Netflix Data Analysis

Defining Problem Statement and Analysing basic metrics

In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sb
```

Data Loading

In [2]:

```
df = pd.read_csv('D:/Workspace/Scaler/Jupyter Notebooks/Python Libraries/Pandas/netflix.
```

In [3]:

```
df.head()
```

Out[3]:

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

Data Processing

In [4]:

```
df.shape
```

Out[4]:

```
(8807, 12)
```

In [5]:

```
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
```

In [6]:

```
df.describe(include='all')
```

Out[6]:

	show_id	type	title	director	cast	country	date_added	release_year
count	8807	8807	8807	6173	7982	7976	8797	8807.000000
unique	8807	2	8807	4528	7692	748	1767	NaN
top	s1	Movie	Dick Johnson Is Dead	Rajiv Chilaka	David Attenborough	United States	January 1, 2020	NaN
freq	1	6131	1	19	19	2818	109	NaN
mean	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2014.180198
std	NaN	NaN	NaN	NaN	NaN	NaN	NaN	8.819312
min	NaN	NaN	NaN	NaN	NaN	NaN	NaN	1925.000000
25%	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2013.000000
50%	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2017.000000
75%	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2019.000000
max	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2021.000000

In [7]:

```
df.columns
```

Out[7]:

```
Index(['show_id', 'type', 'title', 'director', 'cast', 'country', 'date_a
dded',
       'release_year', 'rating', 'duration', 'listed_in', 'description'],
      dtype='object')
```

In [8]:

```
df.select_dtypes(include='object').nunique()
```

Out[8]:

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

Observations

- Only one column is integer type (Release Year) and rest fields are String/Object type
- NULL values present in director, cast, country date_added column
- Unique values, Frequecny, mean values are visible, NaN is present due to data type

Observations on the shape of data, data types of all the attributes, conversion of categorical attributes to 'category' (If required), missing value detection, statistical summary

In [9]:

```
# Shape
df.shape
```

Out[9]:

```
(8807, 12)
```

- Shape of the data - 12 columns and 8807 rows/indexes

In [10]:

```
# Data Type of all attributes
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
```

In [11]:

```
# Checking null values
df.isnull().sum()
```

Out[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
```

In [12]:

```
df.isnull().sum()/len(df)*100
```

Out[12]:

```
show_id          0.000000
type             0.000000
title            0.000000
director        29.908028
cast             9.367549
country          9.435676
date_added       0.113546
release_year     0.000000
rating           0.045418
duration         0.034064
listed_in        0.000000
description      0.000000
dtype: float64
```

In [13]:

```
# Missig value detection

missing = pd.isna(df)
missing.sum()
# Checking for null values
```

Out[13]:

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

In [14]:

```
# Check Unique values
df.nunique()
```

Out[14]:

```
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
```

In [15]:

```
# Statistical Summary
df.describe(include='all')
```

Out[15]:

	show_id	type	title	director	cast	country	date_added	release_year
count	8807	8807	8807	6173	7982	7976	8797	8807.000000
unique	8807	2	8807	4528	7692	748	1767	NaN
top	s1	Movie	Dick Johnson Is Dead	Rajiv Chilaka	David Attenborough	United States	January 1, 2020	NaN
freq	1	6131	1	19	19	2818	109	NaN
mean	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2014.180198
std	NaN	NaN	NaN	NaN	NaN	NaN	NaN	8.819312
min	NaN	NaN	NaN	NaN	NaN	NaN	NaN	1925.000000
25%	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2013.000000
50%	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2017.000000
75%	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2019.000000
max	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2021.000000

- In statistical summary, we can see that there are several Null values that is because of String values in the dataframe
- approx. 30% null values present in director column

Non-Graphical Analysis: Value counts and unique attributes

In [16]:

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

Out[16]:

```
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
```

- As per data set most number of movies directed by Rajiv Chilaka

In [17]:

```
# Unique value counts
df.nunique()
```

Out[17]:

```
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
```

Check for duplicate values

In [18]:

```
df.duplicated().sum()
```

Out[18]:

```
0
```

- Unique values are present
- No duplicate values are present

Working with dates

In [19]:

```
# Date Time format
df['date_added'] = pd.to_datetime(df['date_added'], dayfirst=True, errors='coerce')
df['date_added'] = df['date_added'].astype(str).str.replace(',', '').str.strip()

df['date_added'] = pd.to_datetime(df['date_added'], format="%Y-%m-%d")

df['day_added'] = df['date_added'].dt.day
df['month_added'] = df['date_added'].dt.month
df['year_added'] = df['date_added'].dt.year
```

In [20]:

```
# Update NaN values of date_added field using mode function and convert new date related
df['day_added'].fillna(df['day_added'].mode()[0], inplace = True)
df['day_added'] = df['day_added'].astype(int)

df['month_added'].fillna(df['month_added'].mode()[0], inplace = True)
df['month_added'] = df['month_added'].astype(int)

df['year_added'].fillna(df['year_added'].mode()[0], inplace = True)
df['year_added'] = df['year_added'].astype(int)
```

In [21]:

```
df.head(2)
```

Out[21]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV-MA

- date_added column separated with day, month and year respectively

Number of Movies/TV Shows available in US

In [22]:

```
df.loc[df['country'] == 'United States']['type'].value_counts()
```

Out[22]:

```
type
Movie      2058
TV Show     760
Name: count, dtype: int64
```

Number of Movies/TV Shows available in India

In [23]:

```
df.loc[df['country'] == 'India']['type'].value_counts()
```

Out[23]:

```
type
Movie      893
TV Show     79
Name: count, dtype: int64
```

Year wise count of of Movies and TV Shows visible on Netflix

In [24]:

```
# df.loc[df['year_added'] == 2020]['type']
a = df.groupby('year_added')[['type']].agg({'type':['count']})
a.columns =["_".join(col) for col in a.columns]
a
```

Out[24]:

year_added	type_count
2008	2
2009	2
2010	1
2011	13
2012	3
2013	10
2014	23
2015	73
2016	418

In [25]:

```
a.reset_index()
```

Out[25]:

	year_added	type_count
0	2008	2
1	2009	2
2	2010	1
3	2011	13
4	2012	3
5	2013	10
6	2014	23
7	2015	73
8	2016	418
9	2017	1164

- Number of Movies increasing after 2018 and decresing after 2019, specially in 2020. Probably due to COVID

In [26]:

```
df.loc[df['type']=='TV Show']['date_added'].dt.month
```

Out[26]:

```
1        9.0
2        9.0
3        9.0
4        9.0
5        9.0
        ...
8795     5.0
8796     1.0
8797     9.0
8800    12.0
8803     7.0
Name: date_added, Length: 2676, dtype: float64
```

Year wise count of Movies/TV Shows for each directors

In [27]:

```
dirr = df.groupby("director")[["year_added","type"]].agg({"year_added":["min","max"],
                                                          "type":['count']})
```

In [28]:

```
dirr.columns
dirr.columns =["_".join(col) for col in dirr.columns]
```

In [29]:

```
dirr.reset_index(inplace=True)
```

In [30]:

```
dirr
```

Out[30]:

	director	year_added_min	year_added_max	type_count
0	A. L. Vijay	2018	2019	2
1	A. Raajdheep	2020	2020	1
2	A. Salaam	2017	2017	1
3	A.R. Murugadoss	2018	2019	2
4	Aadish Keluskar	2019	2019	1
...	...	...	...	...
4523	Çagan Irmak	2018	2018	1
4524	Ísold Uggadóttir	2019	2019	1
4525	Óskar Thór Axelsson	2018	2018	1
4526	Ömer Faruk Sorak	2018	2021	2
4527	Şenol Sönmez	2019	2021	2

4528 rows × 4 columns

In [31]:

```
dirr.sort_values(by=['type_count'], ascending = False)
```

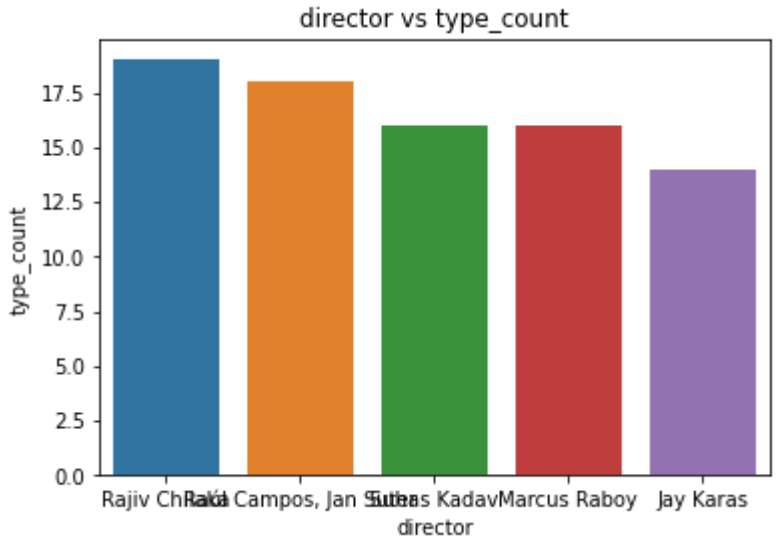
Out[31]:

	director	year_added_min	year_added_max	type_count
3392	Rajiv Chilaka	2019	2021	19
3443	Raúl Campos, Jan Suter	2016	2018	18
4046	Suhas Kadav	2017	2021	16
2598	Marcus Raboy	2016	2020	16
1790	Jay Karas	2014	2020	14
...	...	...	...	...
2049	Jos Humphrey	2020	2020	1
2050	Jose Gomez	2021	2021	1
2051	Jose Javier Reyes	2021	2021	1
2053	Joseduardo Giordano, Sergio Goyri Jr.	2018	2018	1
2264	Khaled Youssef	2019	2019	1

4528 rows × 4 columns

In [32]:

```
sb.barplot(data = dirr.sort_values(by=['type_count'], ascending = False).head(), x='dire
plt.title('director vs type_count')
plt.show()
```



- Top 5 directors with most number of movies/TV Shows from stating to latest dated year respectively

Monthly added Movies/TV Shows

In [33]:

```
monthly = df.groupby("month_added")[["type"]].agg({"type":['count']})
```

In [34]:

```
monthly
```

Out[34]:

	type
	count
month_added	
1	727
2	557
3	734
4	759
5	626
6	724
7	917
8	749

In [35]:

```
monthly.columns =["_".join(col) for col in monthly.columns]
```

In [36]:

```
monthly = monthly.reset_index()
```

In [37]:

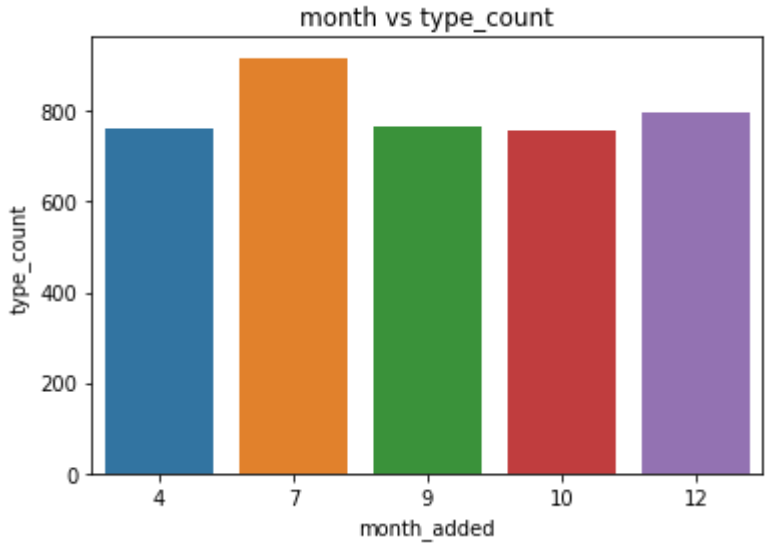
```
monthly.sort_values(by = ['type_count'], ascending=False)
```

Out[37]:

	month_added	type_count
6	7	917
11	12	797
8	9	765
3	4	759
9	10	755
7	8	749
2	3	734
0	1	727
5	6	724
10	11	697
4	5	626
1	2	557

In [38]:

```
sb.barplot(data = monthly.sort_values(by=['type_count'], ascending = False).head(), x='m
plt.title('month vs type_count')
plt.show()
```



- August is the Month when most Movies/TV Shows added on the netflix, followed by December and Septhember

Total number of Movies and TV Shows added on Netflix (On Year basis)

In [39]:

```
t1 = df.groupby(["type", "year_added"])['type'].count()
```

In [40]:

```
t1 = t1.to_frame()
```

In [41]:

```
# t1.columns =["_".join(col) for col in t1.columns]
# t1.reset_index()
t1.rename(columns={'type':'type_count'}, inplace=True)
```

In [42]:

```
t1 = t1.reset_index()
```

In [43]:

```
t1.columns
```

Out[43]:

```
Index(['type', 'year_added', 'type_count'], dtype='object')
```

In [44]:

```
t1_pivot = pd.pivot(t1, index = 'type',
                    columns = 'year_added',
                    values = 'type_count')
t1 pivot
```

Out[44]:

year_added	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
type												
Movie	1.0	2.0	1.0	13.0	3.0	6.0	19.0	56.0	253.0	839.0	1237.0	1424.0
TV Show	1.0	NaN	NaN	NaN	NaN	4.0	4.0	17.0	165.0	325.0	388.0	673.0

- We can get a insight that TV Show count is increasing by year on year basis

Working with Nested data

Fetching top Genres

In [45]:

```
df.listed_in # comma seperated value
```

Out[45]:

```
0                                          Documentaries
1            International TV Shows, TV Dramas, TV Mysteries
2          Crime TV Shows, International TV Shows, TV Act...
3                                  Docuseries, Reality TV
4          International TV Shows, Romantic TV Shows, TV ...
                               ...
8802                       Cult Movies, Dramas, Thrillers
8803               Kids' TV, Korean TV Shows, TV Comedies
8804                              Comedies, Horror Movies
8805                   Children & Family Movies, Comedies
8806         Dramas, International Movies, Music & Musicals
Name: listed_in, Length: 8807, dtype: object
```

In [46]:

```
df_remove_comma = df.listed_in.str.split(',', expand=True)
```

In [47]:

```
df_remove_comma # Comma removed
```

Out[47]:

	0	1	2
0	Documentaries	None	None
1	International TV Shows	TV Dramas	TV Mysteries
2	Crime TV Shows	International TV Shows	TV Action & Adventure
3	Docuseries	Reality TV	None
4	International TV Shows	Romantic TV Shows	TV Comedies
...	...	...	...
8802	Cult Movies	Dramas	Thrillers
8803	Kids' TV	Korean TV Shows	TV Comedies
8804	Comedies	Horror Movies	None
8805	Children & Family Movies	Comedies	None
8806	Dramas	International Movies	Music & Musicals

8807 rows × 3 columns

In [48]:

```
#remove listed in from df
df = df.drop(['listed_in'], axis = 1)
df.head(2)
```

Out[48]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV-MA

In [49]:

```
# Combine splitted data
df_new = pd.concat([df,df_remove_comma], axis=1)
```

In [50]:

```
df_new.head(2)
```

Out[50]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV-MA

In [51]:

```
# Use melt to convert into long format frpom wide format
df_melt = pd.melt(df_new, id_vars = ['show_id', 'type', 'title', 'director', 'cast', 'co
                                     'duration', 'description', 'day_added', 'month_added'
                  var_name = 'listed_total', value_name = 'listed_in')
```

In [52]:

```
df_melt.head(2)
```

Out[52]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV-MA

In [53]:

```
# Analysis

df2 = df_melt.groupby(['listed_in'])['title'].nunique()
```

In [54]:

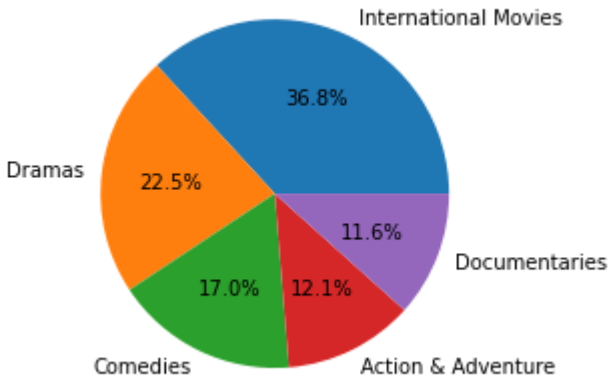
```
# TOP 5 GENRE
df_final = df2.sort_values(ascending=False).head()
df_final
```

Out[54]:

```
listed_in
 International Movies    2624
Dramas                   1600
Comedies                 1210
Action & Adventure        859
Documentaries             829
Name: title, dtype: int64
```

In [55]:

```
plt.pie(df_final.head().values, labels = df_final.head().index, autopct = '%1.1f%%')
plt.show()
```



Visual Analysis - Univariate, Bivariate after pre-processing of the data

Note: Pre-processing involves unnesting of the data in columns like Actor, Director, Country

A. For continuous variable(s): Distplot, countplot, histogram for univariate analysis

B. For categorical variable(s): Boxplot

C. For correlation: Heatmaps, Pairplots

In [56]:

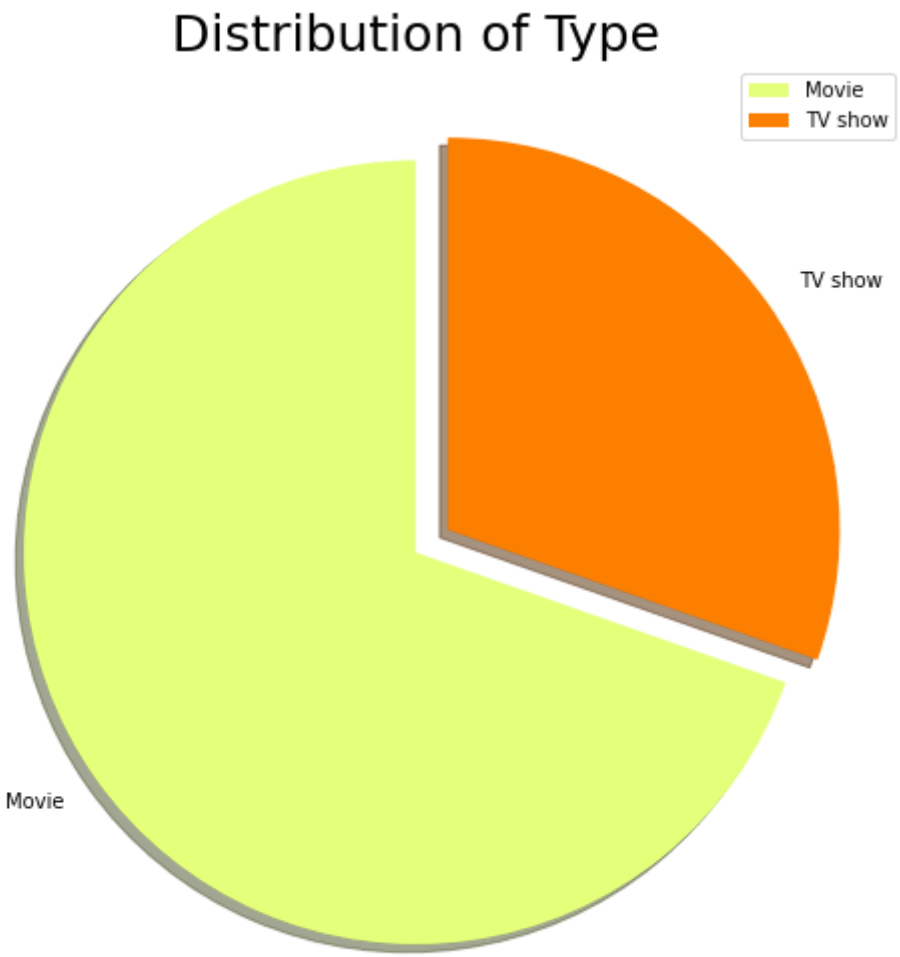
```
df.head()
```

Out[56]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	c
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13	90 min	f
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV-MA	2 Seasons	
		TV		Julien	Sami Bouajila, Tracy				TV-	1	

In [57]:

```
labels = ['Movie', 'TV show']
size = df['type'].value_counts()
colors = plt.cm.Wistia(np.linspace(0, 1, 2))
explode = [0, 0.1]
plt.rcParams['figure.figsize'] = (9, 9)
plt.pie(size,labels=labels, colors = colors, explode = explode, shadow = True, startangl
plt.title('Distribution of Type', fontsize = 25)
plt.legend()
plt.show()
```



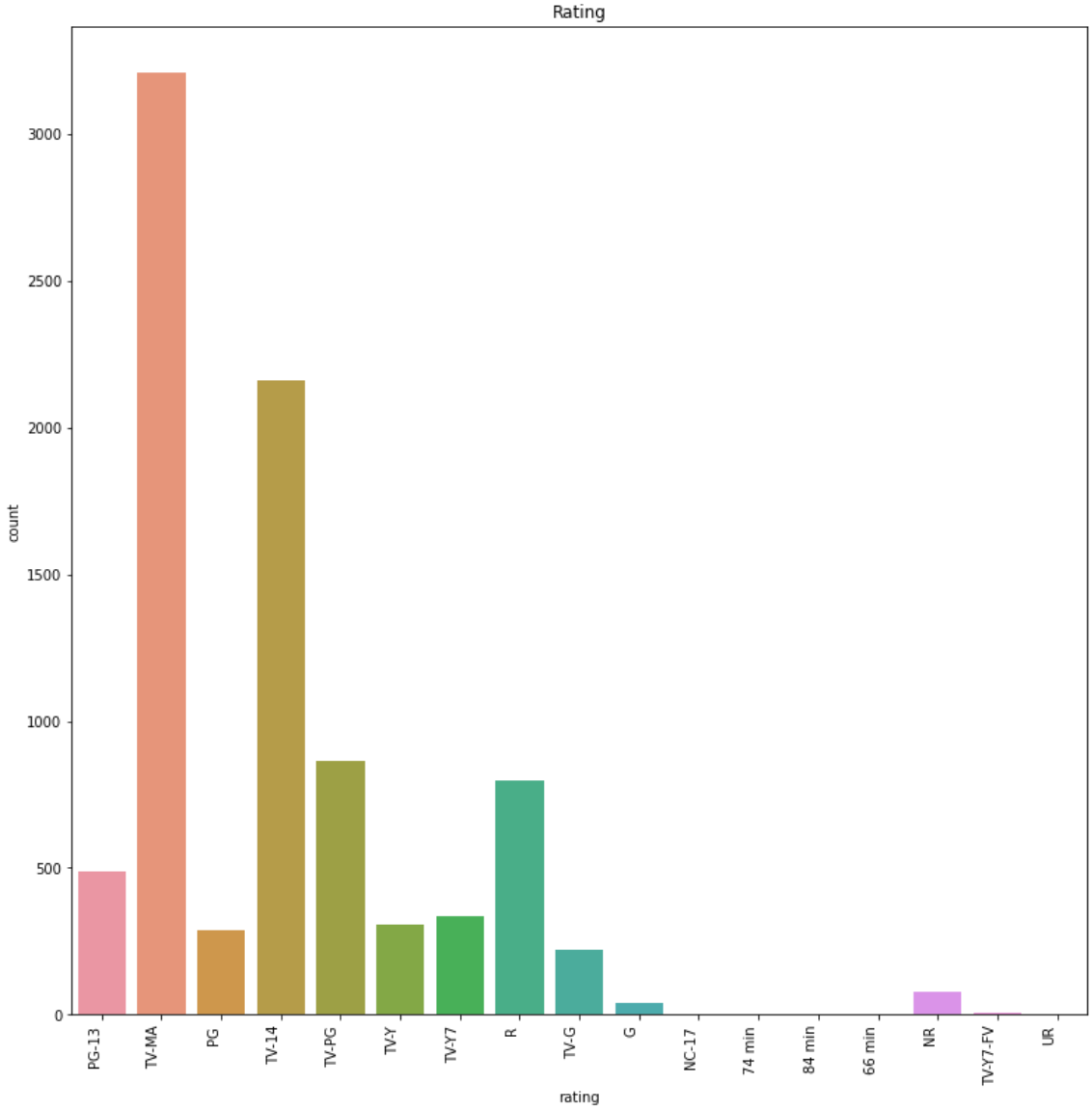
- As per recorded data, Netflix mostly focused on Movies and Movies are the marjoty revenuw generator for netflix

In [58]:

```
sb.countplot(x = df['rating'])
sb.countplot(x = df['rating']).set_xticklabels(sb.countplot(x = df['rating']).get_xtickl
fig = plt.gcf()
fig.set_size_inches(13,13)
plt.title('Rating')
```

Out[58]:

```
Text(0.5, 1.0, 'Rating')
```



- Most highest giving rating is TV-MA

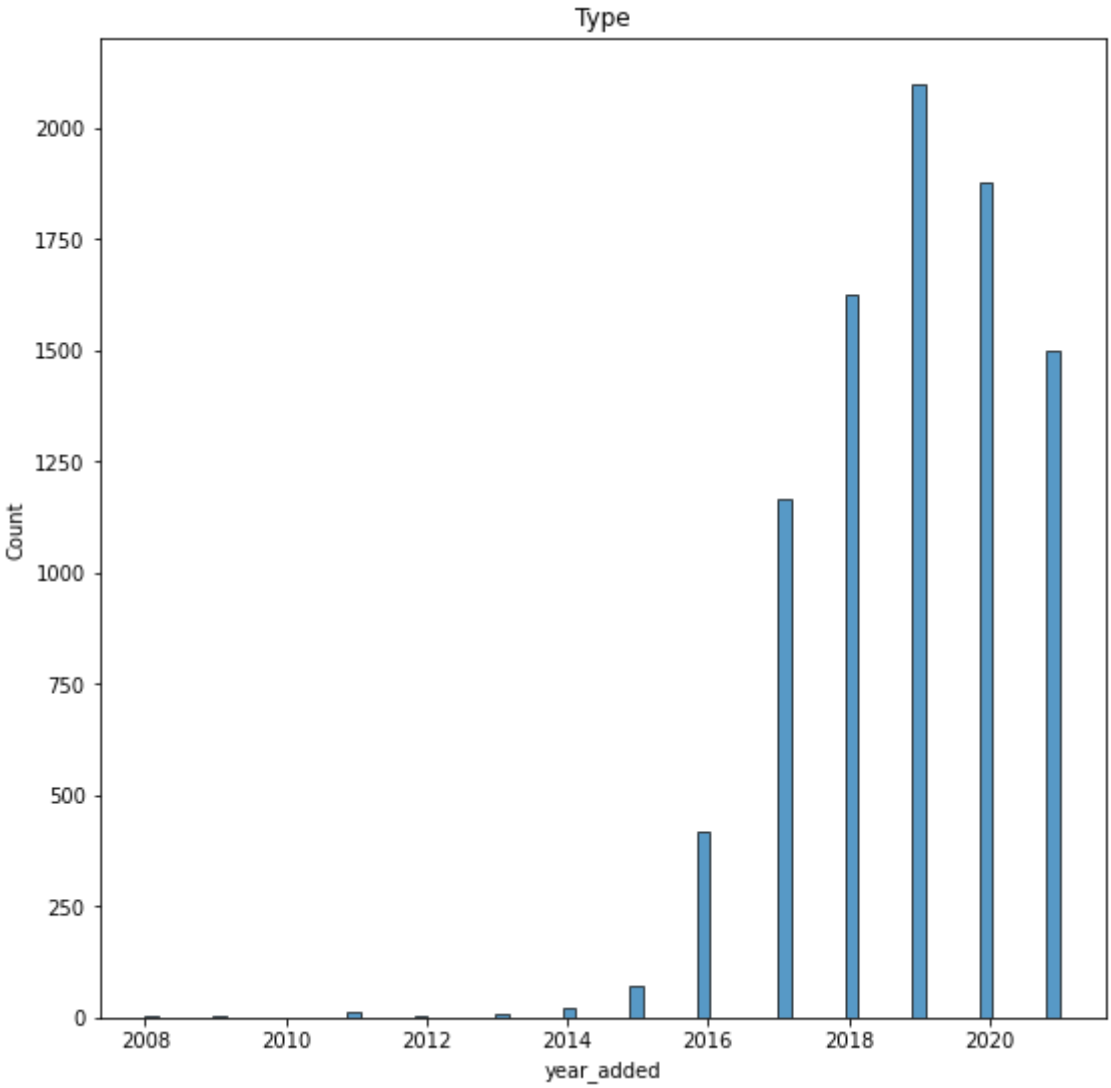
In [59]:

```
# Histplot

sb.histplot(df['year_added'])
fig = plt.gcf()
plt.title('Type')
```

Out[59]:

```
Text(0.5, 1.0, 'Type')
```



- Highest number of movie/TV Show was added into Netflix between 2018-2020
- After 2019 there are some downfall, Number of new Movies/TV Shows decresing since 2019

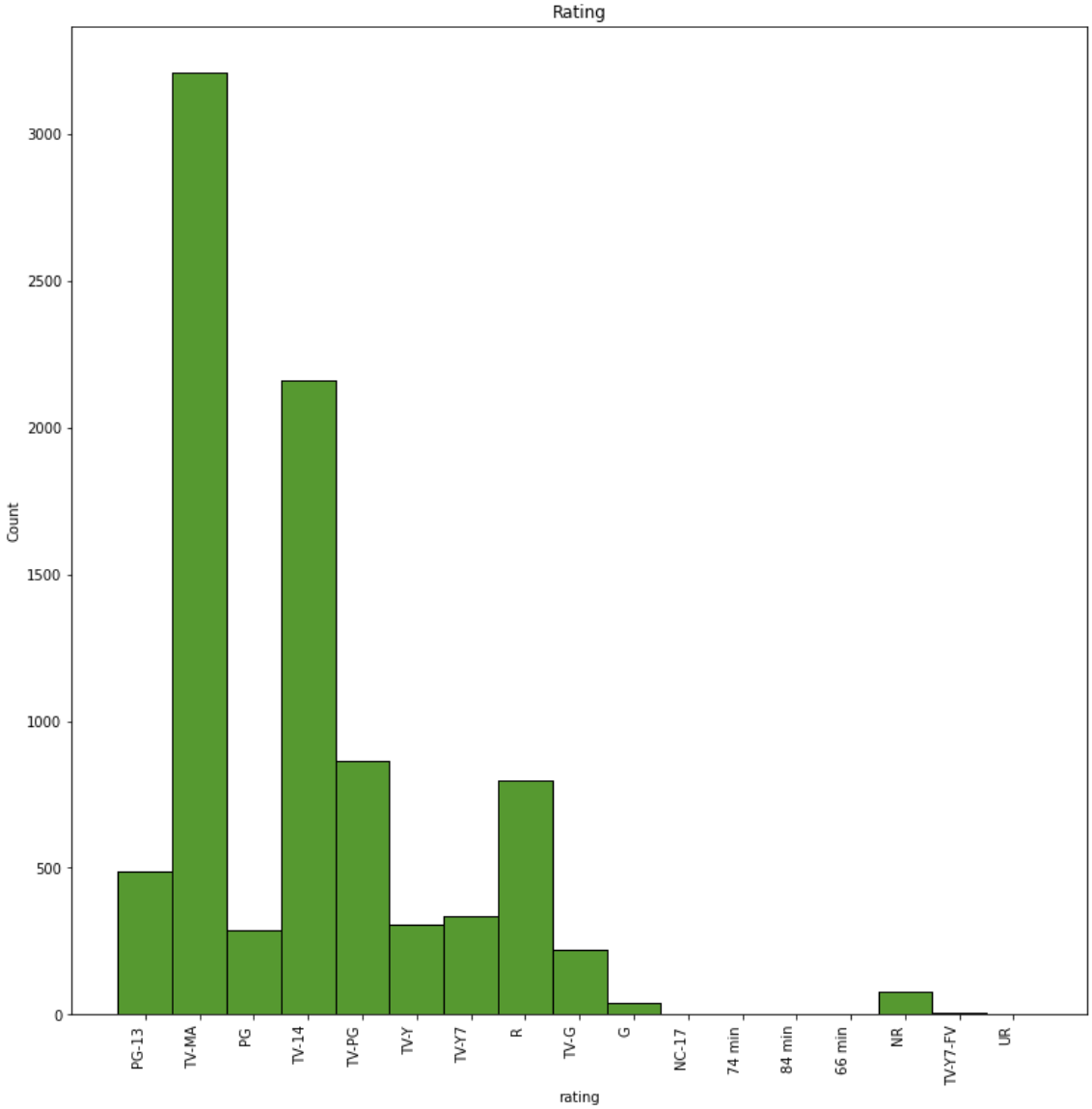
In [60]:

```
sb.histplot(x = df['rating'])
sb.histplot(x = df['rating']).set_xticklabels(sb.histplot(x = df['rating']).get_xticklab
fig = plt.gcf()
fig.set_size_inches(13,13)
plt.title('Rating')
```

```
C:\Users\Deep\AppData\Local\Temp\ipykernel_6944\3008557954.py:2: UserWarn
ing: FixedFormatter should only be used together with FixedLocator
  sb.histplot(x = df['rating']).set_xticklabels(sb.histplot(x = df['ratin
g']).get_xticklabels(), rotation=90, ha="right")
```

Out[60]:

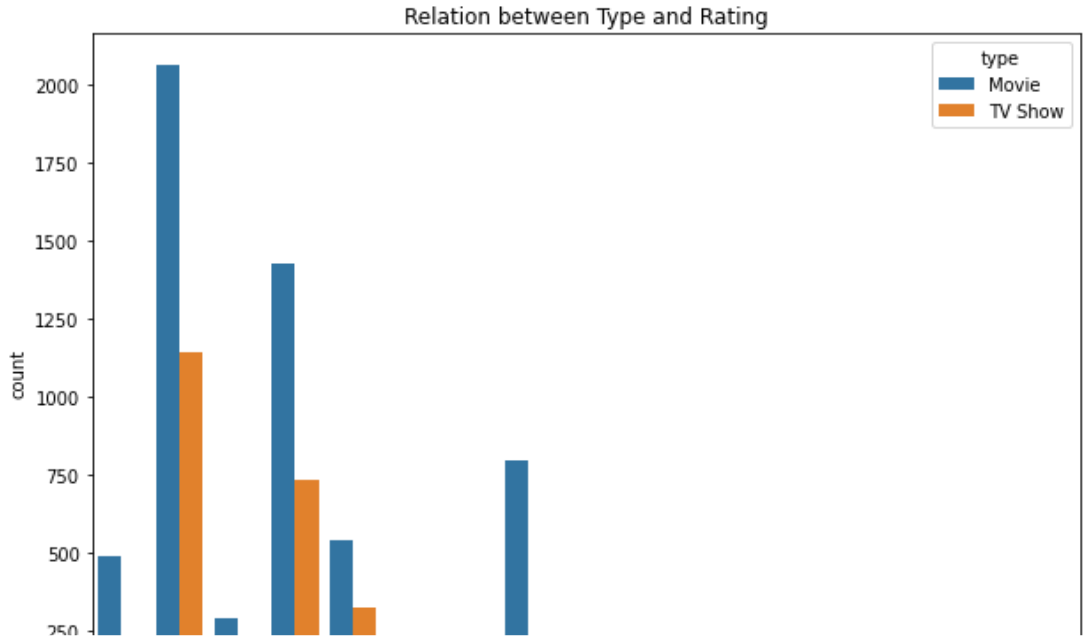
```
Text(0.5, 1.0, 'Rating')
```



Relation between type and rating

In [61]:

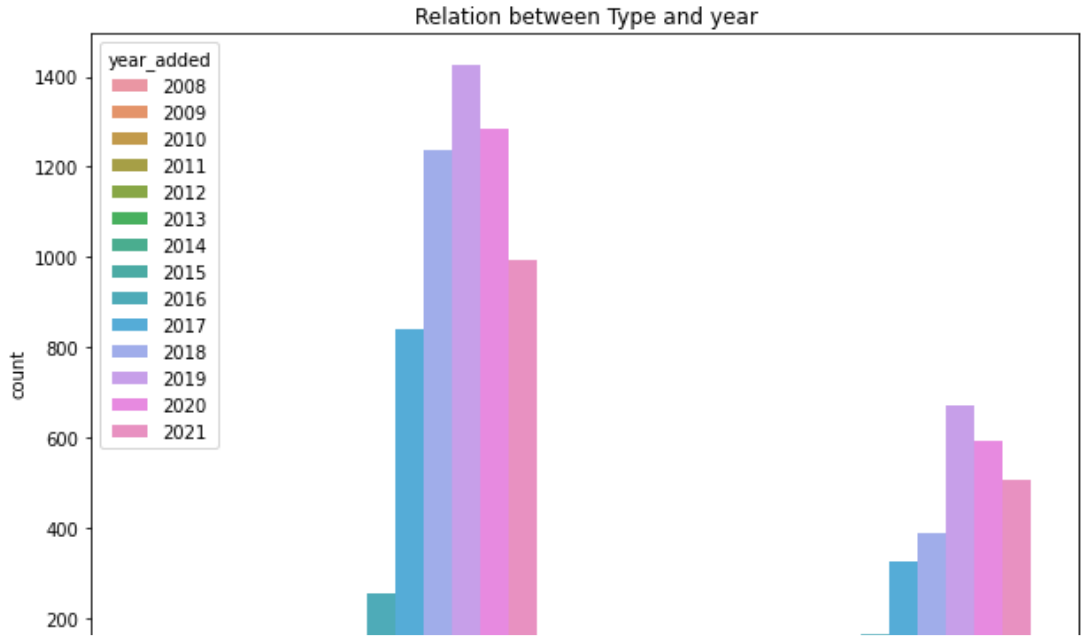
```
plt.figure(figsize=(10,7))
sb.countplot(x='rating', hue = 'type', data = df)
plt.title('Relation between Type and Rating')
plt.show()
```



- TV Shows are the Highest rated shows on Netflix. Hence, we can concluded that viewers love to watch TV Shows

In [62]:

```
plt.figure(figsize=(10,7))
sb.countplot(x='type', hue = 'year_added', data = df)
plt.title('Relation between Type and year')
plt.show()
```



- In year 2019, highest movie and TV Show was added and after that there is a downfall, May be due to Covid

Distplot

In [63]:

```
sb.distplot(x = df['release_year'])
fig.set_size_inches(10,10)
```

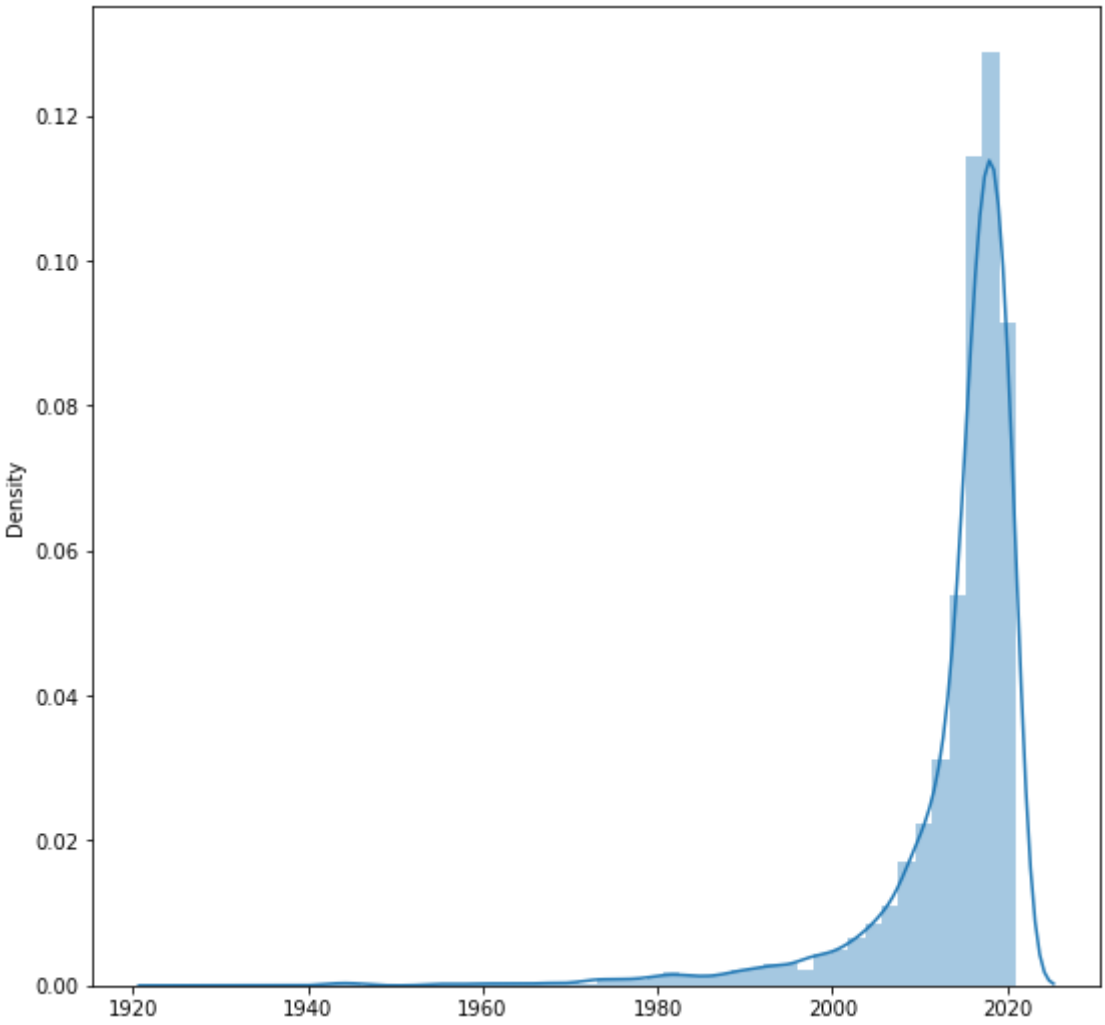
```
C:\Users\Deep\AppData\Local\Temp\ipykernel_6944\368058081.py:1: UserWarni
ng:

`distplot` is a deprecated function and will be removed in seaborn v0.14.
0.

Please adapt your code to use either `displot` (a figure-level function w
ith
similar flexibility) or `histplot` (an axes-level function for histogram
s).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751 (http
s://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751)

  sb.distplot(x = df['release_year'])
```

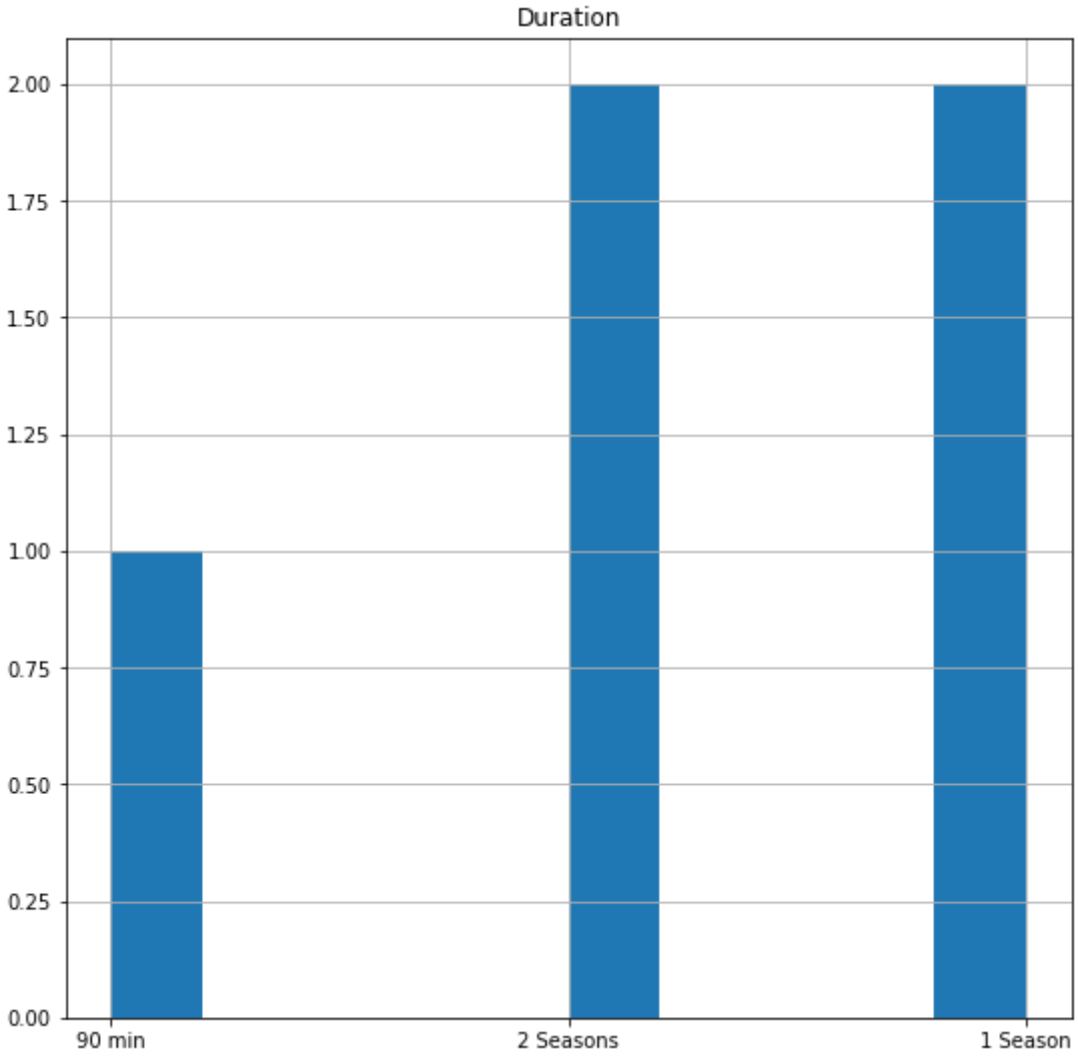


In [64]:

```
df['duration'].head().hist()
fig.set_size_inches(13,13)
plt.title('Duration')
```

Out[64]:

```
Text(0.5, 1.0, 'Duration')
```



Top 5 countries with most number of Shows

In [65]:

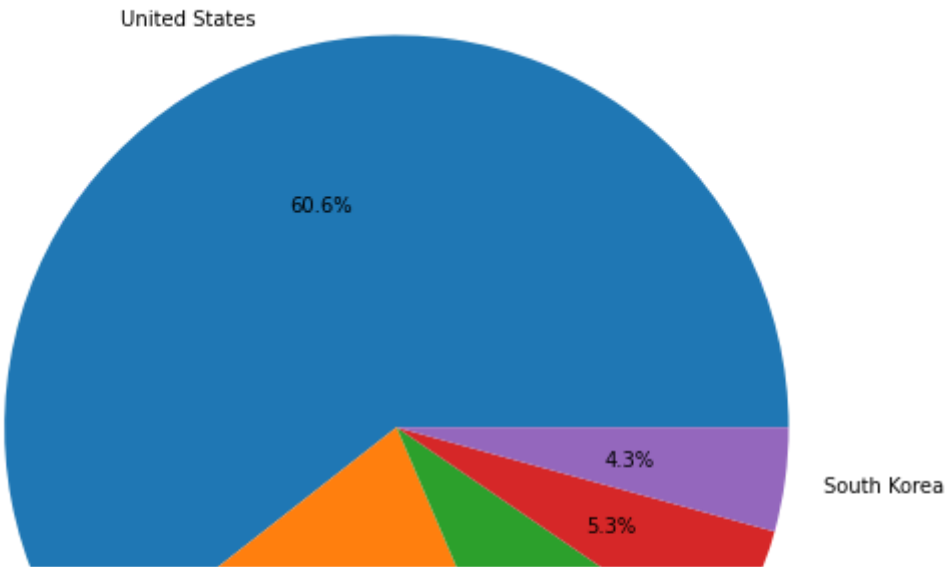
```
z = df['country'].value_counts()
z
```

Out[65]:

```
country
United States                              2818
India                                       972
United Kingdom                              419
Japan                                       245
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
```

In [66]:

```
plt.pie(z.head().values, labels = z.head().index, autopct = '%1.1f%%')
plt.show()
```



- From above pie chart we can concluded that USA, INDIA, UK, JAPAN & SOUTH KOREA are the biggest market for netfilx

Top 5 Rating Categories

In [67]:

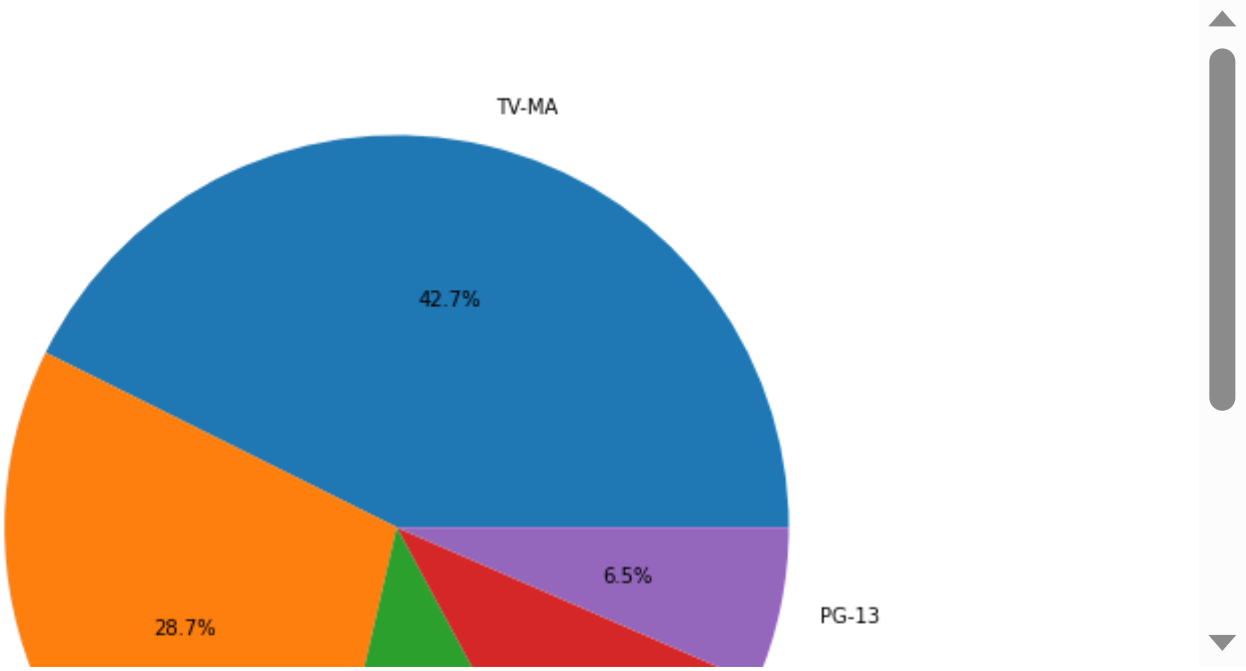
```
y = df['rating'].value_counts()
y
```

Out[67]:

```
rating
TV-MA       3207
TV-14       2160
TV-PG        863
R            799
PG-13        490
TV-Y7        334
TV-Y         307
PG           287
TV-G         220
NR            80
G             41
TV-Y7-FV       6
NC-17          3
UR             3
74 min         1
84 min         1
66 min         1
Name: count, dtype: int64
```

In [68]:

```
plt.pie(y.head().values, labels = y.head().index, autopct='%1.1f%%')
plt.show()
```



- Top 5 ratings are are visible

Top 5 directors by Movie counts

In [69]:

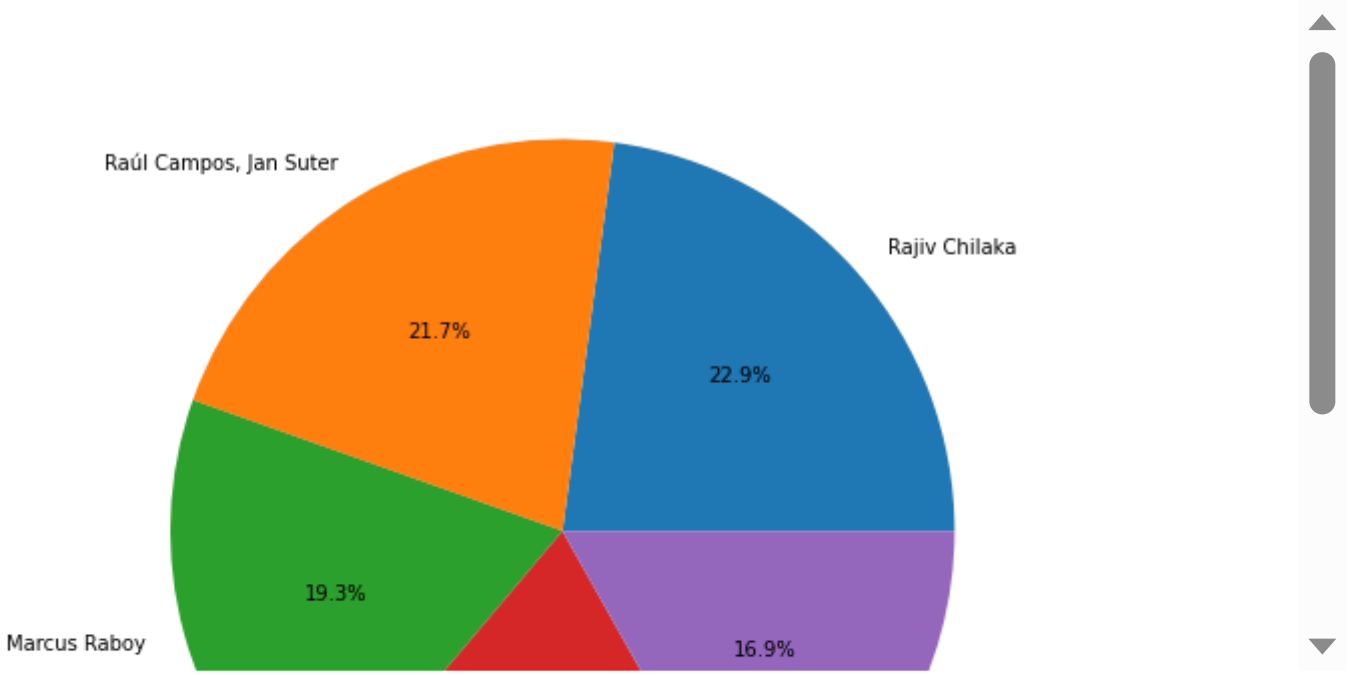
```
d = df['director'].value_counts()
d
```

Out[69]:

```
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
```

In [70]:

```
plt.pie(d.head().values, labels = d.head().index, autopct='%1.1f%%')
plt.show()
```



- Most number of directed movies are on Netfilx are directed by Rajiv Chilaka (As per Data Set)

Bivariate Analysis

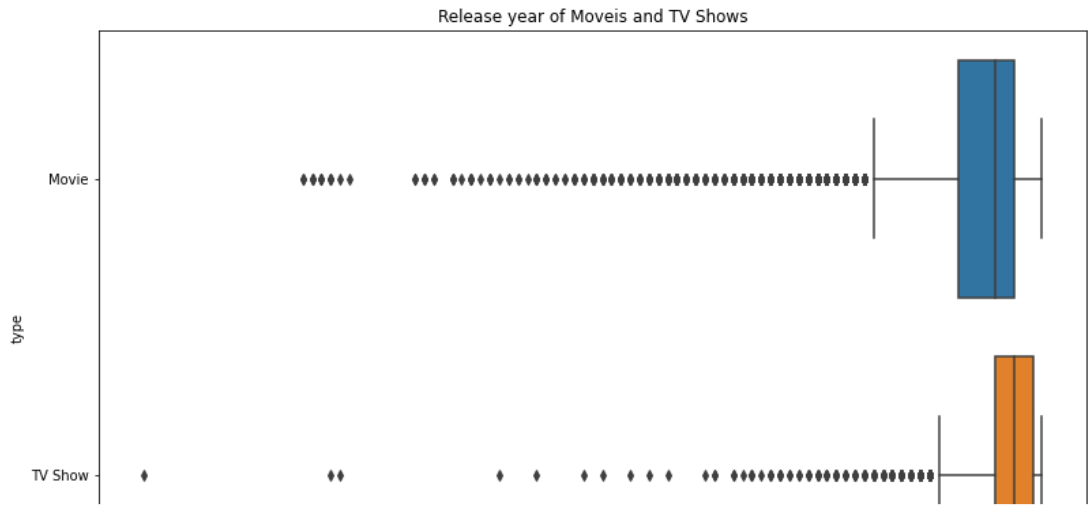
Release year of Moveis and TV Shows

In [71]:

```
#Boxplot
boxplot = sb.boxplot(x = df['release_year'], y = df['type'])
fig = plt.gcf()
fig.set_size_inches(13,8)
plt.title('Release year of Moveis and TV Shows')
```

Out[71]:

```
Text(0.5, 1.0, 'Release year of Moveis and TV Shows')
```



In [72]:

```
df.head(2)
```

Out[72]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV-MA

In [73]:

```
sb.__version__
```

Out[73]:

```
'0.12.2'
```

Heatmaps

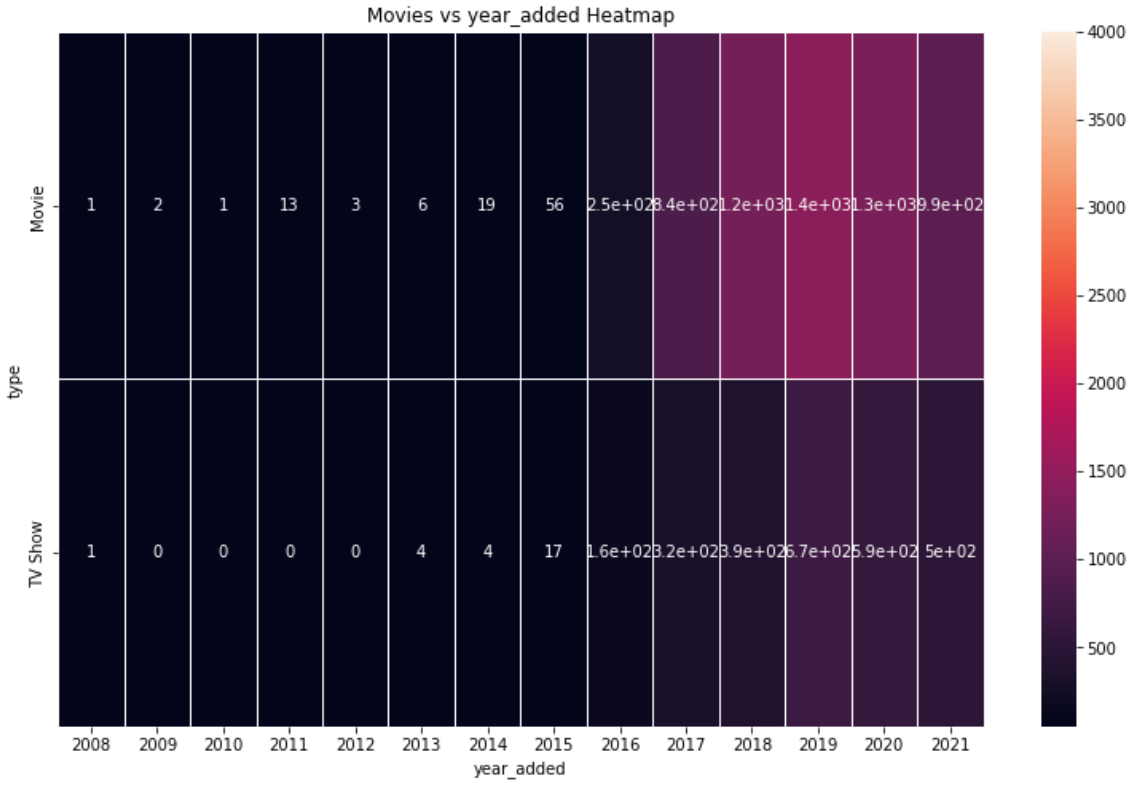
Added Movies and TV Shows per year

In [74]:

```
a = pd.crosstab(df['type'],df['year_added'])
sb.heatmap(a, annot = True, linewidth=0.5, vmin=50, vmax=4000)
fig = plt.gcf()
fig.set_size_inches(13,8)
plt.title('Movies vs year_added Heatmap')
```

Out[74]:

```
Text(0.5, 1.0, 'Movies vs year_added Heatmap')
```



- Count of TV Shows and Movie varies from yeat to year

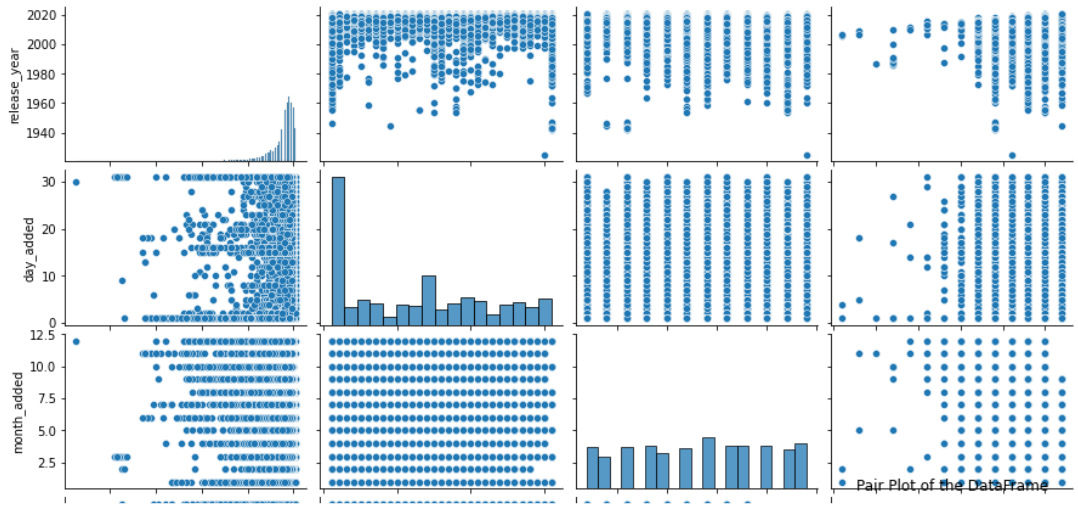
Pairplots

In [75]:

```
sb.pairplot(df)
fig = plt.gcf()
fig.set_size_inches(13,8)
plt.title('Pair Plot of the DataFrame')
```

Out[75]:

```
Text(0.5, 1.0, 'Pair Plot of the DataFrame')
```



In [76]:

```
df.head(2)
```

Out[76]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV-MA

Working with Cast column

In [77]:

```
df.head(2)
```

Out[77]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV-MA

In [78]:

```
constraint = df['cast'].apply(lambda x : str(x).split(', ')).tolist()
```

In [79]:

```
df_new = pd.DataFrame(constraint, index = df['title'])
df_new = df_new.stack()
df_new = pd.DataFrame(df_new)
df_new.reset_index(inplace=True) # reset index
df_new = df_new[['title', 0]] # consider only 2 column which is necessary
df_new.columns=['title', 'cast'] # Remaning last column with 'cast'
df_new[df_new['cast'] == 'Rupa Bhimani']
```

Out[79]:

	title	cast
313	Chhota Bheem	Rupa Bhimani
708	Mighty Raju	Rupa Bhimani
3373	Chhota Bheem - Dinosaur World	Rupa Bhimani
3379	Chhota Bheem - Neeli Pahaadi	Rupa Bhimani
3386	Chhota Bheem & Ganesh	Rupa Bhimani
3393	Chhota Bheem & Krishna: Mayanagari	Rupa Bhimani
3400	Chhota Bheem & Krishna: Pataliputra- City of t...	Rupa Bhimani
3407	Chhota Bheem And The Broken Amulet	Rupa Bhimani
3414	Chhota Bheem And The Crown of Valhalla	Rupa Bhimani
3421	Chhota Bheem and the Incan Adventure	Rupa Bhimani

In [80]:

```
df_new.cast.value_counts().head()
```

Out[80]:

```
cast
nan                 825
Anupam Kher          43
Shah Rukh Khan       35
Julie Tejwani        33
Naseeruddin Shah     32
Name: count, dtype: int64
```

- Cast Group and their movie counts & there are 825 Null values

In [81]:

```
df_cast=df.reset_index().merge(df_new, on='title', how='inner')
```

In [82]:

```
df_cast[df_cast['cast_y']=='Anupam Kher']
```

Out[82]:

	index	show_id	type	title	director	cast_x	country	date_added	release_year
1606	192	s193	Movie	C Kkompany	Sachin Yardi	Mithun Chakraborty, Tusshar Kapoor, Anupam Khe...	India	2021-08-27	2008
1704	202	s203	Movie	Kyaa Kool Hai Hum	Sangeeth Sivan	Tusshar Kapoor, Riteish Deshmukh, Isha Koppika...	India	2021-08-27	2005
1718	204	s205	Movie	Kyaa Super Kool Hain	Sachin	Tusshar Kapoor, Riteish	India	2021-08-27	2012

In [83]:

```
x=pd.DataFrame(df_cast.groupby('cast_y')['title'].count())
```

In [84]:

```
x.reset_index(inplace=True)
```

In [85]:

```
x[x['cast_y']=='Anupam Kher']
```

Out[85]:

	cast_y	title
2833	Anupam Kher	43

- Total Movie count of Anupam Kher

5. Missing Value & Outlier check

In [86]:

```
df.head(2)
```

Out[86]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV-MA

In [87]:

```
df.isnull().sum()
```

Out[87]:

```
show_id          0
type             0
title            0
director      2634
cast           825
country        831
date_added      98
release_year     0
rating           4
duration         3
description      0
day_added        0
month_added      0
year_added       0
dtype: int64
```

In [88]:

```
# Using mode function we are working on missing values
mode_value = df['director'].mode()[0]
```

In [89]:

```
df['director'].fillna(mode_value, inplace = True)
```

In [90]:

```
df['country'].fillna(df['country'].mode()[0], inplace = True)
df['cast'].fillna(df['cast'].mode()[0], inplace = True)
df['date_added'].fillna(df['date_added'].mode()[0], inplace = True)
df['rating'].fillna(df['rating'].mode()[0], inplace = True)
```

In [91]:

```
df
```

Out[91]:

	show_id	type	title	director	cast	country	date_added	release_year
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	David Attenborough	United States	2021-09-25	2020
1	s2	TV Show	Blood & Water	Rajiv Chilaka	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	United States	2021-09-24	2021
3	s4	TV Show	Jailbirds New Orleans	Rajiv Chilaka	David Attenborough	United States	2021-09-24	2021
4	s5	TV Show	Kota Factory	Rajiv Chilaka	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	2021-09-24	2021
...	...	...	...	...	...	...	...	...
8802	s8803	Movie	Zodiac	David Fincher	Mark Ruffalo, Jake Gyllenhaal, Robert Downey J...	United States	2019-11-20	2007
8803	s8804	TV Show	Zombie Dumb	Rajiv Chilaka	David Attenborough	United States	2019-07-01	2018
8804	s8805	Movie	Zombieland	Ruben Fleischer	Jesse Eisenberg, Woody Harrelson, Emma Stone, ...	United States	2019-11-01	2009
8805	s8806	Movie	Zoom	Peter Hewitt	Tim Allen, Courteney Cox, Chevy Chase, Kate Ma...	United States	2020-01-11	2006
8806	s8807	Movie	Zubaan	Mozez Singh	Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan...	India	2019-03-02	2015

8807 rows × 14 columns

In [92]:

```
df.isnull().sum()
```

Out[92]:

```
show_id         0
type            0
title           0
director        0
cast            0
country         0
date_added      0
release_year    0
rating          0
duration        3
description     0
day_added       0
month_added     0
year_added      0
dtype: int64
```

In [93]:

```
df.describe(include='all')
```

Out[93]:

	show_id	type	title	director	cast	country	date_added	release
count	8807	8807	8807	8807	8807	8807	8807	8807.0
unique	8807	2	8807	4528	7692	748	NaN	
top	s1	Movie	Dick Johnson Is Dead	Rajiv Chilaka	David Attenborough	United States	NaN	
freq	1	6131	1	2653	844	3649	NaN	
mean	NaN	NaN	NaN	NaN	NaN	NaN	2019-05-25 13:17:35.024412160	2014.1
min	NaN	NaN	NaN	NaN	NaN	NaN	2008-01-01 00:00:00	1925.0
25%	NaN	NaN	NaN	NaN	NaN	NaN	2018-04-30 12:00:00	2013.0
50%	NaN	NaN	NaN	NaN	NaN	NaN	2019-07-26 00:00:00	2017.0
75%	NaN	NaN	NaN	NaN	NaN	NaN	2020-08-18 00:00:00	2019.0
max	NaN	NaN	NaN	NaN	NaN	NaN	2021-09-25 00:00:00	2021.0
std	NaN	NaN	NaN	NaN	NaN	NaN	NaN	8.8

- Here let assume, for TV shows 1 season is equals to 60 minute

In [94]:

```
df['duration']=df['duration'].apply(lambda x:str(x).split(' ')[0])
```

In [95]:

```
for i in range(len(df)):
    if df['type'][i]=='TV Show':
        df['duration'][i]=int(df['duration'][i])*60
```

```
C:\Users\Deep\AppData\Local\Temp\ipykernel_6944\146563206.py:3: Settin
gWithCopyWarning:
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
(https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html
#returning-a-view-versus-a-copy)
  df['duration'][i]=int(df['duration'][i])*60
C:\Users\Deep\AppData\Local\Temp\ipykernel_6944\146563206.py:3: Settin
gWithCopyWarning:
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
(https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html
#returning-a-view-versus-a-copy)
  df['duration'][i]=int(df['duration'][i])*60
C:\Users\Deep\AppData\Local\Temp\ipykernel_6944\146563206.py:3: Settin
```

In [96]:

```
df.head()
```

Out[96]:

	show_id	type	title	director	cast	country	date_added	release_year	rat
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	David Attenborough	United States	2021-09-25	2020	
1	s2	TV Show	Blood & Water	Rajiv Chilaka	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	United States	2021-09-24	2021	
3	s4	TV Show	Jailbirds New Orleans	Rajiv Chilaka	David Attenborough	United States	2021-09-24	2021	
4	s5	TV Show	Kota Factory	Rajiv Chilaka	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	2021-09-24	2021	

- We have convert duration into minute format

In [97]:

```
df['duration'].fillna(df['duration'].mode()[0], inplace = True)
df['duration']
```

Out[97]:

```
0        90
1       120
2        60
3        60
4       120
       ...
8802    158
8803    120
8804     88
8805     88
8806    111
Name: duration, Length: 8807, dtype: object
```

In [98]:

```
df['duration'].isnull().sum()
df['duration'].dtype
```

Out[98]:

```
dtype('O')
```

In [99]:

```
# print(np.where(df['duration']>200))

# # Q1 = df.price.quantile(0.25)
# # Q3 = df.price.quantile(0.75)
# # IQR = Q3-Q1
# # df_final = df[~((df.price<(Q1-1.5*IQR)) | (df.price>(Q3+1.5*IQR)))]
```

In [100]:

```
# Convert 'duration' column to numeric data type

df['duration'] = pd.to_numeric(df['duration'], errors='coerce')
```

In [101]:

```
df['duration'].dtype
```

Out[101]:

```
dtype('float64')
```

In [102]:

```
# Calculate Z-score
z_score = (df['duration']-df['duration'].mean())/df['duration'].std()
z_score
```

Out[102]:

```
0      -0.199975
1       0.321787
2      -0.721738
3      -0.721738
4       0.321787
          ...
8802    0.982686
8803    0.321787
8804   -0.234759
8805   -0.234759
8806    0.165258
Name: duration, Length: 8807, dtype: float64
```

In [103]:

```
# Identify outliers using z-score
outliers_zscore = np.where(np.abs(z_score)>3)
outliers_zscore
```

Out[103]:

```
(array([   8,   21,   55,   65,   67,   72,   82,  106,  109,  254,  272,
         274,  323,  336,  338,  380,  390,  425,  514,  521,  525,  526,
         537,  544,  548,  631,  667,  669,  677,  789, 1043, 1059, 1173,
        1245, 1354, 1362, 1408, 1427, 1480, 1622, 1639, 1701, 1750, 1759,
        1779, 1851, 1878, 1922, 1933, 1980, 1998, 2009, 2021, 2073, 2124,
        2160, 2173, 2201, 2203, 2293, 2390, 2405, 2422, 2423, 2470, 2515,
        2523, 2526, 2599, 2600, 2658, 2718, 2740, 2947, 2962, 2994, 3108,
        3168, 3247, 3369, 3452, 3477, 3541, 3601, 3608, 3653, 3749, 3774,
        3886, 3927, 3943, 4084, 4163, 4220, 4253, 4264, 4311, 4413, 4504,
        4709, 4747, 4798, 4845, 4946, 4964, 5035, 5054, 5063, 5090, 5096,
        5138, 5165, 5180, 5221, 5245, 5274, 5287, 5320, 5363, 5412, 5421,
        5650, 5674, 5803, 5908, 5923, 5940, 6126, 6174, 6250, 6456, 6504,
        6505, 6506, 6519, 6549, 6603, 6742, 6795, 6806, 6885, 6941, 6955,
        6970, 7342, 7368, 7628, 7709, 7721, 7729, 7756, 7847, 7856, 7870,
        7896, 7953, 8174, 8189, 8311, 8378, 8422, 8442, 8557, 8710, 872
6],
       dtype=int64),)
```

In [104]:

```
# Calculate IQR
Q1 = df['duration'].quantile(0.25)
Q3 = df['duration'].quantile(0.75)

IQR = Q3 - Q1
```

In [105]:

```
# Identify outlier using IQR

outliers_IQR = np.where((df['duration'] < Q1 - 1.5*IQR) | (df['duration']> Q3 + 1.5*IQR))
outliers_IQR
```

Out[105]:

```
(array([   8,   15,   21,   55,   65,   67,   72,   82,   89,  106,  109,
         160,  166,  220,  254,  272,  274,  323,  336,  338,  380,  386,
         390,  391,  425,  477,  512,  514,  521,  525,  526,  537,  540,
         544,  548,  628,  631,  660,  661,  667,  669,  676,  677,  684,
         717,  789,  807,  890, 1019, 1043, 1059, 1081, 1158, 1173, 1179,
        1235, 1245, 1302, 1308, 1354, 1362, 1377, 1395, 1401, 1408, 1419,
        1427, 1473, 1480, 1569, 1590, 1618, 1622, 1639, 1687, 1698, 1701,
        1750, 1759, 1765, 1779, 1781, 1791, 1847, 1848, 1851, 1878, 1922,
        1929, 1933, 1948, 1949, 1958, 1980, 1998, 2009, 2021, 2069, 2073,
        2124, 2127, 2135, 2160, 2173, 2201, 2203, 2254, 2293, 2388, 2390,
        2395, 2399, 2405, 2415, 2417, 2422, 2423, 2466, 2470, 2484, 2487,
        2488, 2491, 2515, 2523, 2526, 2583, 2599, 2600, 2628, 2632, 2658,
        2718, 2731, 2740, 2790, 2846, 2931, 2947, 2962, 2994, 3011, 3035,
        3108, 3168, 3192, 3227, 3247, 3330, 3369, 3452, 3477, 3541, 3601,
        3608, 3653, 3749, 3774, 3886, 3920, 3927, 3943, 4084, 4163, 4167,
        4201, 4206, 4220, 4253, 4264, 4311, 4413, 4498, 4504, 4527, 4551,
        4573, 4709, 4747, 4762, 4798, 4837, 4844, 4845, 4857, 4946, 4964,
        5035, 5054, 5063, 5090, 5096, 5126, 5138, 5147, 5149, 5165, 5180,
        5221, 5244, 5245, 5262, 5274, 5285, 5287, 5320, 5363, 5380, 5381,
        5412, 5421, 5523, 5650, 5674, 5785, 5803, 5908, 5923, 5939, 5940,
        6126, 6174, 6250, 6264, 6279, 6456, 6504, 6505, 6506, 6519, 6549,
        6603, 6742, 6795, 6803, 6806, 6885, 6935, 6941, 6955, 6970, 7321,
        7342, 7368, 7406, 7628, 7709, 7721, 7729, 7756, 7842, 7847, 7856,
        7867, 7870, 7896, 7932, 7953, 8002, 8064, 8174, 8189, 8311, 8331,
        8378, 8422, 8442, 8539, 8541, 8557, 8653, 8710, 8726], dtype=int6
4),)
```

In [106]:

```
# Print indeces of value greater than 200
print(np.where(df['duration']>200))
```

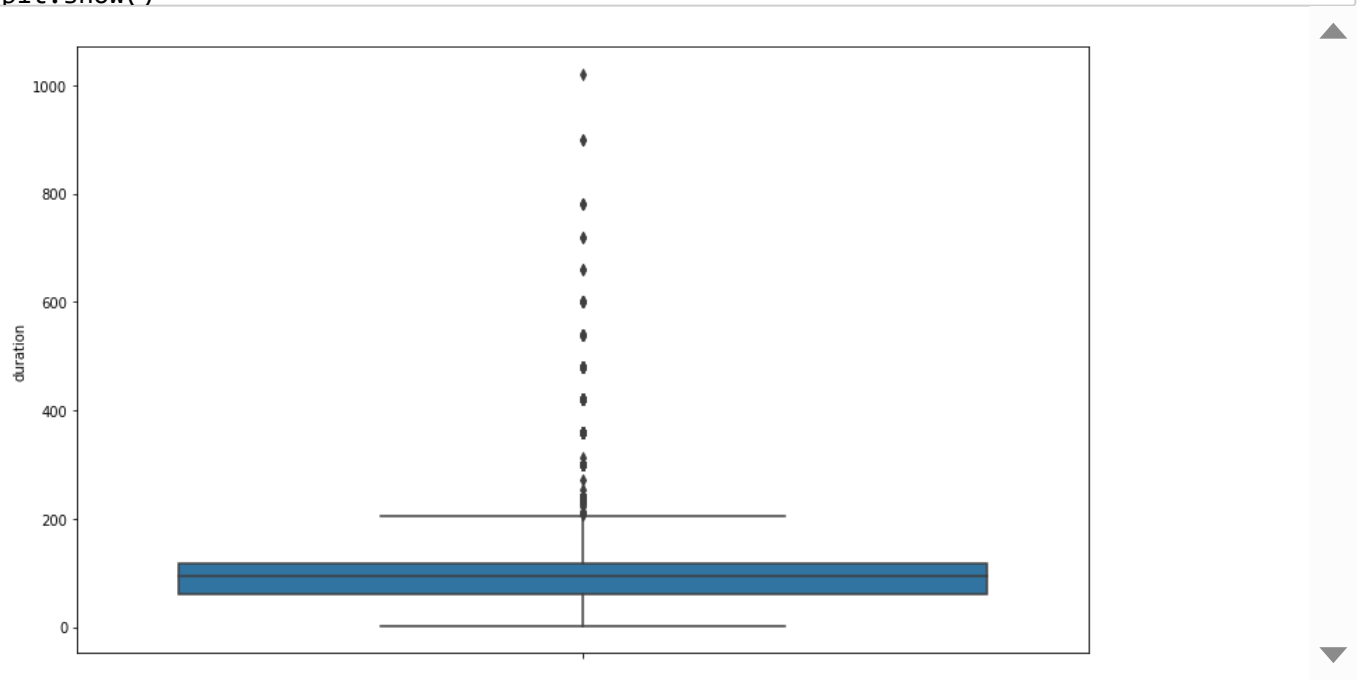
```
(array([   8,   15,   21,   55,   65,   67,   72,   82,   89,  106,  109,
        160,  166,  220,  254,  272,  274,  323,  336,  338,  380,  386,
        390,  391,  425,  477,  512,  514,  521,  525,  526,  537,  540,
        544,  548,  628,  631,  660,  661,  667,  669,  676,  677,  684,
        717,  789,  806,  807,  890, 1019, 1043, 1059, 1081, 1158, 1173,
       1179, 1235, 1245, 1302, 1308, 1354, 1362, 1377, 1395, 1401, 1408,
       1419, 1427, 1473, 1480, 1569, 1590, 1618, 1622, 1639, 1687, 1698,
       1701, 1750, 1759, 1765, 1779, 1781, 1791, 1847, 1848, 1851, 1878,
       1922, 1929, 1933, 1948, 1949, 1958, 1980, 1998, 2009, 2021, 2069,
       2073, 2124, 2126, 2127, 2135, 2160, 2173, 2201, 2203, 2254, 2293,
       2388, 2390, 2395, 2399, 2405, 2415, 2417, 2422, 2423, 2466, 2470,
       2483, 2484, 2487, 2488, 2491, 2515, 2523, 2526, 2583, 2599, 2600,
       2628, 2632, 2658, 2718, 2731, 2740, 2790, 2846, 2931, 2947, 2962,
       2994, 3011, 3035, 3108, 3168, 3192, 3227, 3247, 3330, 3369, 3452,
       3477, 3541, 3601, 3608, 3653, 3749, 3774, 3886, 3920, 3927, 3943,
       4084, 4163, 4167, 4201, 4206, 4220, 4253, 4264, 4311, 4413, 4498,
       4504, 4527, 4551, 4573, 4709, 4747, 4762, 4798, 4837, 4844, 4845,
       4857, 4946, 4964, 5035, 5054, 5063, 5090, 5096, 5126, 5138, 5147,
       5149, 5165, 5180, 5221, 5244, 5245, 5262, 5274, 5285, 5287, 5320,
       5363, 5380, 5381, 5412, 5421, 5523, 5650, 5674, 5785, 5803, 5908,
       5923, 5939, 5940, 6126, 6174, 6250, 6264, 6279, 6456, 6504, 6505,
       6506, 6519, 6549, 6603, 6742, 6795, 6803, 6806, 6885, 6935, 6941,
       6955, 6970, 7321, 7342, 7368, 7406, 7628, 7709, 7721, 7729, 7756,
       7842, 7847, 7856, 7867, 7870, 7896, 7932, 7953, 8002, 8064, 8174,
       8189, 8311, 8327, 8331, 8378, 8404, 8422, 8442, 8539, 8541, 8557,
       8653, 8710, 8726], dtype=int64),)
```

In [107]:

```
# Box Plot

boxplot = sb.boxplot(data = df, y = 'duration')

fig = plt.gcf()
fig.set_size_inches(13,8)
plt.show()
```



- IQR and Z-Score results along with Boxplot is visible

Business Insights

- As per Dataset most of the movies & TV Shows are directed by Rajiv Chilaka(19) followed by Raúl Campos and Jan Suter (18 each)
- Netflix started adding more and more TV Shows as the demand for the same is growing
- After 2019 there is a dip in the count of Movies and TV Shows, which may be the COVID effect
- Most directed movies on Netflix are directed by Rajiv Chilaka (As per Data Set)
- Highest percentile rating is for TV-MA
- The most number of Movies and TV Shows available in the US followed by INDIA
- Top 5 Genre is already analyzed, International Movies genre contains the highest number of Movies/TV Shows, i.e. 2624
- Estimate duration of any Show is around 200 minutes mostly
- August is the Month when most Movies/TV Shows are added to Netflix, followed by December and September

Recommendations

- As the popularity of TV Shows increases, Netflix should focus on TV Shows as well. This step can help Netflix to increase its user base
- India is the second largest user base for Netflix, Netflix should focus on more such content which can work efficiently in India

- Netflix should focus on the Comedy, Action & Adventure genres as these genres have great potential and are currently in a growing state (On Netflix's platform)
- After Covid Period, i.e. after 2020, Netflix should focus on increasing the number of contents