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.

Netflix Dataset

Netflix is one of the most popular media and video streaming platforms. They have over 8000 movies or tv shows available on their platform, as of mid-2021, they have over 200M Subscribers globally. This tabular dataset consists of listings of all the movies and tv shows available on Netflix, along with details such as - cast, directors, ratings, release year, duration, etc.

The dataset consists of a list of all the TV shows/movies available on Netflix:

- Show_id: Unique ID for every Movie / Tv Show
- Type: Identifier - A Movie or TV Show
- Title: Title of the Movie / Tv Show
- Director: Director of the Movie
- Cast: Actors involved in the movie/show
- Country: Country where the movie/show was produced
- Date_added: Date it was added on Netflix
- Release_year: Actual Release year of the movie/show
- Rating: TV Rating of the movie/show
- Duration: Total Duration - in minutes or number of seasons
- Listed_in: Genre
- Description: The summary description

Objectives of the Project

- Perform EDA on the given dataset and find insights.
- Provide Useful Insights and Business recommendations that can help the business to grow.

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")
```

```
df.head()
```

	show_id	type	title	director	cast	country	date_added	release_year
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	September 25, 2021	2020
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	September 24, 2021	2021
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	NaN	September 24, 2021	2021

Next steps: Generate code with df View recommended plots

```
#Actual size of the data set is 8807 rows and 12 columns
df.shape
```

```
(8807, 12)
```

```
df.info()
```

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

```
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
```

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. Hence It can be concluded that ,

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

```
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

Only single column having numerical values. It gives idea of release year of the content ranges between what timeframe. Rest all the columns are having categorical data.

Release year range is **from 1925 to 2021**

```
df.describe(include = object)
```

	show_id	type	title	director	cast	country	date_added	rating	d
count	8807	8807	8807	6173	7982	7976	8797	8803	
unique	8807	2	8807	4528	7692	748	1767	17	
top	s1	Movie	Dick Johnson Is Dead	Rajiv Chilaka	David Attenborough	United States	January 1, 2020	TV-MA	

2. Data Cleaning

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
```

- 3 missing values are found in duration column , and it is also found that by mistake those data got entered in rating column

```
df[df["duration"].isna()]
```

	show_id	type	title	director	cast	country	date_added	release_year	rat
5541	s5542	Movie	Louis C.K. 2017	Louis C.K.	Louis C.K.	United States	April 4, 2017	2017	74
5794	s5795	Movie	Louis C.K.: Hilarious	Louis C.K.	Louis C.K.	United States	September 16, 2016	2010	84

```
indx = df[df['duration'].isna()].index
```

```
df.loc[indx] = df.loc[indx].fillna(method = 'ffill' , axis = 1)
```

```
# replaced the wrong entries done in the rating column
df.loc[indx ,'rating'] = 'Not Available'
```

```
df.loc[indx]
```

	show_id	type	title	director	cast	country	date_added	release_year	ra
5541	s5542	Movie	Louis C.K. 2017	Louis C.K.	Louis C.K.	United States	April 4, 2017	2017	Ava
5794	s5795	Movie	Louis C.K.: Hilarious	Louis C.K.	Louis C.K.	United States	September 16, 2016	2010	Ava

- Fill the null values in rating column

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

	show_id	type	title	director	cast	country	date_added	release_
5989	s5990	Movie	13TH: A Conversation with Oprah Winfrey & Ava ...	NaN	Oprah Winfrey, Ava DuVernay	NaN	January 26, 2017	
6827	s6828	TV Show	Gargantia on the Verdurous Planet	NaN	Kaito Ishikawa, Hisako Kanemoto, Ai Kayano, Ka...	Japan	December 1, 2016	
7312	s7313	TV Show	Little Lunch	NaN	Flynn Curry, Olivia Deeble, Madison Lu, Oisín ...	Australia	February 1, 2018	

```
indx = df[df["rating"].isna()].index
indx
```

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

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

```
#Now the rating for null values are updated to "Not Available"
df.loc[indx]
```

	show_id	type	title	director	cast	country	date_added	release_
5989	s5990	Movie	13TH: A Conversation with Oprah Winfrey & Ava ...	NaN	Oprah Winfrey, Ava DuVernay	NaN	January 26, 2017	
6827	s6828	TV Show	Gargantia on the Verdurous Planet	NaN	Kaito Ishikawa, Hisako Kanemoto, Ai Kayano, Ka...	Japan	December 1, 2016	
7312	s7313	TV Show	Little Lunch	NaN	Flynn Curry, Olivia Deeble, Madison Lu, Oisín ...	Australia	February 1, 2018	

```
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
```

- Lets now drop the null from date_added column

```
df['date_added'].isna().sum()
```

```
10
```

We have 10 null values here

```
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[df["date_added"] ==  "August 4, 2017"].index.value_counts()
```

```
5342    1
5343    1
5344    1
5345    1
6613    1
Name: count, dtype: int64
```

```
#In this dataset we have dates in 2 format  "August 4, 2017" and " August 4, 2017" to remove this will strip dates
df['date_added'] = df['date_added'].str.strip()
```

```
df['date_added'] = pd.to_datetime(df['date_added'])
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
```

% Null values in each column

```
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%)

```
indices = df[df.director.isna()].index
indices
```

```
Index([   1,    3,    4,   10,   14,   15,   17,   19,   21,   25,
       ...
       8775, 8780, 8783, 8784, 8785, 8795, 8796, 8797, 8800, 8803],
      dtype='int64', length=2624)
```

```
df.loc[indices , 'director'] = 'Unknown director'
```

```
df.loc[indices]
```

	show_id	type	title	director	cast	country	date_added	release_y
1	s2	TV Show	Blood & Water	Unknown director	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2(
3	s4	TV Show	Jailbirds New Orleans	Unknown director	NaN	NaN	2021-09-24	2(
4	s5	TV Show	Kota Factory	Unknown director	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	2021-09-24	2(
10	s11	TV Show	Vendetta: Truth, Lies and The Mafia	Unknown director	NaN	NaN	2021-09-24	2(
14	s15	TV Show	Crime Stories: India Detectives	Unknown director	NaN	NaN	2021-09-22	2(
...	...	...	...	...	...	...	...	
8795	s8796	TV Show	Yu-Gi-Oh! Arc-V	Unknown director	Mike Liscio, Emily Bauer, Billy Bob Thompson, ...	Japan, Canada	2018-05-01	2(
8796	s8797	TV Show	Yunus Emre	Unknown director	Gökhan Atalay, Payidar Tüfekçioglu, Baran Akbu...	Turkey	2017-01-17	2(
8797	s8798	TV Show	Zak Storm	Unknown director	Michael Johnston, Jessica Gee-George, Christin...	United States, France, South Korea, Indonesia	2018-09-13	2(
8800	s8801	TV Show	Zindagi Gulzar Hai	Unknown director	Sanam Saeed, Fawad Khan, Ayesha Omer, Mehreen ...	Pakistan	2016-12-15	2(
8803	s8804	TV Show	Zombie Dumb	Unknown director	NaN	NaN	2019-07-01	2(

2624 rows × 14 columns

```
indices = df[df.cast.isna()].index
indices
```

```
Index([   0,    3,   10,   14,   16,   20,   45,   66,   69,   74,
       ...
       8727, 8728, 8738, 8739, 8744, 8746, 8755, 8756, 8763, 8803],
      dtype='int64', length=825)
```

```
df.loc[indices , 'cast'] = 'Unknown cast'
```

```
#Filling missing values for country
indices = df[df.country.isna()].index
indices
```

```
Index([   2,    3,    5,    6,   10,   11,   13,   14,   16,   18,
       ...
       8602, 8609, 8622, 8679, 8690, 8718, 8759, 8783, 8785, 8803],
      dtype='int64', length=830)
```

```
df.loc[indices , 'country'] = 'Contry Not updated'
```

```
#Now we have no missing values
df.isna().sum()
```

```
show_id         0
type            0
title           0
director        0
cast            0
country         0
date_added      0
release_year    0
rating          0
duration        0
listed_in       0
description     0
year_added      0
month_added     0
dtype: int64
```

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	director	cast	country	date_added	release_
4250	s4251	TV Show	Pioneers: First Women Filmmakers*	Unknown director	Unknown cast	Contry Not updated	2018-12-30	
966	s967	Movie	Get the Grift	Pedro Antonio	Marcus Majella, Samantha Schmütz, Caito Mainie...	Brazil	2021-04-28	
967	s968	TV Show	Headspace Guide to Sleep	Unknown director	Evelyn Lewis Prieto	Contry Not updated	2021-04-28	
968	s969	TV Show	Sexify	Unknown director	Aleksandra Skraba, Maria Sobocińska, Sandra Dr...	Poland	2021-04-28	
972	s973	TV Show	Fatma	Unknown director	Burcu Biricik, Uğur Yücel, Mehmet Yılmaz Ak, H...	Turkey	2021-04-27	
...	...	...	...	...	...	...	...	
466	s467	TV Show	My Unorthodox Life	Unknown director	Unknown cast	Contry Not updated	2021-07-14	
467	s468	Movie	Private Network: Who Killed Manuel Buendía?	Manuel Alcalá	Daniel Giménez Cacho	Contry Not updated	2021-07-14	
468	s469	Movie	The Guide to the Perfect Family	Ricardo Trogi	Louis Morissette, Émilie Bierre, Catherine Cha...	Contry Not updated	2021-07-14	
471	s472	Movie	Day of Destiny	Akay Mason, Abosi Ogba	Olumide Oworu, Denola Grey, Gbemi Akinlade, Ji...	Contry Not updated	2021-07-13	
8437	s8438	TV Show	The Netflix Afterparty	Unknown director	David Spade, London Hughes, Fortune Feimster	United States	2021-01-02	

593 rows × 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

- country

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

```
country
United States                               2812
India                                        972
Contry Not updated                           830
United Kingdom                               418
Japan                                        244
                                            ...
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: 749, dtype: int64
```

```
country_tb = df[['show_id' , 'type' , 'country']]
country_tb.drop(country_tb.loc[country_tb["country"] == "Contry Not updated"].index , axis = 0 , 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 × 3 columns

Next steps: Generate code with country_tb View recommended plots

```
# 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 × 2 columns

- Director column

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

```
director
Unknown director                 2624
Rajiv Chilaka                      19
Raúl Campos, Jan Suter             18
Suhas Kadav                        16
Marcus Raboy                       16
                                 ... 
Raymie Muzquiz, Stu Livingston      1
Joe Menendez                        1
Eric Bross                          1
Will Eisenberg                      1
Mozez Singh                         1
Name: count, Length: 4529, 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.drop(dir_tb.loc[dir_tb["director"] == "Unknown director"].index , axis = 0 , inplace = True )
dir_tb.dropna(inplace = True)
dir_tb['director'] = dir_tb['director'].apply(lambda x : x.split(','))
dir_tb.head()
```

	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]

Next steps: Generate code with dir_tb View recommended plots

```
dir_tb = dir_tb.explode('director')
dir_tb.head(10)
```

	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
7	s8	Movie	Haile Gerima
8	s9	TV Show	Andy Devonshire
9	s10	Movie	Theodore Melfi
11	s12	TV Show	Kongkiat Komesiri
12	s13	Movie	Christian Schwochow

Next steps: Generate code with dir_tb View recommended plots

```
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 × 3 columns

Next steps: Generate code with dir_tb View recommended plots

```
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 × 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 × 3 columns

Next steps: Generate code with `genre_tb` View recommended plots

```
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.drop(cast_tb.loc[cast_tb["cast"] == "Unknown cast"].index , axis = 0 , inplace = True )
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 × 3 columns

Next steps: Generate code with `cast_tb` View recommended plots

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

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

show_id	type	cast

```
# 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)
```

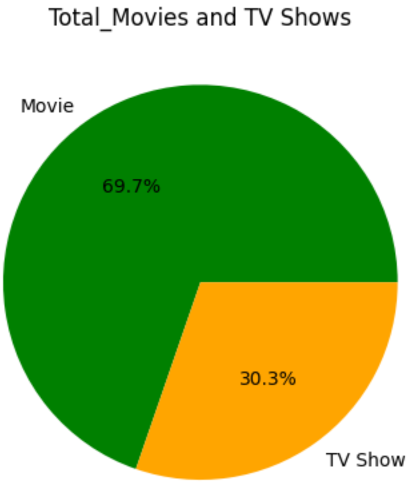
type	Movie	TV Show
cast		
Takahiro Sakurai	7.0	25.0
Yuki Kaji	10.0	19.0
Junichi Suwabe	4.0	17.0
Daisuke Ono	5.0	17.0
Ai Kayano	2.0	17.0
...	...	...
Şerif Sezer	1.0	NaN
Şevket Çoruh	1.0	NaN
Şinasi Yurtsever	3.0	NaN
Şükran Ovalı	1.0	NaN
Ṣọpẹ́ Dìrísù	1.0	NaN

36403 rows × 2 columns

4. Visual Analysis - Univariate & Bivariate

- 4.1. Distribution of content across the different types

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

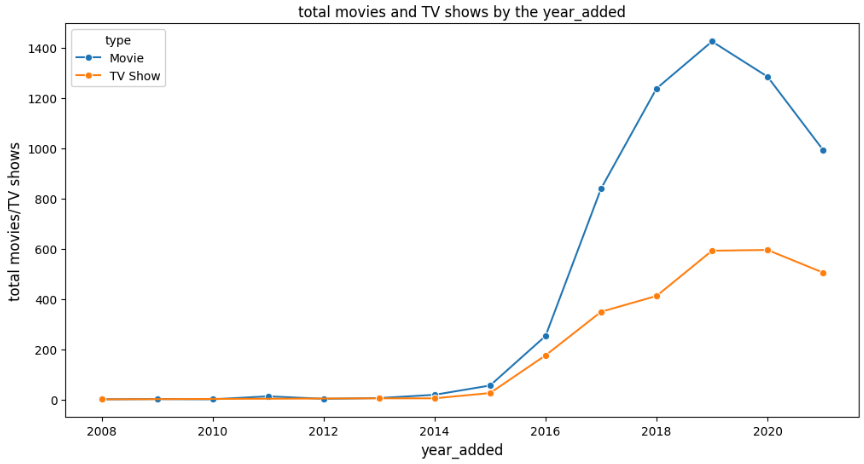


It is observed that , around 70% content is Movies and around 30% content is TV shows.

- 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

How has the number of movies released per year changed over the last 20-30 years?

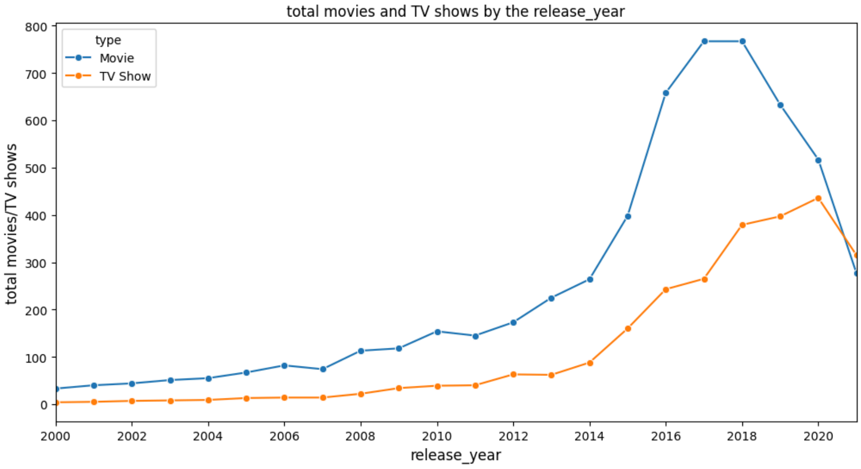
```
d = df.groupby(['type' , 'release_year'])['show_id'].count().reset_index()
d.rename({'show_id' : 'total movies/TV shows'}, axis = 1 , inplace = True)
d
```

	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 × 3 columns

Next steps: Generate code with d View recommended plots

```
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()
```



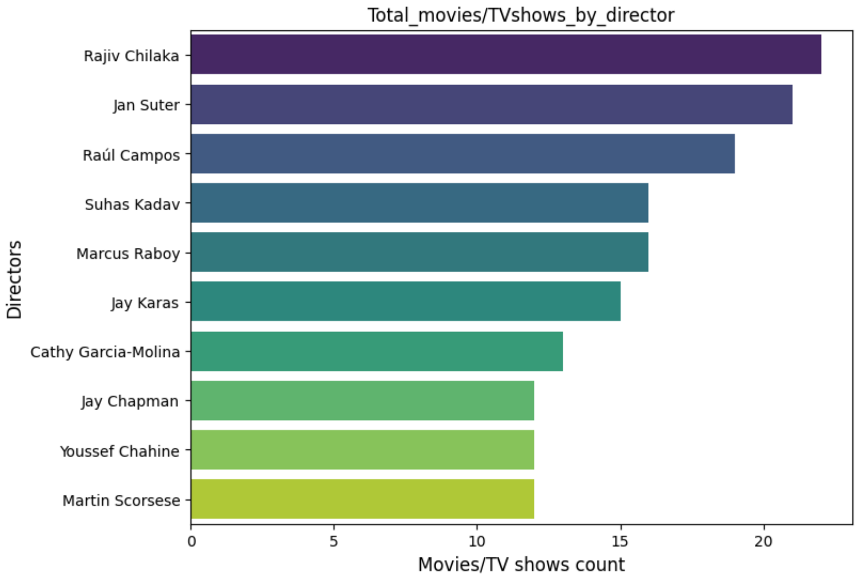
Observation:

- 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 , palette='viridis')
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
```

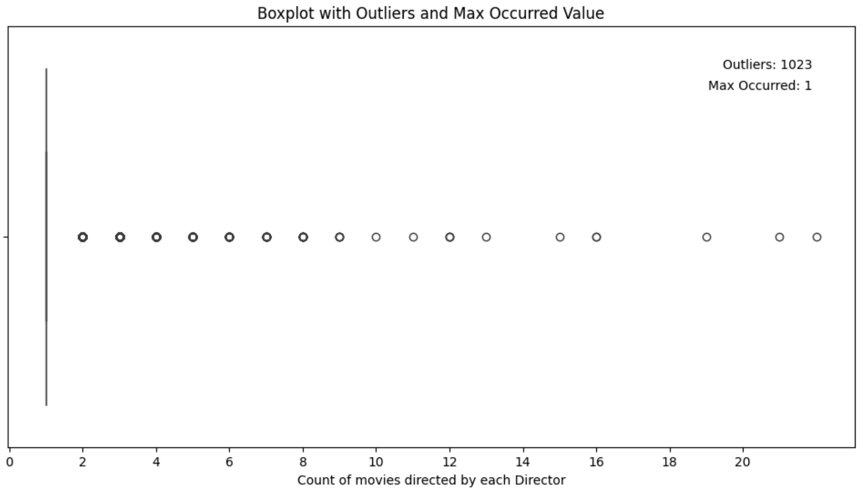
```
def calculate_outliers(data):
    # Calculate the first quartile (Q1)
    q1 = np.percentile(data, 25)

    # 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


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}
```

```
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.

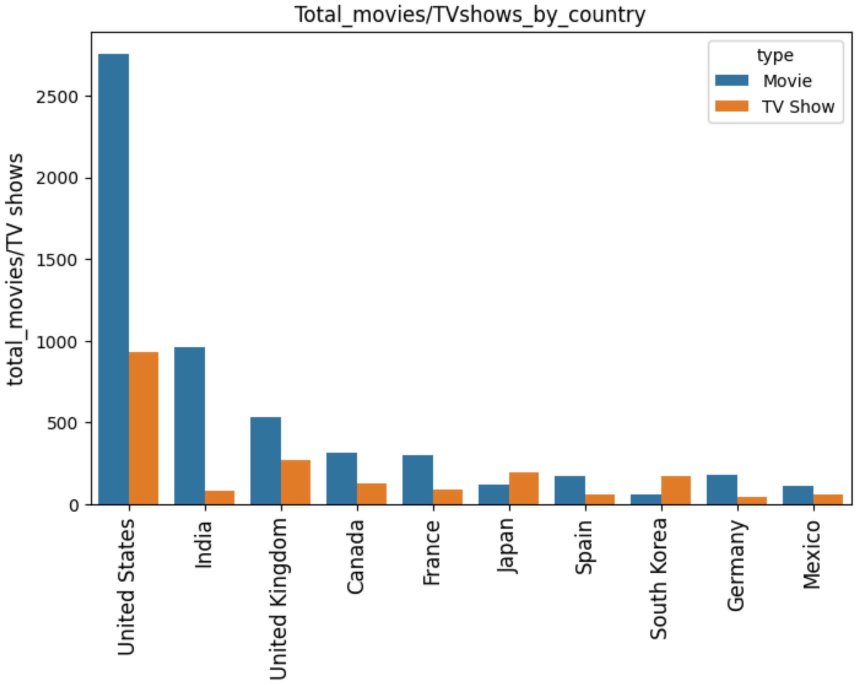
- 4.5 Total movies/TV shows by each country

```
# 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)]
```

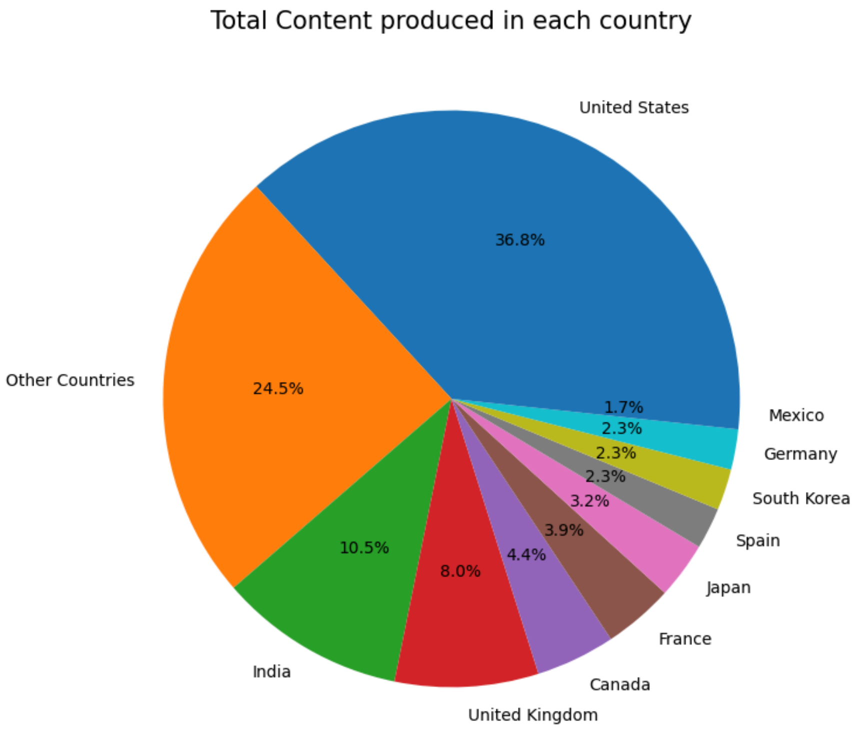
```
x = df_new.groupby(['country' , 'type'])['show_id'].count().reset_index()
x.pivot(index = 'country' , columns = 'type' , values = 'show_id').sort_values('Movie',ascending = False)
```

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()
```



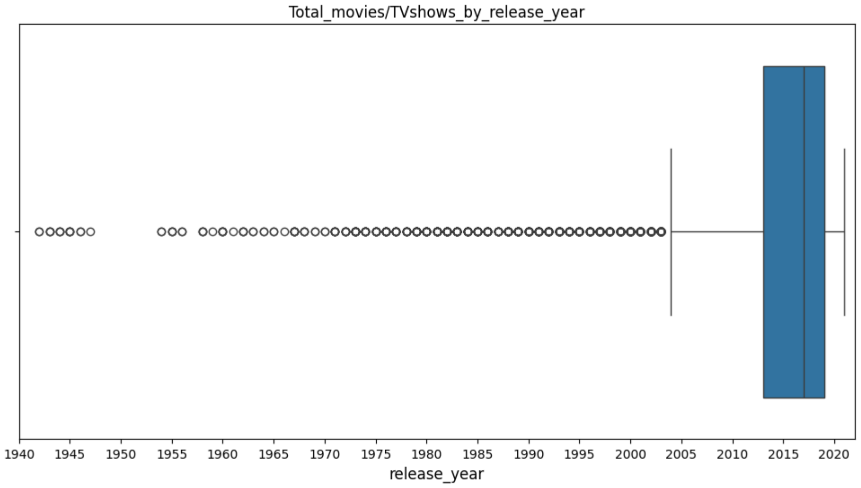
Observation:

- 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()
```

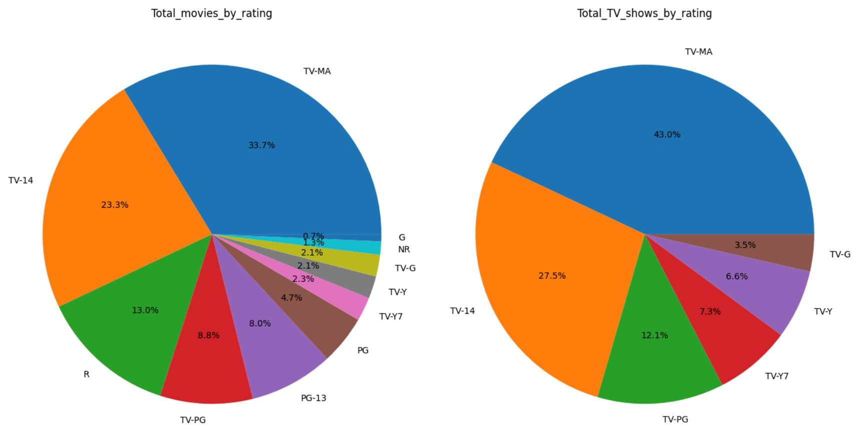


Observations:

- 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

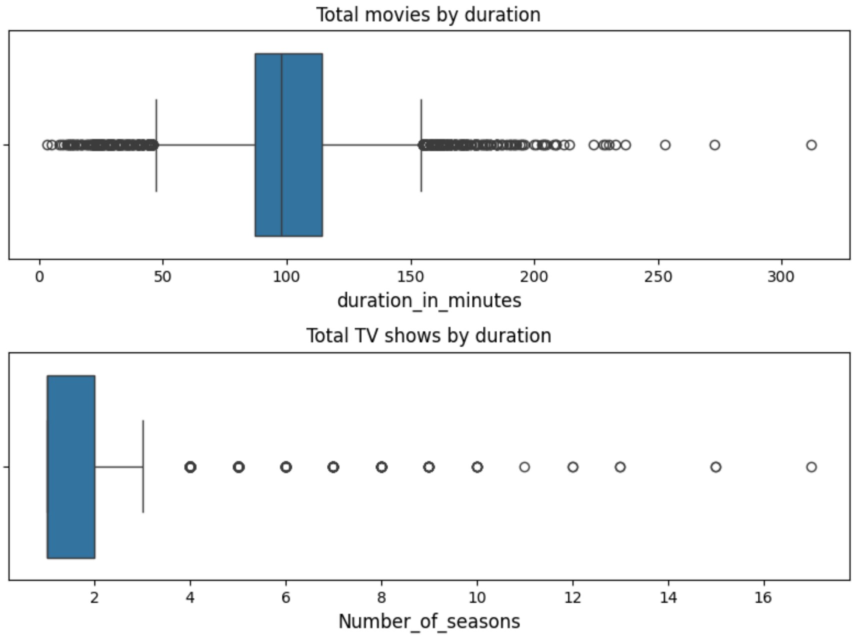
```
m = movies.loc[~movies.rating.isin(['Not Available' , 'NC-17' , 'TV-Y7-FV'])]
m = m.rating.value_counts()
t = tv_shows.loc[~tv_shows.rating.isin(['Not Available' , 'R' , 'NR', 'TV-Y7-FV'])]
t = t.rating.value_counts()


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()
```



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

- 4.8 Total movies/TV shows distribution by duration of the content

```
fig, ax = plt.subplots(2,1, figsize=(8,6))

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()
```

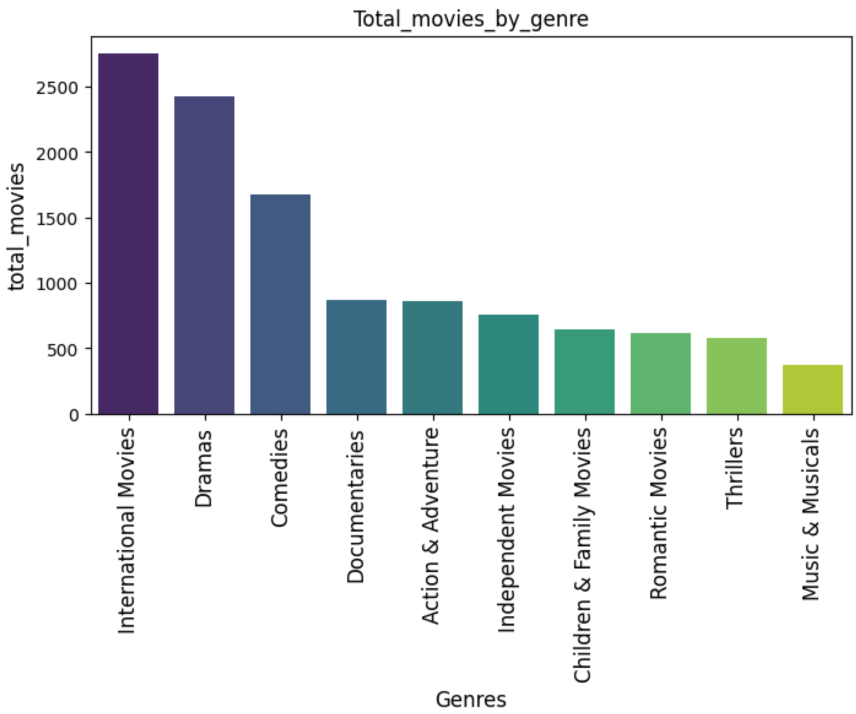


Observations:

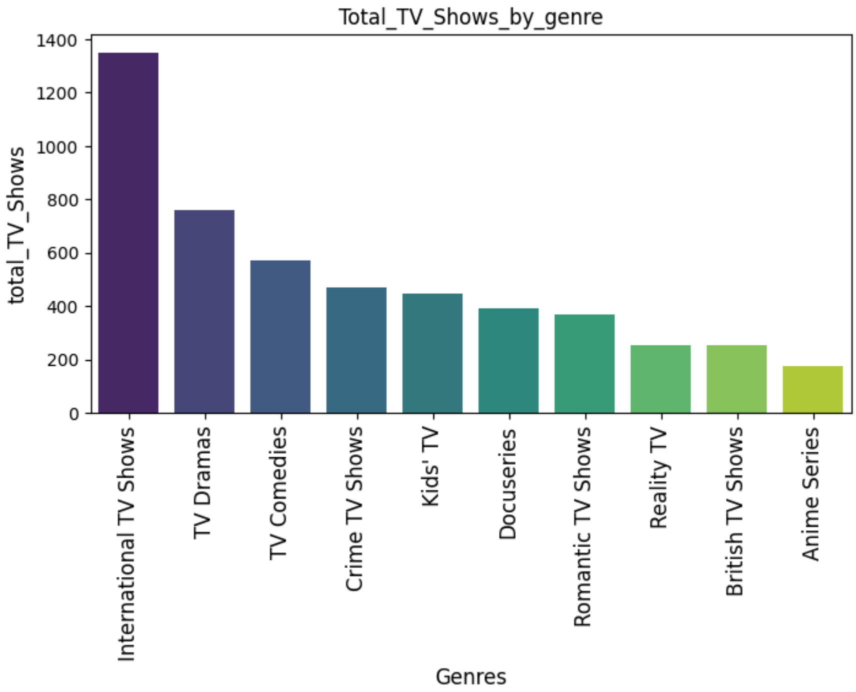
- Movie Duration: 50 mins - 150 mins is the range excluding potential outliers (values lying outside the whiskers of boxplot)
- TV Show Duration: 1-3 seasons is the range for TV shows excluding potential outliers

- 4.9 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,palette='viridis')
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,palette='viridis')
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()
```



Observations:

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

5. Bivariate Analysis

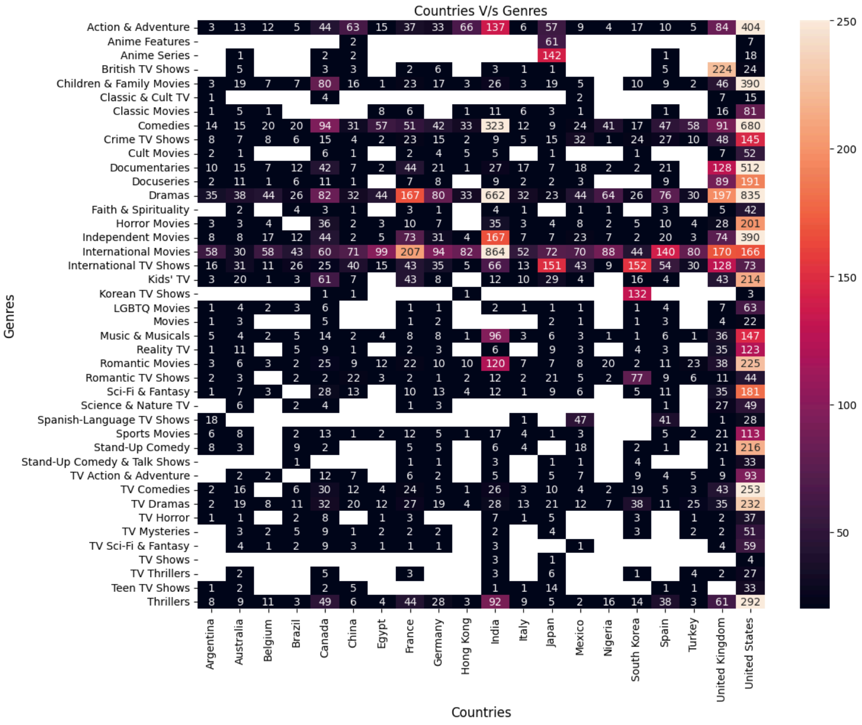
- 5.1 Lets check popular genres in top 20 countries

```
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')
```



Observations:

- 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.

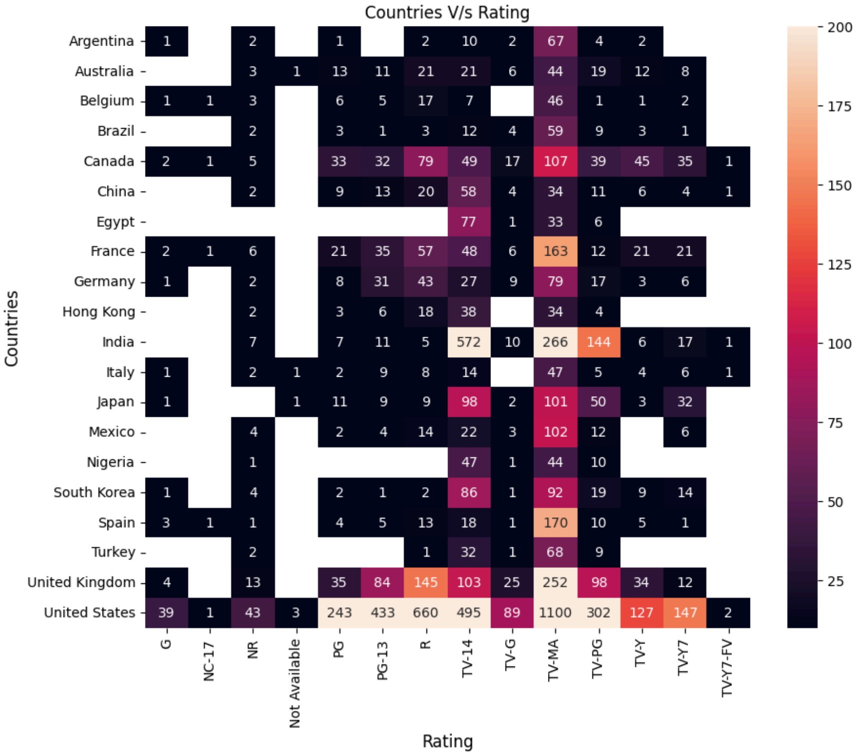
- 5.2 Country-wise Rating of Content

```
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()
```

	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

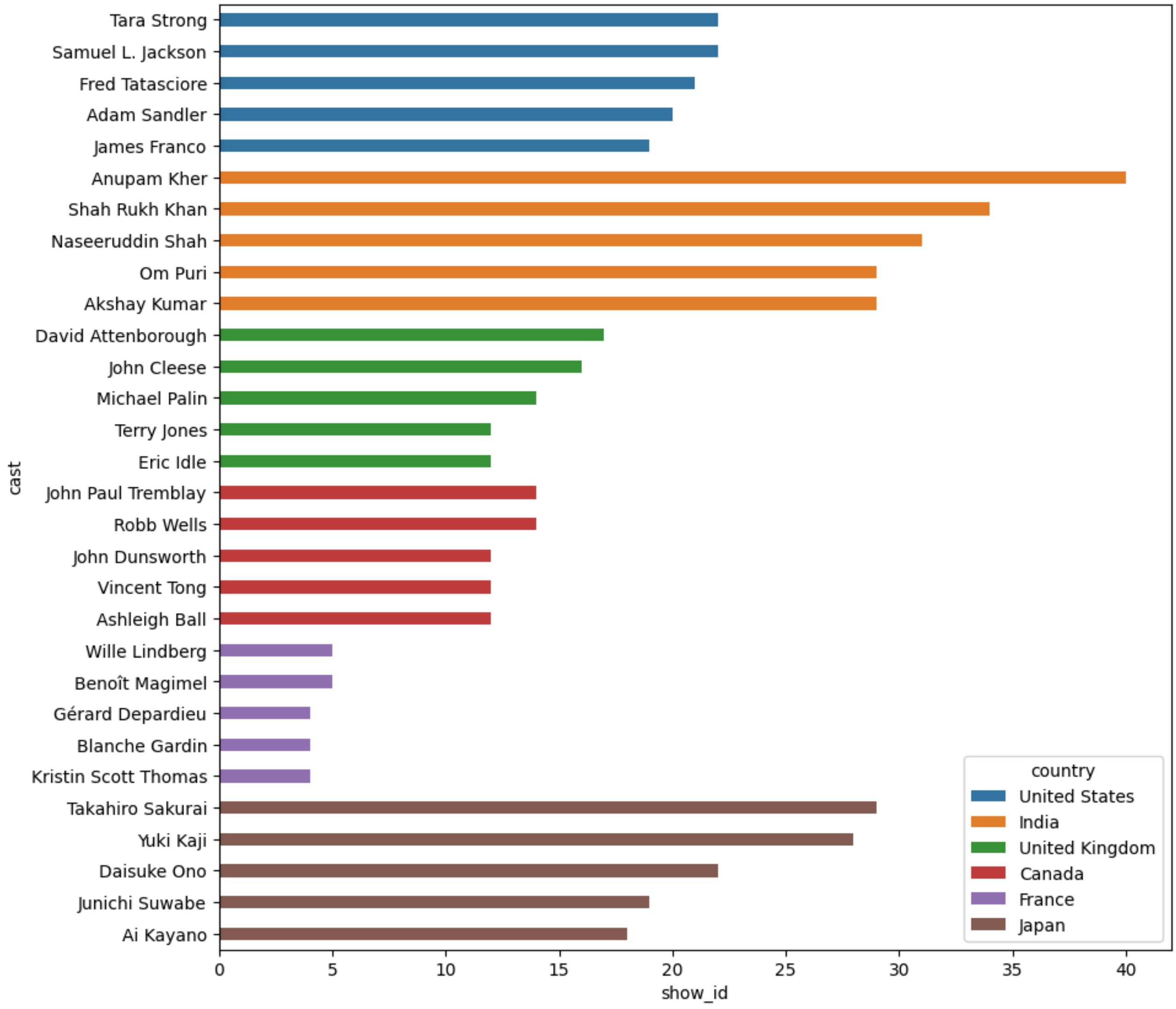
```
country_list = ['India'  , 'United Kingdom' , 'Canada' , 'France' , 'Japan']
top_5_actors = x.loc[x['country'].isin(['United States'])].sort_values('show_id' , ascending = False).head()


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

Next steps: Generate code with `top_5_actors` View recommended plots

```
plt.figure(figsize = (10,10))
sns.barplot(data = top_5_actors , y = 'cast' , x = 'show_id' , hue = 'country',width= 0.4)
```

```
<Axes: xlabel='show_id', ylabel='cast'>
```



- 5.4 Top 5 directors by Genre

```
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

Next steps: Generate code with `top_5_dir` View recommended plots

- 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
```

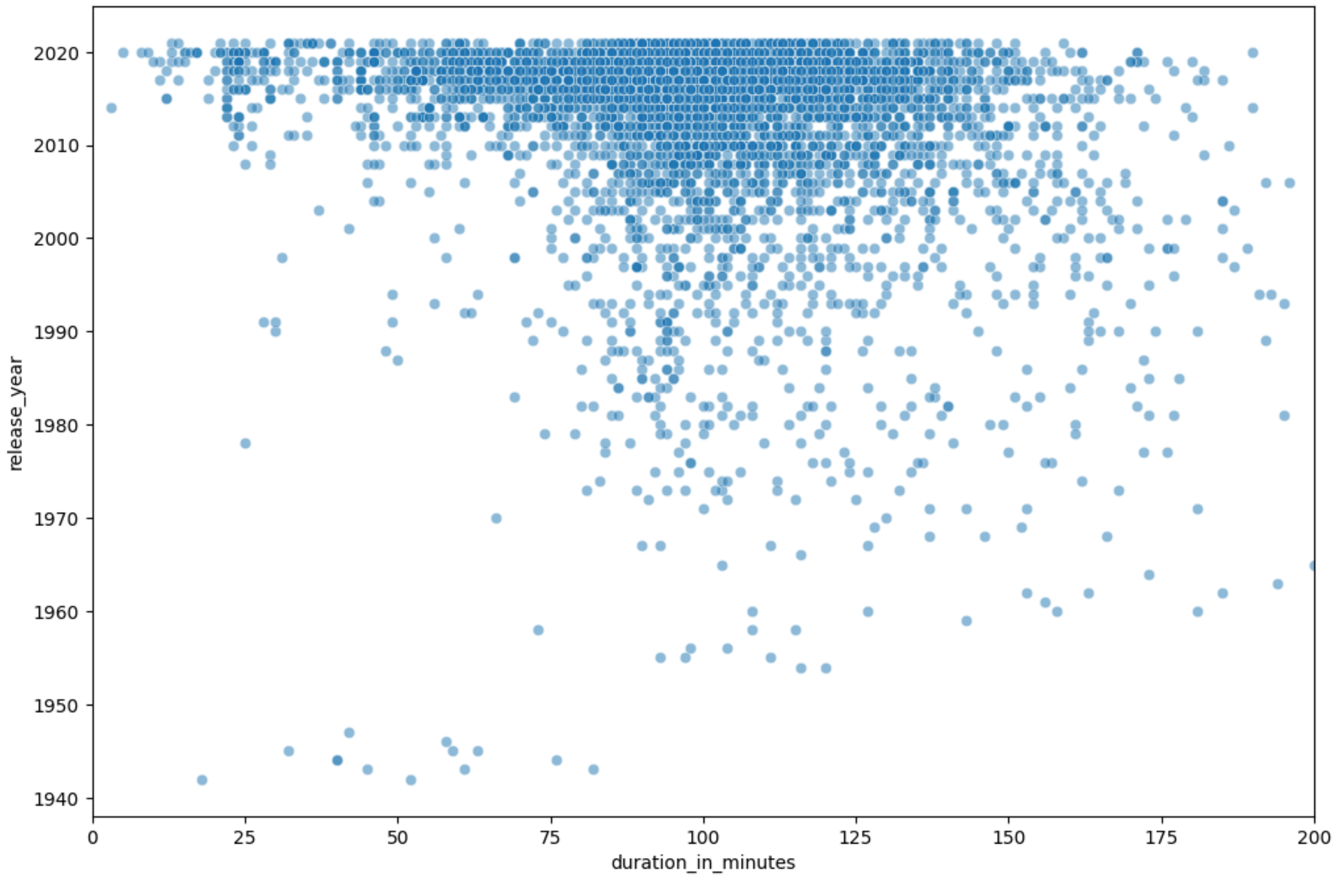
	country	listed_in	show_id
0	United States	Dramas	835
1	United States	Comedies	680
2	United States	Documentaries	512
3	United States	Action & Adventure	404
4	United States	Independent Movies	390
5	India	International Movies	864
6	India	Dramas	662
7	India	Comedies	323
8	India	Independent Movies	167
9	India	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

Next steps: Generate code with `top_5_genre` View recommended plots

- 5.6 Variation in duration of movies by Release year

```
plt.figure(figsize = (12,8))
sns.scatterplot(x = 'duration_in_minutes', y = 'release_year', data = movies,alpha = 0.5)
plt.xlim((0,200))
```

```
(0.0, 200.0)
```



Observations:

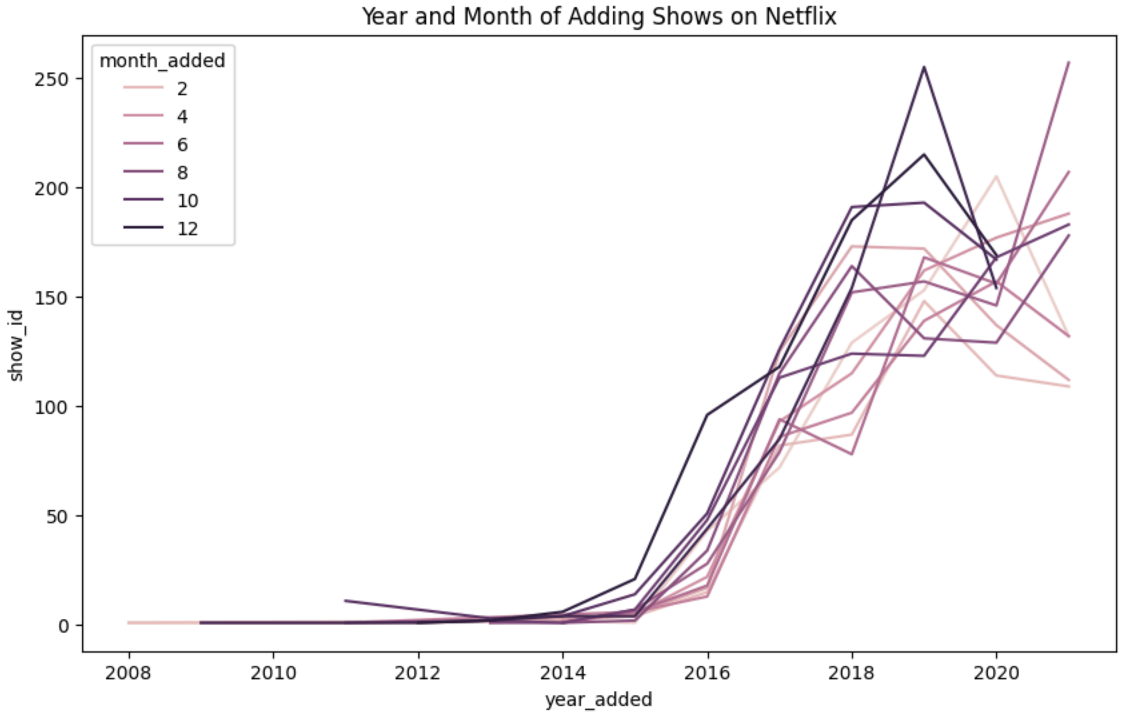
- The movies shorter than 150 minutes duration have increased drastically after 2000 while movies longer than 150 minutes are not much popular.
- There is a huge surge in the number of shorter duration movies (less than 75 mins) post 2010. Overall, Short movies have been popular in last 10 years.

- 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.

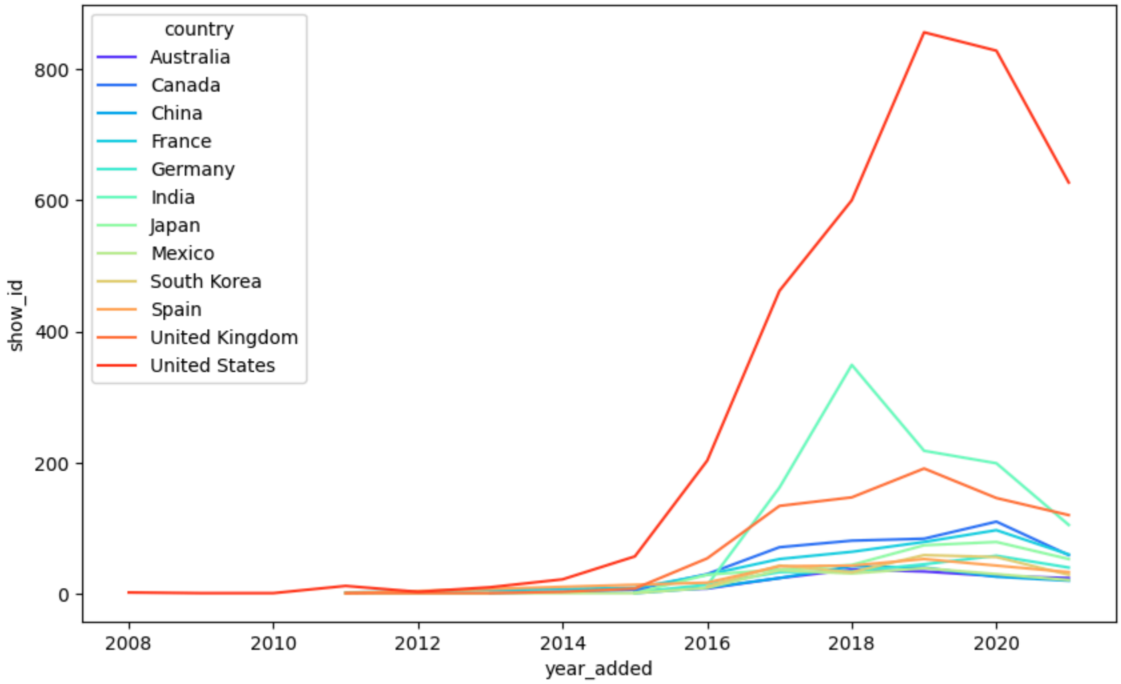
- 5.8 Which countries are adding more number of content over the time?

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

```
plt.figure(figsize = (10,6))
sns.lineplot(data = country_year_grp , x = 'year_added' , y = 'show_id' , hue = 'country' , palette ='rainbow' )
```

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

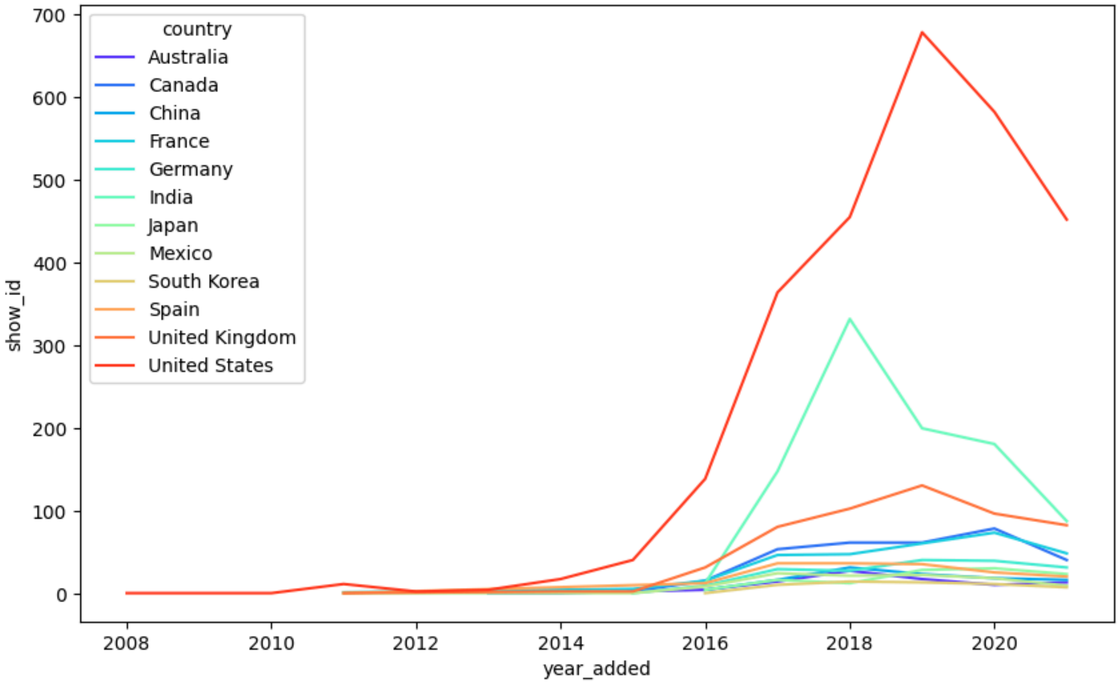


Observation : United Stated have always added highset number of movies/TV shows over the time. Since 2016, India has seen spike in popularity of content and added more number of content, followed by United Kingdom at 3rd position.

```
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()
```

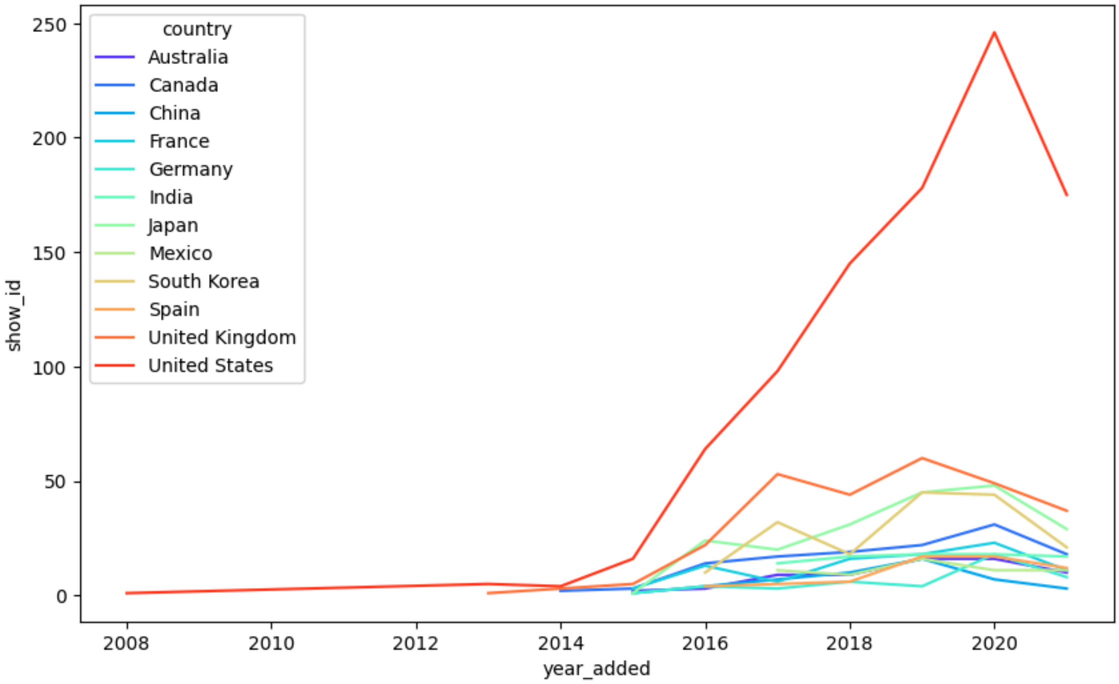
```
plt.figure(figsize = (10,6))
sns.lineplot(data = movie_type , x = 'year_added' , y = 'show_id' , hue = 'country' , palette ='rainbow' )
```

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



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

```
<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

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.
- 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.
- 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.

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.
- 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.

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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Start coding or generate with AI.
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