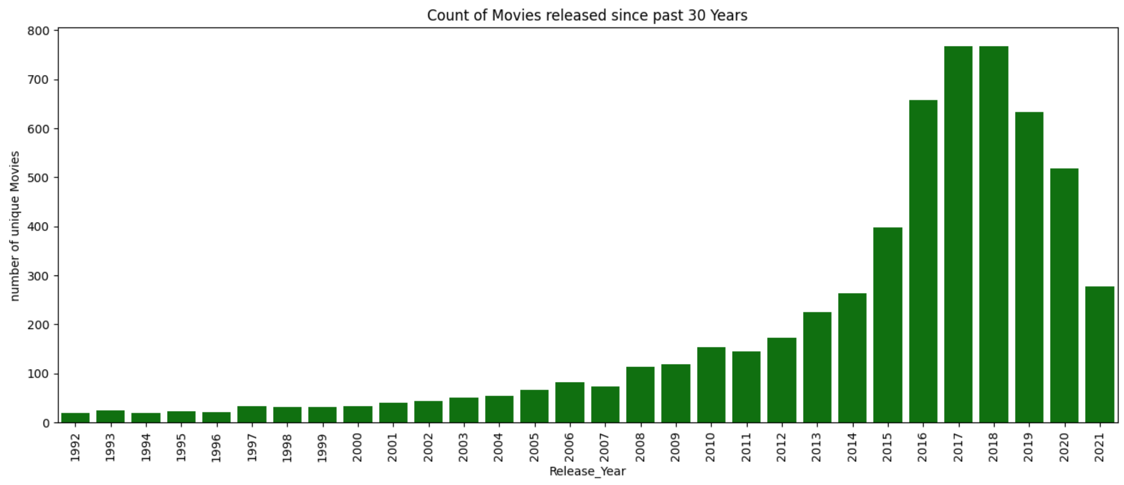
```
[ ]: Movies_released_throughout_years_of_time = df[df['type'] == 'Movie'].
       ↪groupby('release_year')['title'].nunique()
     Movies_released_throughout_years_of_time =␣
       ↪Movies_released_throughout_years_of_time.sort_index(ascending = False).
       ↪head(30)
     Movies_released_throughout_years_of_time =␣
       ↪Movies_released_throughout_years_of_time.reset_index()
     Movies_released_throughout_years_of_time
```

```
[ ]:     release_year  title
     0           2021    277
     1           2020    517
     2           2019    633
     3           2018    767
     4           2017    767
     5           2016    658
     6           2015    398
     7           2014    264
     8           2013    225
     9           2012    173
     10          2011    145
     11          2010    154
     12          2009    118
     13          2008    113
     14          2007     74
     15          2006     82
     16          2005     67
     17          2004     55
     18          2003     51
     19          2002     44
     20          2001     40
     21          2000     33
     22          1999     32
     23          1998     32
     24          1997     34
     25          1996     21
     26          1995     23
```

```
27              1994      20
28              1993      24
29              1992      20
```

Graphical represenatation of Number of movie releases since 1992

```
[ ]: plt.figure(figsize = (16,6))
     sns.barplot(data = Movies_released_throughout_years_of_time, x =␣
      ↪'release_year', y = 'title', color = 'g')
     plt.title('Count of Movies released since past 30 Years')
     plt.xlabel('Release_Year')
     plt.ylabel('number of unique Movies')
     plt.xticks(rotation = 90)
     plt.show()
```



Change of Number of TVshows releases

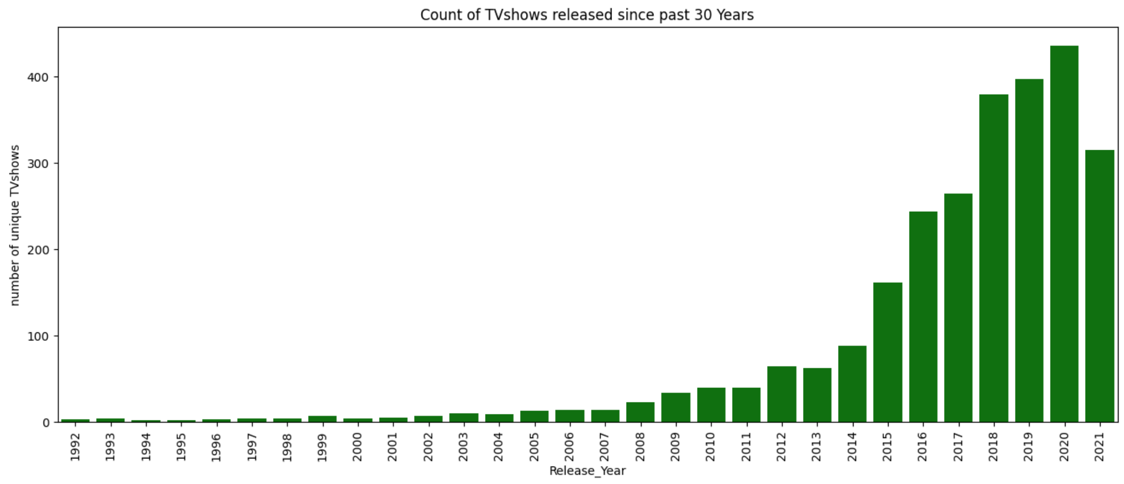
```
[ ]: TVshows_released_throughout_years_of_time = df[df['type'] == 'TV Show'].
      ↪groupby('release_year')['title'].nunique()
     TVshows_released_throughout_years_of_time =␣
      ↪TVshows_released_throughout_years_of_time.sort_index(ascending = False).
      ↪head(30)
     TVshows_released_throughout_years_of_time =␣
      ↪TVshows_released_throughout_years_of_time.reset_index()
     TVshows_released_throughout_years_of_time
```

```
[ ]:    release_year  title
     0          2021    315
     1          2020    436
     2          2019    397
     3          2018    380
```

```
4             2017    265
5             2016    244
6             2015    162
7             2014     88
8             2013     63
9             2012     64
10            2011     40
11            2010     40
12            2009     34
13            2008     23
14            2007     14
15            2006     14
16            2005     13
17            2004      9
18            2003     10
19            2002      7
20            2001      5
21            2000      4
22            1999      7
23            1998      4
24            1997      4
25            1996      3
26            1995      2
27            1994      2
28            1993      4
29            1992      3
```

Graphical represenatation of Number of TVshows releases since 1992

```
[ ]: plt.figure(figsize = (16,6))
     sns.barplot(data = TVshows_released_throughout_years_of_time, x =␣
      ↪'release_year', y = 'title', color = 'g')
     plt.title('Count of TVshows released since past 30 Years')
     plt.xlabel('Release_Year')
     plt.ylabel('number of unique TVshows')
     plt.xticks(rotation = 90)
     plt.show()
```



Insight: (Movies) Looking at the movies graph which are released since 1992, we can observe that netflix hosts most number of movie titles which were released in the period from 2015 to 2021. Almost a combined share of 65.5 % of total movies within the timeline of seven years. And most important insight would be of 2017 and 2018 which hold equal share in movie releases in the platform.

(TVshows) Looking at the graph of TVshows, we can observe that there was a rapid increment in the hosting of TVshows from 2013 and then the trend continued to escalate till 2020 and got suddenly reduced in 2021; it went below the graph line of of 2018, 2019 respectively. But specifically looking at the numbers, the releases from 2015-2021 holds a combined share of staggering 82.17 % of total shows.

Recommendation: Even though netflix was started in 1997, Majority of its hosting movies and TVshows were released on and after 2015. It means most of the content in netflix was latest and that should exactly be the business strategy of any content providing platform. Replacing the old content with new ones was the best approach that it can follow to maintain the viewership.

««««——————————————————————»»»»

4. Top 10 best actors and directors in Movies/Tvshows.

(i) Top 10 actors in movies and Tvshows

Top 10 actors in Movies

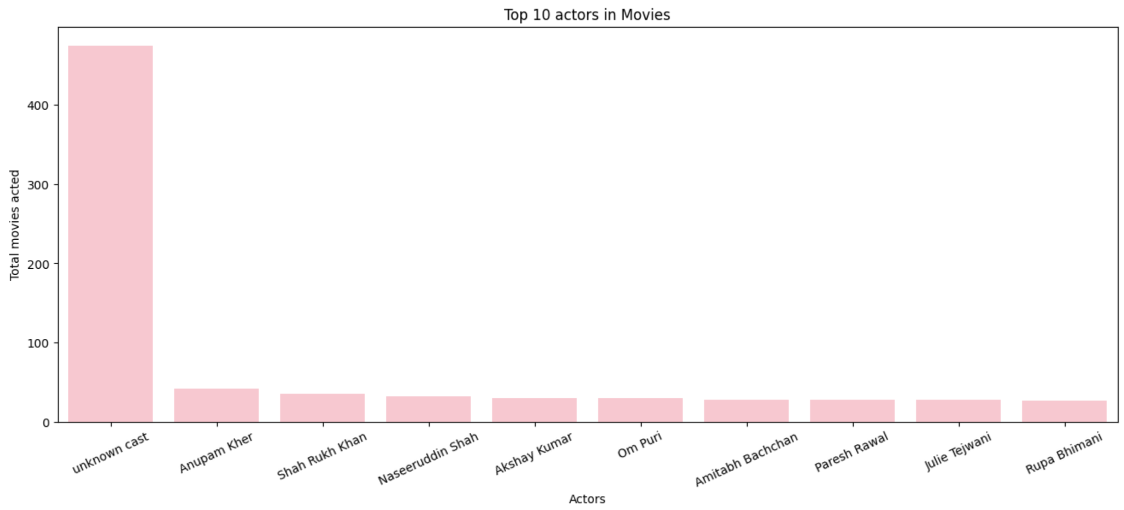
[ ]:
```
top_10_actors_in_Movies= df[df['type'] == 'Movie'].groupby('cast')['title'].
  ↪nunique()
top_10_actors_in_Movies= top_10_actors_in_Movies.sort_values(ascending = False).
  ↪head(10)
top_10_actors_in_Movies = top_10_actors_in_Movies.reset_index()
top_10_actors_in_Movies
```

```
[ ]:                 cast  title
     0       unknown cast    475
     1        Anupam Kher     42
     2     Shah Rukh Khan     35
     3   Naseeruddin Shah     32
     4       Akshay Kumar     30
     5            Om Puri     30
     6   Amitabh Bachchan     28
     7       Paresh Rawal     28
     8      Julie Tejwani     28
     9       Rupa Bhimani     27
```

Graphical representation of Top 10 actors in Movies

```
[ ]: plt.figure(figsize = (16,6))
     sns.barplot(data = top_10_actors_in_Movies, x = 'cast', y = 'title', color =␣
      ↪'pink')
     plt.title('Top 10 actors in Movies')
     plt.xlabel('Actors')
     plt.ylabel('Total movies acted')
     plt.xticks(rotation = 25)
```

```
[ ]: ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9],
      [Text(0, 0, 'unknown cast'),
       Text(1, 0, 'Anupam Kher'),
       Text(2, 0, 'Shah Rukh Khan'),
       Text(3, 0, 'Naseeruddin Shah'),
       Text(4, 0, 'Akshay Kumar'),
       Text(5, 0, 'Om Puri'),
       Text(6, 0, 'Amitabh Bachchan'),
       Text(7, 0, 'Paresh Rawal'),
       Text(8, 0, 'Julie Tejwani'),
       Text(9, 0, 'Rupa Bhimani')])
```



Top 10 actors in TVshows

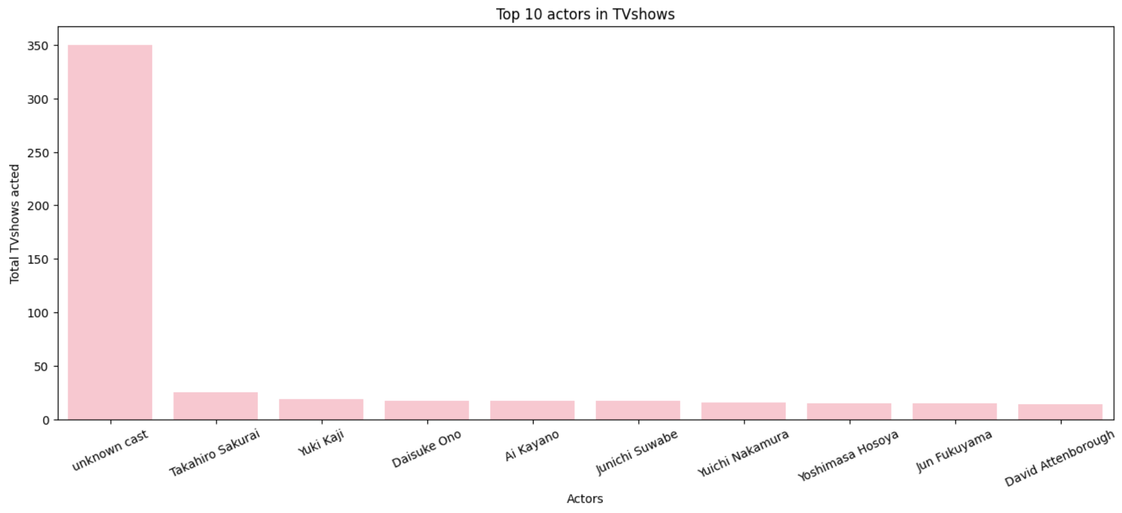
```
[ ]: top_10_actors_in_Tvshows= df[df['type'] == 'TV Show'].groupby('cast')['title'].
     ↪nunique()
     top_10_actors_in_Tvshows= top_10_actors_in_Tvshows.sort_values(ascending =␣
     ↪False).head(10)
     top_10_actors_in_Tvshows = top_10_actors_in_Tvshows.reset_index()
     top_10_actors_in_Tvshows
```

```
[ ]:                  cast  title
     0        unknown cast    350
     1    Takahiro Sakurai     25
     2           Yuki Kaji     19
     3          Daisuke Ono     17
     4           Ai Kayano     17
     5      Junichi Suwabe     17
     6     Yuichi Nakamura     16
     7   Yoshimasa Hosoya     15
     8        Jun Fukuyama     15
     9  David Attenborough     14
```

Graphical representation of Top 10 actors in TV shows

```
[ ]: plt.figure(figsize = (16,6))
     sns.barplot(data = top_10_actors_in_Tvshows, x = 'cast', y = 'title', color =␣
     ↪'pink')
     plt.title('Top 10 actors in TVshows')
     plt.xlabel('Actors')
     plt.ylabel('Total TVshows acted')
     plt.xticks(rotation = 25)
```

```
[ ]: ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9],
      [Text(0, 0, 'unknown cast'),
       Text(1, 0, 'Takahiro Sakurai'),
       Text(2, 0, 'Yuki Kaji'),
       Text(3, 0, 'Daisuke Ono'),
       Text(4, 0, 'Ai Kayano'),
       Text(5, 0, 'Junichi Suwabe'),
       Text(6, 0, 'Yuichi Nakamura'),
       Text(7, 0, 'Yoshimasa Hosoya'),
       Text(8, 0, 'Jun Fukuyama'),
       Text(9, 0, 'David Attenborough')])
```



Insight: (Movies): looking at the graph of top 10 actors in movies hosted in netflix, we can observe that actor named ‘Anupham kher’ stood at first with a total Movies count of 42 and then comes Sharukh khan with a total count of 35, interestingly both these people are from Bollywood film industry in India. And not only that, because, most of the actors who appeared in the list are actors from Bollywood.

(TVshows) : Coming to Tvshows, we know that india is still an emerging market in this area, thus most of the actors are from other parts of asia like Japan, korea, china etc.

Recommendation: As India was a major hotspot for movies, people in india are emotionally very connected to watch films. Thus, it would be an opportunity for netflix to promote Indian actors and cast them into new Movies. And for Tvshows, actors from Japan, Korea and china are the best fit.

(ii) Top 10 directors in Movies and TVshows

Top 10 directors in movies

```
[ ]: top_10_directors_in_Movies= df[df['type'] == 'Movie'].
      ↪groupby('director')['title'].nunique()
```

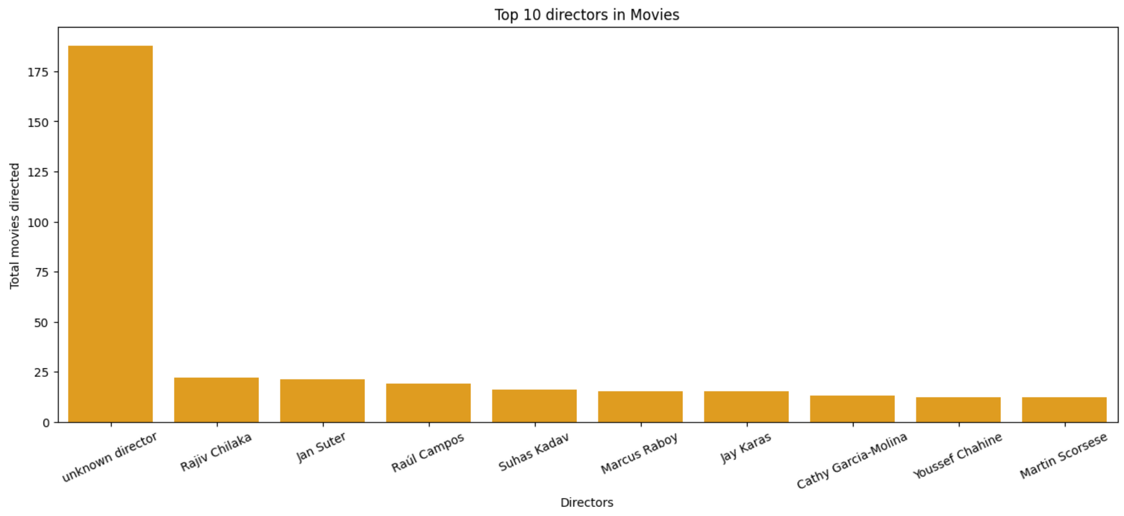
```
top_10_directors_in_Movies= top_10_directors_in_Movies.sort_values(ascending =␣
 ↪False).head(10)
top_10_directors_in_Movies = top_10_directors_in_Movies.reset_index()
top_10_directors_in_Movies
```

[ ]:
```
               director  title
0      unknown director    188
1         Rajiv Chilaka     22
2             Jan Suter     21
3           Raúl Campos     19
4           Suhas Kadav     16
5          Marcus Raboy     15
6             Jay Karas     15
7   Cathy Garcia-Molina     13
8       Youssef Chahine     12
9       Martin Scorsese     12
```

Graphical represenatation of top 10 directors in Movies

[ ]:
```
plt.figure(figsize = (16,6))
sns.barplot(data = top_10_directors_in_Movies, x = 'director', y = 'title',␣
 ↪color = 'orange')
plt.title('Top 10 directors in Movies')
plt.xlabel('Directors')
plt.ylabel('Total movies directed')
plt.xticks(rotation = 25)
```

[ ]:
```
([0, 1, 2, 3, 4, 5, 6, 7, 8, 9],
 [Text(0, 0, 'unknown director'),
  Text(1, 0, 'Rajiv Chilaka'),
  Text(2, 0, 'Jan Suter'),
  Text(3, 0, 'Raúl Campos'),
  Text(4, 0, 'Suhas Kadav'),
  Text(5, 0, 'Marcus Raboy'),
  Text(6, 0, 'Jay Karas'),
  Text(7, 0, 'Cathy Garcia-Molina'),
  Text(8, 0, 'Youssef Chahine'),
  Text(9, 0, 'Martin Scorsese')])
```



Top 10 directors in TVshows

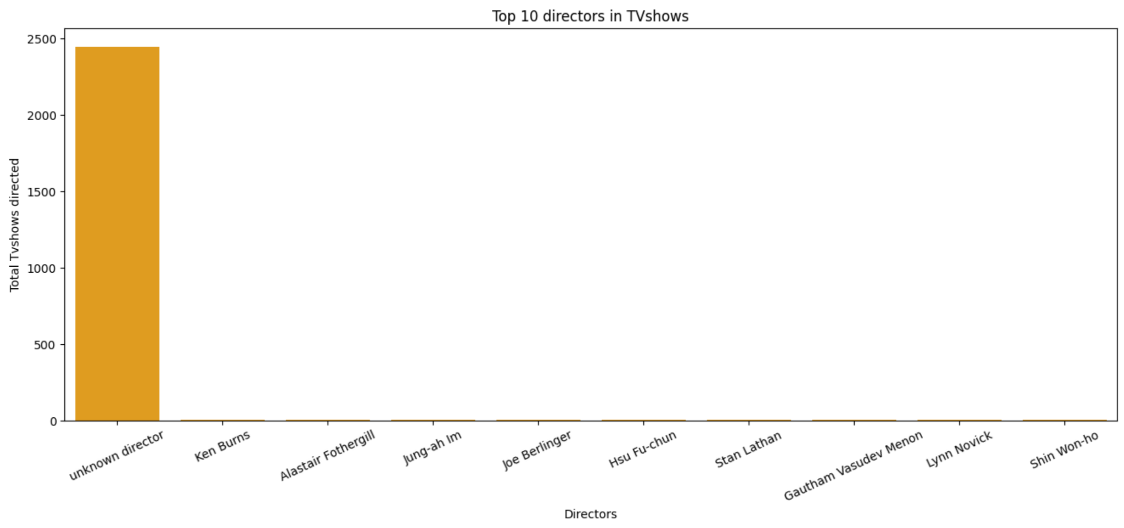
[ ]:
```
top_10_directors_in_TVshows= df[df['type'] == 'TV Show'].
 ↪groupby('director')['title'].nunique()
top_10_directors_in_TVshows= top_10_directors_in_TVshows.sort_values(ascending␣
 ↪= False).head(10)
top_10_directors_in_TVshows = top_10_directors_in_TVshows.reset_index()
top_10_directors_in_TVshows
```

[ ]:
```
                 director  title
0        unknown director   2446
1               Ken Burns      3
2     Alastair Fothergill      3
3              Jung-ah Im      2
4          Joe Berlinger      2
5            Hsu Fu-chun      2
6             Stan Lathan      2
7   Gautham Vasudev Menon      2
8             Lynn Novick      2
9            Shin Won-ho      2
```

Graphical represenatation of top 10 directors in TVshows

[ ]:
```
plt.figure(figsize = (16,6))
sns.barplot(data =top_10_directors_in_TVshows, x = 'director', y = 'title',␣
 ↪color = 'orange')
plt.title('Top 10 directors in TVshows')
plt.xlabel('Directors')
plt.ylabel('Total Tvshows directed')
plt.xticks(rotation = 25)
```

```
[ ]: ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9],
      [Text(0, 0, 'unknown director'),
       Text(1, 0, 'Ken Burns'),
       Text(2, 0, 'Alastair Fothergill'),
       Text(3, 0, 'Jung-ah Im'),
       Text(4, 0, 'Joe Berlinger'),
       Text(5, 0, 'Hsu Fu-chun'),
       Text(6, 0, 'Stan Lathan'),
       Text(7, 0, 'Gautham Vasudev Menon'),
       Text(8, 0, 'Lynn Novick'),
       Text(9, 0, 'Shin Won-ho')])
```



—> As majority of directors in TVshowsa are unknown values, i cannot give any probabale insight or recommendation.

«««« —————————————————————————— »»»»

5. **Most produced genre content in movies and TVshows**

(i) Most produced genre content in Movies

```
[ ]: most_popular_genre_movies = df[df['type'] == 'Movie'].
      ↪groupby('listed_in')['title'].nunique()
     most_popular_genre_movies = most_popular_genre_movies.sort_values(ascending =␣
      ↪False)
     most_popular_genre_movies = most_popular_genre_movies.reset_index()
     most_popular_genre_movies
```

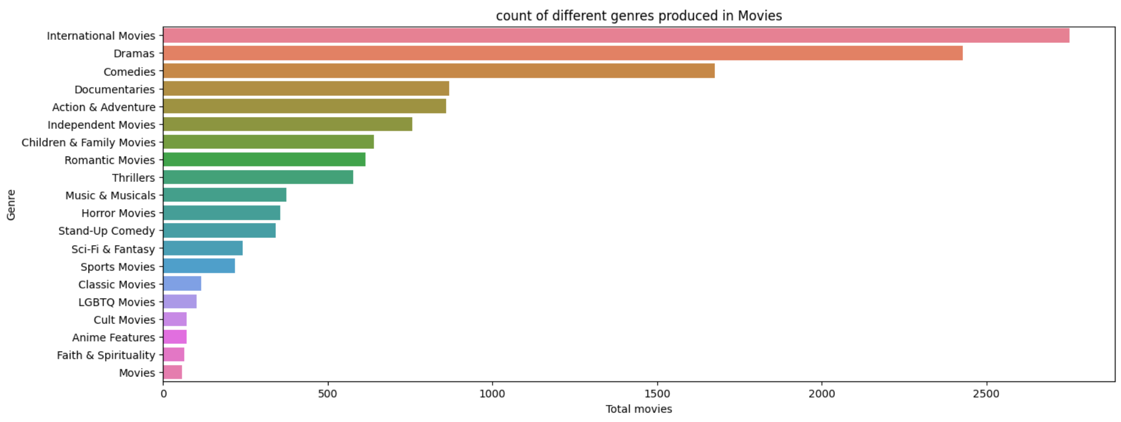
```
[ ]:                 listed_in  title
     0      International Movies   2752
     1                    Dramas   2427
```

```
2                   Comedies   1674
3              Documentaries    869
4         Action & Adventure    859
5         Independent Movies    756
6   Children & Family Movies    641
7            Romantic Movies    616
8                  Thrillers    577
9           Music & Musicals    375
10             Horror Movies    357
11           Stand-Up Comedy    343
12          Sci-Fi & Fantasy    243
13             Sports Movies    219
14            Classic Movies    116
15              LGBTQ Movies    102
16               Cult Movies     71
17           Anime Features     71
18       Faith & Spirituality    65
19                    Movies     57
```

Graphical representation of most produced movie genres

[ ]:
```
plt.figure(figsize = (16,6))
sns.barplot(data = most_popular_genre_movies, x = 'title', y = 'listed_in', hue␣
 ↪= 'listed_in')
plt.title('count of different genres produced in Movies')
plt.xlabel('Total movies')
plt.ylabel('Genre')
```

[ ]:
```
Text(0, 0.5, 'Genre')
```



(ii) Most produced genre content in TVshows

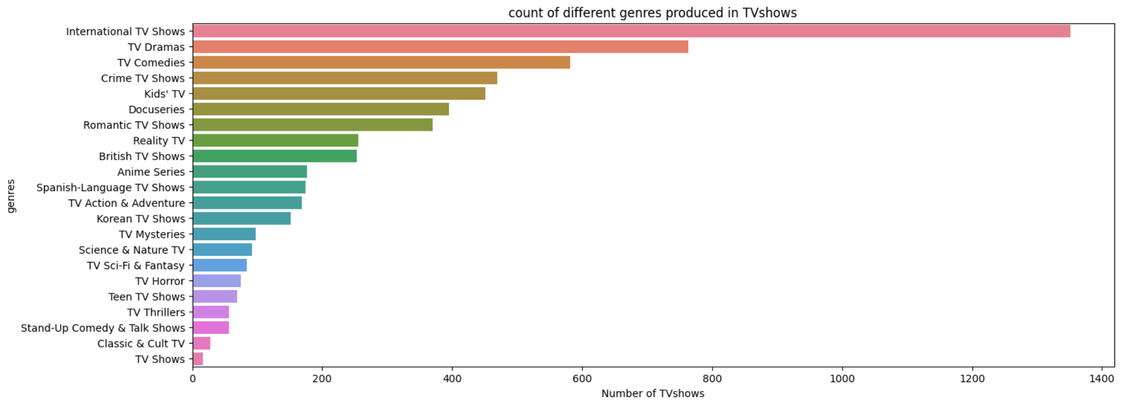
```
[ ]: most_popular_genre_TVshows = df[df['type'] == 'TV Show'].
      ↪groupby('listed_in')['title'].nunique()
     most_popular_genre_TVshows = most_popular_genre_TVshows.sort_values(ascending =␣
      ↪False)
     most_popular_genre_TVshows = most_popular_genre_TVshows.reset_index()
     most_popular_genre_TVshows
```

```
[ ]:                       listed_in  title
     0         International TV Shows   1351
     1                      TV Dramas    763
     2                    TV Comedies    581
     3                 Crime TV Shows    470
     4                       Kids' TV    451
     5                     Docuseries    395
     6              Romantic TV Shows    370
     7                     Reality TV    255
     8               British TV Shows    253
     9                   Anime Series    176
     10     Spanish-Language TV Shows    174
     11          TV Action & Adventure    168
     12               Korean TV Shows    151
     13                 TV Mysteries     98
     14            Science & Nature TV     92
     15            TV Sci-Fi & Fantasy     84
     16                     TV Horror     75
     17                 Teen TV Shows     69
     18                  TV Thrillers     57
     19  Stand-Up Comedy & Talk Shows     56
     20             Classic & Cult TV     28
     21                      TV Shows     16
```

Graphical representation of most produced Tvshow genres

```
[ ]: plt.figure(figsize = (16,6))
     sns.barplot(data = most_popular_genre_TVshows, x = 'title', y = 'listed_in',␣
      ↪hue = 'listed_in')
     plt.title('count of different genres produced in TVshows')
     plt.xlabel('Number of TVshows')
     plt.ylabel('genres')
```

```
[ ]: Text(0, 0.5, 'genres')
```



—> Because of the splitting of of 'listed_in' column, we have a repeated count of the movie titles which comes under multiple genres. But anyway our insight doesn't get affected.

Insight: (Movies) Looking at the graph of Top genres in movies, we can observe that major movie tites belong to these five genres 'International Movies', 'Dramas', 'comedies', 'Documentaries', and 'Action & Adventure'. And the bottom ones are 'LGTBQ+', 'cult', 'family /spirituality' and 'Anime'.

(TVshows) Looking at the graph of Top ten genres in TVshows, we can observe that major TVshow titles belong to these five genres 'International TV shows', 'Drama', 'Comedies', 'crime', and 'Kids'. But if we observe the bottom ones we can see genres like 'horror', 'teen shows', 'thrillers', 'stand_up comedy & talkshows', and 'cult'.

Recommedation: Upon closer examination of both graphs, it becomes evident that the majority of productions, whether movies or TV shows, fall under genres such as International, Comedy, or Drama, or a combination thereof. This combination emerges as a high priority. Notably, the genre 'Cult,' which occupies the bottom position in both movies and TV shows, is underproduced and not recommended.

««««——————————————————»»»»

6. **What kind of content is available in different countries?**

   (i) Number of movies produced grouping under countries and genres

```
[ ]: division_of_Moviegenre_in_countries = df[df['type'] == 'Movie'].
       ↪groupby(['country','listed_in'])['title'].nunique()
     division_of_Moviegenre_in_countries = division_of_Moviegenre_in_countries.
       ↪sort_values(ascending = False).head(20)
     division_of_Moviegenre_in_countries = division_of_Moviegenre_in_countries.
       ↪reset_index()
     division_of_Moviegenre_in_countries
```

```
[ ]:             country                listed_in  title
     0             India     International Movies    864
     1     United States                   Dramas    835
```

```
2     United States               Comedies    680
3             India                 Dramas    662
4     United States          Documentaries    511
5     United States     Action & Adventure    404
6     United States     Independent Movies    390
7     United States  Children & Family Movies 390
8             India               Comedies    323
9     United States              Thrillers    292
10    United States        Romantic Movies    225
11    United States         Stand-Up Comedy   216
12  unknown country   International Movies    209
13           France   International Movies    207
14    United States          Horror Movies    201
15   United Kingdom                 Dramas    196
16    United States       Sci-Fi & Fantasy    181
17   United Kingdom   International Movies    168
18           France                 Dramas    167
19            India     Independent Movies    167
```

Graphical representation of Movies produced under different genres in different countries

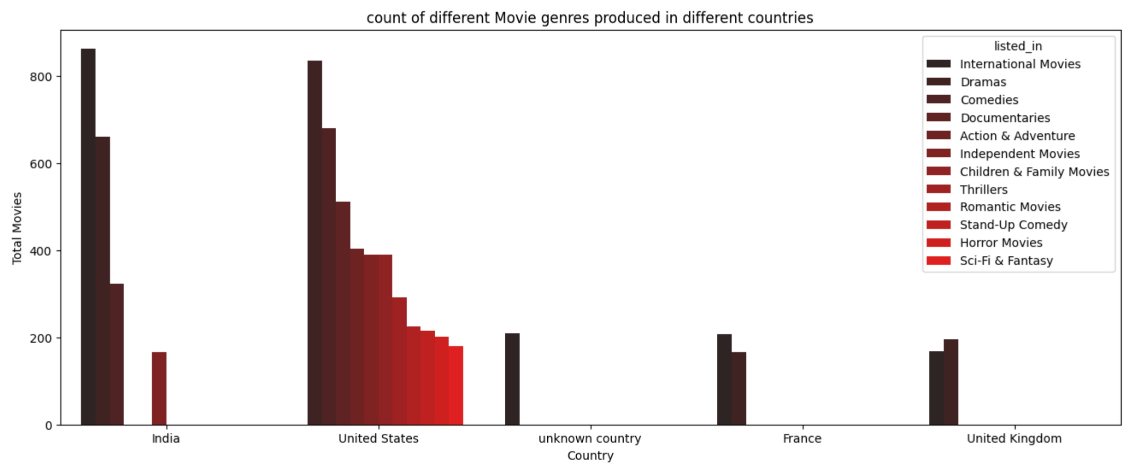
```
[ ]: plt.figure(figsize = (16,6))
     sns.barplot(data = division_of_Moviegenre_in_countries, x='country', y =␣
      ↪'title', hue ='listed_in', color = 'r')
     plt.title('count of different Movie genres produced in different countries')
     plt.xlabel('Country')
     plt.ylabel('Total Movies')
```

```
<ipython-input-129-aaaa6d90e851>:2: FutureWarning:

Setting a gradient palette using color= is deprecated and will be removed in
v0.14.0. Set `palette='dark:r'` for the same effect.

  sns.barplot(data = division_of_Moviegenre_in_countries, x='country', y =
'title', hue ='listed_in', color = 'r')
```

```
[ ]: Text(0, 0.5, 'Total Movies')
```



(ii) Number of TVshows produced grouping under countries and genres

```
[ ]: division_of_genre_in_countries = df[df['type'] == 'TV Show'].
      ↪groupby(['country','listed_in'])['title'].nunique()
     division_of_genre_in_countries = division_of_genre_in_countries.
      ↪sort_values(ascending = False).head(20)
     division_of_genre_in_countries = division_of_genre_in_countries.reset_index()
     division_of_genre_in_countries
```

```
[ ]:             country              listed_in  title
     0     United States            TV Comedies    258
     1     United States              TV Dramas    232
     2    United Kingdom        British TV Shows    225
     3   unknown country  International TV Shows    223
     4     United States               Kids' TV    214
     5     United States             Docuseries    192
     6       South Korea  International TV Shows    152
     7             Japan  International TV Shows    151
     8     United States          Crime TV Shows    145
     9             Japan           Anime Series    143
     10      South Korea         Korean TV Shows    132
     11   United Kingdom  International TV Shows    128
     12    United States             Reality TV    123
     13  unknown country              TV Dramas    100
     14    United States   TV Action & Adventure     94
     15   United Kingdom             Docuseries     89
     16  unknown country               Kids' TV     81
     17  unknown country            TV Comedies     80
     18      South Korea      Romantic TV Shows     77
     19    United States  International TV Shows     74
```

Graphical representation of TVshows produced under different genres in different countries

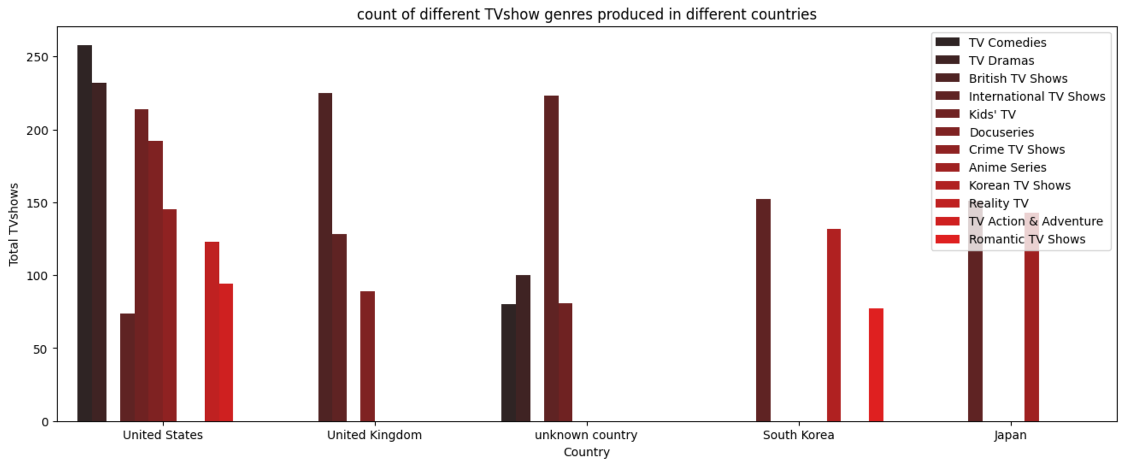
[ ]:
```
plt.figure(figsize = (16,6))
sns.barplot(data = division_of_genre_in_countries, x='country', y = 'title',␣
  ↪hue ='listed_in', color = 'r')
plt.title('count of different TVshow genres produced in different countries')
plt.xlabel('Country')
plt.ylabel('Total TVshows')
plt.legend(loc = 'upper right')
```

```
<ipython-input-133-3c9b26cb6eee>:2: FutureWarning:

Setting a gradient palette using color= is deprecated and will be removed in
v0.14.0. Set `palette='dark:r'` for the same effect.

  sns.barplot(data = division_of_genre_in_countries, x='country', y = 'title',
hue ='listed_in', color = 'r')
```

[ ]:
```
<matplotlib.legend.Legend at 0x7e1c7c62af20>
```



Insight: (Movies) Observing the graph of movies produced under different genres in different countries we can pretty much conclude that USA tops in Netflix listing of movies in different genres, it occupied almost all 12 movie genres with a staggering record. While on the other hand India holds high count in genres like International, dramas and comedies. Coming to countries like UK & France they were max occupied with genres like International & Drama.

(TVshows) Observing the graph of TVshows produced under different genres in different countries we can reasonably conclude that again Netflix hosts most diverse contet from USA. 'Britian' similar to their movies production, were sticking with Dramas and domestic britian TVshows. Other countries like South korea and japan are producing International TV shows and their individual domestic Tvshows.

Recommendation: For both Movies and TVshows, American content is the best one running in netflix. Genres like International, Comedy, Dramas, Action, Documentaries have very strong viewership; hence focusing on american content withrespect to these genres yield high results. And then content from UK holds second most advantageous position for both movies and TVshows in similar genres. After that we have other countries like India, which is an emerging online streaming platform for movies genres like International, dramas and comedies. Also eastern countries like Japan and korea were noticed for their distinct, feelgood romantic TVshows.

««««——————————————————————»»»»

—> Formatting 'date_added' column to extract week and month

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

```
[ ]: df['week_added'] = df['date_added'].dt.isocalendar().week
```

```
[ ]: df['month_added'] = df['date_added'].dt.month
```

7. **Analysis on best time to launch Movies/TVshows**

(i) Best Week and Month to launch Movies

Best weeks

```
[ ]: best_week_to_launch_movies = df[df['type'] == 'Movie'].
      ↪groupby('week_added')['title'].nunique()
     best_week_to_launch_movies = best_week_to_launch_movies.sort_index()
     best_week_to_launch_movies = best_week_to_launch_movies.reset_index()
     best_week_to_launch_movies
```

```
[ ]:     week_added  title
     0            1    316
     1            2     78
     2            3     81
     3            4     56
     4            5    135
     5            6     64
     6            7    106
     7            8     72
     8            9    207
     9           10    107
     10          11    115
     11          12     67
     12          13    174
     13          14    124
     14          15    100
     15          16    124
     16          17    109
     17          18    173
     18          19     73
     19          20     85
     20          21     76
     21          22    146
```

```
22          23    112
23          24     89
24          25    101
25          26    195
26          27    154
27          28     89
28          29     94
29          30    116
30          31    185
31          32     73
32          33    105
33          34    102
34          35    189
35          36     97
36          37    114
37          38     88
38          39    111
39          40    215
40          41     84
41          42     90
42          43     88
43          44    243
44          45     61
45          46     83
46          47     85
47          48    139
48          49     95
49          50    119
50          51     86
51          52     80
52          53     61
```

Best months

[ ]:
```
best_month_to_launch_movies = df[df['type'] == 'Movie'].
 ↪groupby('month_added')['title'].nunique()
best_month_to_launch_movies = best_month_to_launch_movies.sort_index()
best_month_to_launch_movies = best_month_to_launch_movies.reset_index()
best_month_to_launch_movies
```

[ ]:
```
    month_added  title
0             1    546
1             2    382
2             3    529
3             4    550
4             5    439
5             6    492
```

```
6               7    565
7               8    519
8               9    519
9              10    545
10             11    498
11             12    547
```

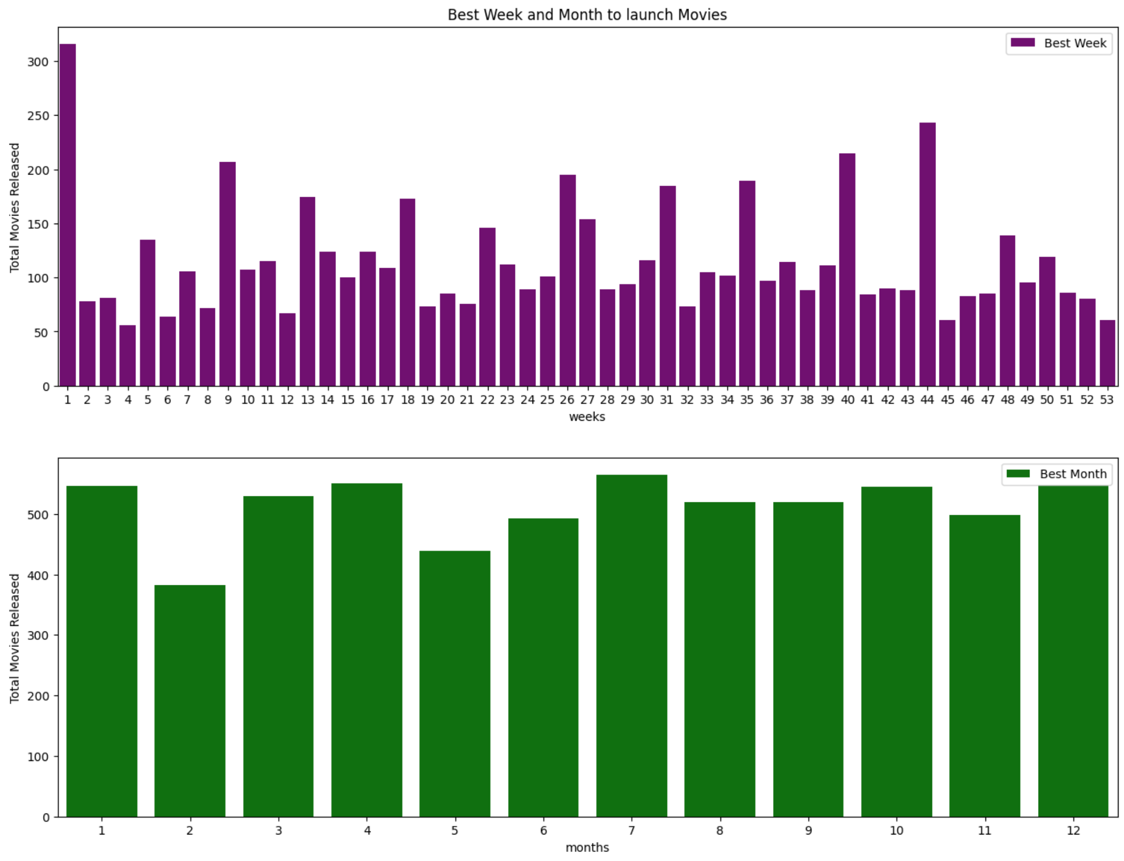
Graphical representation of best weeks/months for launching movies using barplot

```
[ ]: plt.figure(figsize=(16, 12))

     plt.subplot(2,1,1)
     sns.barplot(data = best_week_to_launch_movies, x = 'week_added', y='title',␣
      ↪label='Best Week', color='Purple')
     plt.title('Best Week and Month to launch Movies')
     plt.xlabel('weeks')
     plt.ylabel('Total Movies Released')


     plt.subplot(2,1,2)
     sns.barplot(data = best_month_to_launch_movies, x = 'month_added', y='title',␣
      ↪label='Best Month', color='Green')
     plt.xlabel('months')
     plt.ylabel('Total Movies Released')
```

```
[ ]: Text(0, 0.5, 'Total Movies Released')
```



Ignoring the first week in the both graph, as by default the null values in the date_added column are replaced by a default value '01-01-1970'

Insight: (Movies) If we observe the graph, most movies were released on 44th week and 7th month. Weeks like 9th, 13th, 18th, 22nd, 26th, 27th, 31st, 35th, 40th, 44th held as major weeks for movie releases. And coming to months, all most every month except 2 and 5 held most releases on netflix.

Recommendation: At the beginning of six months, releasing movies during first and second weeks tend to be higher, thus, the same was suggested, whereas coming to the other half, releasing the movies in 3rd and 4th weeks tends to be desirable.

(ii) Best Week and month to launch TVshows

Best weeks

[ ]:
```
best_week_to_launch_TVshows = df[df['type'] == 'TV Show'].
  ↪groupby('week_added')['title'].nunique()
best_week_to_launch_TVshows = best_week_to_launch_TVshows.sort_index()
best_week_to_launch_TVshows =best_week_to_launch_TVshows.reset_index()
best_week_to_launch_TVshows
```

```
[ ]:     week_added  title
     0            1     66
     1            2     30
     2            3     32
     3            4     32
     4            5     73
     5            6     33
     6            7     41
     7            8     38
     8            9     47
     9           10     28
     10          11     48
     11          12     42
     12          13     76
     13          14     49
     14          15     52
     15          16     36
     16          17     45
     17          18     61
     18          19     43
     19          20     46
     20          21     41
     21          22     60
     22          23     39
     23          24     75
     24          25     42
     25          26     73
     26          27     86
     27          28     41
     28          29     46
     29          30     44
     30          31     83
     31          32     49
     32          33     48
     33          34     41
     34          35     74
     35          36     45
     36          37     69
     37          38     51
     38          39     55
     39          40     72
     40          41     32
     41          42     45
     42          43     28
     43          44     75
     44          45     37
     45          46     51
```

```
46          47    35
47          48    60
48          49    45
49          50    70
50          51    51
51          52    52
52          53    43
```

Best months

```
[ ]: best_month_to_launch_TVshows = df[df['type'] == 'TV Show'].
      ↪groupby('month_added')['title'].nunique()
     best_month_to_launch_TVshows = best_month_to_launch_TVshows.sort_index()
     best_month_to_launch_TVshows = best_month_to_launch_TVshows.reset_index()
     best_month_to_launch_TVshows
```

```
[ ]:     month_added  title
     0             1    202
     1             2    181
     2             3    213
     3             4    214
     4             5    193
     5             6    236
     6             7    262
     7             8    236
     8             9    251
     9            10    215
     10           11    207
     11           12    266
```

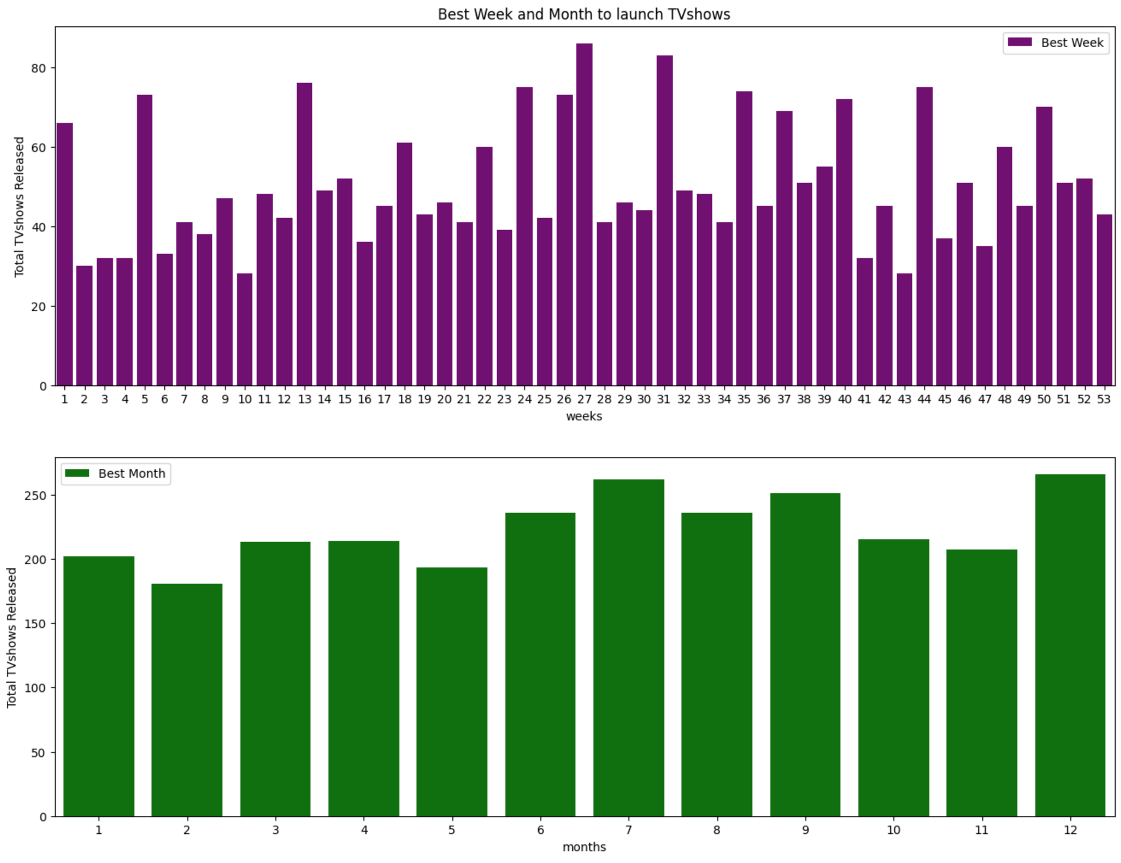
Graphical representation of best weeks/months for launching TVshows using barplot

```
[ ]: plt.figure(figsize=(16, 12))

     plt.subplot(2,1,1)
     sns.barplot(data =best_week_to_launch_TVshows, x = 'week_added', y = 'title',␣
      ↪label='Best Week', color='Purple')
     plt.title('Best Week and Month to launch TVshows')
     plt.xlabel('weeks')
     plt.ylabel('Total TVshows Released')


     plt.subplot(2,1,2)
     sns.barplot(data = best_month_to_launch_TVshows, x = 'month_added', y= 'title',␣
      ↪label='Best Month', color='Green')
     plt.xlabel('months')
     plt.ylabel('Total TVshows Released')
```

```
[ ]: Text(0, 0.5, 'Total TVshows Released')
```



Ignoring the first week in the both graph, as by default the null values in the date_added column are replaced by a default value '01-01-1970'

Insight: (TVshows) If we observe the graph, most shows were released on 44th week and 7th month. Weeks like 5th, 13th, 18th, 24th, 26th, 27th, 31st, 35th, 37th, 40th, 44th, 48th, 50th held as major weeks for Tvshow releases. And coming to months 6,7,8,9,12 held most releases.

Recommendation: Most TVshows were released more in 3rd and 4th weeks and hence releasing the future installations during these periods tend to be advantageous.

««««——————————————————————»»»»

8. **Finding how many approx years it takes for a movie/Tvshow to be added on netflix after its initial original release.**

```
[ ]: df['year_diff'] = df['date_added'].dt.year - df['release_year']
```

—> Ignore (1970) year, they are by default **null_value replacement**

```
[ ]: Approx_time_taken_in_years = df[['date_added', 'release_year', 'year_diff']]
     Approx_time_taken_in_years.sort_values(by = 'year_diff', ascending = False)
```

```
[ ]:      date_added  release_year  year_diff
     4250 2018-12-30          1925         93
     1331 2021-02-09          1945         76
     8205 2017-03-31          1942         75
     8205 2017-03-31          1942         75
     8205 2017-03-31          1942         75
     …         …             …         …
     7406 1970-01-01          2016        -46
     7406 1970-01-01          2016        -46
     7406 1970-01-01          2016        -46
     7406 1970-01-01          2016        -46
     6174 1970-01-01          2018        -48

     [201991 rows x 3 columns]
```

Insight : The highest time differnece is 93 years, which indicates that netflix often do hosts and experiment with some pretty old movies/TVshows. We also have movies/TvShows ageing in 70's and 60's.

Recommendation: Experimenting is good and sometimes a few old classics might savour the taste of niche group of audiences, but it was desiarble to focus on fresh content of movies/TVShows.

««««————————————————————————»»»»

9. **Finding which rating and genre combination holds more movie/TVshows releases.**

(i) Top 10 (rating and genre) combination holding most movies

```
[ ]: movies_listed_under_ratings = df[df['type'] == 'Movie'].groupby(['rating',␣
      ↪'listed_in'])['title'].nunique()
     movies_listed_under_ratings = movies_listed_under_ratings.sort_values(ascending␣
      ↪= False).head(20)
     movies_listed_under_ratings = movies_listed_under_ratings.reset_index()
     movies_listed_under_ratings
```

```
[ ]:    rating                listed_in  title
     0   TV-MA     International Movies   1130
     1   TV-14     International Movies   1065
     2   TV-MA                   Dramas    830
     3   TV-14                   Dramas    693
     4   TV-14                 Comedies    465
     5   TV-MA                 Comedies    431
     6       R                   Dramas    375
     7   TV-MA       Independent Movies    344
     8   TV-MA            Documentaries    321
     9   TV-PG     International Movies    294
     10  TV-MA          Stand-Up Comedy    291
     11  TV-MA                Thrillers    240
     12  TV-14            Documentaries    227
```

```
13      R         Action & Adventure    220
14  TV-14         Action & Adventure    213
15  TV-14            Romantic Movies    208
16  TV-MA         Action & Adventure    201
17  TV-PG                     Dramas    200
18     PG   Children & Family Movies    195
19      R         Independent Movies    193
```

(ii) Top 10 (rating and genre) combination holding most TVshows

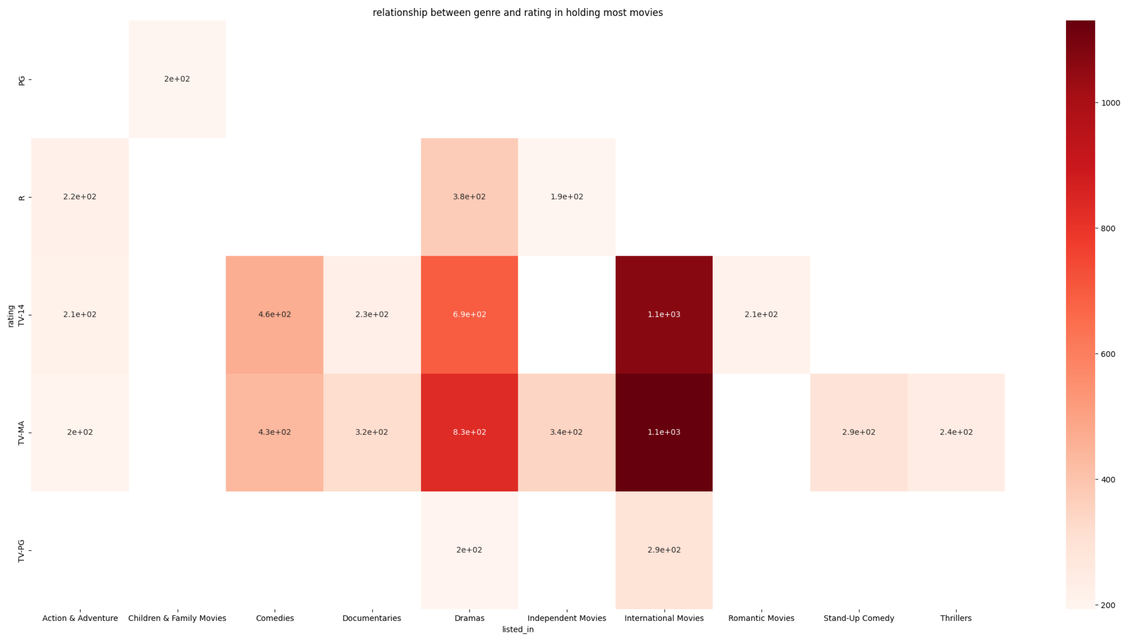
```
[ ]: TVshows_listed_under_ratings = df[df['type'] == 'TV Show'].groupby(['rating',␣
     ↪'listed_in'])['title'].nunique()
     TVshows_listed_under_ratings = TVshows_listed_under_ratings.
     ↪sort_values(ascending = False).head(20)
     TVshows_listed_under_ratings = TVshows_listed_under_ratings.reset_index()
     TVshows_listed_under_ratings
```

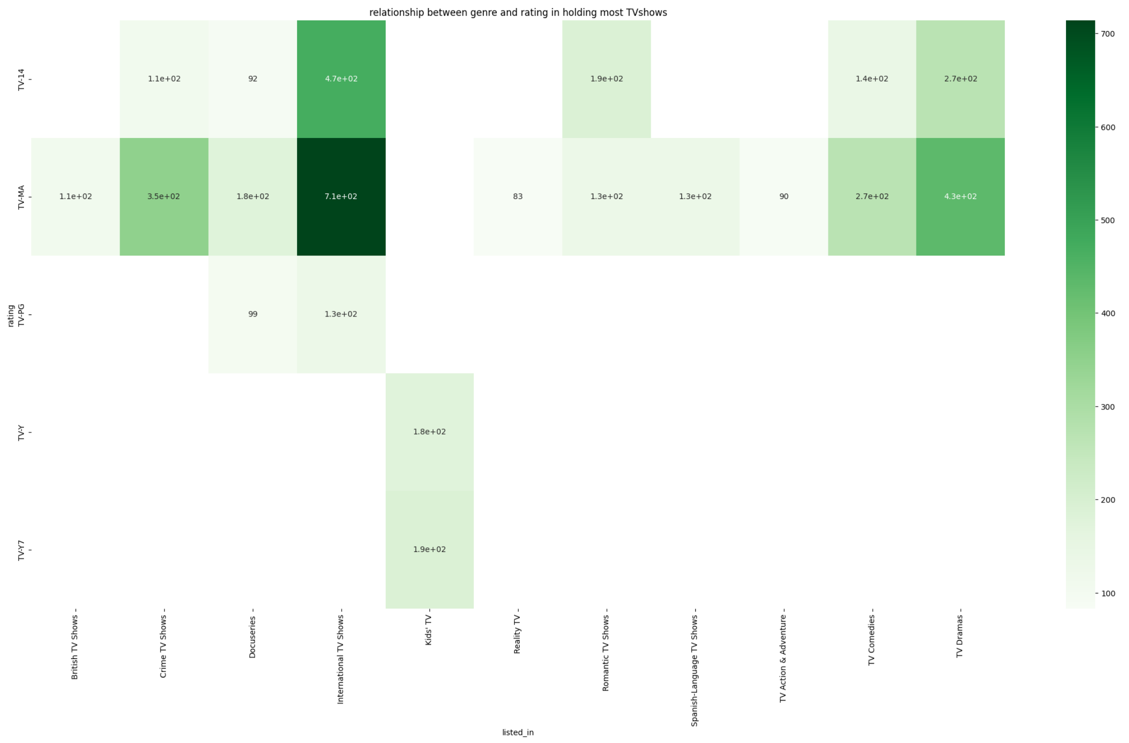
```
[ ]:   rating                  listed_in  title
     0   TV-MA     International TV Shows    714
     1   TV-14     International TV Shows    472
     2   TV-MA                  TV Dramas    434
     3   TV-MA             Crime TV Shows    350
     4   TV-MA                TV Comedies    269
     5   TV-14                  TV Dramas    269
     6   TV-14          Romantic TV Shows    190
     7   TV-Y7                   Kids' TV    189
     8   TV-MA                 Docuseries    179
     9    TV-Y                   Kids' TV    176
     10  TV-14                TV Comedies    140
     11  TV-PG     International TV Shows    134
     12  TV-MA          Romantic TV Shows    132
     13  TV-MA  Spanish-Language TV Shows    130
     14  TV-14             Crime TV Shows    111
     15  TV-MA           British TV Shows    108
     16  TV-PG                 Docuseries     99
     17  TV-14                 Docuseries     92
     18  TV-MA       TV Action & Adventure     90
     19  TV-MA                 Reality TV     83
```

Graphical representation using **Heat map** of Genre and rating combination on movies/Tvshows

```
[ ]: plt.figure(figsize = (28, 30))
     plt.subplot(2,1,1)
     Movies_heat_map_data = movies_listed_under_ratings.pivot(index ='rating',␣
     ↪columns ='listed_in', values ='title')
     sns.heatmap(Movies_heat_map_data, annot=True, cmap = 'Reds')
     plt.title('relationship between genre and rating in holding most movies')
     plt.subplot(2,1,2)
     TVshows_heat_map_data = TVshows_listed_under_ratings.pivot(index ='rating',␣
     ↪columns ='listed_in', values ='title')
     sns.heatmap(TVshows_heat_map_data, annot=True, cmap = 'Greens')
     plt.title('relationship between genre and rating in holding most TVshows')
```

```
[ ]: Text(0.5, 1.0, 'relationship between genre and rating in holding most TVshows')
```





Insight: (Movies) Observing the Top 10 (rating and genre) combination holding most number of movies, thus, we can conclude that there was high positive correlation between majority of international movies and ratings like 'TV 14','TV MA'. Even majority of Dramas got the same types of correlation with similar ratings. Least correlation was observed in International movies and ‘TV PG’ rating, and other genres like Action&Adventure have least correlation with ‘TV MA’, ‘TV 14’ AND ‘R’ rating types and a few genres like Independent movies and Documentaries also have same correlation with ‘TV MA’.

(TVshows): Observing the Top 10 (rating and genre) combination holding most TVShows, we can conclude that there is high positive correlation between majority of international TVshows and ‘TV MA’,‘TV 14’ rating types. Least correlation was observed in Docuseries with ‘TV PG’,‘TV 14’, and even shows like Realities and adventures have less correlation with TV MA rating. Same follows with Kids-TV and ‘TV Y7’, ‘TV Y’ rating types which have low correlation.

Recommendation: As most movies and TVshows hosted in Netflix belong to ‘TV MA’ rating type and holds good positive correlation; It is advantageous to lauch contents like, International movies/TVshows and Dramas with similar style and theme which ultimately falls under the above rating.

««««——————————————————————————»»»»

10. Count of Movie/TVshows titles grouping under duration

(i) Top 10 Movie runtimes holding most number of movies

```
[ ]: Number_of_different_Movie_runtime = df[df['type'] == 'Movie'].
      ↪groupby('duration')['title'].nunique()
     Number_of_different_Movie_runtime  = Number_of_different_Movie_runtime.
      ↪sort_values(ascending = False).head(10)
     Number_of_different_Movie_runtime = Number_of_different_Movie_runtime.
      ↪reset_index()
     Number_of_different_Movie_runtime
```

```
[ ]:   duration  title
     0   90 min    152
     1   94 min    146
     2   93 min    146
     3   97 min    146
     4   91 min    144
     5   95 min    137
     6   96 min    130
     7   92 min    129
     8  102 min    122
     9   98 min    120
```

(ii) finding under what number of Seasons netflix produced most numebr of TVshows

```
[ ]: Number_of_different_seasons = df[df['type'] == 'TV Show'].
      ↪groupby('duration')['title'].nunique()
     Number_of_different_seasons = Number_of_different_seasons.sort_values(ascending␣
      ↪= False)
     Number_of_different_seasons = Number_of_different_seasons.reset_index()
     Number_of_different_seasons
```

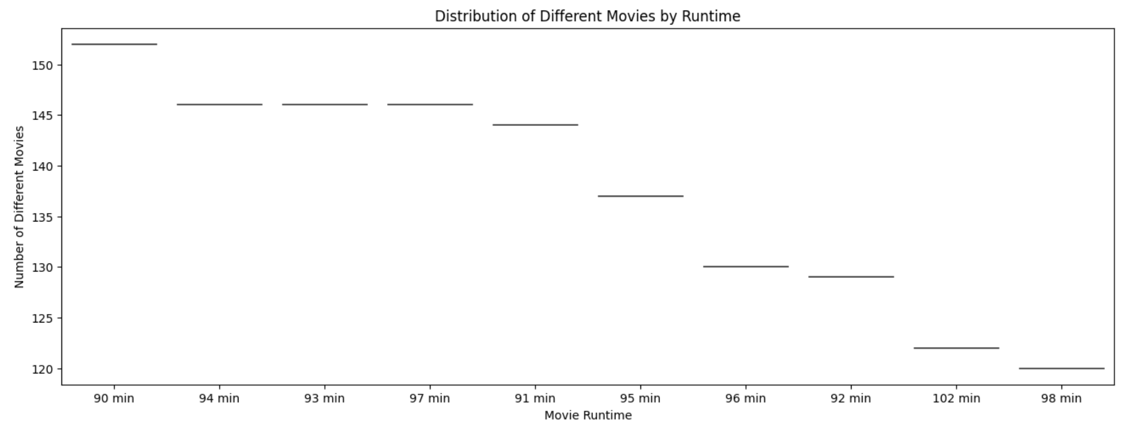
```
[ ]:       duration  title
     0      1 Season   1793
     1     2 Seasons    425
     2     3 Seasons    199
     3     4 Seasons     95
     4     5 Seasons     65
     5     6 Seasons     33
     6     7 Seasons     23
     7     8 Seasons     17
     8     9 Seasons      9
     9    10 Seasons      7
     10   13 Seasons      3
     11   11 Seasons      2
     12   12 Seasons      2
     13   15 Seasons      2
     14   17 Seasons      1
```

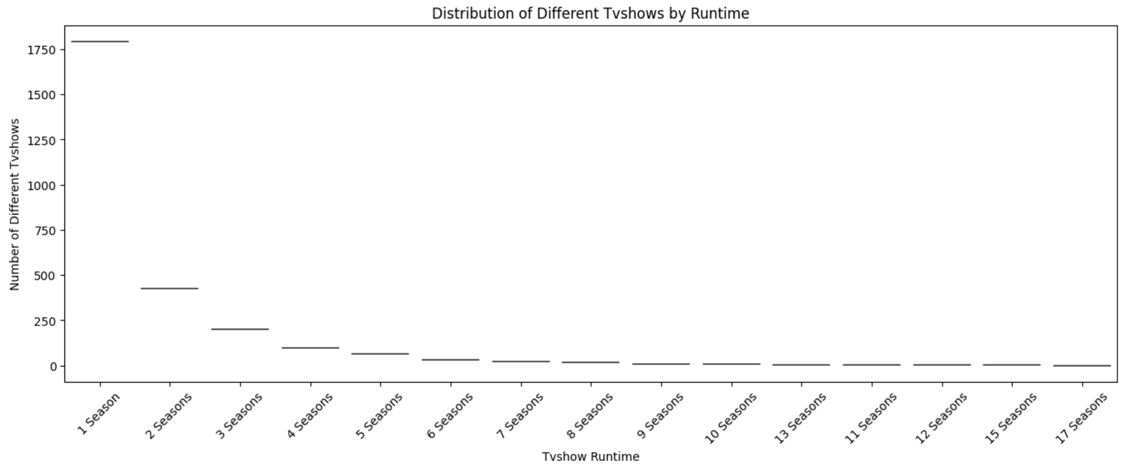
Graphical representation of Movie/Tvshow durations using **Violin plot**

```
[ ]: plt.figure(figsize = (16,12))
     plt.subplot(2,1,1)
     sns.violinplot(x='duration', y='title', data=Number_of_different_Movie_runtime)
     plt.title('Distribution of Different Movies by Runtime')
     plt.xlabel('Movie Runtime')
     plt.ylabel('Number of Different Movies')

     plt.subplot(2,1,2)
     sns.violinplot(x='duration', y='title', data=Number_of_different_seasons)
     plt.title('Distribution of Different Tvshows by Runtime')
     plt.xlabel('Tvshow Runtime')
     plt.ylabel('Number of Different Tvshows')
     plt.xticks(rotation = 45)
```

```
[ ]: ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14],
      [Text(0, 0, '1 Season'),
       Text(1, 0, '2 Seasons'),
       Text(2, 0, '3 Seasons'),
       Text(3, 0, '4 Seasons'),
       Text(4, 0, '5 Seasons'),
       Text(5, 0, '6 Seasons'),
       Text(6, 0, '7 Seasons'),
       Text(7, 0, '8 Seasons'),
       Text(8, 0, '9 Seasons'),
       Text(9, 0, '10 Seasons'),
       Text(10, 0, '13 Seasons'),
       Text(11, 0, '11 Seasons'),
       Text(12, 0, '12 Seasons'),
       Text(13, 0, '15 Seasons'),
       Text(14, 0, '17 Seasons')])
```





Insight: (Movies) If we observe the graph of different movies by runtime, we could oberve that most movies have a run time between 1:30 min to 1:40 min.

(TVhows) : If we observe the graph of different Tvshows by runtime, we could pretty much conclude that netflix majorily produces or hosts shows with max 1 season of runtime (contributing 67 %) of netflix total shows, and then next positions were occupied in a decreasing order of seasons. We have '17' TV shows crossing the mark of 10 seasons out of 2676 shows. And especially there is only one show that reached the mark of 17 seasons in total.

Recommendation: Given that the majority of hosted movies are English, American, and British productions, the optimal duration falls between 1:30 and 1:40. However, for TV shows, the trend indicates that many conclude after their first season. Thus, extending beyond one season warrants careful consideration, with factors such as content, actors, and directors being crucial, particularly for genres with broad appeal like International Drama, Thriller, or Comedy.

```
[1]: !pip install nbconvert
```

```
Requirement already satisfied: nbconvert in /usr/local/lib/python3.10/dist-
```