netflixcasestudy

September 26, 2024

1 Business Problem

Analyze the data and generate insights that could help Netflix in deciding which type of shows/movies to produce and how they can grow the business in different countries.

2 1. Importing Libraries , Loading the data and Basic Observations

[ ]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

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

These are the first 5 rows of the dataset.

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

[ ]:
```
  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  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
3  September 24, 2021          2021  TV-MA   1 Season
4  September 24, 2021          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
0  As her father nears the end of his life, filmm…
1  After crossing paths at a party, a Cape Town t…
2  To protect his family from a powerful drug lor…
3  Feuds, flirtations and toilet talk go down amo…
4  In a city of coaching centers known to train I…
```

The actual size of the dataset is total 8807 rows and 12 columns.

[ ]:
```
df.columns
```

[ ]:
```
Index(['show_id', 'type', 'title', 'director', 'cast', 'country', 'date_added',
       'release_year', 'rating', 'duration', 'listed_in', 'description',
       'year_added', 'month_added'],
      dtype='object')
```

In this dataset we have,

Type identifier; Movie or Tv Show Titles Directors Actors Country where the Movie or Tv Show was produced Date it was added on Netflix Actual Release year of the Content Ratings Total Duration - in minutes or number of seasons

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

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

[ ]:
```
#What types of data we have
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
```

These are total features of our dataset. It is seen that show_id column has all unique values, Title column has all unique values i.e. total 8807 which equates with total rows in the dataset.

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

[ ]:
```
show_id         8807
type               2
title           8807
director        4528
cast            7692
country          748
date_added      1767
release_year      74
rating            17
duration         220
listed_in        514
description     8775
dtype: int64
```

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

[ ]:
```
       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
```

```
<google.colab._quickchart_helpers.SectionTitle at 0x7a5c6286e2f0>
```

```
from matplotlib import pyplot as plt
_df_0['release_year'].plot(kind='hist', bins=20, title='release_year')
```

```
plt.gca().spines[['top', 'right',]].set_visible(False)
```

```
<google.colab._quickchart_helpers.SectionTitle at 0x7a5c6286c790>
```

```
from matplotlib import pyplot as plt
_df_1['release_year'].plot(kind='line', figsize=(8, 4), title='release_year')
plt.gca().spines[['top', 'right']].set_visible(False)
```

We have content that has been the released year 1925 to 2021. We have the mean year 2014 We have a standard deviation of ~ 8.82 and this can show us; we have release_year data spreads from 1925 to 2021, probably we have outliers mostly from 1925 to 2014

3 2. Data Cleaning

[ ]:
```
# Is there any null value in dataset
df.isnull().values.any()
```

[ ]:
```
True
```

Overall null values in each column of the dataset -

[ ]:
```
df.isna().sum()
```

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

Replaced the wrong entries in the rating column

[ ]:
```
ind = df[df['duration'].isna()].index
df.loc[ind] = df.loc[ind].fillna(method = 'ffill' , axis = 1)
df.loc[ind ,'rating'] = 'Not Available'
```

[ ]:
```
df.loc[ind]
```

[ ]:
```
     show_id   type                                title    director  \
5541   s5542  Movie                 Louis C.K. 2017  Louis C.K.
5794   s5795  Movie            Louis C.K.: Hilarious  Louis C.K.
5813   s5814  Movie  Louis C.K.: Live at the Comedy Store  Louis C.K.
```

```
            cast        country          date_added release_year  \
5541  Louis C.K.  United States       April 4, 2017         2017
5794  Louis C.K.  United States  September 16, 2016         2010
5813  Louis C.K.  United States     August 15, 2016         2015

             rating duration listed_in  \
5541  Not Available   74 min    Movies
5794  Not Available   84 min    Movies
5813  Not Available   66 min    Movies

                                           description
5541  Louis C.K. muses on religion, eternal love, gi…
5794  Emmy-winning comedy writer Louis C.K. brings h…
5813  The comic puts his trademark hilarious/thought…
```

Fill the null values in rating column

[ ]:
```
df[df.rating.isna()]
```

[ ]:
```
     show_id     type                                                  title  \
5989   s5990    Movie  13TH: A Conversation with Oprah Winfrey & Ava …
6827   s6828  TV Show                 Gargantia on the Verdurous Planet
7312   s7313  TV Show                                      Little Lunch
7537   s7538    Movie                                My Honor Was Loyalty

             director                                               cast  \
5989              NaN                         Oprah Winfrey, Ava DuVernay
6827              NaN  Kaito Ishikawa, Hisako Kanemoto, Ai Kayano, Ka…
7312              NaN  Flynn Curry, Olivia Deeble, Madison Lu, Oisín …
7537  Alessandro Pepe  Leone Frisa, Paolo Vaccarino, Francesco Miglio…

        country        date_added release_year rating  duration  \
5989        NaN  January 26, 2017         2017    NaN    37 min
6827      Japan  December 1, 2016         2013    NaN  1 Season
7312  Australia  February 1, 2018         2015    NaN  1 Season
7537      Italy     March 1, 2017         2015    NaN   115 min

                               listed_in  \
5989                             Movies
6827  Anime Series, International TV Shows
7312                Kids' TV, TV Comedies
7537                             Dramas

                                           description
5989  Oprah Winfrey sits down with director Ava DuVe…
6827  After falling through a wormhole, a space-dwel…
```

```
7312  Adopting a child's perspective, this show take…
7537  Amid the chaos and horror of World War II, a c…
```

[ ]:
```
indices = df[df.rating.isna()].index
indices
```

[ ]:
```
Index([5989, 6827, 7312, 7537], dtype='int64')
```

[ ]:
```
df.loc[indices , 'rating'] = 'Not Available'
df.loc[indices]
```

[ ]:
```
     show_id     type                                              title  \
5989   s5990    Movie  13TH: A Conversation with Oprah Winfrey & Ava …
6827   s6828  TV Show                  Gargantia on the Verdurous Planet
7312   s7313  TV Show                                       Little Lunch
7537   s7538    Movie                             My Honor Was Loyalty

             director                                               cast  \
5989              NaN                       Oprah Winfrey, Ava DuVernay
6827              NaN  Kaito Ishikawa, Hisako Kanemoto, Ai Kayano, Ka…
7312              NaN  Flynn Curry, Olivia Deeble, Madison Lu, Oisín …
7537  Alessandro Pepe  Leone Frisa, Paolo Vaccarino, Francesco Miglio…

        country        date_added release_year         rating  duration  \
5989        NaN  January 26, 2017         2017  Not Available    37 min
6827      Japan  December 1, 2016         2013  Not Available  1 Season
7312  Australia  February 1, 2018         2015  Not Available  1 Season
7537      Italy     March 1, 2017         2015  Not Available   115 min

                               listed_in  \
5989                              Movies
6827  Anime Series, International TV Shows
7312                Kids' TV, TV Comedies
7537                              Dramas

                                          description
5989  Oprah Winfrey sits down with director Ava DuVe…
6827  After falling through a wormhole, a space-dwel…
7312  Adopting a child's perspective, this show take…
7537  Amid the chaos and horror of World War II, a c…
```

[ ]:
```
df.rating.unique()
```

[ ]:
```
array(['PG-13', 'TV-MA', 'PG', 'TV-14', 'TV-PG', 'TV-Y', 'TV-Y7', 'R',
       'TV-G', 'G', 'NC-17', 'Not Available', 'NR', 'TV-Y7-FV', 'UR'],
      dtype=object)
```

In rating column , NR (Not rated) is same as UR (Unrated). lets change UR to NR.

[ ]:
```
df.loc[df['rating'] == 'UR' , 'rating'] = 'NR'
df.rating.value_counts()
```

[ ]:
```
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                  83
G                   41
Not Available        7
TV-Y7-FV             6
NC-17                3
Name: count, dtype: int64
```

dropped the null from date_added column

[ ]:
```
df.drop(df.loc[df['date_added'].isna()].index , axis = 0 , inplace = True)
df['date_added'].value_counts()
```

[ ]:
```
date_added
January 1, 2020      109
November 1, 2019      89
March 1, 2018         75
December 31, 2019     74
October 1, 2018       71
                    ...
December 4, 2016       1
November 21, 2016      1
November 19, 2016      1
November 17, 2016      1
January 11, 2020       1
Name: count, Length: 1767, dtype: int64
```

For 'date_added' column, all values confirm to date format, So we can convert its data type from object to datetime

[ ]:
```
df['date_added'] = pd.to_datetime(df['date_added'].str.strip(), format='%B %d,␣
 ↪%Y')
# Added .str.strip() to remove any leading or trailing spaces from the date␣
 ↪strings
```

[ ]:
```
df['date_added']
```

[ ]:
```
0       2021-09-25
1       2021-09-24
2       2021-09-24
3       2021-09-24
4       2021-09-24
           ...
8802    2019-11-20
8803    2019-07-01
8804    2019-11-01
8805    2020-01-11
8806    2019-03-02
Name: date_added, Length: 8797, dtype: datetime64[ns]
```

[ ]:
```

```

We can add the new column 'year_added' by extracting the year from 'date_added' column

[ ]:
```
df['year_added'] = df['date_added'].dt.year
```

Similar way, We can add the new column 'month_added' by extracting the month from 'date_added' column

[ ]:
```
df['month_added'] = df['date_added'].dt.month
df[['date_added' , 'year_added' , 'month_added']].info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 8797 entries, 0 to 8806
Data columns (total 3 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   date_added   8797 non-null   datetime64[ns]
 1   year_added   8797 non-null   int32
 2   month_added  8797 non-null   int32
dtypes: datetime64[ns](1), int32(2)
memory usage: 206.2 KB
```

[ ]:
```

```

[ ]:
```
# total null values in each column
df.isna().sum()
```

[ ]:
```
show_id            0
type               0
title              0
director        2624
cast             825
```

```
country          830
date_added         0
release_year       0
rating             0
duration           0
listed_in          0
description        0
year_added         0
month_added        0
dtype: int64
```

[ ]:
```
round((df.isna().sum()/ df.shape[0])*100)
```

[ ]:
```
show_id          0.0
type             0.0
title            0.0
director        30.0
cast             9.0
country          9.0
date_added       0.0
release_year     0.0
rating           0.0
duration         0.0
listed_in        0.0
description      0.0
year_added       0.0
month_added      0.0
dtype: float64
```

We can see that, after cleaning some data we still have null values in 3 columns. These are much higher in numbers.

For some content - country is missing. (9%)

for some content - director names are missing (30%)

for some content - cast is missing (9%)

[ ]:
```

```

4 3. Data Exploration and Non Graphical Analysis

[ ]:
```
# 2 types of content present in dataset - either Movie or TV Show
df['type'].unique()
```

[ ]:
```
array(['Movie', 'TV Show'], dtype=object)
```

[ ]:
```
movies  = df.loc[df['type'] == 'Movie']
tv_shows = df.loc[df['type'] == 'TV Show']
```

[ ]:
```
movies.duration.value_counts()
```

[ ]:
```
duration
90 min     152
94 min     146
97 min     146
93 min     146
91 min     144
           …
208 min      1
5 min        1
16 min       1
186 min      1
191 min      1
Name: count, Length: 205, dtype: int64
```

[ ]:
```
tv_shows.duration.value_counts()
```

[ ]:
```
duration
1 Season      1793
2 Seasons      421
3 Seasons      198
4 Seasons       94
5 Seasons       64
6 Seasons       33
7 Seasons       23
8 Seasons       17
9 Seasons        9
10 Seasons       6
13 Seasons       2
15 Seasons       2
12 Seasons       2
17 Seasons       1
11 Seasons       1
Name: count, dtype: int64
```

Since movie and TV shows both have different format for duration, we can change duration for movies as minutes & TV shows as seasons

[ ]:
```
movies['duration'] = movies['duration'].str[:-3]
movies['duration'] = movies['duration'].astype('float')
```

[ ]:
```
tv_shows['duration'] = tv_shows.duration.str[:-7].apply(lambda x : x.strip())
tv_shows['duration'] = tv_shows['duration'].astype('float')
```

[ ]:
```
tv_shows.rename({'duration': 'duration_in_seasons'} ,axis = 1 , inplace = True)
movies.rename({'duration': 'duration_in_minutes'} ,axis = 1 , inplace = True)
```

[ ]:
```
tv_shows.duration_in_seasons
```

[ ]:
```
1       2.0
2       1.0
3       1.0
4       2.0
5       1.0
       …
8795    2.0
8796    2.0
8797    3.0
8800    1.0
8803    2.0
Name: duration_in_seasons, Length: 2666, dtype: float64
```

[ ]:
```
movies.duration_in_minutes
```

[ ]:
```
0        90.0
6        91.0
7       125.0
9       104.0
12      127.0
        …
8801     96.0
8802    158.0
8804     88.0
8805     88.0
8806    111.0
Name: duration_in_minutes, Length: 6131, dtype: float64
```

[ ]:
```

```

when was first movie added on netflix and when is the most recent movie added on netflix as per data i.e. dataset duration

[ ]:
```
timeperiod = pd.Series((df['date_added'].min().strftime('%B %Y') ,␣
 ↪df['date_added'].max().strftime('%B %Y')))
timeperiod.index = ['first' , 'Most Recent']
timeperiod
```

[ ]:
```
first            January 2008
Most Recent    September 2021
dtype: object
```

The oldest and the most recent movie/TV show released on the Netflix in which year?

[ ]:
```
df.release_year.min() , df.release_year.max()
```

[ ]:
```
(1925, 2021)
```

[ ]:
```
df.loc[(df.release_year == df.release_year.min()) | (df.release_year == df.
↪release_year.max())].sort_values('release_year')
```

[ ]:
```
     show_id     type                                        title  \
4250   s4251  TV Show           Pioneers: First Women Filmmakers*
966     s967    Movie                                Get the Grift
967     s968  TV Show                  Headspace Guide to Sleep
968     s969  TV Show                                      Sexify
972     s973  TV Show                                       Fatma
…       …     …                                             …
466     s467  TV Show                         My Unorthodox Life
467     s468    Movie  Private Network: Who Killed Manuel Buendía?
468     s469    Movie            The Guide to the Perfect Family
471     s472    Movie                                 Day of Destiny
8437   s8438  TV Show                     The Netflix Afterparty

                    director  \
4250                     NaN
966            Pedro Antonio
967                      NaN
968                      NaN
972                      NaN
…                        …
466                      NaN
467            Manuel Alcalá
468            Ricardo Trogi
471   Akay Mason, Abosi Ogba
8437                     NaN

                                                   cast        country  \
4250                                                NaN            NaN
966   Marcus Majella, Samantha Schmütz, Caito Mainie…         Brazil
967                               Evelyn Lewis Prieto            NaN
968   Aleksandra Skraba, Maria Sobocińska, Sandra Dr…         Poland
972   Burcu Biricik, Uğur Yücel, Mehmet Yılmaz Ak, H…         Turkey
…                                                   …            …
466                                                 NaN            NaN
467                             Daniel Giménez Cacho            NaN
468   Louis Morissette, Émilie Bierre, Catherine Cha…            NaN
471   Olumide Oworu, Denola Grey, Gbemi Akinlade, Ji…            NaN
8437       David Spade, London Hughes, Fortune Feimster  United States

     date_added release_year rating  duration  \
```

```
4250 2018-12-30         1925  TV-14  1 Season
966  2021-04-28         2021  TV-MA    95 min
967  2021-04-28         2021   TV-G  1 Season
968  2021-04-28         2021  TV-MA  1 Season
972  2021-04-27         2021  TV-MA  1 Season
…         …          …    …       …
466  2021-07-14         2021  TV-MA  1 Season
467  2021-07-14         2021  TV-MA   100 min
468  2021-07-14         2021  TV-MA   102 min
471  2021-07-13         2021  TV-PG   110 min
8437 2021-01-02         2021  TV-MA  1 Season

                                              listed_in  \
4250                                          TV Shows
966                       Comedies, International Movies
967                      Docuseries, Science & Nature TV
968      International TV Shows, TV Comedies, TV Dramas
972     International TV Shows, TV Dramas, TV Thrillers
…                                                    …
466                                          Reality TV
467                 Documentaries, International Movies
468              Comedies, Dramas, International Movies
471   Children & Family Movies, Dramas, Internationa…
8437          Stand-Up Comedy & Talk Shows, TV Comedies

                                              description  year_added  \
4250  This collection restores films from women who …        2018
966   After a botched scam, Clóvis bumps into Lohane…        2021
967   Learn how to sleep better with Headspace. Each…        2021
968   To build an innovative sex app and win a tech …        2021
972   Reeling from tragedy, a nondescript house clea…        2021
…                                                    …         …
466   Follow Julia Haart, Elite World Group CEO and …        2021
467   A deep dive into the work of renowned Mexican …        2021
468   A couple in Québec deals with the pitfalls, pr…        2021
471   With their family facing financial woes, two t…        2021
8437  Hosts David Spade, Fortune Feimster and London…        2021

      month_added
4250           12
966             4
967             4
968             4
972             4
…             …
466             7
467             7
```

```
468             7
471             7
8437            1

[593 rows x 14 columns]
```

[ ]:

Which are different ratings available on Netflix in each type of content? Check the number of content released in each type.

[ ]:
```
df.groupby(['type' , 'rating'])['show_id'].count()
```

[ ]:
```
type     rating
Movie    G                  41
         NC-17               3
         NR                 78
         Not Available       5
         PG                287
         PG-13             490
         R                 797
         TV-14            1427
         TV-G              126
         TV-MA            2062
         TV-PG             540
         TV-Y              131
         TV-Y7             139
         TV-Y7-FV            5
TV Show  NR                  4
         Not Available       2
         R                   2
         TV-14             730
         TV-G               94
         TV-MA            1143
         TV-PG             321
         TV-Y              175
         TV-Y7             194
         TV-Y7-FV            1
Name: show_id, dtype: int64
```

Working on the columns having maximum null values and the columns having comma separated multiple values for each record

[ ]:
```
df['country'].value_counts()
```

[ ]:
```
country
United States                 2812
India                          972
```

```
United Kingdom                                418
Japan                                         244
South Korea                                   199
                                              …
Romania, Bulgaria, Hungary                      1
Uruguay, Guatemala                              1
France, Senegal, Belgium                        1
Mexico, United States, Spain, Colombia          1
United Arab Emirates, Jordan                    1
Name: count, Length: 748, dtype: int64
```

We see that many movies are produced in more than 1 country. Hence, the country column has many comma separated values of countries.

we are Creating a separate table for country , to avoid the duplicasy of records in our origional table after exploding.

[ ]:
```
country_tb = df[['show_id' , 'type' , 'country']]
country_tb.dropna(inplace = True)
country_tb['country'] = country_tb['country'].apply(lambda x : x.split(','))
country_tb = country_tb.explode('country')
country_tb
```

[ ]:
```
     show_id     type        country
0         s1    Movie  United States
1         s2  TV Show   South Africa
4         s5  TV Show          India
7         s8    Movie  United States
7         s8    Movie          Ghana
…       …       …              …
8801   s8802    Movie         Jordan
8802   s8803    Movie  United States
8804   s8805    Movie  United States
8805   s8806    Movie  United States
8806   s8807    Movie          India

[10010 rows x 3 columns]
```

[ ]:
```
# some duplicate values are found, which have unnecessary spaces. some empty␣
 ↪strings found
country_tb['country'] = country_tb['country'].str.strip()
```

[ ]:
```
country_tb.loc[country_tb['country'] == '']
```

[ ]:
```
     show_id     type country
193     s194  TV Show
365     s366    Movie
1192   s1193    Movie
```

```
2224   s2225    Movie
4653   s4654    Movie
5925   s5926    Movie
7007   s7008    Movie
```

[ ]:
```
country_tb = country_tb.loc[country_tb['country'] != '']
country_tb['country'].nunique()
```

[ ]:
```
122
```

Netflix has movies from the total 122 countries.

Total movies and tv shows in each country

[ ]:
```
x = country_tb.groupby(['country' , 'type'])['show_id'].count().reset_index()
x.pivot(index = ['country'] , columns = 'type' , values = 'show_id').
  ↪sort_values('Movie',ascending = False)
```

[ ]:
```
type             Movie  TV Show
country
United States   2752.0    932.0
India            962.0     84.0
United Kingdom   534.0    271.0
Canada           319.0    126.0
France           303.0     90.0
…                …       …
Azerbaijan         NaN      1.0
Belarus            NaN      1.0
Cuba               NaN      1.0
Cyprus             NaN      1.0
Puerto Rico        NaN      1.0

[122 rows x 2 columns]
```

Director column

[ ]:
```
df['director'].value_counts()
```

[ ]:
```
director
Rajiv Chilaka                     19
Raúl Campos, Jan Suter            18
Marcus Raboy                      16
Suhas Kadav                       16
Jay Karas                         14
                                  ..
Raymie Muzquiz, Stu Livingston     1
Joe Menendez                       1
Eric Bross                         1
```

```
Will Eisenberg                      1
Mozez Singh                         1
Name: count, Length: 4528, dtype: int64
```

There are some movies which are directed by multiple directors. Hence multiple names of directors are given in comma separated format. We will explode the director column as well. It will create many duplicate records in originaltable hence we created separate table for directors.

[ ]:
```
dir_tb = df[['show_id' , 'type' , 'director']]
dir_tb.dropna(inplace = True)
dir_tb['director'] = dir_tb['director'].apply(lambda x : x.split(','))
dir_tb
```

[ ]:

	show_id	type	director
0	s1	Movie	[Kirsten Johnson]
2	s3	TV Show	[Julien Leclercq]
5	s6	TV Show	[Mike Flanagan]
6	s7	Movie	[Robert Cullen, José Luis Ucha]
7	s8	Movie	[Haile Gerima]
…	…	…	…
8801	s8802	Movie	[Majid Al Ansari]
8802	s8803	Movie	[David Fincher]
8804	s8805	Movie	[Ruben Fleischer]
8805	s8806	Movie	[Peter Hewitt]
8806	s8807	Movie	[Mozez Singh]

[6173 rows x 3 columns]

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

[ ]:
```
dir_tb['director'] = dir_tb['director'].str.strip()
```

[ ]:
```
# checking if empty stirngs are there in director column
dir_tb.director.apply(lambda x : True if len(x) == 0 else False).value_counts()
```

[ ]:
```
director
False    6978
Name: count, dtype: int64
```

[ ]:
```
dir_tb
```

[ ]:

	show_id	type	director
0	s1	Movie	Kirsten Johnson
2	s3	TV Show	Julien Leclercq
5	s6	TV Show	Mike Flanagan
6	s7	Movie	Robert Cullen
6	s7	Movie	José Luis Ucha

```
…       …       …                 …
8801    s8802    Movie   Majid Al Ansari
8802    s8803    Movie     David Fincher
8804    s8805    Movie   Ruben Fleischer
8805    s8806    Movie      Peter Hewitt
8806    s8807    Movie       Mozez Singh

[6978 rows x 3 columns]
```

[ ]:
```
dir_tb['director'].nunique()
```

[ ]:
```
4993
```

There are total 4993 unique directors in the dataset.

Total movies and tv shows directed by each director

[ ]:
```
x = dir_tb.groupby(['director' , 'type'])['show_id'].count().reset_index()
x.pivot(index= ['director'] , columns = 'type' , values = 'show_id').
 ↪sort_values('Movie' ,ascending = False)
```

[ ]:
```
type                 Movie  TV Show
director
Rajiv Chilaka         22.0      NaN
Jan Suter             21.0      NaN
Raúl Campos           19.0      NaN
Suhas Kadav           16.0      NaN
Marcus Raboy          15.0      1.0
…                     …         …
Vijay S. Bhanushali    NaN      1.0
Wouter Bouvijn         NaN      1.0
YC Tom Lee             NaN      1.0
Yasuhiro Irie          NaN      1.0
Yim Pilsung            NaN      1.0

[4993 rows x 2 columns]
```

[ ]:
```

```

'listed_in' column to understand more about genres

[ ]:
```
genre_tb = df[['show_id' , 'type', 'listed_in']]
genre_tb['listed_in'] = genre_tb['listed_in'].apply(lambda x : x.split(','))
genre_tb = genre_tb.explode('listed_in')
genre_tb['listed_in'] = genre_tb['listed_in'].str.strip()
```

[ ]:
```
genre_tb
```

[ ]:
```
     show_id     type                  listed_in
0          s1    Movie              Documentaries
1          s2  TV Show    International TV Shows
1          s2  TV Show                 TV Dramas
1          s2  TV Show               TV Mysteries
2          s3  TV Show             Crime TV Shows
…       …      …                          …
8805    s8806    Movie  Children & Family Movies
8805    s8806    Movie                  Comedies
8806    s8807    Movie                    Dramas
8806    s8807    Movie       International Movies
8806    s8807    Movie           Music & Musicals

[19303 rows x 3 columns]
```

[ ]:
```
genre_tb.listed_in.unique()
```

[ ]:
```
array(['Documentaries', 'International TV Shows', 'TV Dramas',
       'TV Mysteries', 'Crime TV Shows', 'TV Action & Adventure',
       'Docuseries', 'Reality TV', 'Romantic TV Shows', 'TV Comedies',
       'TV Horror', 'Children & Family Movies', 'Dramas',
       'Independent Movies', 'International Movies', 'British TV Shows',
       'Comedies', 'Spanish-Language TV Shows', 'Thrillers',
       'Romantic Movies', 'Music & Musicals', 'Horror Movies',
       'Sci-Fi & Fantasy', 'TV Thrillers', "Kids' TV",
       'Action & Adventure', 'TV Sci-Fi & Fantasy', 'Classic Movies',
       'Anime Features', 'Sports Movies', 'Anime Series',
       'Korean TV Shows', 'Science & Nature TV', 'Teen TV Shows',
       'Cult Movies', 'TV Shows', 'Faith & Spirituality', 'LGBTQ Movies',
       'Stand-Up Comedy', 'Movies', 'Stand-Up Comedy & Talk Shows',
       'Classic & Cult TV'], dtype=object)
```

[ ]:
```
genre_tb.listed_in.nunique()
```

[ ]:
```
42
```

Total 42 genres present in dataset

[ ]:
```
df.merge(genre_tb , on = 'show_id' ).groupby(['type_y'])['listed_in_y'].
↪nunique()
```

[ ]:
```
type_y
Movie      20
TV Show    22
Name: listed_in_y, dtype: int64
```

Movies have 20 genres and TV shows have 22 genres.

[ ]:
```
# total movies/TV shows in each genre
x = genre_tb.groupby(['listed_in' , 'type'])['show_id'].count().reset_index()
x.pivot(index = 'listed_in' , columns = 'type' , values = 'show_id').
 ↪sort_index()
```

[ ]:

type	Movie	TV Show
listed_in		
Action & Adventure	859.0	NaN
Anime Features	71.0	NaN
Anime Series	NaN	175.0
British TV Shows	NaN	252.0
Children & Family Movies	641.0	NaN
Classic & Cult TV	NaN	26.0
Classic Movies	116.0	NaN
Comedies	1674.0	NaN
Crime TV Shows	NaN	469.0
Cult Movies	71.0	NaN
Documentaries	869.0	NaN
Docuseries	NaN	394.0
Dramas	2427.0	NaN
Faith & Spirituality	65.0	NaN
Horror Movies	357.0	NaN
Independent Movies	756.0	NaN
International Movies	2752.0	NaN
International TV Shows	NaN	1350.0
Kids' TV	NaN	449.0
Korean TV Shows	NaN	151.0
LGBTQ Movies	102.0	NaN
Movies	57.0	NaN
Music & Musicals	375.0	NaN
Reality TV	NaN	255.0
Romantic Movies	616.0	NaN
Romantic TV Shows	NaN	370.0
Sci-Fi & Fantasy	243.0	NaN
Science & Nature TV	NaN	92.0
Spanish-Language TV Shows	NaN	173.0
Sports Movies	219.0	NaN
Stand-Up Comedy	343.0	NaN
Stand-Up Comedy & Talk Shows	NaN	56.0
TV Action & Adventure	NaN	167.0
TV Comedies	NaN	574.0
TV Dramas	NaN	762.0
TV Horror	NaN	75.0
TV Mysteries	NaN	98.0
TV Sci-Fi & Fantasy	NaN	83.0
TV Shows	NaN	16.0
TV Thrillers	NaN	57.0

```
Teen TV Shows                    NaN      69.0
Thrillers                      577.0       NaN
```

[ ]:

Exploring cast column

[ ]:
```
cast_tb = df[['show_id' , 'type' ,'cast']]
cast_tb.dropna(inplace = True)
cast_tb['cast'] = cast_tb['cast'].apply(lambda x : x.split(','))
cast_tb = cast_tb.explode('cast')
cast_tb
```

[ ]:
```
     show_id     type                    cast
1         s2  TV Show              Ama Qamata
1         s2  TV Show              Khosi Ngema
1         s2  TV Show            Gail Mabalane
1         s2  TV Show            Thabang Molaba
1         s2  TV Show         Dillon Windvogel
…       …       …                       …
8806   s8807    Movie         Manish Chaudhary
8806   s8807    Movie             Meghna Malik
8806   s8807    Movie            Malkeet Rauni
8806   s8807    Movie           Anita Shabdish
8806   s8807    Movie   Chittaranjan Tripathy

[64057 rows x 3 columns]
```

[ ]:
```
cast_tb['cast'] = cast_tb['cast'].str.strip()
```

[ ]:
```
# checking empty strings
cast_tb[cast_tb['cast'] == '']
```

[ ]:
```
Empty DataFrame
Columns: [show_id, type, cast]
Index: []
```

[ ]:
```
# Total actors on the Netflix
cast_tb.cast.nunique()
```

[ ]:
```
36403
```

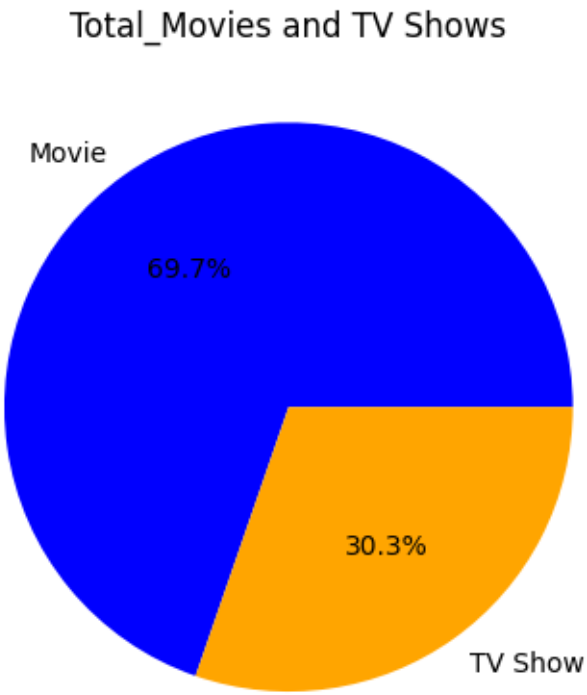
[ ]:
```
# Total movies/TV shows by each actor
x = cast_tb.groupby(['cast' , 'type'])['show_id'].count().reset_index()
x.pivot(index = 'cast' , columns = 'type' , values = 'show_id').sort_values('TV␣
 ↪Show' , ascending = False)
```

[ ]:
```
type              Movie  TV Show
cast
Takahiro Sakurai    7.0     25.0
Yuki Kaji          10.0     19.0
Junichi Suwabe      4.0     17.0
Daisuke Ono         5.0     17.0
Ai Kayano           2.0     17.0
…                   …       …
Şerif Sezer         1.0      NaN
Şevket Çoruh        1.0      NaN
Şinasi Yurtsever    3.0      NaN
Şükran Ovalı        1.0      NaN
Ṣọpẹ́ Dìrísù        1.0      NaN

[36403 rows x 2 columns]
```

5 4 Visual Analysis - Univariate & Bivariate after pre-processing of the data

4.1 Distribution of content across the different types

[ ]:
```
types = df.type.value_counts()
plt.pie(types,  labels=types.index, autopct='%1.1f%%' , colors = ['blue' ,␣
 ↪'orange'])
plt.title('Total_Movies and TV Shows')
plt.show()
```



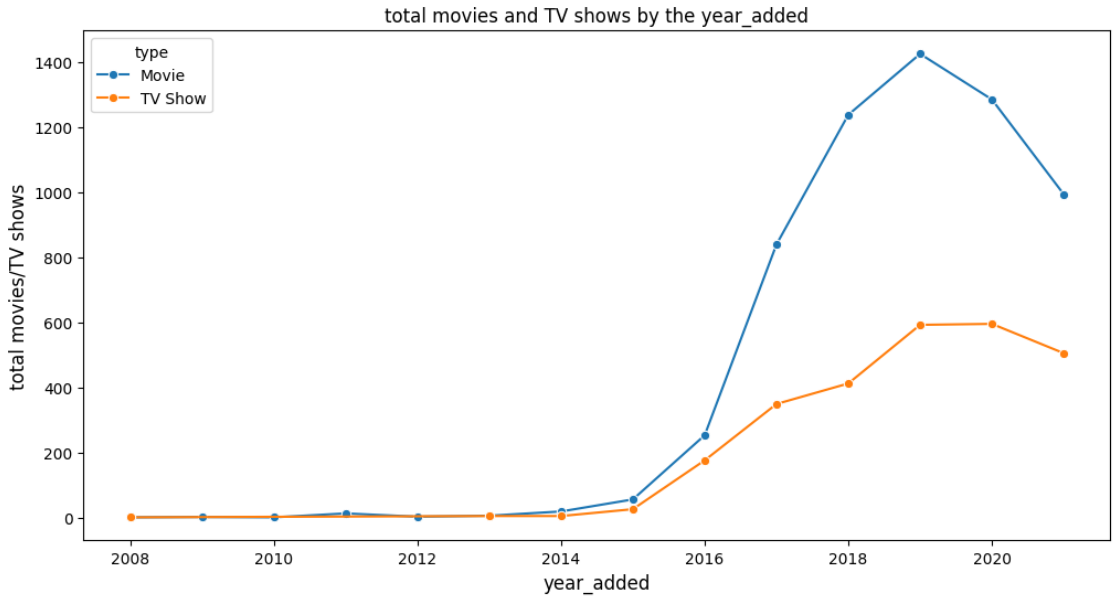
It is observed that , around 70% content is Movies and around 30% content is TV shows.

4.2 Distribution of 'date_added' column

How has the number of movies/TV shows added on Netflix per year changed over the time?

[ ]:
```
d = df.groupby(['year_added' ,'type' ])['show_id'].count().reset_index()
d.rename({'show_id' : 'total movies/TV shows'}, axis = 1 , inplace = True)
```

[ ]:
```
plt.figure(figsize = (12,6))
sns.lineplot(data = d , x = 'year_added' , y = 'total movies/TV shows' , hue =␣
↪'type', marker = 'o'  , ms = 6)
plt.xlabel('year_added' , fontsize = 12)
plt.ylabel('total movies/TV shows' , fontsize = 12)
plt.title('total movies and TV shows by the year_added' , fontsize = 12)
plt.show()
```



Observation:

The content added on the Netflix surged drastically after 2015. 2019 marks the highest number of movies and TV shows added on the Netflix. Year 2020 and 2021 has seen the drop in content added on Netflix, possibly because of Pandemic. But still , TV shows content have not dropped as drastic as movies. In recent years TV shows are focussed more than Movies.

[ ]:

4.3 Distribution of 'Release_year' column

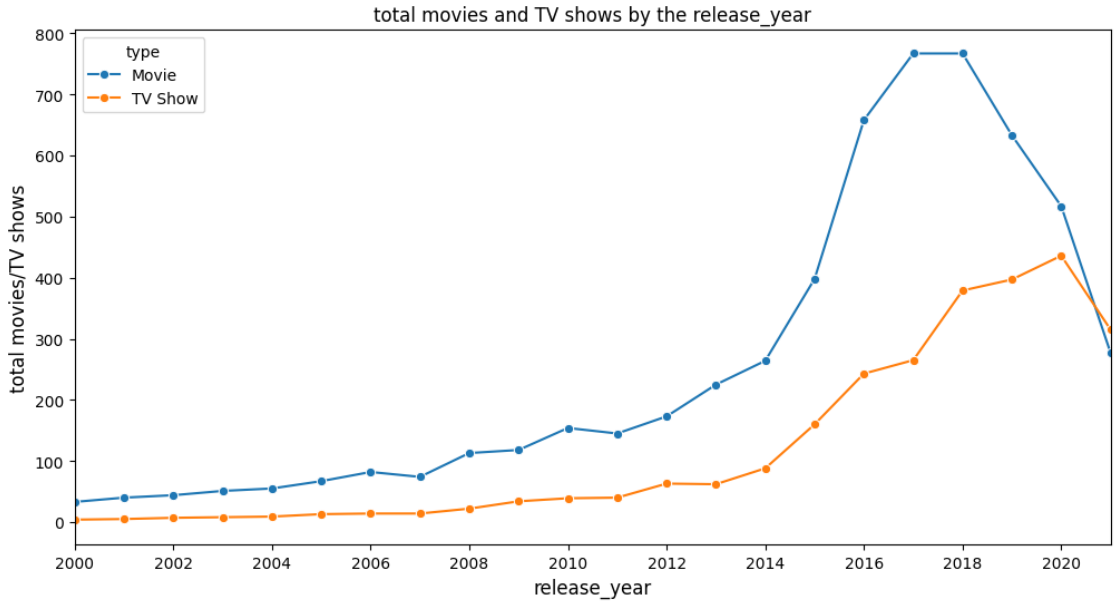
[ ]:
```
d = df.groupby(['type' , 'release_year'])['show_id'].count().reset_index()
d.rename({'show_id' : 'total movies/TV shows'}, axis = 1 , inplace = True)
d
```

[ ]:

	type	release_year	total movies/TV shows
0	Movie	1942	2
1	Movie	1943	3
2	Movie	1944	3
3	Movie	1945	3
4	Movie	1946	1
..	…	…	…
114	TV Show	2017	265
115	TV Show	2018	379
116	TV Show	2019	397
117	TV Show	2020	436
118	TV Show	2021	315

```
[119 rows x 3 columns]
```

[ ]:
```
plt.figure(figsize = (12,6))
sns.lineplot(data = d , x = 'release_year' , y = 'total movies/TV shows' , hue␣
↪= 'type' , marker = 'o'  , ms = 6 )
plt.xlabel('release_year' , fontsize = 12)
plt.ylabel('total movies/TV shows' , fontsize = 12)
plt.title('total movies and TV shows by the release_year' , fontsize = 12)
plt.xlim( left = 2000 , right = 2021)
plt.xticks(np.arange(2000 , 2021 , 2))
plt.show()
```



Observation:

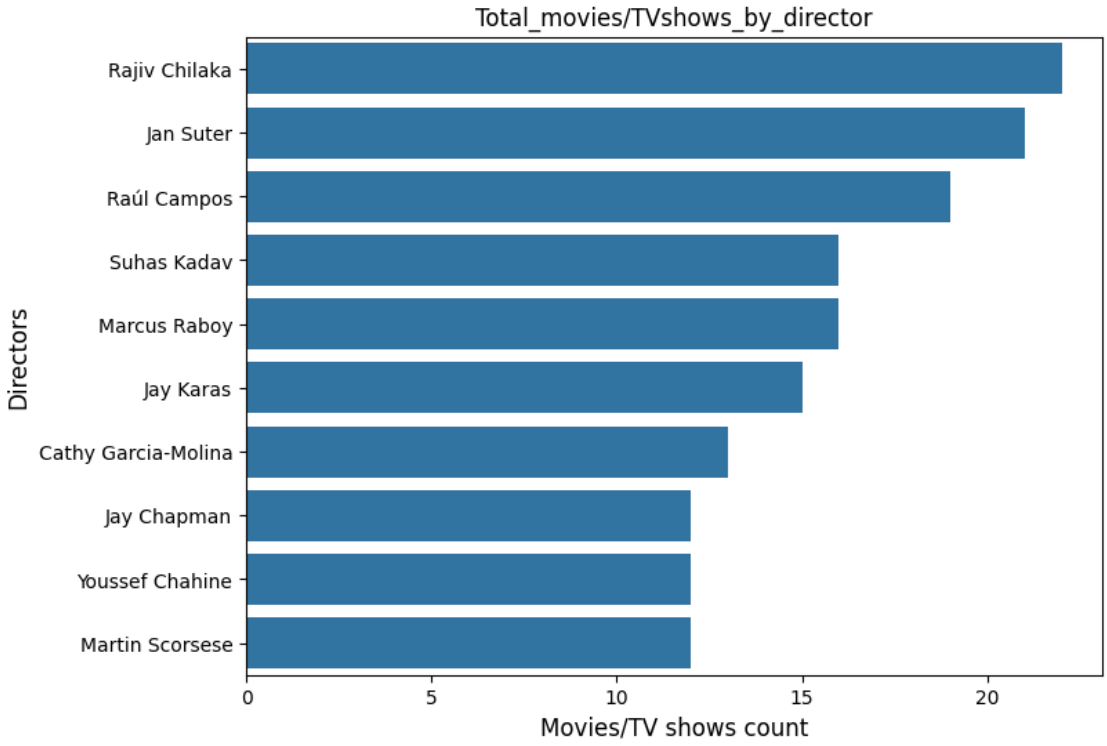
2018 marks the highest number of movie and TV show releases. Since 2018, A drop in movies is seen and rise in TV shows is observed clearly, and TV shows surpasses the movies count in mid 2020. In recent years TV shows are focussed more than Movies. The yearly number of releases has surged drastically from 2015.

4.4 Total movies/TV shows by each director

[ ]:
```
# total Movies directed by top 10 directors
top_10_dir = dir_tb.director.value_counts().head(10).index
df_new = dir_tb.loc[dir_tb['director'].isin(top_10_dir)]
```

[ ]:
```
plt.figure(figsize= (8 , 6))
sns.countplot(data = df_new , y = 'director' , order = top_10_dir , orient =␣
↪'v')
```

```
plt.xlabel('total_movies/TV shows' , fontsize = 12)
plt.xlabel('Movies/TV shows count')
plt.ylabel('Directors' , fontsize = 12)
plt.title('Total_movies/TVshows_by_director')
plt.show()
```



Observation:

The top 3 directors on Netflix in terms of count of movies directed by them are - Rajiv Chilaka, Jan Suter, Raúl Campos

4.4 Checking Outliers for number of movies directed by each director

[ ]:
```
x = dir_tb.director.value_counts()
x
```

[ ]:
```
director
Rajiv Chilaka     22
Jan Suter         21
Raúl Campos       19
Suhas Kadav       16
Marcus Raboy      16
                  ..
Raymie Muzquiz     1
```

```
Stu Livingston     1
Joe Menendez       1
Eric Bross         1
Mozez Singh        1
Name: count, Length: 4993, dtype: int64
```

[ ]:
```python
def calculate_outliers(data):
    # Calculate the first quartile (Q1)
    q1 = np.percentile(data, 25)

    # Calculate the third quartile (Q3)
    q3 = np.percentile(data, 75)

    # Calculate the interquartile range (IQR)
    iqr = q3 - q1

    # Determine the lower and upper bounds for outliers
    lower_bound = q1 - 1.5 * iqr
    upper_bound = q3 + 1.5 * iqr

    # Identify outliers in the dataset
    outliers = [value for value in data if value < lower_bound or value >␣
 ↪upper_bound]

    return outliers


def calculate_max_occurred_value(data):
    # Calculate the unique values and their counts in the dataset
    unique_values, value_counts = np.unique(data, return_counts=True)

    # Find the index of the maximum count
    max_count_index = np.argmax(value_counts)

    # Retrieve the corresponding unique value with the maximum count
    max_occurred_value = unique_values[max_count_index]

    return max_occurred_value
```

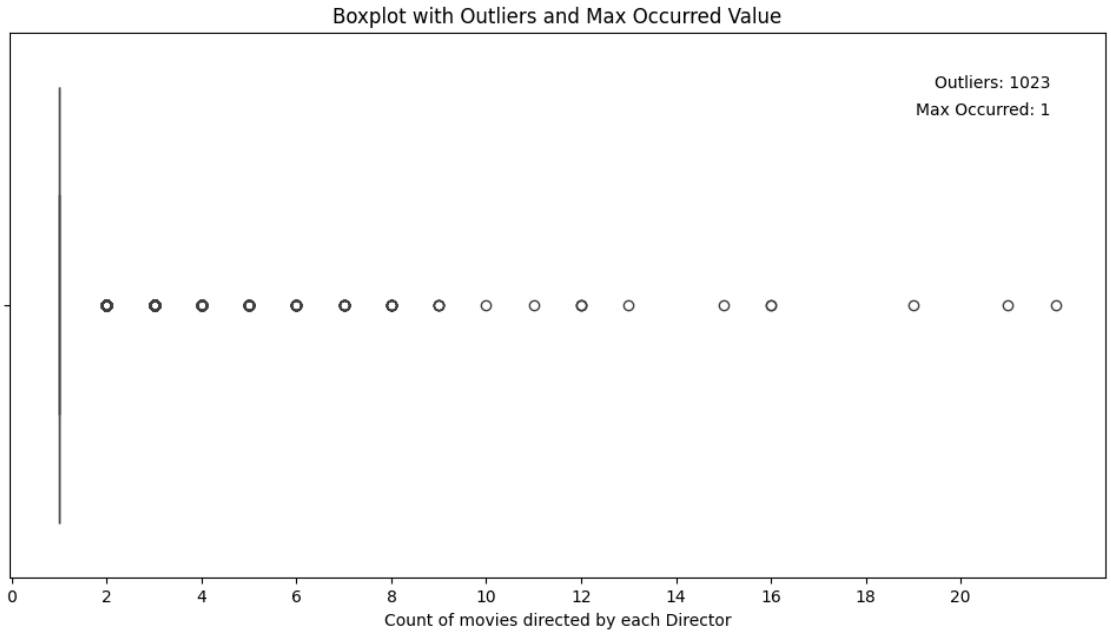
[ ]:
```python
outliers = calculate_outliers(x)  # Implement your outlier calculation method
max_occurred_value = calculate_max_occurred_value(x)  # Implement your method␣
 ↪to find the maximum-occurred value
set(outliers)
```

[ ]:
```
{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 19, 21, 22}
```

[ ]:
```python
max_occurred_value
```

[ ]: 1

[ ]:
```
plt.figure(figsize = (12,6))
sns.boxplot(data=x, showfliers=True, whis=1.5 , orient = 'h')

# Calculate the outliers and maximum-occurred value
outliers = calculate_outliers(x)  # Implement your outlier calculation method
max_occurred_value = calculate_max_occurred_value(x)  # Implement your method␣
 ↪to find the maximum-occurred value

# Annotate the plot
plt.text(0.95, 0.9, f"Outliers: {len(outliers)}", transform=plt.gca().
 ↪transAxes, ha='right')
plt.text(0.95, 0.85, f"Max Occurred: {max_occurred_value}", transform=plt.gca().
 ↪transAxes, ha='right')


plt.xlabel("Count of movies directed by each Director")
plt.xticks(np.arange(0,22,2))
plt.title("Boxplot with Outliers and Max Occurred Value")

# Show the plot
plt.show()
```



It is Observed that maximum occured value is 1, which means maximum directors on the Netflix have directed 1 movie/Tv show. There are few directors who have directed more than 1 movies/tv

shows and they are outliers.

[ ]:

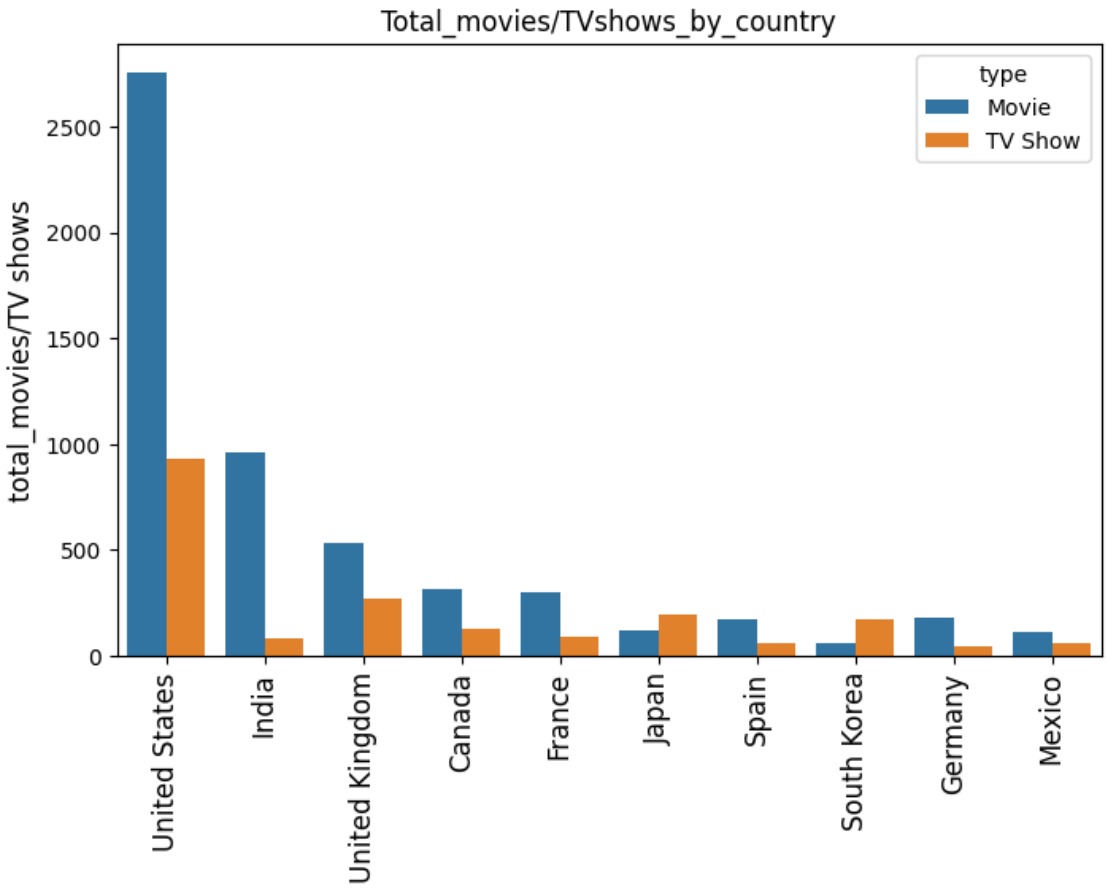
4.5 Total movies/TV shows by each country

[ ]:
```
# Lets check for top 10 countries
top_10_country = country_tb.country.value_counts().head(10).index
df_new = country_tb.loc[country_tb['country'].isin(top_10_country)]
```

[ ]:
```
x = df_new.groupby(['country' , 'type'])['show_id'].count().reset_index()
x.pivot(index = 'country' , columns = 'type' , values = 'show_id').
 ↪sort_values('Movie',ascending = False)
```

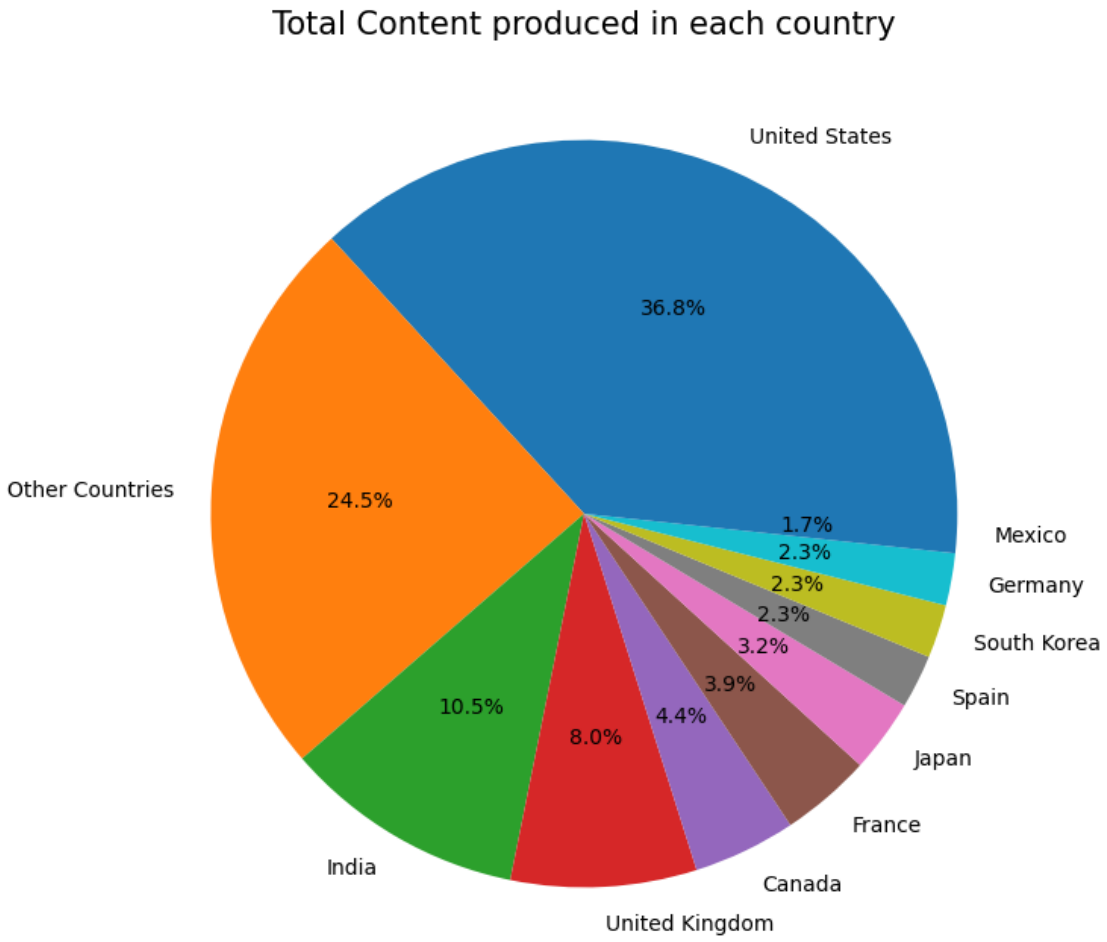
[ ]:
```
type            Movie  TV Show
country
United States    2752      932
India             962       84
United Kingdom    534      271
Canada            319      126
France            303       90
Germany           182       44
Spain             171       61
Japan             119      198
Mexico            111       58
South Korea        61      170
```

[ ]:
```
plt.figure(figsize= (8,5))
sns.countplot(data = df_new , x = 'country' , order = top_10_country , hue =␣
 ↪'type')
plt.xticks(rotation = 90 , fontsize = 12)
plt.ylabel('total_movies/TV shows' , fontsize = 12)
plt.xlabel('')
plt.title('Total_movies/TVshows_by_country')
plt.show()
```



[ ]:
```
top_10_country = country_tb.country.value_counts().head(10).index
country_tb['cat'] = country_tb['country'].apply(lambda x : x if x in␣
 ↪top_10_country else 'Other Countries' )
```

[ ]:
```
x = country_tb.cat.value_counts()

plt.figure(figsize = (8,8))
plt.pie(x , labels = x.index, autopct='%1.1f%%')
plt.title('Total Content produced in each country' , fontsize = 15)
plt.show()
```

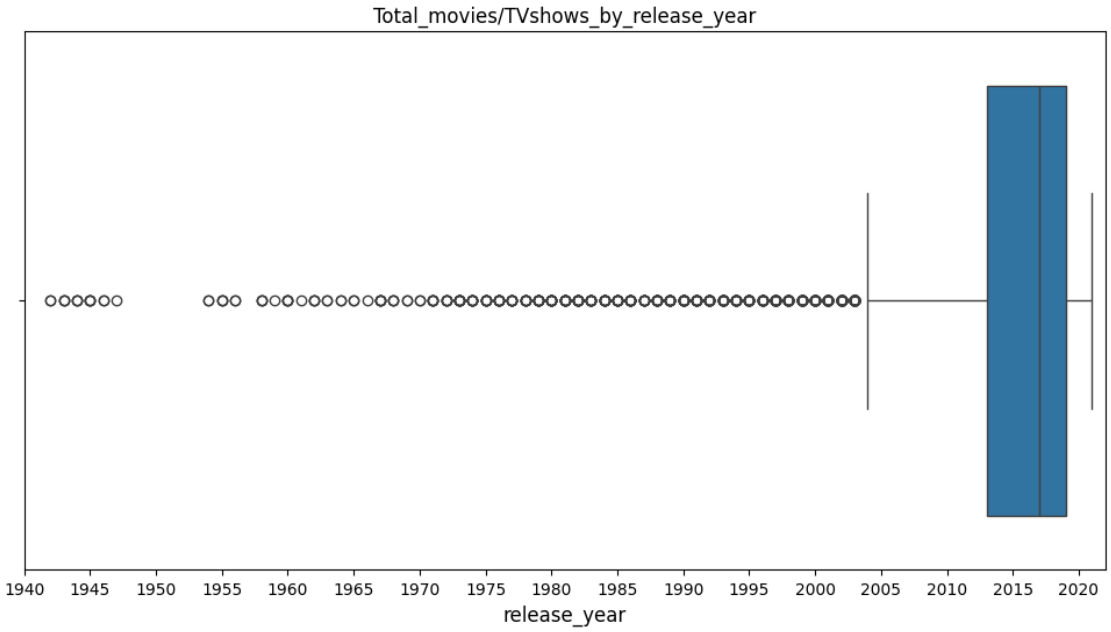


Observation: United States is the HIGHEST contributor country on Netflix, followed by India and United Kingdom. Maximum content of Netflix which is around 75% , is coming from these top 10 countries. Rest of the world only contributes 25% of the content.

[ ]:

4.6 Total content distribution by release year of the content

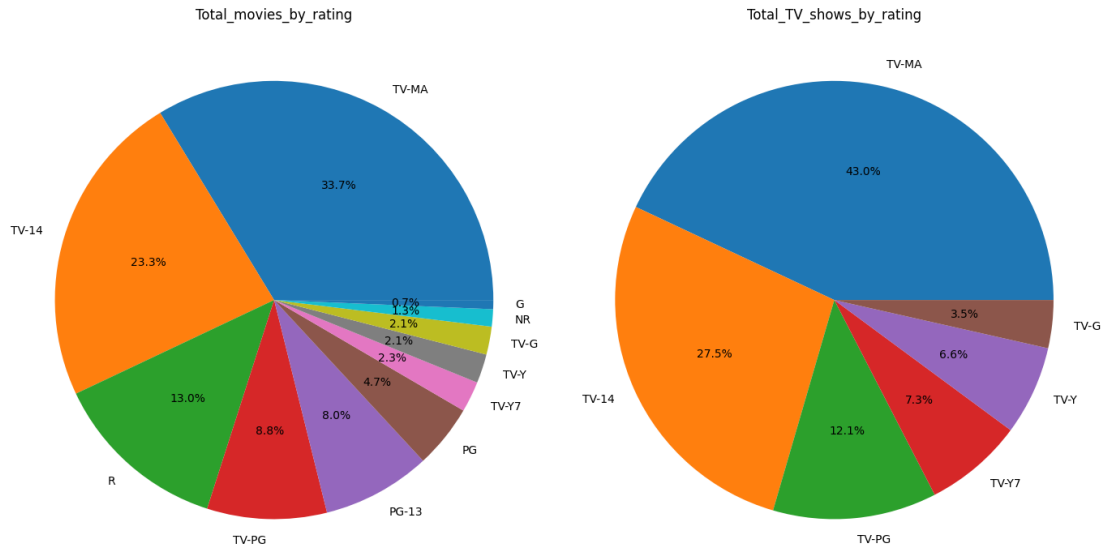
[ ]:
```
plt.figure(figsize= (12,6))
sns.boxplot(data = df , x = 'release_year')
plt.xlabel('release_year' , fontsize = 12)
plt.title('Total_movies/TVshows_by_release_year')
plt.xticks(np.arange(1940 , 2021 , 5))
plt.xlim((1940 , 2022))
plt.show()
```



Netflix have major content which is released in the year range 2000-2021 It seems that the content older than year 2000 is almost missing from the Netflix.

4.7 Total movies/TV shows distribution by rating of the content

[ ]:
```
m = movies.loc[~movies.rating.isin(['Not Available' , 'NC-17' , 'TV-Y7-FV'])]
m = m.rating.value_counts()
t = tv_shows.loc[~tv_shows.rating.isin(['Not Available' , 'R' , 'NR',␣
  ↪'TV-Y7-FV'])]
t = t.rating.value_counts()


fig, ax = plt.subplots(1,2, figsize=(14,8))
ax[0].pie(m , labels = m.index, autopct='%1.1f%%')
ax[0].set_title('Total_movies_by_rating')

ax[1].pie(t , labels = t.index, autopct='%1.1f%%')
ax[1].set_title('Total_TV_shows_by_rating')

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



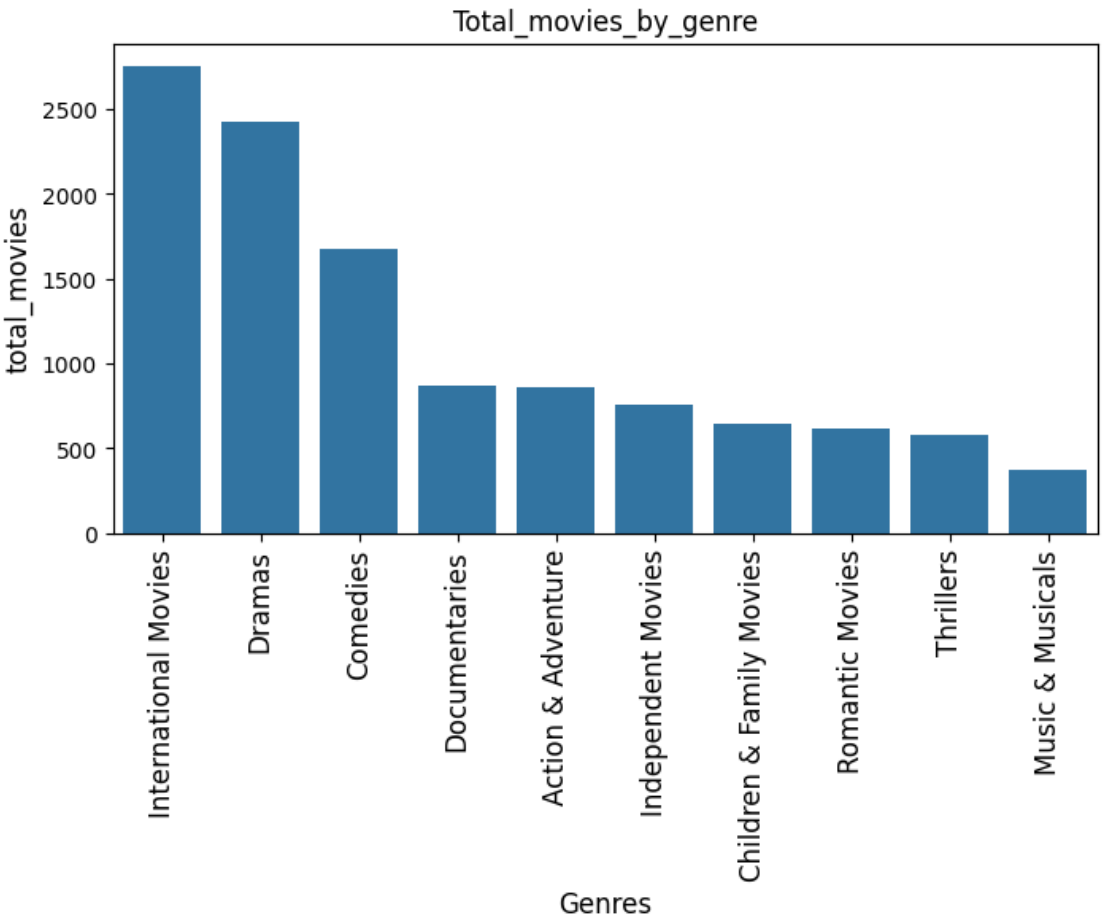
[ ]:

4.8 Total movies/TV shows in each Genre

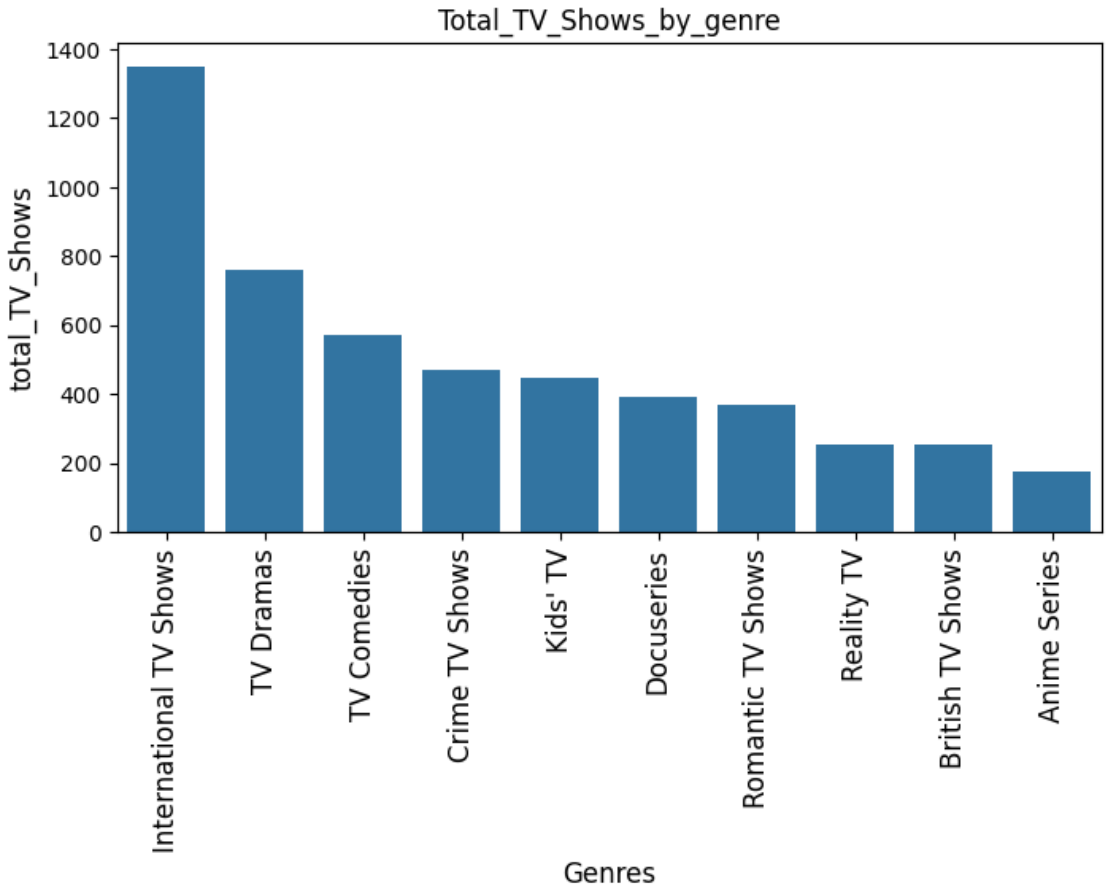
[ ]:
```
# Lets check the count for top 10 genres in Movies and TV_shows
top_10_movie_genres = genre_tb[genre_tb['type'] == 'Movie'].listed_in.
 ↪value_counts().head(10).index
df_movie = genre_tb.loc[genre_tb['listed_in'].isin(top_10_movie_genres)]
```

[ ]:
```
top_10_TV_genres = genre_tb[genre_tb['type'] == 'TV Show'].listed_in.
 ↪value_counts().head(10).index
df_tv = genre_tb.loc[genre_tb['listed_in'].isin(top_10_TV_genres)]
```

[ ]:
```
plt.figure(figsize= (8,4))
sns.countplot(data = df_movie , x = 'listed_in' , order = top_10_movie_genres)
plt.xticks(rotation = 90 , fontsize = 12)
plt.ylabel('total_movies' , fontsize = 12)
plt.xlabel('Genres' , fontsize = 12)
plt.title('Total_movies_by_genre')
plt.show()
```



[ ]:
```
plt.figure(figsize= (8,4))
sns.countplot(data = df_tv , x = 'listed_in' , order = top_10_TV_genres)
plt.xticks(rotation = 90 , fontsize = 12)
plt.ylabel('total_TV_Shows' , fontsize = 12)
plt.xlabel('Genres' , fontsize = 12)
plt.title('Total_TV_Shows_by_genre')
plt.show()
```



International Movies and TV Shows , Dramas , and Comedies are the top 3 genres on Netflix for both Movies and TV shows.

[ ]:

6 Bivariate Analysis

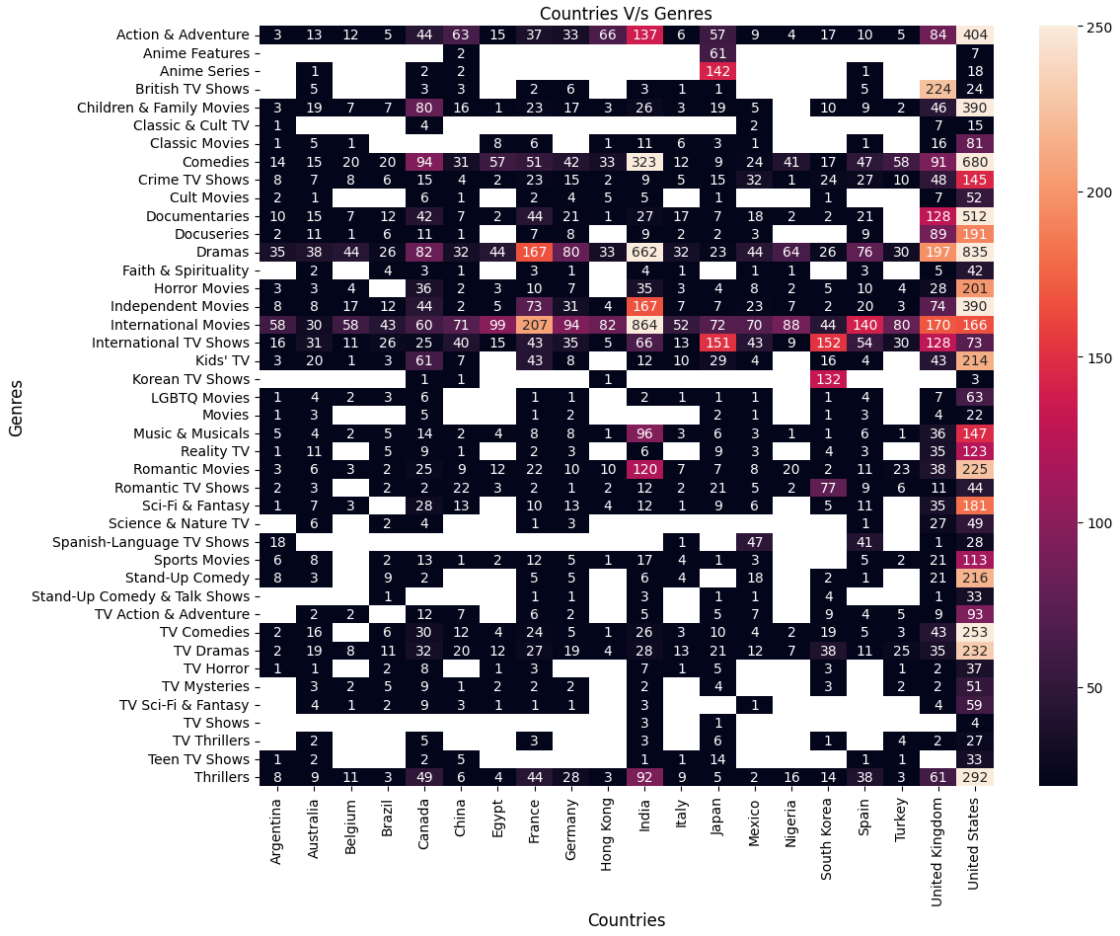
5.1 Lets check popular genres in top 20 countries

[ ]:
```
top_20_country = country_tb.country.value_counts().head(20).index
top_20_country = country_tb.loc[country_tb['country'].isin(top_20_country)]
```

[ ]:
```
x = top_20_country.merge(genre_tb , on = 'show_id').drop_duplicates()
country_genre = x.groupby([ 'country' , 'listed_in'])['show_id'].count().
 ↪sort_values(ascending = False).reset_index()
country_genre = country_genre.pivot(index = 'listed_in' , columns = 'country' ,␣
 ↪values = 'show_id')
```

[ ]:
```
plt.figure(figsize = (12,10))
sns.heatmap(data = country_genre , annot = True , fmt=".0f" , vmin = 20 , vmax
 ↪= 250 )
plt.xlabel('Countries' , fontsize = 12)
plt.ylabel('Genres' , fontsize = 12)
plt.title('Countries V/s Genres' , fontsize = 12)
```

[ ]:
```
Text(0.5, 1.0, 'Countries V/s Genres')
```



Popular genres across countries: Action & Adventure, Children & Family Movies, Comedies, Dramas, International Movies & TV Shows, TV Dramas, Thrillers

Country-specific genres: Korean TV shows (Korea), British TV Shows (UK), Anime features and Anime series (Japan), Spanish TV Shows (Argentina, Mexico and Spain)

United States and UK have a good mix of almost all genres.

Maximum International movies are produced in India.

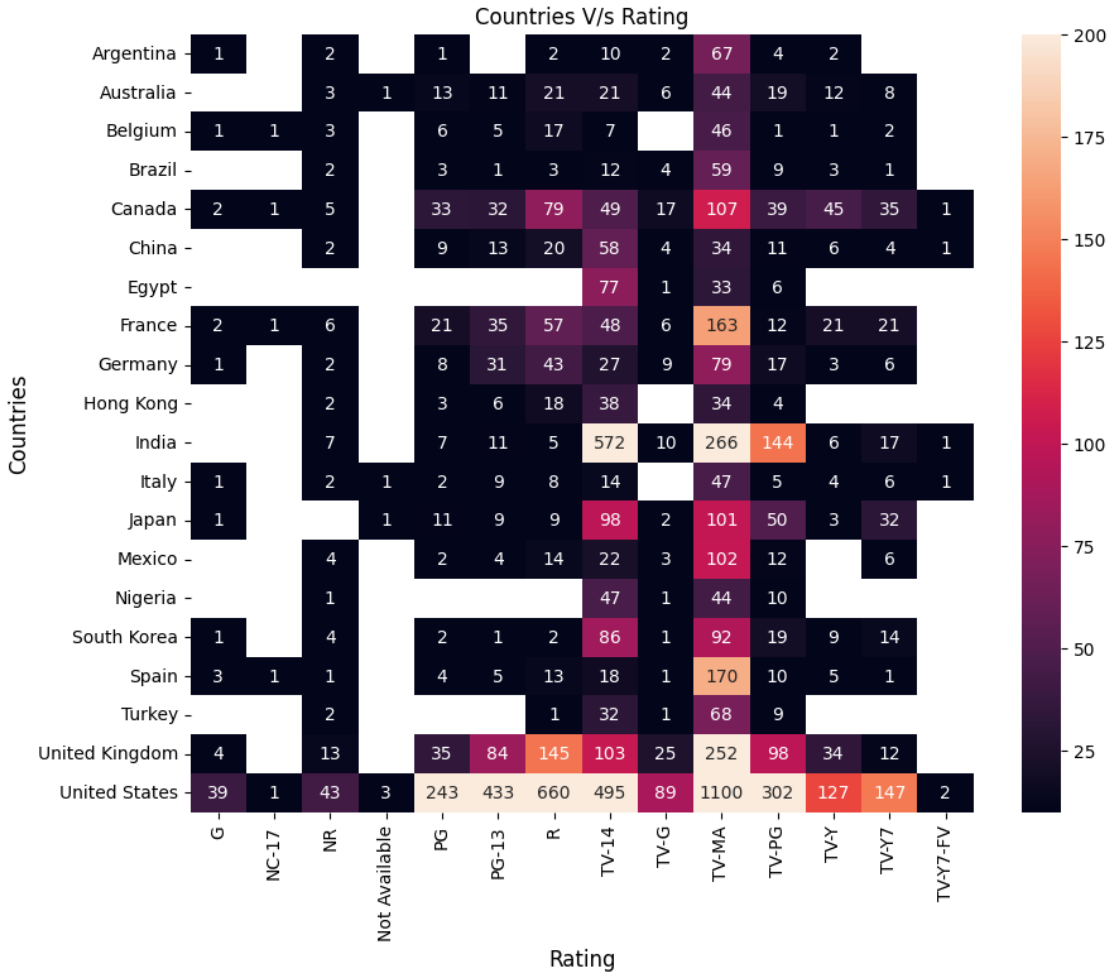
[ ]:
```

```

5.2 Country-wise Rating of Content

```
[ ]: x = top_20_country.merge(df , on = 'show_id').groupby(['country_x' ,␣
      ↪'rating'])['show_id'].count().reset_index()
     country_rating = x.pivot(index = ['country_x'] , columns = 'rating' , values =␣
      ↪'show_id')
```

```
[ ]: plt.figure(figsize = (10,8))
     sns.heatmap(data = country_rating , annot = True , fmt=".0f"  , vmin = 10 ,␣
      ↪vmax=200)
     plt.ylabel('Countries' , fontsize = 12)
     plt.xlabel('Rating' , fontsize = 12)
     plt.title('Countries V/s Rating' , fontsize = 12)
```

```
[ ]: Text(0.5, 1.0, 'Countries V/s Rating')
```



Overall, Netflix has an large amount of adult content across all countries (TV-MA & TV-14). India

also has many titles rated TV-PG, other than TV-MA & TV-14. Only US, Canada, UK, France and Japan have content for young audiences (TV-Y & TV-Y7). There is scarce content for general audience (TV-G & G) across all countries except US.

5.3 The top actors by country

[ ]:
```
x = cast_tb.merge(country_tb , on = 'show_id').drop_duplicates()
x = x.groupby(['country' , 'cast'])['show_id'].count().reset_index()
x.loc[x['country'].isin(['United States'])].sort_values('show_id' , ascending =␣
↪False).head(5)
```

[ ]:

	country	cast	show_id
49405	United States	Tara Strong	22
48330	United States	Samuel L. Jackson	22
40463	United States	Fred Tatasciore	21
35733	United States	Adam Sandler	20
41672	United States	James Franco	19

[ ]:
```
country_list = ['India'  , 'United Kingdom' , 'Canada' , 'France' , 'Japan']
top_5_actors = x.loc[x['country'].isin(['United States'])].
↪sort_values('show_id' , ascending = False).head(5)
```

[ ]:
```
for i in country_list:
    new = x.loc[x['country'].isin([i])].sort_values('show_id' , ascending =␣
↪False).head(5)
    top_5_actors = pd.concat( [top_5_actors , new] , ignore_index = True)
```

[ ]:
```
# top 5 actors in top countries and their movies/tv shows count
top_5_actors
```

[ ]:

	country	cast	show_id
0	United States	Tara Strong	22
1	United States	Samuel L. Jackson	22
2	United States	Fred Tatasciore	21
3	United States	Adam Sandler	20
4	United States	James Franco	19
5	India	Anupam Kher	40
6	India	Shah Rukh Khan	34
7	India	Naseeruddin Shah	31
8	India	Om Puri	29
9	India	Akshay Kumar	29
10	United Kingdom	David Attenborough	17
11	United Kingdom	John Cleese	16
12	United Kingdom	Michael Palin	14
13	United Kingdom	Terry Jones	12
14	United Kingdom	Eric Idle	12
15	Canada	John Paul Tremblay	14
16	Canada	Robb Wells	14

```
17          Canada        John Dunsworth       12
18          Canada          Vincent Tong       12
19          Canada         Ashleigh Ball       12
20          France        Wille Lindberg        5
21          France        Benoît Magimel        5
22          France      Gérard Depardieu        4
23          France        Blanche Gardin        4
24          France  Kristin Scott Thomas        4
25           Japan      Takahiro Sakurai       29
26           Japan             Yuki Kaji       28
27           Japan           Daisuke Ono       22
28           Japan        Junichi Suwabe       19
29           Japan             Ai Kayano       18
```

[ ]:
```
genre_list = [ 'Children & Family Movies', 'Comedies','Dramas', 'International␣
 ↪Movies', 'Documentaries' ,
              'International TV Shows', 'Sci-Fi & Fantasy', 'Thrillers',␣
 ↪'Horror Movies']

x = dir_tb.merge(genre_tb , on = 'show_id').groupby([ 'listed_in' ,␣
 ↪'director',])['show_id'].count().reset_index()

top_5_dir = x.loc[x['listed_in'] == 'Action & Adventure'].sort_values('show_id'␣
 ↪, ascending = False).head()

for i in genre_list:
    new = x.loc[x['listed_in'] == i].sort_values('show_id' , ascending = False).
 ↪head()
    top_5_dir = pd.concat([top_5_dir , new])

top_5_dir
```

[ ]:
```
                     listed_in              director  show_id
147          Action & Adventure      Don Michael Paul        9
550          Action & Adventure        S.S. Rajamouli        7
651          Action & Adventure     Toshiya Shinohara        7
215          Action & Adventure        Hidenori Inoue        7
606          Action & Adventure      Steven Spielberg        5
1215   Children & Family Movies         Rajiv Chilaka       22
1303   Children & Family Movies           Suhas Kadav       16
1211   Children & Family Movies         Prakash Satam        7
1241   Children & Family Movies      Robert Rodriguez        7
1288   Children & Family Movies            Steve Ball        6
1756                   Comedies          David Dhawan        9
1905                   Comedies           Hakan Algül        8
2686                   Comedies           Suhas Kadav        8
2456                   Comedies         Prakash Satam        7
```

1663	Comedies	Cathy Garcia-Molina	7
5935	Dramas	Youssef Chahine	12
4254	Dramas	Cathy Garcia-Molina	9
5099	Dramas	Martin Scorsese	9
4590	Dramas	Hanung Bramantyo	8
5544	Dramas	S.S. Rajamouli	7
7509	International Movies	Cathy Garcia-Molina	13
9330	International Movies	Youssef Chahine	10
9340	International Movies	Yılmaz Erdoğan	9
7620	International Movies	David Dhawan	8
8208	International Movies	Kunle Afolayan	8
3834	Documentaries	Vlad Yudin	6
3799	Documentaries	Thierry Donard	5
3217	Documentaries	Edward Cotterill	4
3262	Documentaries	Frank Capra	4
3075	Documentaries	Barry Avrich	4
9373	International TV Shows	Alastair Fothergill	3
9419	International TV Shows	Hsu Fu-chun	2
9436	International TV Shows	Jung-ah Im	2
9501	International TV Shows	Shin Won-ho	2
9478	International TV Shows	Pali Yahya	1
10752	Sci-Fi & Fantasy	Lilly Wachowski	4
10744	Sci-Fi & Fantasy	Lana Wachowski	4
10684	Sci-Fi & Fantasy	Guillermo del Toro	3
10790	Sci-Fi & Fantasy	Paul W.S. Anderson	3
10635	Sci-Fi & Fantasy	Barry Sonnenfeld	3
11974	Thrillers	Rathindran R Prasad	4
11698	Thrillers	David Fincher	4
11612	Thrillers	Anurag Kashyap	3
11636	Thrillers	Brad Anderson	3
11754	Thrillers	Gregory Hoblit	3
6280	Horror Movies	Rocky Soraya	6
6260	Horror Movies	Poj Arnon	5
6267	Horror Movies	Rathindran R Prasad	4
6191	Horror Movies	Leigh Janiak	3
6052	Horror Movies	Banjong Pisanthanakun	3

5.5 Top 5 genres in each country

[ ]:
```
x = genre_tb.merge(country_tb , on = 'show_id').drop_duplicates()
x = x.groupby(['country' , 'listed_in'])['show_id'].count().reset_index()
x.loc[x['country'] == 'United States'].sort_values('show_id' , ascending =␣
 ↪False).head(5)

country_list = ['India'  , 'United Kingdom' , 'Canada' , 'France' , 'Japan']
top_5_genre = x.loc[x['country'].isin(['United States'])].sort_values('show_id'␣
 ↪, ascending = False).head(5)
```

```
for i in country_list:
    new = x.loc[x['country'] == i].sort_values('show_id' , ascending = False).
 ↪head(5)
    top_5_genre = pd.concat( [top_5_genre , new] , ignore_index = True)
```

[ ]:
```
top_5_genre
```

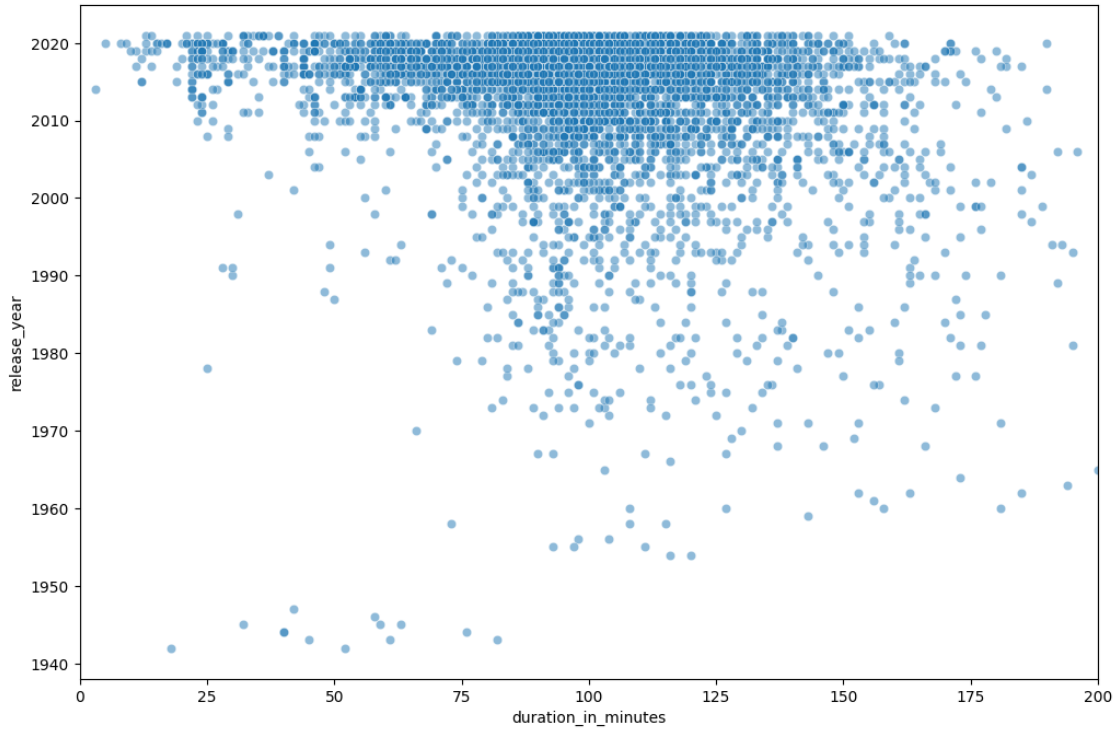
[ ]:

	country	listed_in	show_id
0	United States	Dramas	835
1	United States	Comedies	680
2	United States	Documentaries	512
3	United States	Action & Adventure	404
4	United States	Independent Movies	390
5	India	International Movies	864
6	India	Dramas	662
7	India	Comedies	323
8	India	Independent Movies	167
9	India	Action & Adventure	137
10	United Kingdom	British TV Shows	224
11	United Kingdom	Dramas	197
12	United Kingdom	International Movies	170
13	United Kingdom	International TV Shows	128
14	United Kingdom	Documentaries	128
15	Canada	Comedies	94
16	Canada	Dramas	82
17	Canada	Children & Family Movies	80
18	Canada	Kids' TV	61
19	Canada	International Movies	60
20	France	International Movies	207
21	France	Dramas	167
22	France	Independent Movies	73
23	France	Comedies	51
24	France	Thrillers	44
25	Japan	International TV Shows	151
26	Japan	Anime Series	142
27	Japan	International Movies	72
28	Japan	Anime Features	61
29	Japan	Action & Adventure	57

5.6 Variation in duration of movies by Release year

[ ]:
```
plt.figure(figsize = (12,8))
# Pass x and y as keyword arguments
sns.scatterplot(x=movies['duration_in_minutes'], y=movies['release_year'], ␣
 ↪alpha=0.5)
plt.xlim((0,200))
```

[ ]: (0.0, 200.0)



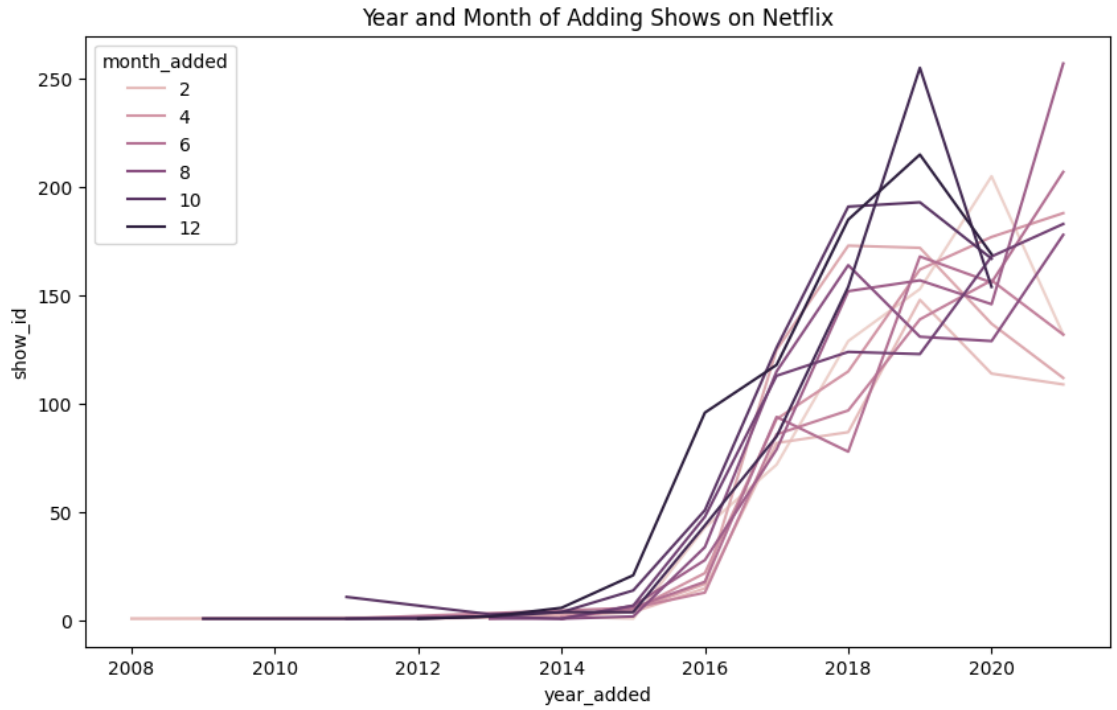
Observation The movies shorter than 150 minutes duration have increased drastically after 2000 while movies longer than 150 minutes are not much popular. There is a huge surge in the number of shorter duration movies (less than 75 mins) post 2010. Overall, Short movies have been popular in last 10 years.

5.7 What is the best time of the year when maximum content get added on the Netflix?

[ ]:
```
month_year = df.groupby(['year_added' , 'month_added'])['show_id'].count().
  ↪reset_index()
```

[ ]:
```
plt.figure(figsize = (10,6))
sns.lineplot(data=month_year, x = 'year_added', y = 'show_id',␣
  ↪hue='month_added')
plt.title('Year and Month of Adding Shows on Netflix')
```

[ ]: Text(0.5, 1.0, 'Year and Month of Adding Shows on Netflix')



The number of shows getting added is increasing with each year until 2020. Also, months in the last quarter of the year (Oct-Dec) have more shows being added than the other months of the year. This could be because US has its festive season in Dec and India also has Diwali in Oct-Nov.

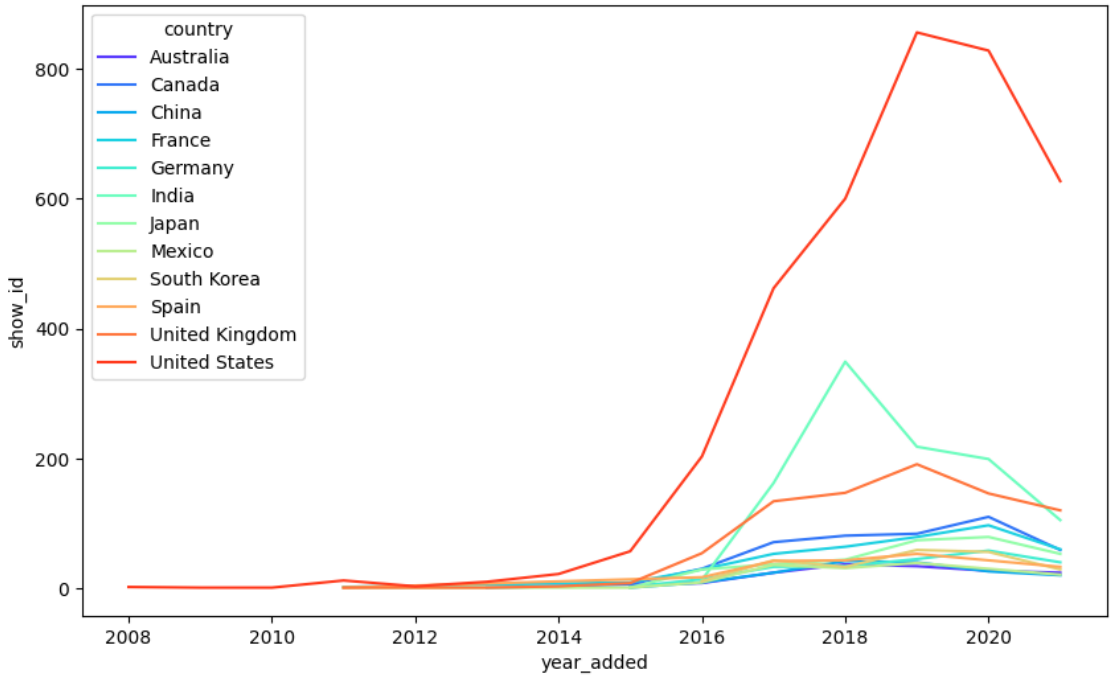
5.8 Which countries are adding more number of content over the time?

[ ]:
```
country_list = country_tb.country.value_counts().head(12).index
top_12_country = country_tb.loc[country_tb['country'].isin(country_list)]
country_year = top_12_country.merge(df , on = 'show_id')[['show_id','country_x'␣
↪,'type_x' , 'year_added' ]]
country_year.columns = ['show_id', 'country', 'type', 'year_added']
```

[ ]:
```
country_year = country_year.groupby(['country' , 'year_added'])['show_id'].
↪count().reset_index()
```

[ ]:
```
plt.figure(figsize = (10,6))
sns.lineplot(data = country_year , x = 'year_added' , y = 'show_id' , hue =␣
↪'country' , palette ='rainbow' )
```

[ ]:
```
<Axes: xlabel='year_added', ylabel='show_id'>
```



Observation : United Stated have always added highset number of movies/TV shows over the time. Since 2016, India has seen spike in popularity of content and added more number of content, followed by United Kingdom at 3rd position.

[ ]:

7 6 Insights based on Non-Graphical and Visual Analysis

- Around 70% content on Netflix is Movies and around 30% content is TV shows.
- The movies and TV shows uploading on the Netflix started from the year 2008, It had very lesser content till 2014. -Year 2015 marks the drastic surge in the content getting uploaded on Netflix. It continues the uptrend since then and 2019 marks the highest number of movies and TV shows added on the Netflix. Year 2020 and 2021 has seen the drop in content added on Netflix, possibly because of Pandemic. But still , TV shows content have not dropped as drastic as movies. -Since 2018, A drop in the movies is seen , but rise in TV shows is observed clearly. Being in continuous uptrend , TV shows surpassed the movies count in mid 2020. It shows the rise in popularity of tv shows in recent years. -The release year for shows is concentrated in the range 2005-2021. -50 mins - 150 mins is the range of movie durations, excluding potential outliers. -1-3 seasons is the range for TV shows seasons, excluding potential outliers. various ratings of content is avaialble on netfilx, for the various viewers categories like kids, adults , families. -Highest number of movies and TV shows are rated TV-MA (for mature audiences). -Mostly country specific popular genres are observed in each country. Only United States have a good mix of almost all genres. Eg. Korean TV shows (Korea), British TV Shows (UK), Anime features and Anime series (Japan) and so on. I-ndian Actors have been acted in maximum movies on netflix. Top 5 actors are in India

based on quantity of movies.

8 7 Business Insights

- Netflix have majority of content which is released after the year 2000. It is observed that the content older than year 2000 is very scarce on Netflix. Senior Citizen could be the target audience for such content, which is almost missing currently.
- Most popular genres on Netflix are International Movies and TV Shows , Dramas , Comedies, Action & Adventure, Children & Family Movies, Thrillers.
- Maximum content of Netflix which is around 75% , is coming from the top 10 countries. Rest of the world only contributes 25% of the content. More countries can be focussed in future to grow the business.
- Liking towards the shorter duration content is on the rise. (duration 75 to 150 minutes and seasons 1 to 3) This can be considered while production of new content on Netflix.
- drop in content is seen across all the countries and type of content in year 2020 and 2021, possibly because of Pandemic.

9 8 Recommendations

Very limited genres are focussed in most of the countries except US. It seems the current available genres suits best for US and few countries but maximum countries need some more genres which are highly popular in the region. eg. Indian Mythological content is highly popular. We can create such more country specific genres and It might also be liked acorss the world just like Japanese Anime.

Netflix is currently serving mostly Mature audiences or Children with parental guidance. It have scope to cater other audiences as well such as familymen , Senior citizen , kids of various age etc.

[ ]:

[ ]:

[ ]:

[ ]:

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[ ]:

[ ]:

[ ]:

[ ]: