# netflix

September 28, 2024

### 0.0.1 Loading Libraries

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

### 0.0.2 Loading and Sampling the Dataset

[8]:
```
df1 = pd.read_csv('/content/drive/MyDrive/netflix.csv')
df1.head()
```

[8]:

| | show_id | type | title | director | cast | country | date_added | release_year | rating | duration | listed_in |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | s1 | Movie | Dick Johnson Is Dead | Kirsten Johnson | NaN | United States | September 25, 2021 | 2020 | PG-13 | 90 min | Documentaries |
| 1 | s2 | TV Show | Blood & Water | NaN | Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban… | South Africa | September 24, 2021 | 2021 | TV-MA | 2 Seasons | International TV Shows, TV Dramas, TV Mysteries |
| 2 | s3 | TV Show | Ganglands | Julien Leclercq | Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi… | NaN | September 24, 2021 | 2021 | TV-MA | 1 Season | Crime TV Shows, International TV Shows, TV Act… |
| 3 | s4 | TV Show | Jailbirds New Orleans | NaN | NaN | NaN | September 24, 2021 | 2021 | TV-MA | 1 Season | Docuseries, Reality TV |
| 4 | s5 | TV Show | Kota Factory | NaN | Mayur More, Jitendra Kumar, Ranjan Raj, Alam K… | India | | | | | |

```
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…
```

Understanding the data, the structure.

[3]:
```
df1.shape
```

[3]:
```
(8807, 12)
```

The Dataset has 8807 rows and 12 columns

[9]:
```
df1.describe()
```

[9]:
```
       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
```

The release_year column only has numerical data, So the rest are categorical data.

[10]:
```
df1['date_added'] = pd.to_datetime(df1['date_added'].str.strip(), format='%B␣
 ↪%d, %Y', errors='coerce')
```

[6]:
```
df1.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   datetime64[ns]
 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: datetime64[ns](1), int64(1), object(10)
memory usage: 825.8+ KB
```

information about the whole data, null values and datatype of the coolumns and changed the Datatypr of the field 'Date Added' to DateTime.

[11]:
```
df1.isnull().sum()
```

[11]:
```
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
```

Many nulls in directors, cast and country columns.

[12]:
```
df1.nunique()
```

[12]:
```
show_id         8807
type               2
title           8807
director        4528
cast            7692
country          748
date_added      1714
release_year      74
rating            17
duration         220
listed_in        514
description     8775
dtype: int64
```

These are total features of the dataset. It is seen that show_id and the title column has all unique values i.e. total 8807 which equates with total rows in the dataset. Hence It can be concluded that ,

Total 8807 movies/TV shows data is provided in the dataset.

### 0.0.3 Observating the shape of data, data types of all the attributes, missing value detection, statistical summary

[13]:
```
df1.describe(include = object)
```

[13]:
```
       show_id   type                 title       director  \
count     8807   8807                  8807           6173
unique    8807      2                  8807           4528
top         s1  Movie  Dick Johnson Is Dead  Rajiv Chilaka
freq         1   6131                     1             19

                      cast        country rating  duration  \
count                 7982           7976   8803      8804
unique                7692            748     17       220
top     David Attenborough  United States  TV-MA  1 Season
freq                    19           2818   3207      1793

                           listed_in  \
count                           8807
unique                           514
top     Dramas, International Movies
freq                             362

                                                 description
count                                                   8807
unique                                                  8775
top     Paranormal activity at a lush, abandoned prope…
freq                                                       4
```

### Data Cleanup and Modification

[14]:
```
df1[df1['duration'].isna()]
```

[14]:
```
     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  rating duration  \
5541  Louis C.K.  United States 2017-04-04          2017  74 min      NaN
5794  Louis C.K.  United States 2016-09-16          2010  84 min      NaN
5813  Louis C.K.  United States 2016-08-15          2015  66 min      NaN

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

[15]:
```
df1[df1['rating'].isna()]
```

[15]:

```
     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 2017-01-26          2017    NaN    37 min
6827      Japan 2016-12-01          2013    NaN  1 Season
7312  Australia 2018-02-01          2015    NaN  1 Season
7537      Italy 2017-03-01          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…
```

We can see there are 4 rows with missing rating column values and 3 rows have the duration misplaced in the rating column.

[16]:
```
rt_idx = df1[df1['duration'].isna()].index
df1.loc[rt_idx] = df1.loc[rt_idx].fillna(method = 'ffill' , axis = 1)
```

```
<ipython-input-16-446607691486>:2: FutureWarning: DataFrame.fillna with 'method'
is deprecated and will raise in a future version. Use obj.ffill() or obj.bfill()
instead.
  df1.loc[rt_idx] = df1.loc[rt_idx].fillna(method = 'ffill' , axis = 1)
<ipython-input-16-446607691486>:2: FutureWarning: Setting an item of
incompatible dtype is deprecated and will raise in a future error of pandas.
Value '[2017 2010 2015]' has dtype incompatible with int64, please explicitly
cast to a compatible dtype first.
  df1.loc[rt_idx] = df1.loc[rt_idx].fillna(method = 'ffill' , axis = 1)
```

[17]:
```
df1.loc[rt_idx ,'rating'] = 'Not Rated'
```

[18]:
```
df1.loc[rt_idx]
```

[18]:
```
     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     rating duration  \
5541  Louis C.K.  United States 2017-04-04         2017  Not Rated   74 min
5794  Louis C.K.  United States 2016-09-16         2010  Not Rated   84 min
5813  Louis C.K.  United States 2016-08-15         2015  Not Rated   66 min

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

replaced the wrong entries in the rating column

[19]:
```
df1[df1.rating.isna()]
```

[19]:
```
     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 2017-01-26         2017    NaN    37 min
6827      Japan 2016-12-01         2013    NaN  1 Season
7312  Australia 2018-02-01         2015    NaN  1 Season
7537      Italy 2017-03-01         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…
```

[20]:
```
rt_idx2 = df1[df1.rating.isna()].index
rt_idx2
```

[20]:
```
Index([5989, 6827, 7312, 7537], dtype='int64')
```

[21]:
```
df1.loc[rt_idx2 , 'rating'] = 'Not Rated'
df1.loc[rt_idx2]
```

[21]:
```
     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 2017-01-26         2017  Not Rated    37 min
6827      Japan 2016-12-01         2013  Not Rated  1 Season
7312  Australia 2018-02-01         2015  Not Rated  1 Season
7537      Italy 2017-03-01         2015  Not Rated   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…
```

[22]:
```
df1[df1.rating == 'Not Rated']
```

[22]:

| | show_id | type | title | director | cast | country | date_added | release_year | rating | duration | listed_in | description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5541 | s5542 | Movie | Louis C.K. 2017 | Louis C.K. | Louis C.K. | United States | 2017-04-04 | 2017 | Not Rated | 74 min | Movies | Louis C.K. muses on religion, eternal love, gi… |
| 5794 | s5795 | Movie | Louis C.K.: Hilarious | Louis C.K. | Louis C.K. | United States | 2016-09-16 | 2010 | Not Rated | 84 min | Movies | Emmy-winning comedy writer Louis C.K. brings h… |
| 5813 | s5814 | Movie | Louis C.K.: Live at the Comedy Store | Louis C.K. | Louis C.K. | United States | 2016-08-15 | 2015 | Not Rated | 66 min | Movies | The comic puts his trademark hilarious/thought… |
| 5989 | s5990 | Movie | 13TH: A Conversation with Oprah Winfrey & Ava … | NaN | Oprah Winfrey, Ava DuVernay | NaN | 2017-01-26 | 2017 | Not Rated | 37 min | Movies | Oprah Winfrey sits down with director Ava DuVe… |
| 6827 | s6828 | TV Show | Gargantia on the Verdurous Planet | NaN | Kaito Ishikawa, Hisako Kanemoto, Ai Kayano, Ka… | Japan | 2016-12-01 | 2013 | Not Rated | 1 Season | Anime Series, International TV Shows | After falling through a wormhole, a space-dwel… |
| 7312 | s7313 | TV Show | Little Lunch | NaN | Flynn Curry, Olivia Deeble, Madison Lu, Oisín … | Australia | 2018-02-01 | 2015 | Not Rated | 1 Season | Kids' TV, TV Comedies | Adopting a child's perspective, this show take… |
| 7537 | s7538 | Movie | My Honor Was Loyalty | Alessandro Pepe | Leone Frisa, Paolo Vaccarino, Francesco Miglio… | Italy | 2017-03-01 | 2015 | Not Rated | 115 min | Dramas | Amid the chaos and horror of World War II, a c… |

Rows with missing values in Rating column replaced with placeholder value.

[23]:
```
df1.rating.unique()
```

[23]:
```
array(['PG-13', 'TV-MA', 'PG', 'TV-14', 'TV-PG', 'TV-Y', 'TV-Y7', 'R',
       'TV-G', 'G', 'NC-17', 'Not Rated', 'NR', 'TV-Y7-FV', 'UR'],
      dtype=object)
```

- In rating column , NR (Not rated) is present as NR. lets change 'Not Rated' to NR.
- So now duration and rating columns are free from nulls.

[24]:
```
df1.loc[df1['rating'] == 'Not Rated' , 'rating'] = 'NR'
df1.rating.value_counts()
```

[24]:
```
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            87
G             41
TV-Y7-FV       6
NC-17          3
UR             3
Name: count, dtype: int64
```

[25]:
```
rt_idx3 = df1[df1.date_added.isna()].index
df1.loc[rt_idx3]
```

[25]:
```
     show_id     type                                        title director  \
6066   s6067  TV Show  A Young Doctor's Notebook and Other Stories      NaN
6174   s6175  TV Show              Anthony Bourdain: Parts Unknown      NaN
6795   s6796  TV Show                                      Frasier      NaN
6806   s6807  TV Show                                      Friends      NaN
6901   s6902  TV Show                                Gunslinger Girl      NaN
7196   s7197  TV Show                                      Kikoriki      NaN
7254   s7255  TV Show                           La Familia P. Luche      NaN
7406   s7407  TV Show                                        Maron      NaN
7847   s7848  TV Show                                   Red vs. Blue      NaN
8182   s8183  TV Show                The Adventures of Figaro Pho      NaN

                                                  cast         country  \
6066  Daniel Radcliffe, Jon Hamm, Adam Godley, Chris…  United Kingdom
6174                                Anthony Bourdain   United States
```

```
6795  Kelsey Grammer, Jane Leeves, David Hyde Pierce…   United States
6806  Jennifer Aniston, Courteney Cox, Lisa Kudrow, …   United States
6901  Yuuka Nanri, Kanako Mitsuhashi, Eri Sendai, Am…           Japan
7196                                     Igor Dmitriev             NaN
7254  Eugenio Derbez, Consuelo Duval, Luis Manuel Áv…   United States
7406  Marc Maron, Judd Hirsch, Josh Brener, Nora Zeh…   United States
7847  Burnie Burns, Jason Saldaña, Gustavo Sorola, G…   United States
8182  Luke Jurevicius, Craig Behenna, Charlotte Haml…       Australia

     date_added release_year rating    duration  \
6066        NaT         2013  TV-MA   2 Seasons
6174        NaT         2018  TV-PG   5 Seasons
6795        NaT         2003  TV-PG  11 Seasons
6806        NaT         2003  TV-14  10 Seasons
6901        NaT         2008  TV-14   2 Seasons
7196        NaT         2010   TV-Y   2 Seasons
7254        NaT         2012  TV-14   3 Seasons
7406        NaT         2016  TV-MA   4 Seasons
7847        NaT         2015     NR  13 Seasons
8182        NaT         2015  TV-Y7   2 Seasons

                                          listed_in  \
6066          British TV Shows, TV Comedies, TV Dramas
6174                                      Docuseries
6795                    Classic & Cult TV, TV Comedies
6806                    Classic & Cult TV, TV Comedies
6901                      Anime Series, Crime TV Shows
7196                                       Kids' TV
7254  International TV Shows, Spanish-Language TV Sh…
7406                                     TV Comedies
7847  TV Action & Adventure, TV Comedies, TV Sci-Fi …
8182                            Kids' TV, TV Comedies

                                          description
6066  Set during the Russian Revolution, this comic …
6174  This CNN original series has chef Anthony Bour…
6795  Frasier Crane is a snooty but lovable Seattle …
6806  This hit sitcom follows the merry misadventure…
6901  On the surface, the Social Welfare Agency appe…
7196  A wacky rabbit and his gang of animal pals hav…
7254  This irreverent sitcom featues Ludovico, Feder…
7406  Marc Maron stars as Marc Maron, who interviews…
7847  This parody of first-person shooter games, mil…
8182  Imagine your worst fears, then multiply them: …
```

[26]:
```
df1.drop(df1.loc[df1['date_added'].isna()].index , axis = 0 , inplace = True)
```

Dropping the null values from Date_added Column.

[27]:
```
df1['date_added'].value_counts()
```

[27]:
```
date_added
2020-01-01    110
2019-11-01     91
2018-03-01     75
2019-12-31     74
2018-10-01     71
              ...
2017-02-21      1
2017-02-07      1
2017-01-29      1
2017-01-25      1
2020-01-11      1
Name: count, Length: 1714, dtype: int64
```

[29]:
```
df1['year_added'] = df1['date_added'].dt.year
df1['month_added'] = df1['date_added'].dt.month
df1[['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
```

Creating year and month separate column from Date_added for easy bifercation.

[30]:
```
round((df1.isna().sum()/ df1.shape[0])*100)
```

[30]:
```
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
```

30% of values for the director column is missing and for cast and country 9% in each field.

[33]:
```
df1['country']
```

[33]:
```
0       United States
1        South Africa
2                 NaN
3                 NaN
4               India
             …
8802    United States
8803              NaN
8804    United States
8805    United States
8806            India
Name: country, Length: 8797, dtype: object
```

[35]:
```
df1.country.value_counts()
```

[35]:
```
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
```

[45]:
```
df2 = df1.assign(country=df1.country.str.split(', ')).explode('country')
df2.shape
```

[45]:
```
(10835, 14)
```

[46]:
```
df2.country.value_counts()
```

[46]:
```
country
United States     3683
```

```
India             1046
United Kingdom     803
Canada             445
France             393
                   …
Bermuda              1
Ecuador              1
Armenia              1
Mongolia             1
Montenegro           1
Name: count, Length: 127, dtype: int64
```

[47]:
```
df2['country'].nunique()
```

[47]:
```
127
```

[221]:
```
df2.describe(include='all')
```

[221]:
```
       show_id   type     title       director                cast  \
count    10835  10835     10835           7875                9831
unique    8797      2      8797           4528                7682
top      s6234  Movie  Barbecue  Rajiv Chilaka  David Attenborough
freq        12   7814        12             19                  44
mean       NaN    NaN       NaN            NaN                 NaN
min        NaN    NaN       NaN            NaN                 NaN
25%        NaN    NaN       NaN            NaN                 NaN
50%        NaN    NaN       NaN            NaN                 NaN
75%        NaN    NaN       NaN            NaN                 NaN
max        NaN    NaN       NaN            NaN                 NaN
std        NaN    NaN       NaN            NaN                 NaN

              country                     date_added  release_year rating  \
count           10005                          10835       10835.0  10835
unique            127                            NaN          74.0     14
top     United States                            NaN        2018.0  TV-MA
freq             3683                            NaN        1389.0   3749
mean              NaN  2019-05-10 16:50:03.599446272           NaN    NaN
min               NaN            2008-01-01 00:00:00           NaN    NaN
25%               NaN            2018-04-01 00:00:00           NaN    NaN
50%               NaN            2019-07-02 00:00:00           NaN    NaN
75%               NaN            2020-08-19 12:00:00           NaN    NaN
max               NaN            2021-09-25 00:00:00           NaN    NaN
std               NaN                            NaN           NaN    NaN

       duration                    listed_in  \
count     10835                        10835
unique      220                          513
```

```
top     1 Season  Dramas, International Movies
freq        1985                          485
mean         NaN                          NaN
min          NaN                          NaN
25%          NaN                          NaN
50%          NaN                          NaN
75%          NaN                          NaN
max          NaN                          NaN
std          NaN                          NaN

                                                description    year_added  \
count                                                 10835  10835.000000
unique                                                 8765           NaN
top     A blend of cultural nuance and mesmerizing tec…            NaN
freq                                                     12           NaN
mean                                                    NaN   2018.856853
min                                                     NaN   2008.000000
25%                                                     NaN   2018.000000
50%                                                     NaN   2019.000000
75%                                                     NaN   2020.000000
max                                                     NaN   2021.000000
std                                                     NaN      1.584812

         month_added
count   10835.000000
unique           NaN
top              NaN
freq             NaN
mean        6.624181
min         1.000000
25%         4.000000
50%         7.000000
75%        10.000000
max        12.000000
std         3.460552
```

# 1 Non-Graphical Analysis: Value counts and unique attributes

[52]:
```
df1['type'].unique()
```

[52]:
```
array(['Movie', 'TV Show'], dtype=object)
```

2 'type' of content is present in the Dataset, 'Movie', 'TV Show':

[53]:
```
movies  = df1.loc[df1['type'] == 'Movie']
tv_shows = df1.loc[df1['type'] == 'TV Show']
```

[54]:
```
movies.duration.value_counts()
```

[54]:
```
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
```

[57]:
```
tv_shows.duration.value_counts()
```

[57]:
```
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
```

As movies and TV shows both have different format for duration, let's change duration for movies as minutes & TV shows as seasons.

[58]:
```
#Movies
movies['duration'] = movies['duration'].str[:-3]
movies['duration'] = movies['duration'].astype('float')
movies.rename({'duration': 'duration_in_minutes'} ,axis = 1 , inplace = True)

#Tv-Shows
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)
```

```
<ipython-input-58-de571af18c8e>:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  movies['duration'] = movies['duration'].str[:-3]
<ipython-input-58-de571af18c8e>:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  movies['duration'] = movies['duration'].astype('float')
<ipython-input-58-de571af18c8e>:4: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  movies.rename({'duration': 'duration_in_minutes'} ,axis = 1 , inplace = True)
<ipython-input-58-de571af18c8e>:7: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  tv_shows['duration'] = tv_shows.duration.str[:-7].apply(lambda x : x.strip())
<ipython-input-58-de571af18c8e>:8: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  tv_shows['duration'] = tv_shows['duration'].astype('float')
<ipython-input-58-de571af18c8e>:9: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  tv_shows.rename({'duration': 'duration_in_seasons'} ,axis = 1 , inplace =
True)
```

[59]:
```
tv_shows.duration_in_seasons
```

[59]:
```
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
```

[67]:
```
movies.duration_in_minutes
```

[67]:
```
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
```

The Earliest added movie and tv shows with their name in the Dataset.

[64]:
```
earliest_movie = movies.loc[movies.date_added.idxmin()]
latest_movie = movies.loc[movies.date_added.idxmax()]

earliest_tv_show = tv_shows.loc[tv_shows.date_added.idxmin()]
latest_tv_show = tv_shows.loc[tv_shows.date_added.idxmax()]

print("Earliest Movie Added:")
print(earliest_movie[['title', 'date_added']])
print("\nLatest Movie Added:")
print(latest_movie[['title', 'date_added']])

print("\nEarliest TV Show Added:")
print(earliest_tv_show[['title', 'date_added']])
print("\nLatest TV Show Added:")
print(latest_tv_show[['title', 'date_added']])
```

```
Earliest Movie Added:
title         To and From New York
date_added     2008-01-01 00:00:00
Name: 5957, dtype: object
```

```
Latest Movie Added:
title         Dick Johnson Is Dead
date_added     2021-09-25 00:00:00
Name: 0, dtype: object

Earliest TV Show Added:
title             Dinner for Five
date_added    2008-02-04 00:00:00
Name: 6611, dtype: object

Latest TV Show Added:
title                Blood & Water
date_added    2021-09-24 00:00:00
Name: 1, dtype: object
```

[69]:
```
df1.release_year.min() , df1.release_year.max()
```

[69]:
```
(1925, 2021)
```

The Contents/shows added in this dataset ranges between 1925 and 2021

[70]:
```
df1.groupby(['type' , 'rating'])['show_id'].count()
```

[70]:
```
type     rating
Movie    G              41
         NC-17           3
         NR             80
         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
         UR              3
TV Show  NR              6
         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
```

the number of content released in each type in Netflix bifercation on Ratings.

## 2 Pre-processing Country Data.

[71]:
```
df1['country'].value_counts()
```

[71]:
```
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
```

- Many movies has multiple countries as comma separated values, which leads to analyse number of movies produced by country.
- To have ease of group by country let's unnest them in a separate df.

[72]:
```
cntry_df = df1[['show_id' , 'type' , 'country']]
cntry_df.dropna(inplace = True)
cntry_df['country'] = cntry_df['country'].apply(lambda x : x.split(','))
cntry_df = cntry_df.explode('country')
cntry_df
```

```
<ipython-input-72-ef16d79b7733>:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  cntry_df.dropna(inplace = True)
<ipython-input-72-ef16d79b7733>:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

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

[72]:

| | 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]
```

[75]:
```
cntry_df.loc[cntry_df['country'] == '']
```

[75]:
```
      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
```

[76]:
```
cntry_df = cntry_df.loc[cntry_df['country'] != '']
```

[ ]:
```
cntry_df['country'] = cntry_df['country'].str.strip()
```

[83]:
```
cntry_df['country'].nunique()
```

[83]:
```
122
```

**Netflix has movies from 122 Countries.**

[84]:
```
n = cntry_df.groupby(['country' , 'type'])['show_id'].count().reset_index()
n.pivot(index = ['country'] , columns = 'type' , values = 'show_id').
 ↪sort_values('Movie',ascending = False)
```

[84]:
```
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]
```

Number of contents produced in each countries.

## 3 Pre-processing Director Data.

[86]:
```
df1['director'].value_counts()
```

[86]:
```
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
```

- Many movies' has multiple Directors as comma separated values, which leads to analyse number of movies produced by a director.
- To analyse let's unnest this in a separate df.

[87]:
```
dir_df = df1[['show_id' , 'type' , 'director']]
dir_df.dropna(inplace = True)
dir_df['director'] = dir_df['director'].apply(lambda x : x.split(','))
dir_df
```

```
<ipython-input-87-c2b6c9a62b83>:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  dir_df.dropna(inplace = True)
<ipython-input-87-c2b6c9a62b83>:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
```

```
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  dir_df['director'] = dir_df['director'].apply(lambda x : x.split(','))
```

[87]:

| | 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]

[88]:
```
dir_df = dir_df.explode('director')
dir_df['director'] = dir_df['director'].str.strip()
```

[90]:
```
dir_df.director.apply(lambda x : True if len(x) == 0 else False).value_counts()
```

[90]:
```
director
False    6978
Name: count, dtype: int64
```

[92]:
```
dir_df
```

[92]:

| | 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]

[94]:
```
dir_df['director'].nunique()
```

[94]:
```
4993
```

**There are total 4993 directors have their Contents in this dataset.**

[95]:
```
m = dir_df.groupby(['director' , 'type'])['show_id'].count().reset_index()
m.pivot(index= ['director'] , columns = 'type' , values = 'show_id').
 ↪sort_values('Movie' ,ascending = False)
```

[95]:
```
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]
```

Movies/Tv_shows direceted by each director.

## 4 Pre-processing Genre Data.

[97]:
```
genre_df = df1[['show_id' , 'type', 'listed_in']]
genre_df['listed_in'] = genre_df['listed_in'].apply(lambda x : x.split(','))
genre_df = genre_df.explode('listed_in')
genre_df['listed_in'] = genre_df['listed_in'].str.strip()
```

```
<ipython-input-97-048e4a3d10e9>:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

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

[99]:
```
genre_df
```

[99]:
```
     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]
```

[101]:
```
genre_df.listed_in.nunique()
```

[101]:
```
42
```

[100]:
```
genre_df.listed_in.unique()
```

[100]:
```
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)
```

**available contents which fall in this 42 genres are Listed above.**

[103]:
```
df1.merge(genre_df , on = 'show_id' ).groupby(['type_y'])['listed_in_y'].
 ↪nunique()
```

[103]:
```
type_y
Movie      20
TV Show    22
Name: listed_in_y, dtype: int64
```

Movies of 20 genres and Tv_shows of 22 genres are listed in the dataset.

[105]:
```
c= genre_df.groupby(['listed_in' , 'type'])['show_id'].count().reset_index()
c.pivot(index = 'listed_in' , columns = 'type' , values = 'show_id').
 ↪sort_index()
```

[105]:
```
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 |

**Total Movies/Tv Shows in each genre.**

## 5 Pre-processing Actor Data.

[106]:
```
cast_df = df1[['show_id' , 'type' ,'cast']]
cast_df.dropna(inplace = True)
cast_df['cast'] = cast_df['cast'].apply(lambda x : x.split(','))
cast_df = cast_df.explode('cast')
cast_df
```

```
<ipython-input-106-cad1dac78b54>:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  cast_df.dropna(inplace = True)
<ipython-input-106-cad1dac78b54>:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

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

[106]:

| | 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]

[107]:
```
cast_df['cast'] = cast_df['cast'].str.strip()
```

[108]:
```
cast_df[cast_df['cast'] == ''].sum()
```

[108]:
```
show_id    0
type       0
cast       0
dtype: object
```

[109]:
```
cast_df.cast.nunique()
```

[109]:
```
36403
```

**Total 36403 actors have been casted in the Movies/Shows in the dataset.**

[110]:
```
nc = cast_df.groupby(['cast' , 'type'])['show_id'].count().reset_index()
nc.pivot(index = 'cast' , columns = 'type' , values = 'show_id').
 ↪sort_values('TV Show' , ascending = False)
```

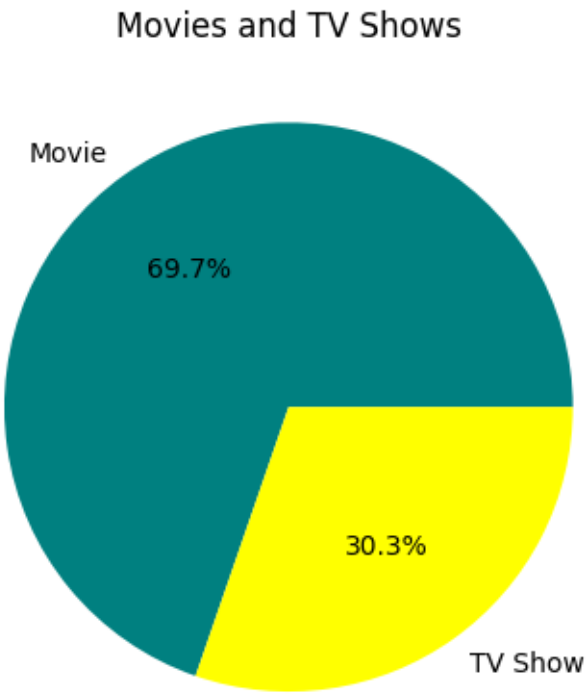
[110]:
```
type              Movie  TV Show
cast
Takahiro Sakurai    7.0     25.0
Yuki Kaji          10.0     19.0
Junichi Suwabe      4.0     17.0
Daisuke Ono         5.0     17.0
Ai Kayano           2.0     17.0
…                   …       …
Şerif Sezer         1.0      NaN
Şevket Çoruh        1.0      NaN
Şinasi Yurtsever    3.0      NaN
Şükran Ovalı        1.0      NaN
Ṣọpẹ́ Dìrísù        1.0      NaN

[36403 rows x 2 columns]
```

number of movies and/or shows done by each actor.

# 6 4. Visual Analysis - Univariate, Bivariate after pre-processing of the data

### 6.0.1 Distribution of content across the different types

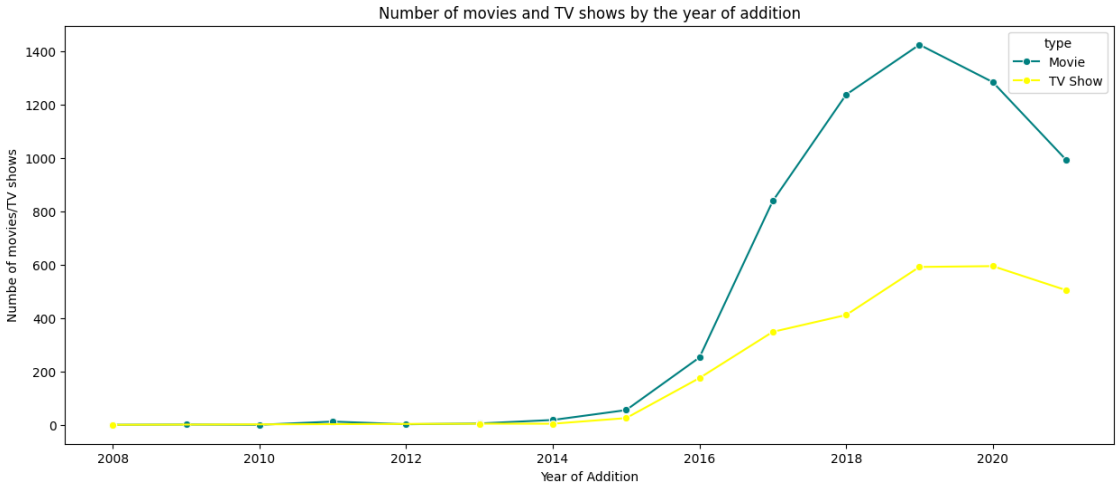
[112]:
```
types = df1.type.value_counts()
plt.pie(types,  labels=types.index, autopct='%1.1f%%' , colors = ['teal' ,␣
 ↪'yellow'])
plt.title('Movies and TV Shows')
plt.show()
```




### 6.0.2 Distribution of Contents added in Netflix along time.

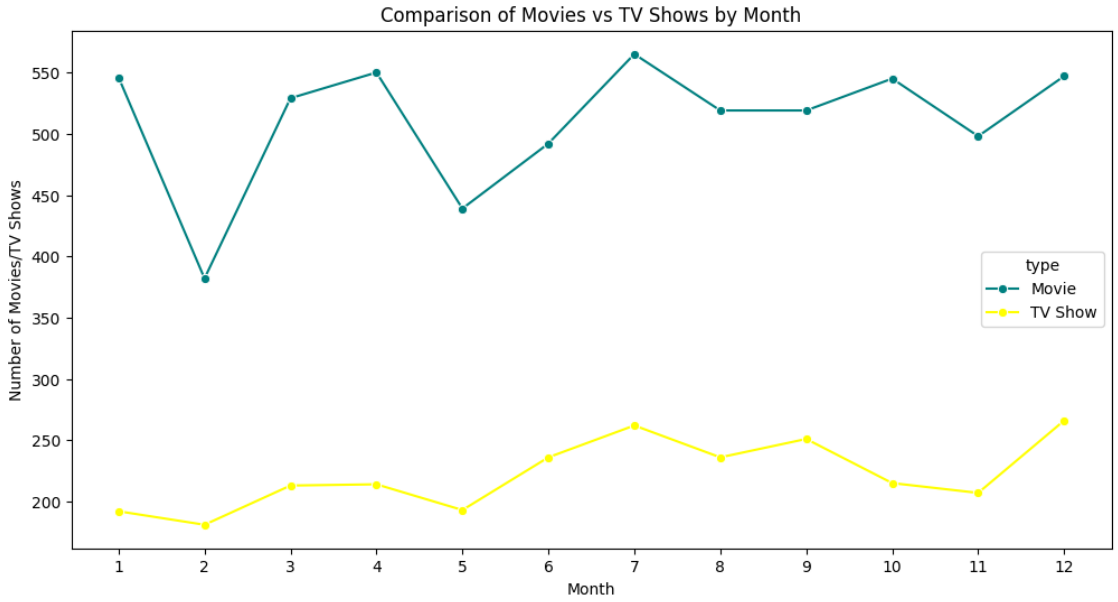
[143]:
```
d = df1.groupby(['year_added' ,'type' ])['show_id'].count().reset_index()
d.rename({'show_id' : 'total movies/TV shows'}, axis = 1 , inplace = True)
```

[144]:
```
plt.figure(figsize = (15,6))
sns.lineplot(data = d , x = 'year_added' , y = 'total movies/TV shows' , hue =␣
 ↪'type', marker = 'o',ms =6,palette=['teal', 'yellow'])
plt.xlabel('Year of Addition' )
plt.ylabel('Numbe of movies/TV shows' )
plt.title('Number of movies and TV shows by the year of addition')
plt.show()
```




**Observation:** * The trend of addition of Movies and Shows started to skyrocket from 2015 which peaked in 2019 with 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, most probably due to Pandemic. * Despite the drop, TV shows content have not dropped as drastic as movies. Which is a result of people focusing on TV shows, rather than Movies in recent years.

[234]:
```
monthly_content = df1.groupby(['month_added', 'type'])['show_id'].count().
  ↪reset_index()
monthly_content.rename(columns={'show_id': 'count'}, inplace=True)

plt.figure(figsize=(12, 6))
sns.lineplot(data=monthly_content, x='month_added', y='count', hue='type',␣
  ↪marker='o', palette=['teal', 'yellow'])
plt.xlabel('Month')
plt.ylabel('Number of Movies/TV Shows')
plt.title('Comparison of Movies vs TV Shows by Month')
plt.xticks(range(1, 13))
plt.show()
```



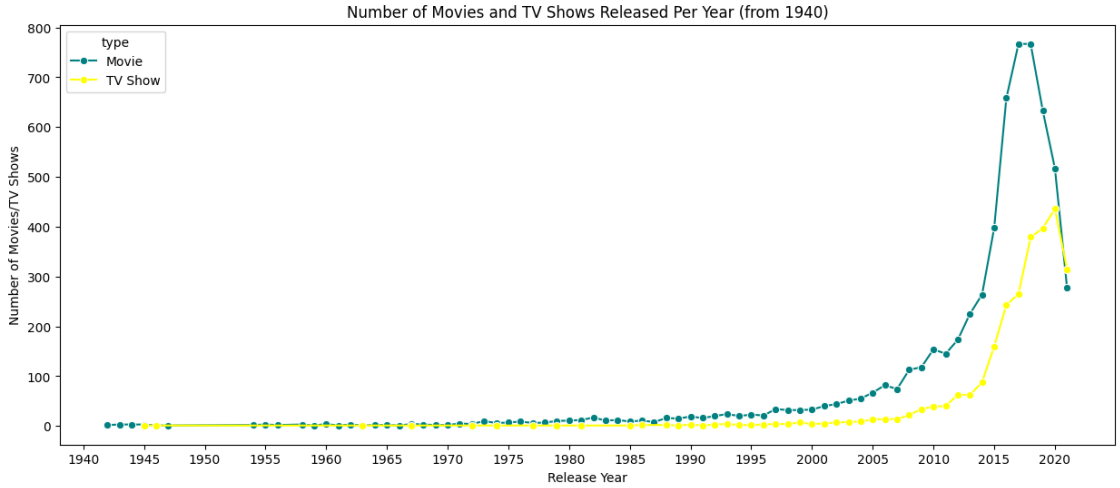

**Observation:**

Clearly the number of movies released per month is much greater that the number of TV Shows released.

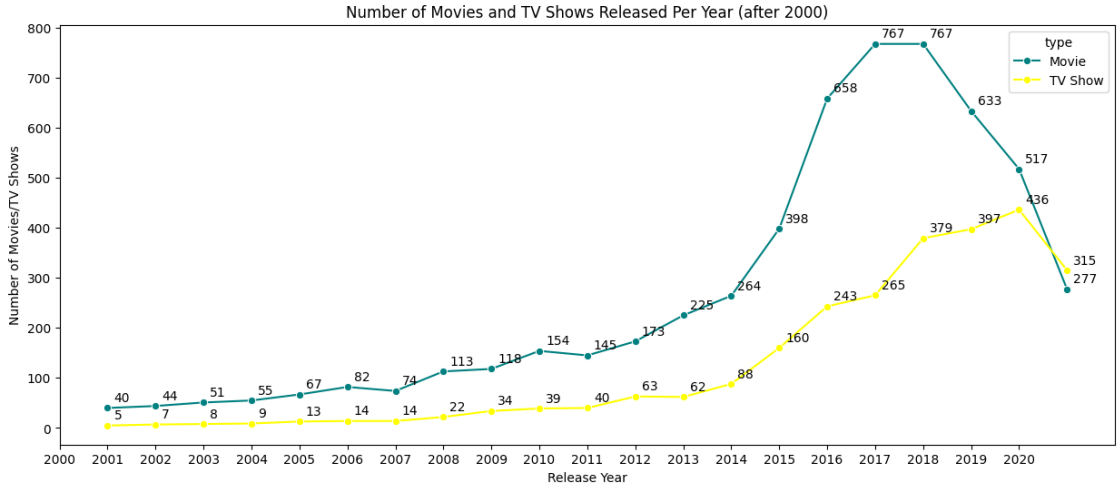
### 6.0.3 Number of movies/shows released per year changed over years(Total and after 2000)

[127]:
```
nd = df1.groupby(['type' , 'release_year'])['show_id'].count().reset_index()
nd.rename({'show_id' : 'total movies/TV shows'}, axis = 1 , inplace = True)
```

[141]:
```
plt.figure(figsize=(15, 6))
sns.lineplot(data=nd[nd['release_year']>1940], x='release_year', y='total␣
↪movies/TV shows', hue='type', marker='o', ms=6,palette=['teal', 'yellow'])
plt.xlabel('Release Year')
plt.ylabel('Number of Movies/TV Shows')
plt.title('Number of Movies and TV Shows Released Per Year (from 1940)')
plt.xticks(np.arange(1940 , 2021 , 5))
plt.show()
```




[140]:
```
plt.figure(figsize=(15, 6))
sns.lineplot(data=nd[nd['release_year']>2000], x='release_year', y='total␣
 ↪movies/TV shows', hue='type', marker='o', ms=6, palette=['teal', 'yellow'])
plt.xlabel('Release Year')
plt.ylabel('Number of Movies/TV Shows')
plt.title('Number of Movies and TV Shows Released Per Year (after 2000)')
plt.xticks(np.arange(2000 , 2021 , 1))

for x, y, type_val in zip(nd[nd['release_year'] > 2000]['release_year'],␣
 ↪nd[nd['release_year'] > 2000]['total movies/TV shows'],␣
 ↪nd[nd['release_year'] > 2000]['type']):
    plt.annotate(str(y), xy=(x, y), xytext=(5, 5), textcoords='offset points')

plt.show()
```



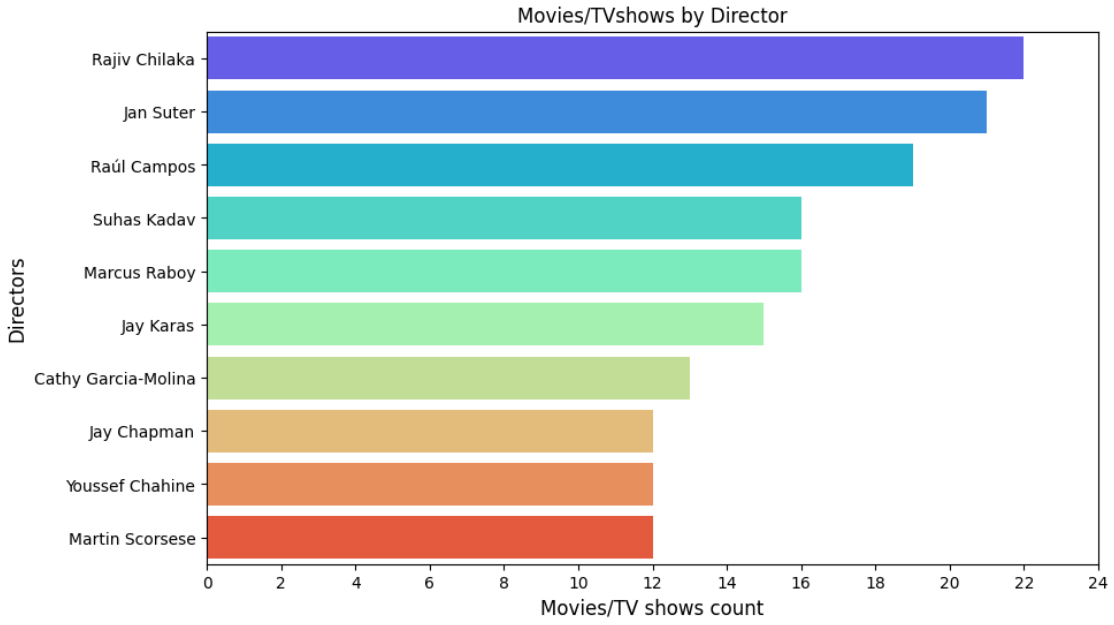
Observation: * Tremendously grown in numbers after 2014 and 2018 marks the peak of number of movies and TV shows released. * Since 2018, A drop in movies is seen and rise in TV shows is observed clearly, and TV shows surpasses the movies count in 2020's. * In recent years TV shows are focussed more than Movies.

### 6.0.4 Total movies/TV shows by each director(top 10)

[145]:
```
top_10_dir = dir_df.director.value_counts().head(10).index
df_new = dir_df.loc[dir_df['director'].isin(top_10_dir)]
```

[153]:
```
plt.figure(figsize= (10 , 6))
sns.countplot(data = df_new , y = 'director' , order = top_10_dir , orient =␣
 ↪'v',palette='rainbow')
plt.xlabel('total_movies/TV shows' , fontsize = 12)
plt.xlabel('Movies/TV shows count')
plt.ylabel('Directors' , fontsize = 12)
plt.title('Movies/TVshows by Director')
plt.xticks(np.arange(0 , 25 , 2))
plt.show()
```

```
<ipython-input-153-57fa0c717139>:2: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in
v0.14.0. Assign the `y` variable to `hue` and set `legend=False` for the same
effect.

  sns.countplot(data = df_new , y = 'director' , order = top_10_dir , orient =
'v',palette='rainbow')
```



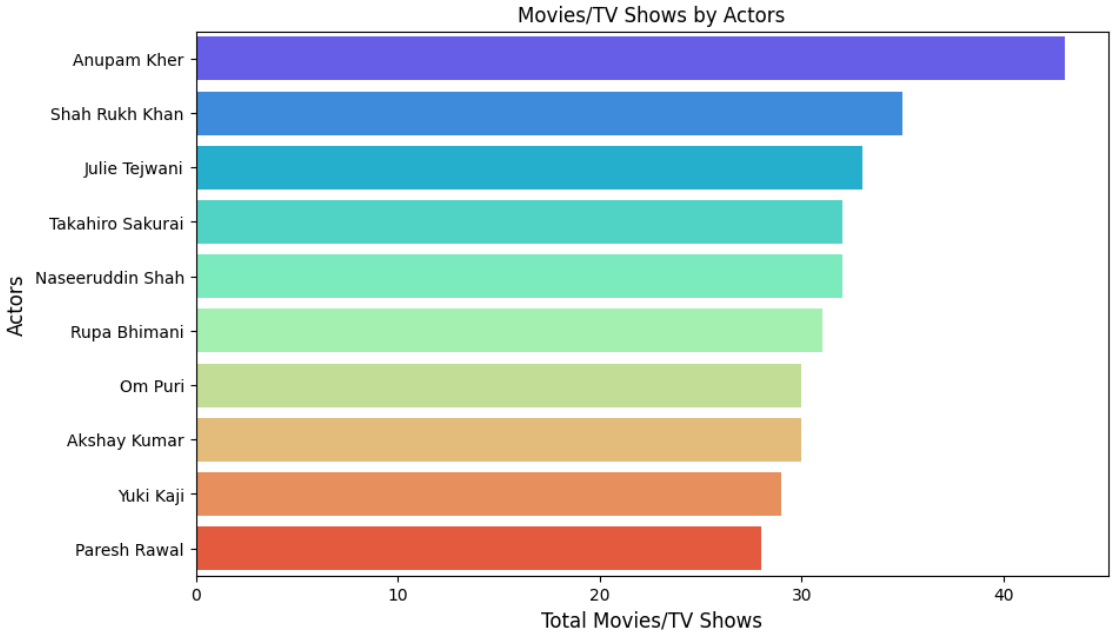
**Observation:**

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

### 6.0.5 Top 10 actors by number of movies and Tv shows done.

[161]:
```
top_10_actors = cast_df.cast.value_counts().head(10).index
df_new = cast_df.loc[cast_df['cast'].isin(top_10_actors)]
plt.figure(figsize=(10, 6))
sns.countplot(data=df_new, y='cast', order=top_10_actors, orient='v',␣
 ↪palette='rainbow')
plt.xlabel('Total Movies/TV Shows', fontsize=12)
plt.ylabel('Actors', fontsize=12)
plt.title('Movies/TV Shows by Actors')
plt.show()
```

```
<ipython-input-161-380496a91738>:6: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in
v0.14.0. Assign the `y` variable to `hue` and set `legend=False` for the same
effect.

  sns.countplot(data=df_new, y='cast', order=top_10_actors, orient='v',
palette='rainbow')
```



# 7 Outliers Check

### 7.0.1 Checking Outliers for number of movies directed by each director

[158]:
```
o = dir_df.director.value_counts()
o
```

[158]:
```
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
```

[166]:
```
def calculate_outliers(data):

    q1 = np.percentile(data, 25)

    q3 = np.percentile(data, 75)

    iqr = q3 - q1

    lower_bound = q1 - 1.5 * iqr
    upper_bound = q3 + 1.5 * iqr

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

    return outliers


def calculate_max_occurred_value(data):
    unique_values, value_counts = np.unique(data, return_counts=True)

    max_count_index = np.argmax(value_counts)

    max_occurred_value = unique_values[max_count_index]
```

```
    return max_occurred_value
```

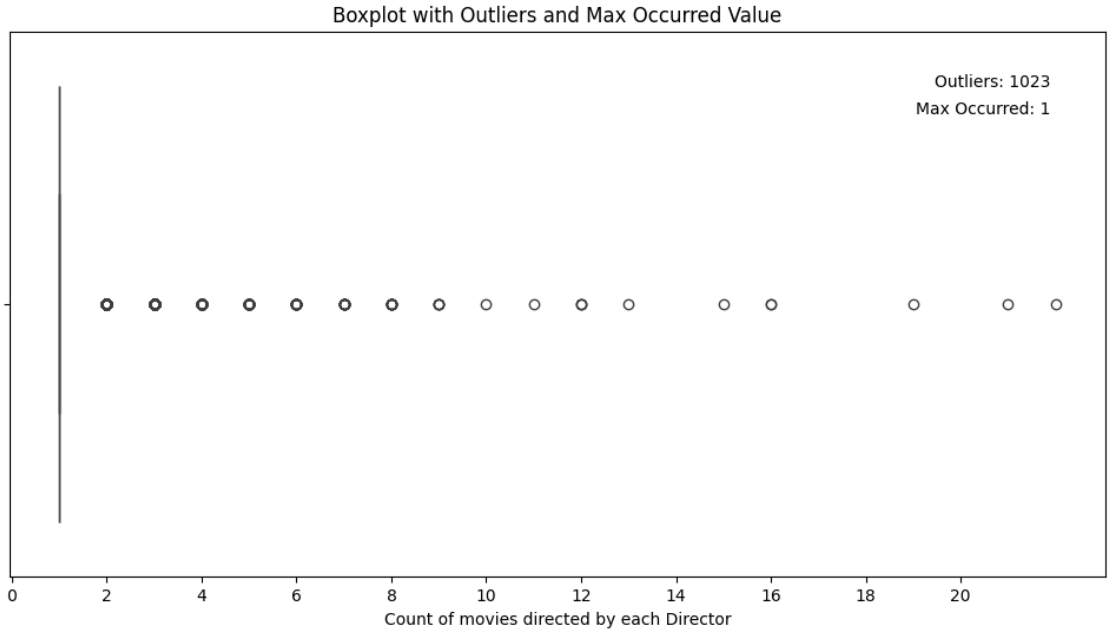
[168]:
```
outliers = calculate_outliers(o)
max_occurred_value = calculate_max_occurred_value(o)
set(outliers)
```

[168]:
```
{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 19, 21, 22}
```

[169]:
```
max_occurred_value
```

[169]:
```
1
```

[171]:
```
plt.figure(figsize = (12,6))
sns.boxplot(data=o, showfliers=True, whis=1.5 , orient = 'h')

outliers = calculate_outliers(o)
max_occurred_value = calculate_max_occurred_value(o)

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")

plt.show()
```




**Observation:**

The 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.

### 7.0.2 Total movies/TV shows by each country

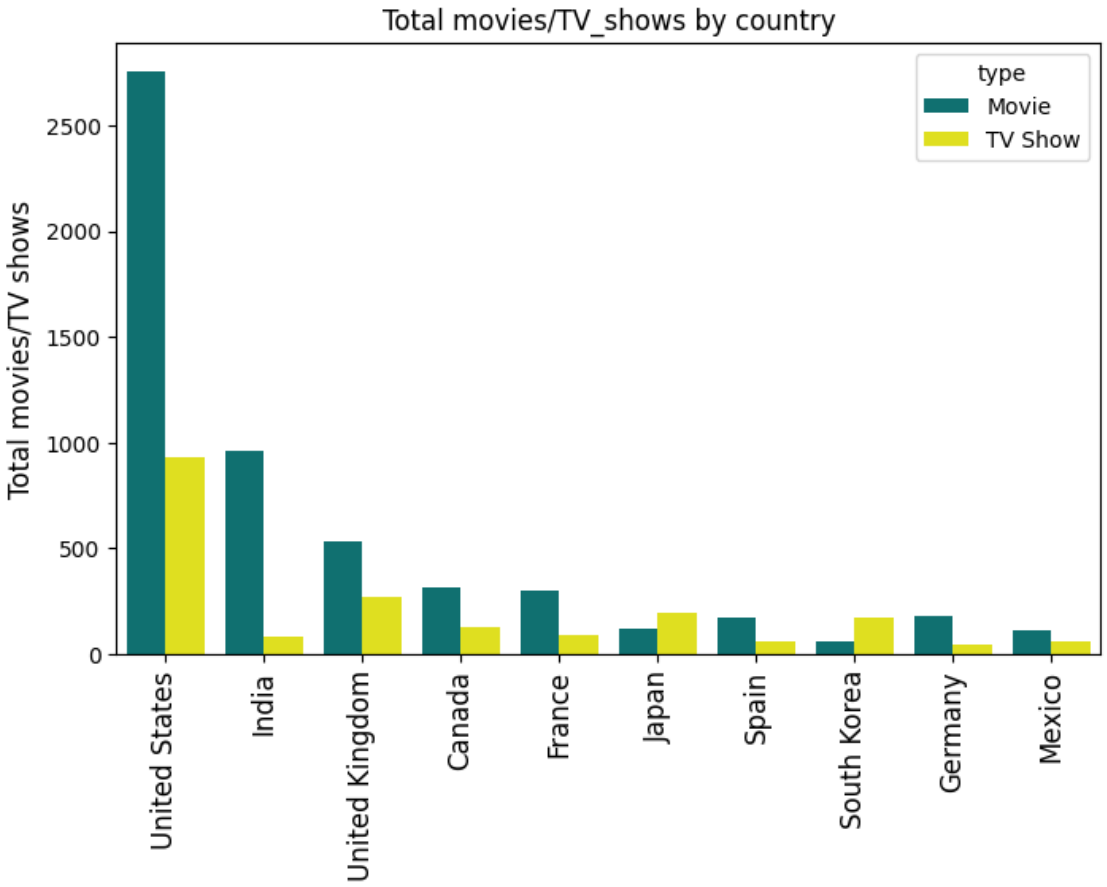
[172]:
```
top_10_country = cntry_df.country.value_counts().head(10).index
df2_country = cntry_df.loc[cntry_df['country'].isin(top_10_country)]
```

[173]:
```
x = df2_country.groupby(['country' , 'type'])['show_id'].count().reset_index()
x.pivot(index = 'country' , columns = 'type' , values = 'show_id').
 ↪sort_values('Movie',ascending = False)
```

[173]:

| 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 |

[175]:
```
plt.figure(figsize= (8,5))
sns.countplot(data = df2_country , x = 'country' , order = top_10_country , hue␣
 ↪= 'type',palette=['Teal','yellow'])
plt.xticks(rotation = 90 , fontsize = 12)
plt.ylabel('Total movies/TV shows' , fontsize = 12)
plt.xlabel('')
plt.title('Total movies/TV_shows by country')
plt.show()
```

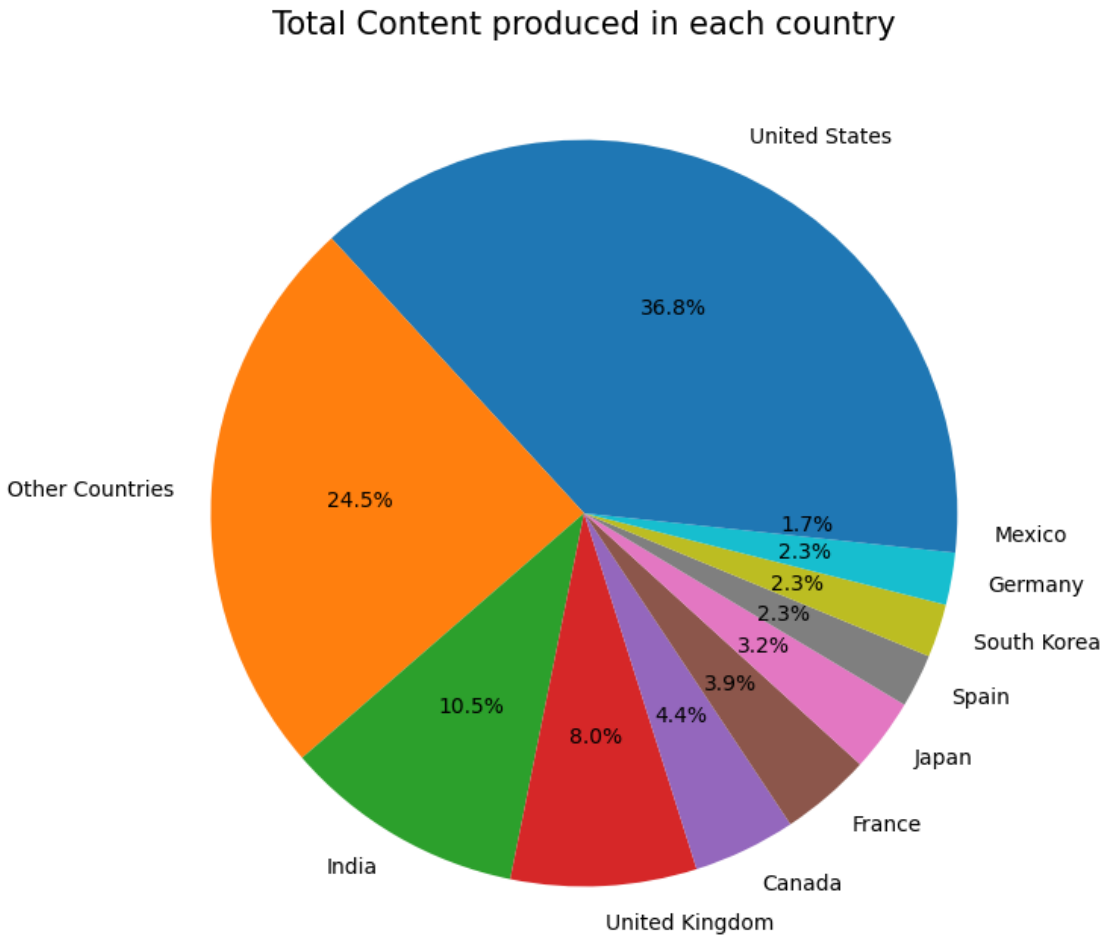



[176]:
```
top_10_country = cntry_df.country.value_counts().head(10).index
cntry_df['cat'] = cntry_df['country'].apply(lambda x : x if x in top_10_country␣
 ↪else 'Other Countries' )
```

```
<ipython-input-176-f2fc36a8be10>:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
```

```
  cntry_df['cat'] = cntry_df['country'].apply(lambda x : x if x in
top_10_country else 'Other Countries' )
```

[177]:
```
x = cntry_df.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()
```

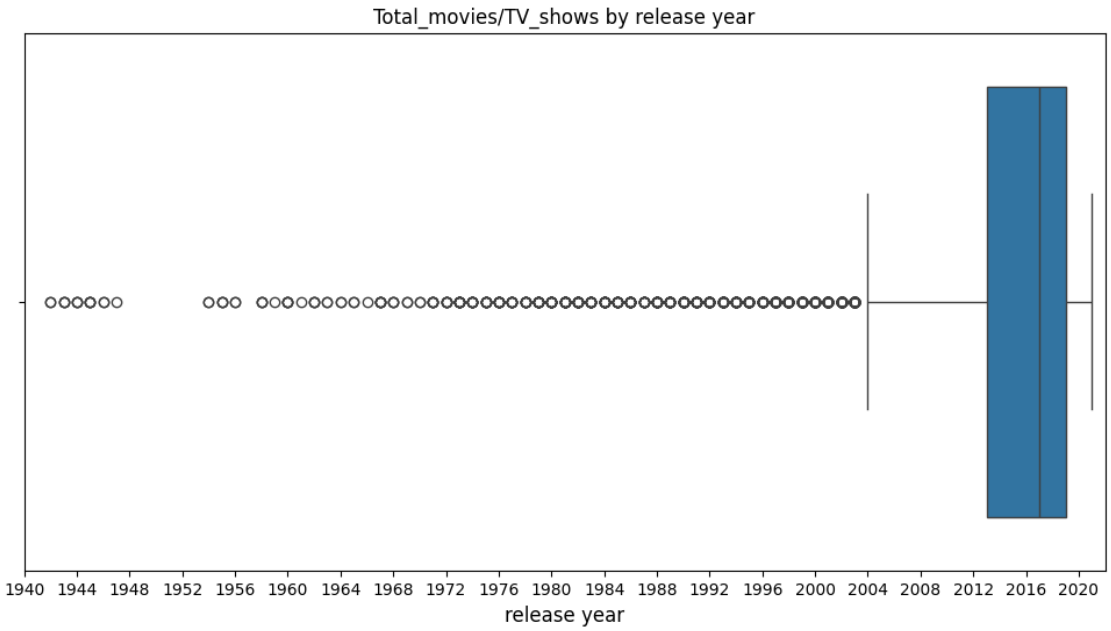



**Observation:**

- 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.

### 7.0.3 Total content distribution by release year of the content.

[182]:
```
plt.figure(figsize= (12,6))
sns.boxplot(data = df1 , x = 'release_year')
plt.xlabel('release year' , fontsize = 12)
plt.title('Total_movies/TV_shows by release year')
plt.xticks(np.arange(1940 , 2021 , 4))
plt.xlim((1940 , 2022))
plt.show()
```



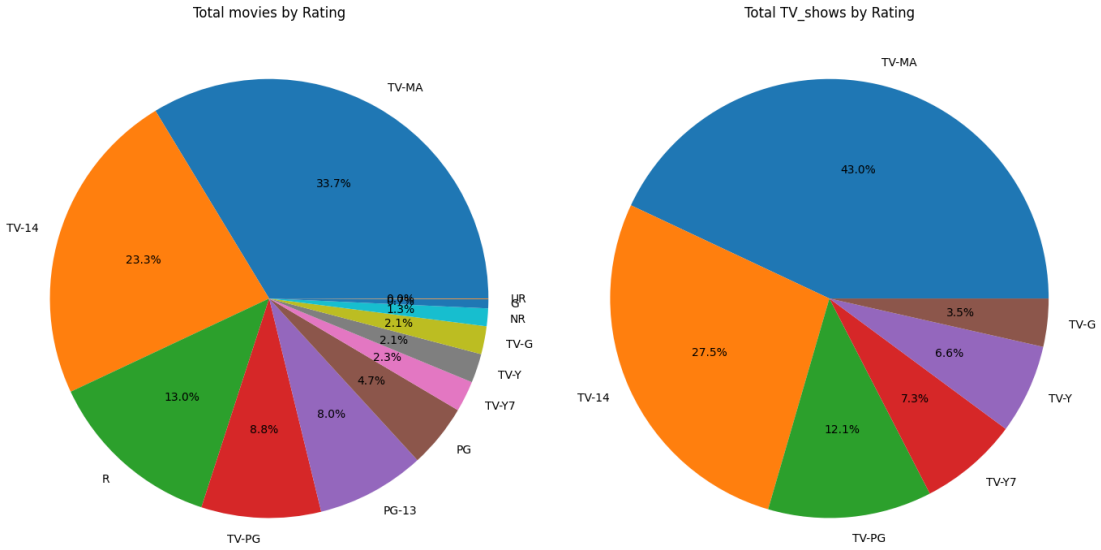

**Observations:**

- Netflix have major content which is released in the year range 2004-2021
- It seems that the content older than year 2000 is almost missing from the Netflix.

### 7.0.4 Total movies/TV shows distribution by rating of the content

[184]:
```
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()
```

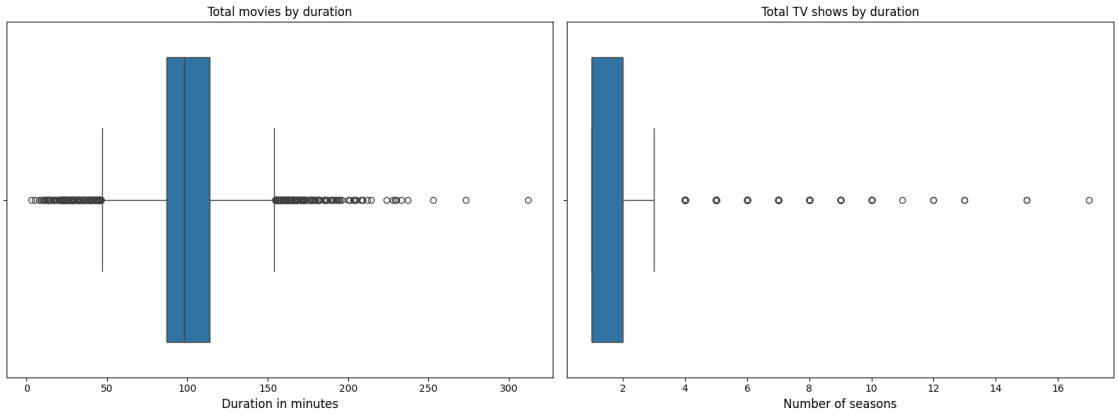



**Observations:**

Most number of movies and TV shows are rated TV-MA (for mature audiences), followed by TV-14 & R/TV-PG

### 7.0.5 Total movies/TV shows distribution by duration of the content

[188]:
```
fig, ax = plt.subplots(1,2, figsize=(16,6))

sns.boxplot (data = movies , x = 'duration_in_minutes' ,ax =ax[0])
ax[0].set_xlabel('Duration in minutes' ,  fontsize = 12)
ax[0].set_title('Total movies by duration')

sns.boxplot (data = tv_shows , x = 'duration_in_seasons' , ax = ax[1])
ax[1].set_xlabel('Number of seasons' ,  fontsize = 12)
ax[1].set_title('Total TV shows by duration')

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




**Observations:**

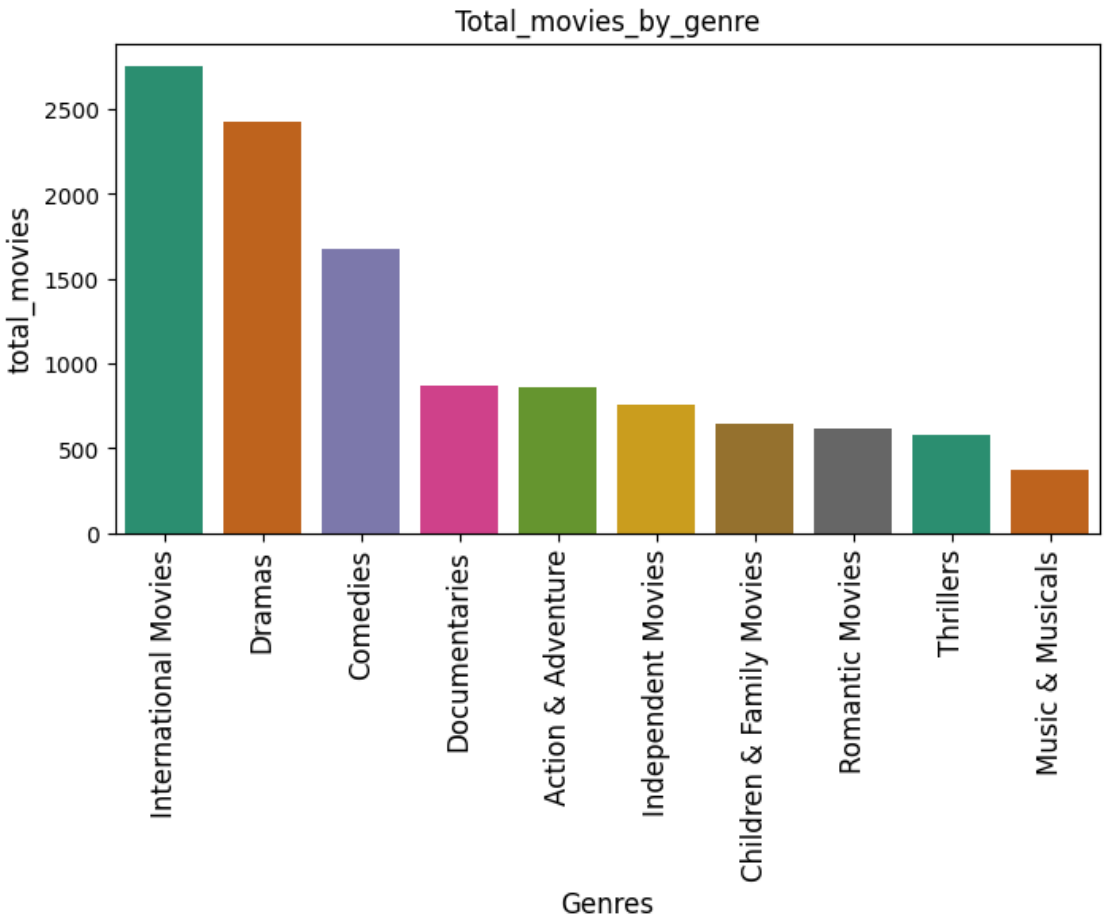
Movie Duration: 50 mins - 150 mins is the range excluding potential outliers (values lying outside the whiskers of boxplot)

TV Show Duration: 1-3 seasons is the range for TV shows excluding potential outliers

### 7.0.6 Total movies/TV shows in each Genre

[197]:
```
top_10_movie_genres = genre_df[genre_df['type'] == 'Movie'].listed_in.
 ↪value_counts().head(10).index
df_movie = genre_df.loc[genre_df['listed_in'].isin(top_10_movie_genres)]

plt.figure(figsize= (8,4))
sns.countplot(data = df_movie , x = 'listed_in' , order = top_10_movie_genres,␣
 ↪palette="Dark2")
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()
```

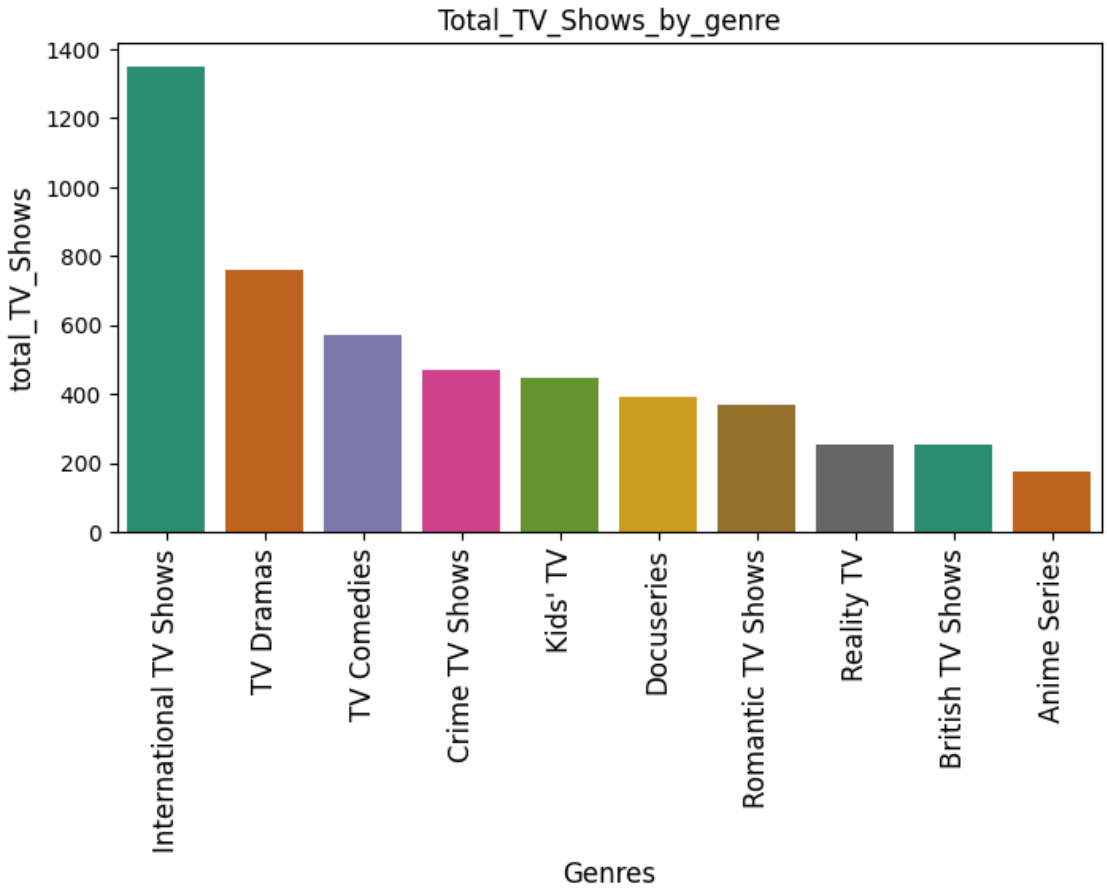
```
<ipython-input-197-204613bc5f81>:5: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in
v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same
effect.

  sns.countplot(data = df_movie , x = 'listed_in' , order = top_10_movie_genres,
palette="Dark2")
```




[198]:
```
top_10_TV_genres = genre_df[genre_df['type'] == 'TV Show'].listed_in.
 ↪value_counts().head(10).index
df_tv = genre_df.loc[genre_df['listed_in'].isin(top_10_TV_genres)]

plt.figure(figsize= (8,4))
sns.countplot(data = df_tv , x = 'listed_in' , order =␣
 ↪top_10_TV_genres,palette="Dark2")
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()
```

```
<ipython-input-198-c5a2507477f6>:5: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in
v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same
effect.
```

```
  sns.countplot(data = df_tv , x = 'listed_in' , order =
top_10_TV_genres,palette="Dark2")
```




**Observation:**

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

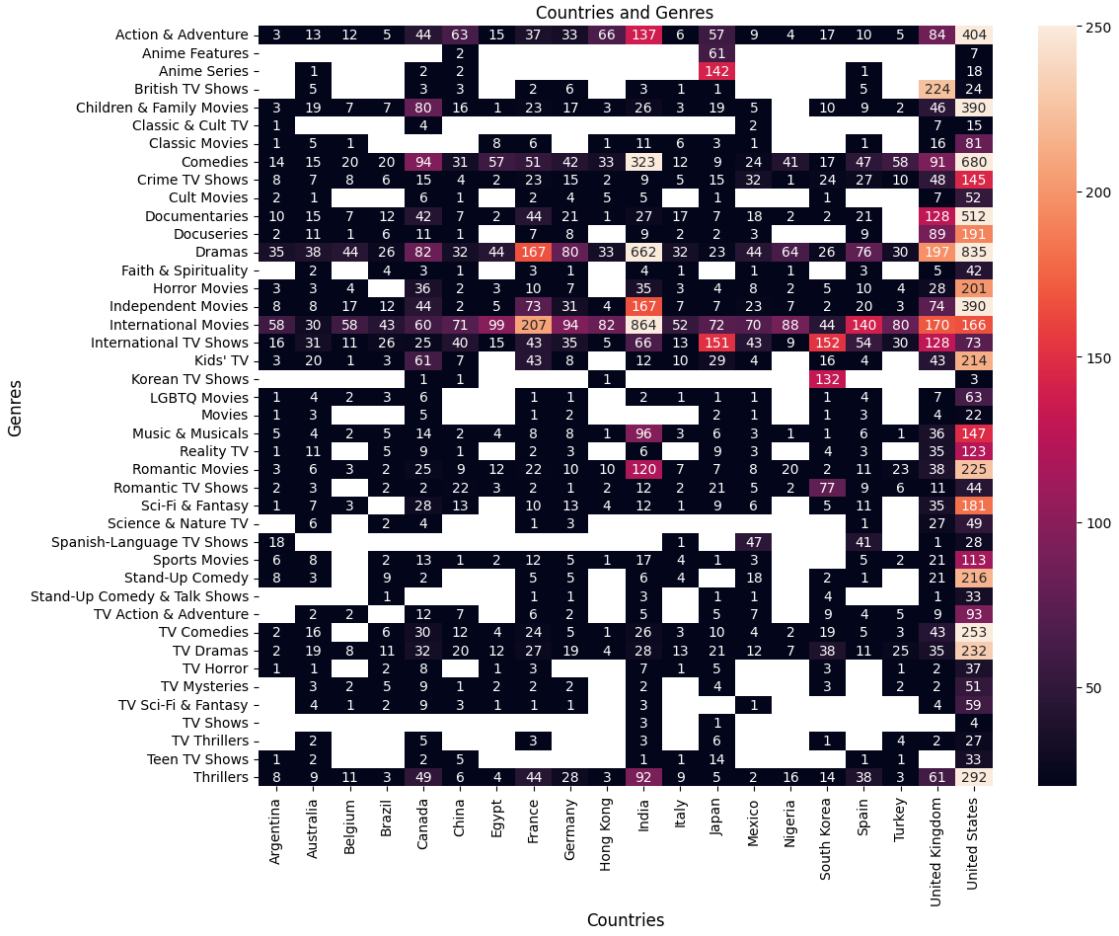
### 7.1 Popular genres in top 20 countries

[199]:
```
top_20_country = cntry_df.country.value_counts().head(20).index
top_20_country = cntry_df.loc[cntry_df['country'].isin(top_20_country)]
```

[200]:
```
x = top_20_country.merge(genre_df , 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')
```

[206]:
```
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 and Genres' , fontsize = 12)
```

[206]:
```
Text(0.5, 1.0, 'Countries and Genres')
```




**Observations:**

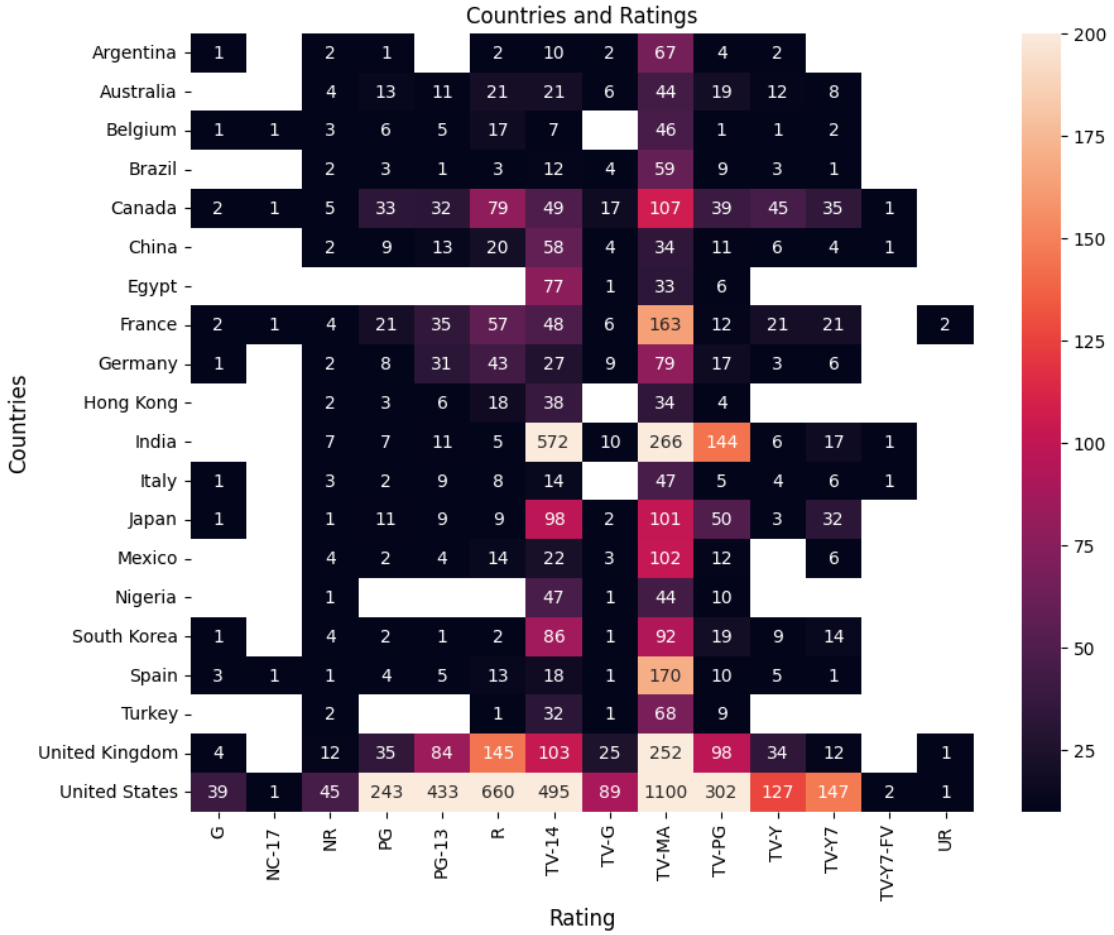
- Maximum International movies are produced in India.
- United States and UK have a good mix of almost all genres.
- Country-specific genres: Korean TV shows (Korea), British TV Shows (UK), Anime features and Anime series (Japan), Spanish TV Shows (Argentina, Mexico and Spain)
- Popular genres across countries: Action & Adventure, Children & Family Movies, Comedies, Dramas, International Movies & TV Shows, TV Dramas, Thrillers.

### 7.1.1 Country-wise Rating of Content

[203]:
```
x = top_20_country.merge(df1 , on = 'show_id').groupby(['country_x' ,␣
↪'rating'])['show_id'].count().reset_index()
country_rating = x.pivot(index = ['country_x'] , columns = 'rating' , values =␣
↪'show_id')
```

[205]:
```
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 and Ratings' , fontsize = 12)
```

[205]:
```
Text(0.5, 1.0, 'Countries and Ratings')
```




**Observations:**

- India also has many titles rated TV-PG, other than TV-MA & TV-14.

- There is scarce content for general audience (TV-G & G) across all countries except US.
- Overall, Netflix has an large amount of adult content across all countries (TV-MA & TV-14).
- NC-17 and TV-Y7-FV is scarce across almost all countries.

### 7.2 The top actors by country

[207]:
```
x = cast_df.merge(cntry_df , 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)
```

[207]:

| | 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 |

[210]:
```
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)
```

[211]:
```
top_5_actors
```

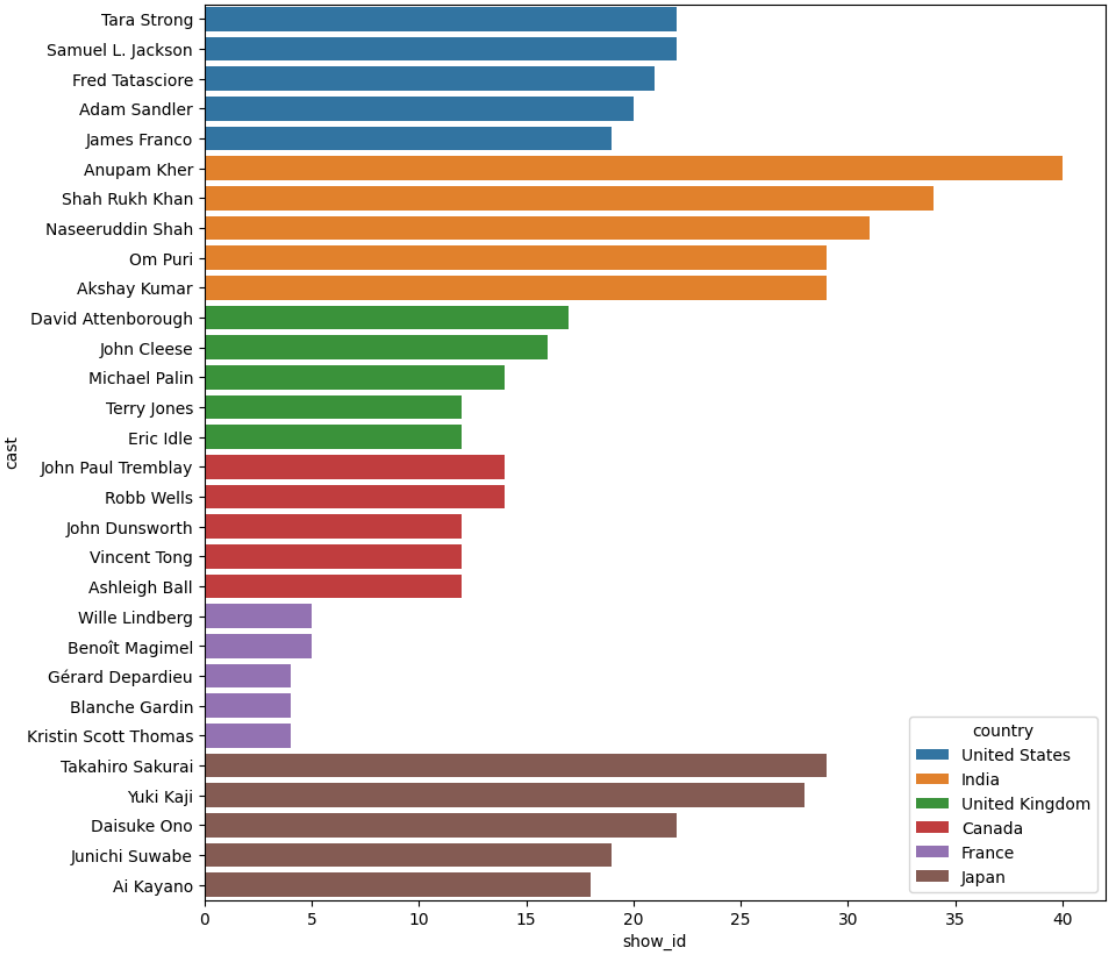
[211]:

| | 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 |

[212]:
```
plt.figure(figsize = (10,10))
sns.barplot(data = top_5_actors , y = 'cast' , x = 'show_id' , hue = 'country')
```

[212]: <Axes: xlabel='show_id', ylabel='cast'>



### 7.3 Top 5 directors by Genre

[213]:
```
genre_list = [ 'Children & Family Movies', 'Comedies','Dramas', 'International␣
 ↪Movies', 'Documentaries' ,
             'International TV Shows', 'Sci-Fi & Fantasy', 'Thrillers',␣
 ↪'Horror Movies']

x = dir_df.merge(genre_df , 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
```

[213]:

| | 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
```

### 7.4 Top 5 genres in each country

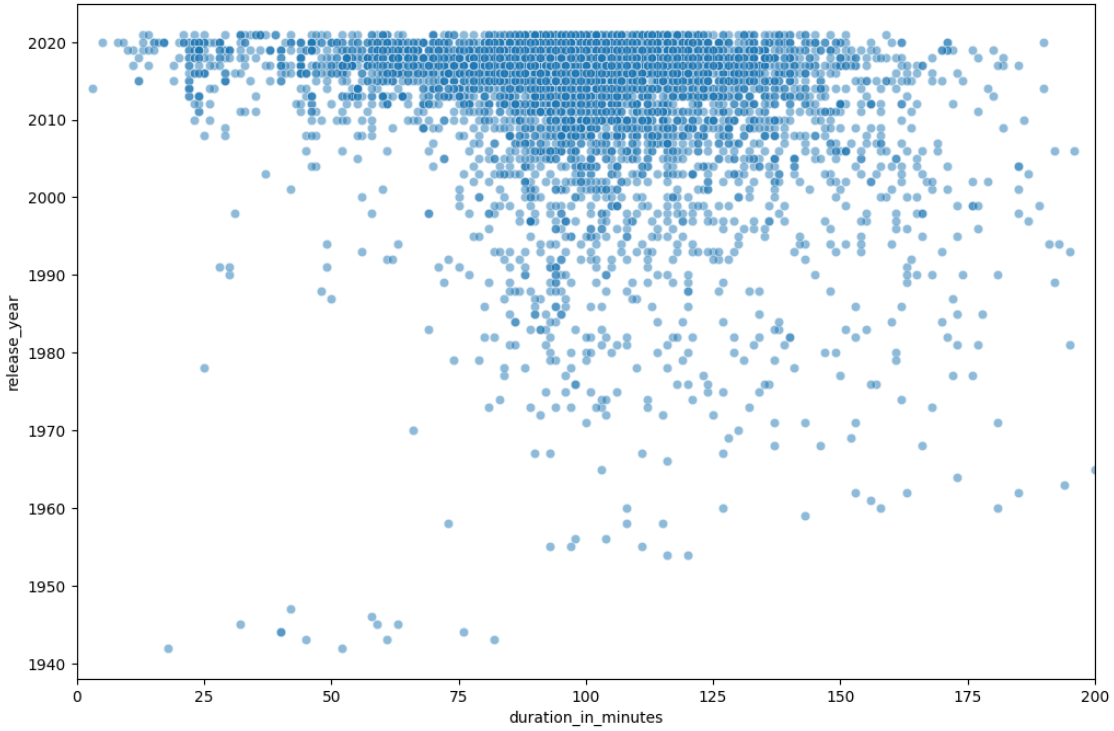
[214]:
```
x = genre_df.merge(cntry_df , on = 'show_id').drop_duplicates()
x = x.groupby(['country' , 'listed_in'])['show_id'].count().reset_index()
x.loc[x['country'] == 'United States'].sort_values('show_id' , ascending =␣
 ↪False).head(5)

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
```

[214]:
```
         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
```

### 7.5 Variation in duration of movies by Release year

[216]:
```
plt.figure(figsize = (12,8))
sns.scatterplot(data=movies, x='duration_in_minutes', y='release_year', alpha=0.
↪5)
plt.xlim((0,200))
plt.show()
```



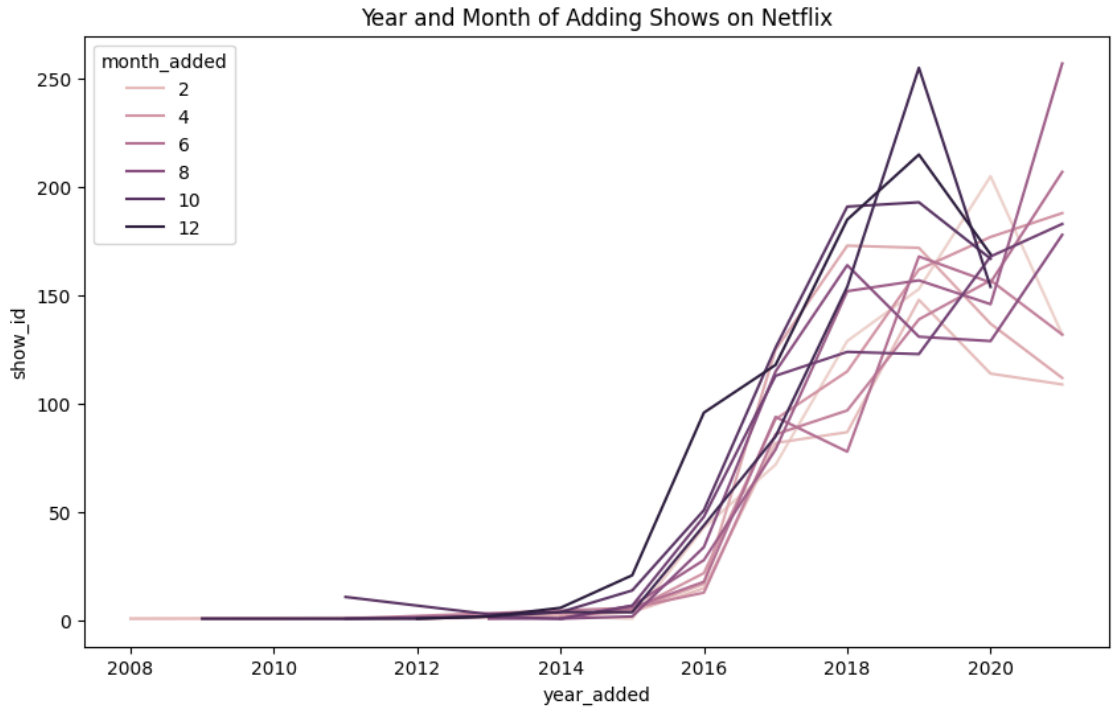

**Observation:**

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.

### 7.6 The best time of the year when maximum content get added on the Netflix

[220]:
```
month_year = df1.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')
```

[220]:
```
Text(0.5, 1.0, 'Year and Month of Adding Shows on Netflix')
```




**Observations:**

- 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 and holidays in Dec and India also has Diwali in Oct-Nov.

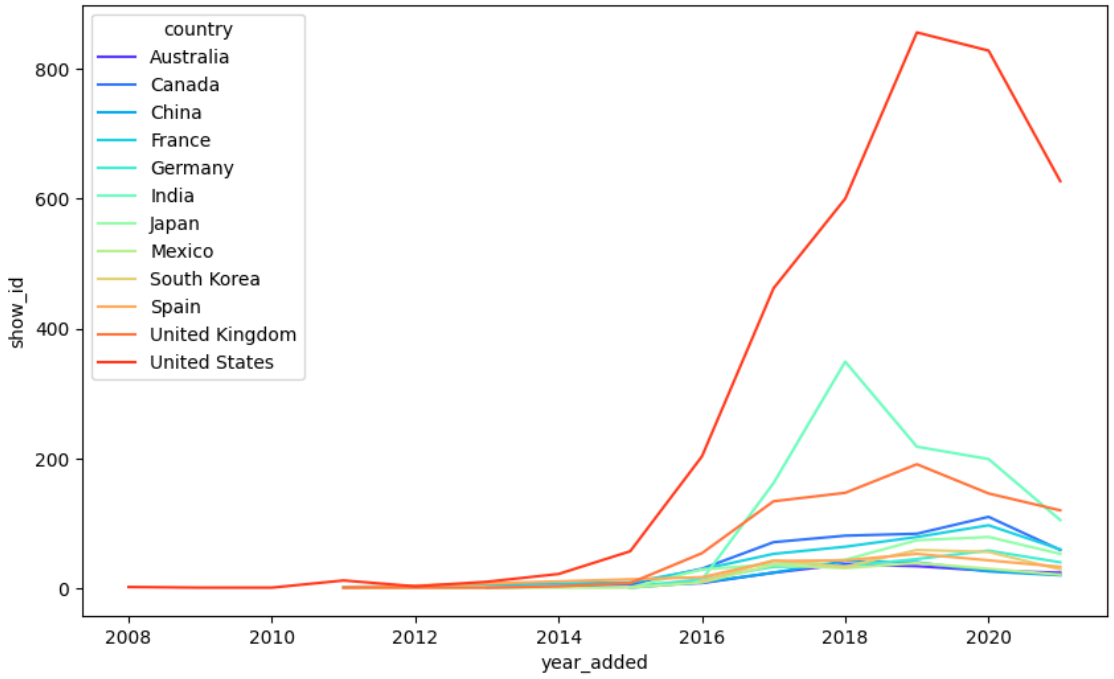
### 7.7 countries that are adding more number of content over the time.

[222]:
```
country_list = cntry_df.country.value_counts().head(12).index
top_12_country = cntry_df.loc[cntry_df['country'].isin(country_list)]
country_year = top_12_country.merge(df1 , on =␣
 ↪'show_id')[['show_id','country_x' ,'type_x' , 'year_added' ]]
country_year.columns = ['show_id', 'country', 'type', 'year_added']
```

[223]:
```
country_year = country_year.groupby(['country' , 'year_added'])['show_id'].
 ↪count().reset_index()
```

[229]:
```
plt.figure(figsize = (10,6))
sns.lineplot(data = country_year , x = 'year_added' , y = 'show_id' , hue =␣
 ↪'country' , palette ='rainbow' )
```

[229]:
```
<Axes: xlabel='year_added', ylabel='show_id'>
```



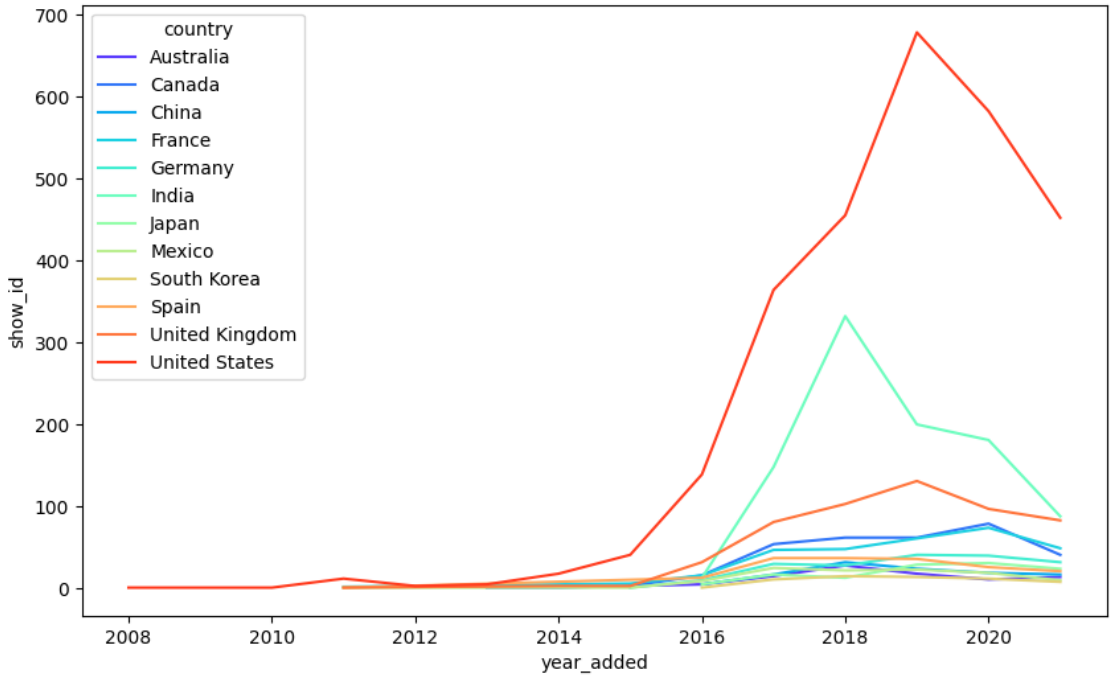

**Observation:**

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.

[231]:
```
country_list = cntry_df.country.value_counts().head(12).index
top_12_country = cntry_df.loc[cntry_df['country'].isin(country_list)]
country_year = top_12_country.merge(df1 , on =␣
 ↪'show_id')[['show_id','country_x' ,'type_x' , 'year_added' ]]
country_year.columns = ['show_id', 'country', 'type', 'year_added']

movie_type = country_year.loc[country_year.type == 'Movie'].groupby(['country'␣
 ↪, 'year_added'])['show_id'].count().reset_index()
tv_type = country_year.loc[country_year.type == 'TV Show'].groupby(['country' ,␣
 ↪'year_added'])['show_id'].count().reset_index()
```

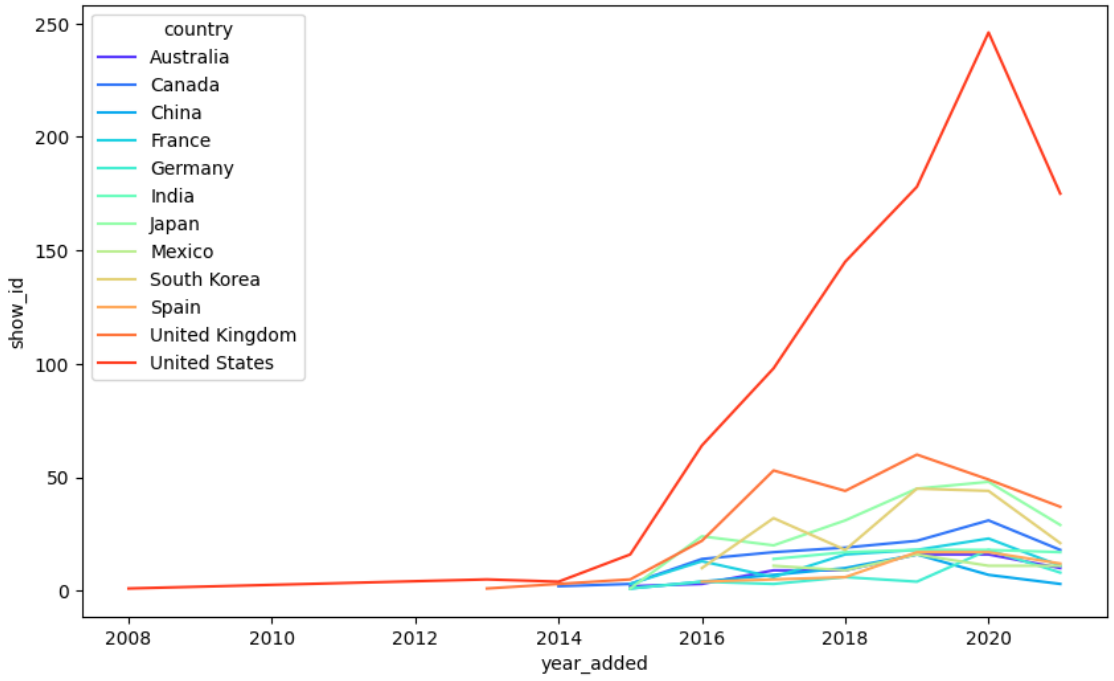
[232]:
```
plt.figure(figsize = (10,6))
sns.lineplot(data = movie_type , x = 'year_added' , y = 'show_id' , hue =␣
 ↪'country' , palette ='rainbow' )
```

[232]:
```
<Axes: xlabel='year_added', ylabel='show_id'>
```




[233]:
```
plt.figure(figsize = (10,6))
sns.lineplot(data = tv_type , x = 'year_added' , y = 'show_id' , hue =␣
↪'country' , palette ='rainbow' )
```

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



**Observation:**

It is observed that United States tops in both movies and TV Shows. India is at 2nd positon in movies but In TV shows United Kingdom is at 2nd position, followed by India ,South Korea , Australia.

It shows in countries like United Kingdom , South Korea , Australia TV Shows popularity is rising more than movies

# 8 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 growth in the content getting added to 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 number of movies released per month is much greater that the number of TV Shows released.
- Netflix has movies from variety of directors. Around **4993 directors** have their movies or tv shows on Netflix.
- Netflix has movies from total **122 countries**, United States being the highset contributor with almost 37% of all the content.
- 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.
- Most of the movies are from only three genres i.e. Dramas, International movies and comedy. And also the movies of these geners are released constantly throught the year.
- 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).
- Content in most of the ratings is available in lesser quanitity except in US. Ratings like TV-Y7 , TV-Y7 FV , PG ,TV-G , G , TV-Y , TV-PG are very less avaialble in all countries except US.
- International Movies and TV Shows , Dramas , and Comedies are the top 3 genres on Netflix for both Movies and TV shows.

- 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.
- Indian Actors have been acted in maximum movies on netflix. Top 5 actors are in India based on quantity of movies.
- Shorter duration movies have been popular in last 10 years.

# 9 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.
- Maximum content (more than 80%) is
- TV-MA - Content intended for mature audiences aged 17 and above.
- TV-14 - Content suitable for viewers aged 14 and above.
- TV-PG - Parental guidance suggested (similar ratings - PG-13 , PG)
- R - Restricted Content, that may not be suitable for viewers under age 17.
- These ratings' movies target Matured and Adult audience. Rest 20 % of the content is for kids aged below 13. It shows that Netflix is currently serving mostly Mature audiences or Children with parental guidance.
- 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.

# 10 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 and soap opera is highly popular. We can create such more country specific genres and It might also be liked acorss the world just like Japanese Anime and Live actions.
- While creating any content for some pirticular genre then, consider the most popular actors and directors for that content.
- The movies produced should have the duration/run-time in the range of 75-150 minutes.

- Country specific insights - The content need to be targetting the demographic of any country. Netflix can produce higher number of content in the perticular rating as per demographic of the country. Eg.
- The country like India , which is highly populous , has maximum content available only in three rating TV-MA, TV-14 , TV-PG. It is unlikely to serve below 14 age and above 35 year age group .
- Country Japan have only 3 rating of content largely served - TV-MA, TV-14 , TV-PG. Japan have high population of age above 60, and this can be served by increasing the content suitable for this age group.
- 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.