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

1. Defining Problem Statement and Analysing basic metrics

We need to explore data to understand and answer how Netflix can grow their business. What is working for them and how they can plan ahead. The challenges that we will face during the analysis will be dealing with missing values,multiple values in columns and datatype of the columns

```
! gdown 1XNHfxmS7qeUSGDHrCrbU-GVS6TPtkEpz

     Downloading...
     From: https://drive.google.com/uc?id=1XNHfxmS7qeUSGDHrCrbU-GVS6TPtkEpz
     To: /content/Netflix.csv
     100% 3.40M/3.40M [00:00<00:00, 168MB/s]
```

```
# Read the csv file
df=pd.read_csv("Netflix.csv")
```

```
# List of columns in the data
df.columns

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

```
# Top 5 rows from the data
df.head()
```

	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,	NaN	September 24, 2021	2021	TV-MA

```
# Check duplicate entries
df[df.duplicated]
# There are no duplicate entries in the data
```

show_id	type	title	director	cast	country	date_added	release_year	rating	duration

2. 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

```
# Shape of the data
df.shape

     (8807, 12)
```

```
# Dimension of the data
df.ndim

     2
```

```
# Data type of data
type(df)
```

```
pandas.core.frame.DataFrame
```

```
# Basic information of the data
df.info()
# Director, cast, country, and date_added has NaN values. We also have minor missing values in rating and duration columns
```

```
<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
```

```
# Changing datatype of the columns

df["date_added"]=pd.to_datetime(df["date_added"])
df["director"]=df["director"].astype(dtype="string")
df["cast"]=df["cast"].astype(dtype="string")
df["listed_in"]=df["listed_in"].astype(dtype="string")
df["country"]=df["country"].astype(dtype="string")
df["duration"]=df["duration"].astype(dtype="string")
```

```
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   string        
 4   cast          7982 non-null   string        
 5   country       7976 non-null   string        
 6   date_added    8797 non-null   datetime64[ns]
 7   release_year  8807 non-null   int64         
 8   rating        8803 non-null   object        
 9   duration      8804 non-null   string        
 10  listed_in     8807 non-null   string        
 11  description   8807 non-null   object        
dtypes: datetime64[ns](1), int64(1), object(5), string(5)
memory usage: 825.8+ KB
```

```
# Statistical details of the data
df.describe(include="all")
```

```
<ipython-input-110-28f691dd05f4>:2: FutureWarning: Treating datetime data as categorical rat
  df.describe(include="all")
```

	show_id	type	title	director	cast	country	date_added	release_year	ra
count	8807	8807	8807	6173	7982	7976	8797	8807.000000	
unique	8807	2	8807	4528	7692	748	1714	NaN	

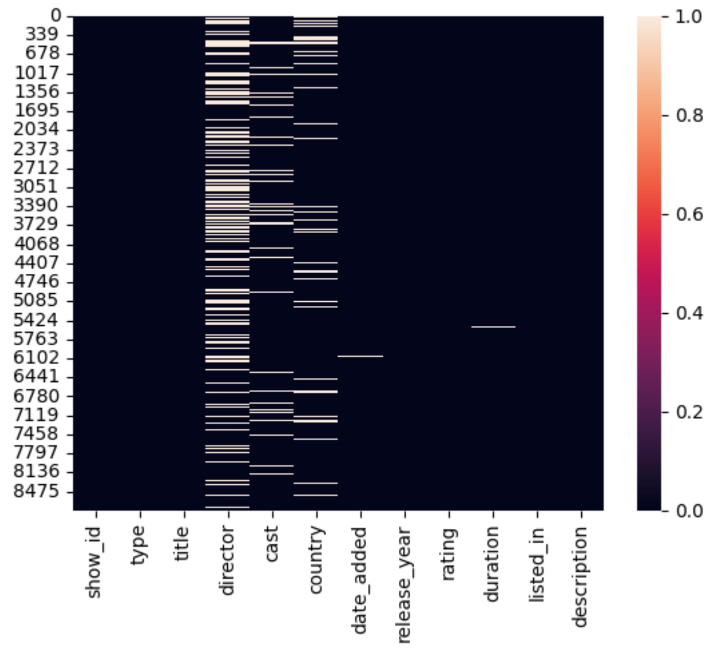
```
# Checking the null values in columns and getting boolean values
df.isnull()
```

	show_id	type	title	director	cast	country	date_added	release_year	rating	durat
0	False	False	False	False	True	False	False	False	False	Fa
1	False	False	False	True	False	False	False	False	False	Fa
2	False	False	False	False	False	True	False	False	False	Fa
3	False	False	False	True	True	True	False	False	False	Fa
4	False	False	False	True	False	False	False	False	False	Fa
...	...	...	...	...	...	...	...	...	...	
8802	False	False	False	False	False	False	False	False	False	Fa
8803	False	False	False	True	True	True	False	False	False	Fa
8804	False	False	False	False	False	False	False	False	False	Fa
8805	False	False	False	False	False	False	False	False	False	Fa
8806	False	False	False	False	False	False	False	False	False	Fa

8807 rows × 12 columns

```
# Heatmap for null values
sns.heatmap(df.isnull())
```

```
<Axes: >
```



3. Dealing with missing values

```
# Using interpolate to filling the missing values

df=df.interpolate(method="pad",limit_direction="forward")
df.fillna("Anonymous",inplace=True)
df
```

	show_id	type	title	director	cast	country	date_added	release_year	rat
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	Anonymous	United States	2021-09-25	2020	PC
1	s2	TV Show	Blood & Water	Kirsten Johnson	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	South Africa	2021-09-24	2021	TV
3	s4	TV Show	Jailbirds New Orleans	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy	South Africa	2021-09-24	2021	TV

4. Non-Graphical and visual analysis of data

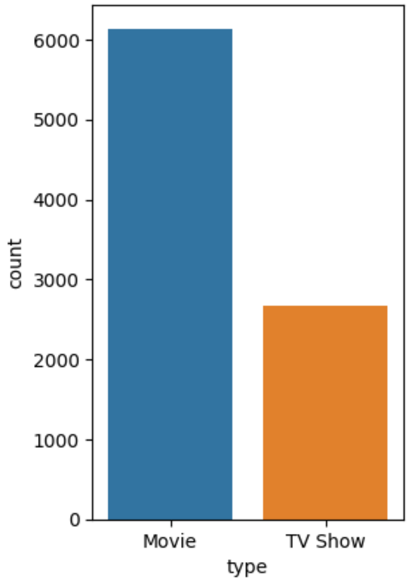
More,

```
# Movies vs TV Show Count
df.groupby("type")[["type"]].value_counts()
```

```
type
Movie      6131
TV Show    2676
dtype: int64
```

```
plt.figure(figsize=(3,5))
sns.countplot(df,x="type")
```

```
<Axes: xlabel='type', ylabel='count'>
```



We can see that Netflix has 6131 Movies and 2676 TV Shows.

```
# Unnesting country's column for further analysis
df_c=df.assign(country=df['country'].str.split(',')).explode('country')
df_c
```

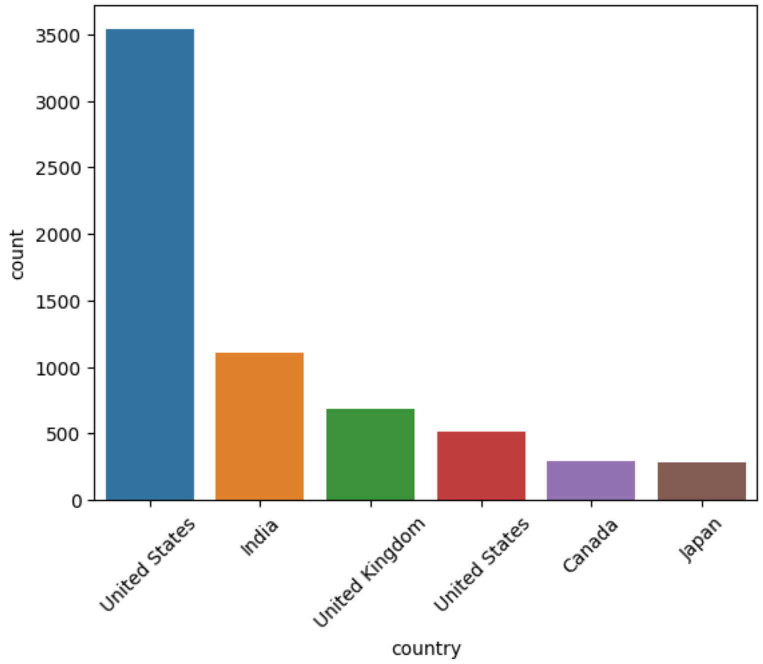
	show_id	type	title	director	cast	country	date_added	release_year	rat
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	Anonymous	United States	2021-09-25	2020	PC
1	s2	TV Show	Blood & Water	Kirsten Johnson	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	South Africa	2021-09-24	2021	TV
3	s4	TV Show	Jailbirds New Orleans	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy,	South Africa	2021-09-24	2021	TV

```
# Count of movies and tv shows contributed by each country
df_country=df_c.groupby("country")[["title"]].count().sort_values(by="title",ascending=False).rename(columns={"title":"count"}).reset_inc
df_c1=df_country.head(6)
df_c1
```

	country	count
0	United States	3537
1	India	1111
2	United Kingdom	687
3	United States	518
4	Canada	291
5	Japan	284

```
sns.barplot(df_c1,x="country",y="count")
plt.xticks(rotation=45)
```

```
(array([0, 1, 2, 3, 4, 5]),
 [Text(0, 0, 'United States'),
  Text(1, 0, 'India'),
  Text(2, 0, 'United Kingdom'),
  Text(3, 0, ' United States'),
  Text(4, 0, 'Canada'),
  Text(5, 0, 'Japan')])
```



```
# Top 5 genres United States has contributed into
df_c.query('country=="United States"')[["listed_in"]].value_counts().head(5).reset_index().rename(columns={0:"count"})
```

	listed_in	count
0	Documentaries	278
1	Stand-Up Comedy	231
2	Children & Family Movies, Comedies	130
3	Kids' TV	121
4	Children & Family Movies	117

Top 5 contributors on Netflix are United States, India, United Kingdom, Canada and Japan with United States on the top with count of 4224 which includes Documentaries as the top listed category.

```
# Top viewed genre on Netflix
df_g=df.assign(listed_in=df['listed_in'].str.split(',')).explode('listed_in')
df_g["listed_in"].value_counts().head()
```

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

Netflix has most content in International movies category. Here we assume that the Netflix has more content that people watch. Hence, the highest count of the genre will be the most viewed genre

```
# Number of movies and tv shows released every year
df.groupby("release_year")[["type"]].count().rename(columns={"type":"count"}).sort_values(by="count",ascending=False).head(10)
```

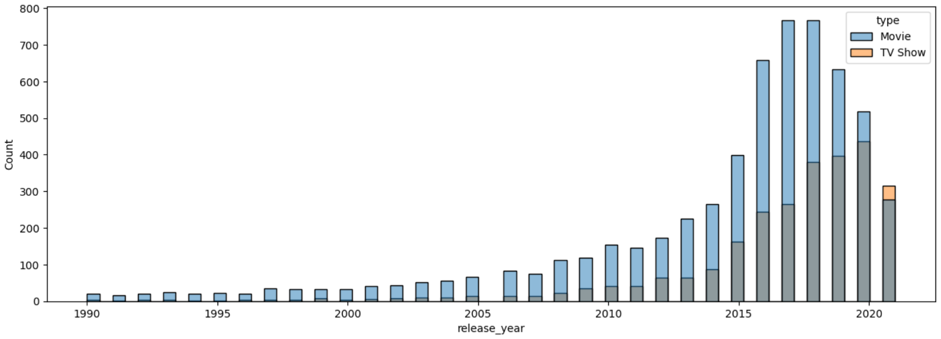
	count
release_year	
2018	1147
2017	1032
2019	1030
2020	953
2016	902
2021	592
2015	560
2014	352
2013	288
2012	237

```
# Number of movies and shows release in the past 30 years
plt.figure(figsize=(15,5))
sns.histplot(df,x=df.query('release_year>=1990')["release_year"])
```

```
<Axes: xlabel='release_year', ylabel='Count'>
```

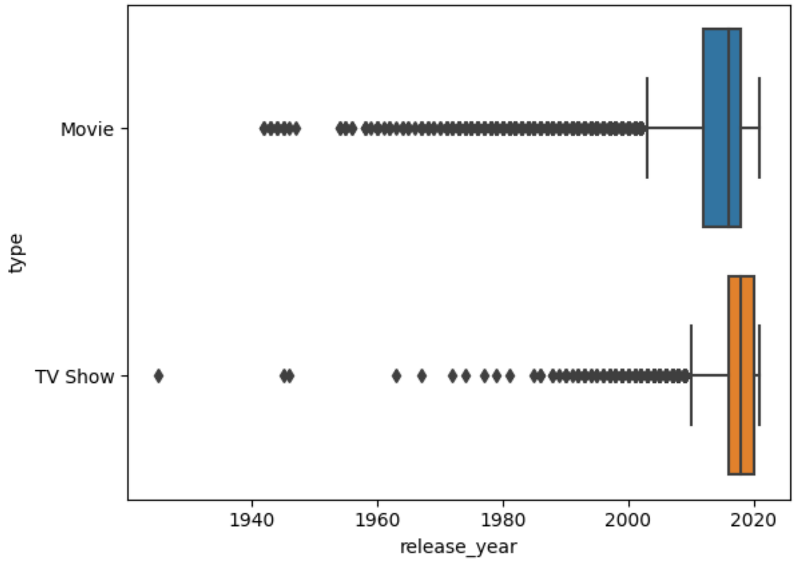
```
# Number of movies vs shows release in the past 30 years
plt.figure(figsize=(15,5))
sns.histplot(df,x=df.query('release_year>=1990')["release_year"],hue="type")
```

```
<Axes: xlabel='release_year', ylabel='Count'>
```



```
# Graphial repesentation via boxplot
sns.boxplot(df,x="release_year",y="type")
```

```
<Axes: xlabel='release_year', ylabel='type'>
```



Most content was released in 2018 on Netflix. However, most of the TV show was released in 2020. From the chart we can see that Netflix has always focused more on Movies rather than Tv shows unlike in 2021 where Tv show was more than movies

```
# Best time to launch a tv vs movies
df["added_month"]=df["date_added"].dt.month_name()
df.query('type=="Movie"')[["added_month"]].value_counts()
```

```
added_month
July           565
April          550
December       547
January        546
October        545
March          529
August         519
September      519
```

```
    November      498
    June          492
    May           439
    February      382
    dtype: int64
```

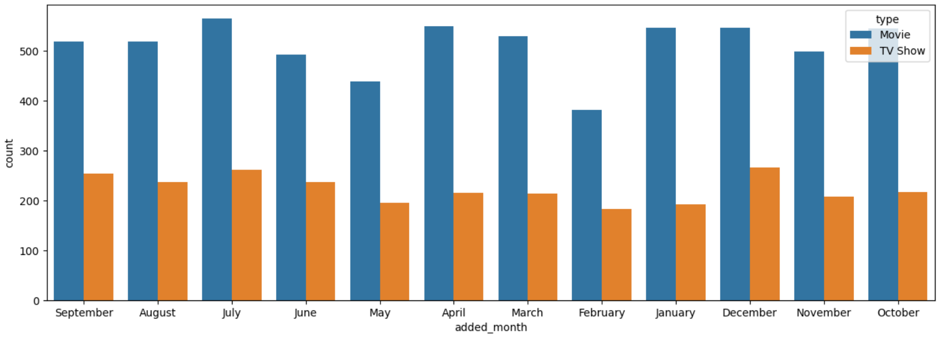
```
df.query('type=="TV Show"')[["added_month"]].value_counts()

# Best time to launch a movie is July and tv show is December as the previous data shows that has monst movies and shows have been launch
```

```
    added_month
    December      266
    July          262
    September     253
    June          237
    August        236
    October       216
    April         215
    March         214
    November      207
    May           195
    January       192
    February      183
    dtype: int64
```

```
#  Graphical representation of best time to launch a movie and tv show
plt.figure(figsize=(15,5))
df["added_month"]=df["date_added"].dt.month_name()
sns.countplot(df,x=df["added_month"],hue="type")
```

```
    <Axes: xlabel='added_month', ylabel='count'>
```



From the charts we can conclude that mostly movies are launched in July and Tv shows in December. As per the data, July and December will be a good time to launch movies and tv shows respectively.

```
# Top 10 directors who has produced max number of movies or tv shows
df_d=df.assign(director=df['director'].str.split(',')).explode('director')
df_d
```

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

```
df_d.query('type=="Movie"')[["director"]].value_counts().head(10)
```

```
director
Rajiv Chilaka          22
Raúl Campos            18
 Jan Suter             18
Jay Karas              16
Suhas Kadav            16
Marcus Raboy           15
Cathy Garcia-Molina    13
Youssef Chahine        13
Jay Chapman            12
Martin Scorsese        12
dtype: int64
```

More,

```
df_d.query('type=="TV Show"')[["director"]].value_counts().head(10)
```

```
director
Marcus Raboy         17
Steve McLean         16
Yen Cheng-kuo        14
Michèle Ohayon       10
Luis Valdez          10
 Alan Hicks           9
Yeo Siew Hua          9
Rashida Jones         9
Hardik Mehta          9
 Abhishek Chaubey     9
dtype: int64
```

```
# Top 10 casts on Netflix
df_cast=df.assign(cast=df['cast'].str.split(',')).explode('cast')
df_cast
```

```
df_cast.query('type=="Movie"')[["cast"]].value_counts().head(10)
```

```
cast
 Anupam Kher         39
 Paresh Rawal        29
 Rupa Bhimani        28
 Boman Irani         27
 Om Puri             27
Shah Rukh Khan       27
Akshay Kumar         26
 Julie Tejwani       25
 Naseeruddin Shah    22
 Kareena Kapoor      21
dtype: int64
```

Show Water Johnson Ngema Africa

```
df_cast.query('type=="TV Show"')[["cast"]].value_counts().head(10)
```

```
cast
 Takahiro Sakurai     25
 Ai Kayano            18
 Junichi Suwabe       18
 Yuki Kaji            17
 Daisuke Ono          15
 Takehito Koyasu      14
David Attenborough    14
 Yuichi Nakamura      14
 Tomokazu Sugita      13
 Yoshimasa Hosoya     13
dtype: int64
```

As per the above analysis, Rajiv Chilaka has directed most movies and Marcus Raboy has directed most Tv shows. Anupam Kher and Takahiro Sakurai acted most movies and tv series present on Netflix.

```
# Analysis of rating
df["rating"].value_counts().head(10)
```

```
TV-MA    3208
TV-14    2161
TV-PG     863
R         801
PG-13     490
TV-Y7     334
TV-Y      307
PG        287
TV-G      220
NR         80
Name: rating, dtype: int64
```

```
df_cast.query('rating=="TV-MA"')["director"].value_counts()
```

```
Youssef Chahine                    113
Luis Valdez                        101
Hardik Mehta                        94
Marcus Raboy                        76
Ryan Polito                         76
                                  ...
Eylem Kaftan                         1
Kirk Wise                            1
Shannon Hartman, Michelle Caputo     1
John Smithson                        1
Tanuja Chandra                       1
Name: director, Length: 2196, dtype: Int64
```

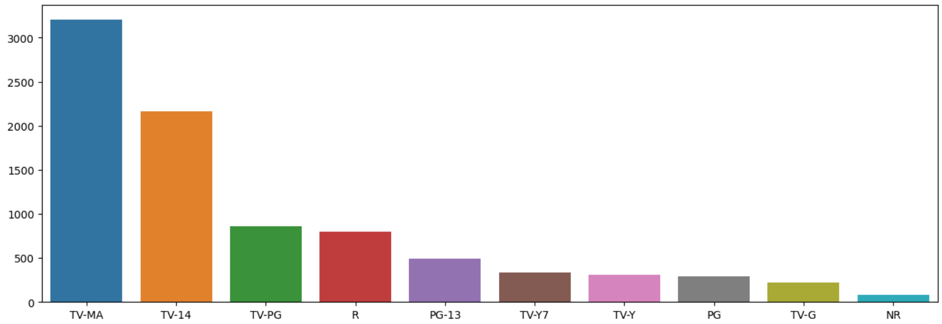
```
df_cast.query('rating=="TV-MA"')["cast"].value_counts()
```

```
 Takahiro Sakurai    20
 Yuki Kaji           14
 Takehito Koyasu     12
 Robb Wells          12
 Junichi Suwabe      11
                     ..
 Kim Hye-jun          1
 Heo Jun-ho           1
 Jung Suk-won         1
 Kim Jong-soo         1
 Mansoor Alfeeli      1
Name: cast, Length: 19034, dtype: int64
```

```
# Graphical representation of rating
plt.figure(figsize=(15,5))
```

```
rating=df["rating"].value_counts().head(10)
sns.barplot(df,x=rating.index,y=rating.values)
```

```
<Axes: >
```



Netflix has most of the content for mature audiences and audience above the age of 14 i.e., TV-MA and TV-14. Youssef Chahine and Takahiro Sakurai has directed and acted most content for TV-MA category respectively.

```
# Duration analysis
# Spliting the duration column
df["duration"]=df["duration"].str.split(expand=True)[0]
df
```

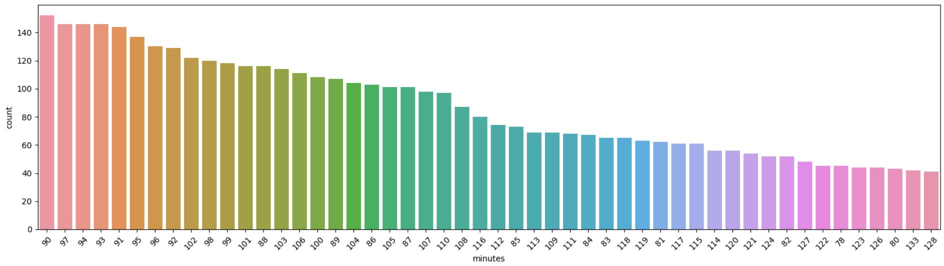
	show_id	type	title	director	cast	country	date_added	release_year	rat
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	Anonymous	United States	2021-09-25	2020	PC
1	s2	TV Show	Blood & Water	Kirsten Johnson	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV
2	s3	TV Show	Ganglands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

```
# Duration that has highest frequency on the movies data
df_dur=df.query('type=="Movie"')[["duration"]].value_counts().reset_index().rename(columns={"duration":"minutes", 0:"count"}).head(50)
df_dur.head()
```

	minutes	count
0	90	152

```
plt.figure(figsize=(20,5))
plt.xticks(rotation=45)
sns.barplot(data=df_dur,x="minutes",y="count")
```

```
<Axes: xlabel='minutes', ylabel='count'>
```

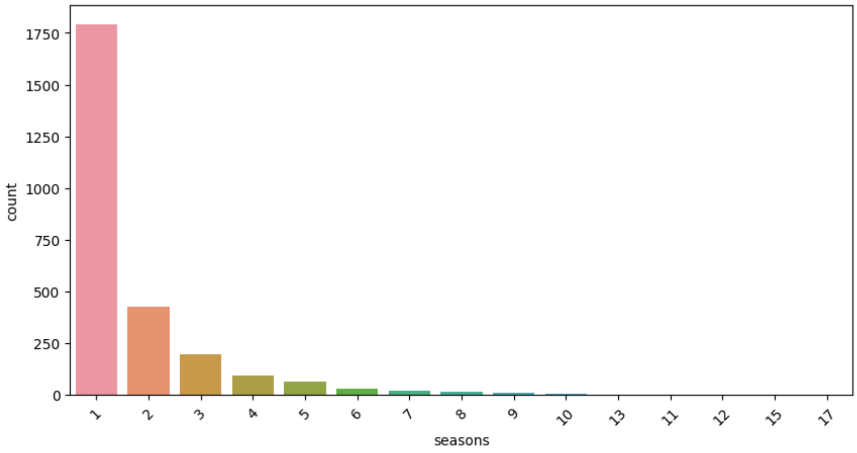


```
# Duration that has highest frequency on the TV Show data
df_dur1=df.query('type=="TV Show"')[["duration"]].value_counts().reset_index().rename(columns={"duration":"seasons", 0:"count"})
df_dur1.head()
```

	seasons	count
0	1	1793
1	2	425
2	3	199
3	4	95
4	5	65

```
plt.figure(figsize=(10,5))
plt.xticks(rotation=45)
sns.barplot(data=df_dur1,x="seasons",y="count")
```

```
<Axes: xlabel='seasons', ylabel='count'>
```



Most favourable duration for movies is 90 minutes. Assuming there are equal number of episodes in each season, tv show with highest number of seasons will be most favourable considering more and more seasons are produced as per the previous seasons' rating and TRP.

Netflix has more movies than tv shows. The United states has contributed most in the content. Netflix should focus on more content from the top 5 contributors (US, India, UK, Canada, Japan) of the content from international movies, dramas and comedies genre. It should also get more and more content directed from Rajiv Chilaka and Marcus Raboy.

Netflix has more content for mature population and anything else. We can infer that most of the people prefer to watch 90 mins of movies as when we compared it with other durations of the movies, it has the highest count. Assuming there are equal number of episodes in each season, tv show with highest number of seasons will me most favourable considering more and more seasons are produced as per the previous seasons' rating and TRP.

✓ 0s completed at 10:38 PM ● ×