Business_Case_Netflix_Data_Exploration_and_Visualisation

April 25, 2024

1 Business Case: Netflix - Data Exploration and Visualisation

About NETFLIX

Netflix is one of the most popular media and video streaming platforms. They have over 10000 movies or tv shows available on their platform, as of mid-2021, they have over 222M 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.

Business Problem

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

---

1.1 Importing required libraries

[ ]:
```
#installing ydata-profiling package for profile report
!pip install ydata-profiling
```

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

1.2 Downloading the Netflix Dataset

[ ]:
```
netflix_df = pd.read_csv("https://d2beiqkhq929f0.cloudfront.net/public_assets/
↪assets/000/000/940/original/netflix.csv")
```

[ ]:
```
#creating deep copy of the dataset for easy access
df = netflix_df.copy()
```

1.3 Basic Metrics of Netflix dataset

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

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

[ ]:
```
#indices
df.index
```

[ ]:
```
RangeIndex(start=0, stop=8807, step=1)
```

[ ]:
```
#rows
df.values
```

[ ]:
```
array([['s1', 'Movie', 'Dick Johnson Is Dead', …, '90 min',
        'Documentaries',
        'As her father nears the end of his life, filmmaker Kirsten Johnson
stages his death in inventive and comical ways to help them both face the
inevitable.'],
       ['s2', 'TV Show', 'Blood & Water', …, '2 Seasons',
        'International TV Shows, TV Dramas, TV Mysteries',
        'After crossing paths at a party, a Cape Town teen sets out to prove
whether a private-school swimming star is her sister who was abducted at
birth.'],
       ['s3', 'TV Show', 'Ganglands', …, '1 Season',
        'Crime TV Shows, International TV Shows, TV Action & Adventure',
        'To protect his family from a powerful drug lord, skilled thief Mehdi
and his expert team of robbers are pulled into a violent and deadly turf war.'],
       …,
       ['s8805', 'Movie', 'Zombieland', …, '88 min',
        'Comedies, Horror Movies',
        'Looking to survive in a world taken over by zombies, a dorky college
student teams with an urban roughneck and a pair of grifter sisters.'],
       ['s8806', 'Movie', 'Zoom', …, '88 min',
        'Children & Family Movies, Comedies',
        'Dragged from civilian life, a former superhero must train a new crop of
youthful saviors when the military preps for an attack by a familiar villain.'],
       ['s8807', 'Movie', 'Zubaan', …, '111 min',
        'Dramas, International Movies, Music & Musicals',
        "A scrappy but poor boy worms his way into a tycoon's dysfunctional
family, while facing his fear of music and the truth about his past."]],
      dtype=object)
```

[ ]:
```
#first 5 rows
df.head()
```

[ ]:

```
  show_id     type                  title         director  \
0      s1    Movie   Dick Johnson Is Dead  Kirsten Johnson
1      s2  TV Show          Blood & Water              NaN
2      s3  TV Show              Ganglands  Julien Leclercq
3      s4  TV Show  Jailbirds New Orleans              NaN
4      s5  TV Show           Kota Factory              NaN

                                                cast        country  \
0                                                NaN  United States
1  Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…   South Africa
2  Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi…            NaN
3                                                NaN            NaN
4  Mayur More, Jitendra Kumar, Ranjan Raj, Alam K…          India

          date_added  release_year rating   duration  \
0  September 25, 2021          2020  PG-13     90 min
1  September 24, 2021          2021  TV-MA  2 Seasons
2  September 24, 2021          2021  TV-MA   1 Season
3  September 24, 2021          2021  TV-MA   1 Season
4  September 24, 2021          2021  TV-MA  2 Seasons

                                        listed_in  \
0                                   Documentaries
1    International TV Shows, TV Dramas, TV Mysteries
2  Crime TV Shows, International TV Shows, TV Act…
3                             Docuseries, Reality TV
4  International TV Shows, Romantic TV Shows, TV …

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

[ ]:

```
#last 5 rows
df.tail()
```

[ ]:

```
     show_id     type        title         director  \
8802   s8803    Movie       Zodiac    David Fincher
8803   s8804  TV Show  Zombie Dumb              NaN
8804   s8805    Movie   Zombieland  Ruben Fleischer
8805   s8806    Movie         Zoom     Peter Hewitt
8806   s8807    Movie       Zubaan      Mozez Singh

                                                cast        country  \
8802  Mark Ruffalo, Jake Gyllenhaal, Robert Downey J…  United States
```

```
8803                                                  NaN            NaN
8804  Jesse Eisenberg, Woody Harrelson, Emma Stone, …  United States
8805  Tim Allen, Courteney Cox, Chevy Chase, Kate Ma…  United States
8806  Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan…          India

             date_added  release_year rating   duration  \
8802  November 20, 2019          2007      R    158 min
8803       July 1, 2019          2018  TV-Y7  2 Seasons
8804   November 1, 2019          2009      R     88 min
8805   January 11, 2020          2006     PG     88 min
8806      March 2, 2019          2015  TV-14    111 min

                                        listed_in  \
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

                                         description
8802  A political cartoonist, a crime reporter and a…
8803  While living alone in a spooky town, a young g…
8804  Looking to survive in a world taken over by zo…
8805  Dragged from civilian life, a former superhero…
8806  A scrappy but poor boy worms his way into a ty…
```

[ ]:
```
#information of dataset
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
```

[ ]:
```
#statistical analysis
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
```

[ ]:
```
#statistical analysis for all columns
df.describe(include = 'all')
```

[ ]:
```
       show_id   type                  title       director  \
count     8807   8807                   8807           6173
unique    8807      2                   8807           4528
top         s1  Movie  Dick Johnson Is Dead  Rajiv Chilaka
freq         1   6131                      1             19
mean       NaN    NaN                    NaN            NaN
std        NaN    NaN                    NaN            NaN
min        NaN    NaN                    NaN            NaN
25%        NaN    NaN                    NaN            NaN
50%        NaN    NaN                    NaN            NaN
75%        NaN    NaN                    NaN            NaN
max        NaN    NaN                    NaN            NaN

                       cast        country       date_added  release_year  \
count                  7982           7976             8797   8807.000000
unique                 7692            748             1767           NaN
top     David Attenborough  United States  January 1, 2020           NaN
freq                     19           2818              109           NaN
mean                    NaN            NaN              NaN   2014.180198
std                     NaN            NaN              NaN      8.819312
min                     NaN            NaN              NaN   1925.000000
25%                     NaN            NaN              NaN   2013.000000
50%                     NaN            NaN              NaN   2017.000000
75%                     NaN            NaN              NaN   2019.000000
max                     NaN            NaN              NaN   2021.000000

       rating  duration                     listed_in  \
count    8803      8804                          8807
unique     17       220                           514
```

```
top     TV-MA  1 Season  Dramas, International Movies
freq     3207      1793                           362
mean      NaN       NaN                           NaN
std       NaN       NaN                           NaN
min       NaN       NaN                           NaN
25%       NaN       NaN                           NaN
50%       NaN       NaN                           NaN
75%       NaN       NaN                           NaN
max       NaN       NaN                           NaN

                                                description
count                                                  8807
unique                                                 8775
top     Paranormal activity at a lush, abandoned prope…
freq                                                      4
mean                                                    NaN
std                                                     NaN
min                                                     NaN
25%                                                     NaN
50%                                                     NaN
75%                                                     NaN
max                                                     NaN
```

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

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

[ ]:
```
#unique counts in each column
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
```

[ ]:
```
#types in dataset
df['type'].unique()
```

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

We can see that number of unique values for 'title' column equals row count (in df.shape). This indicates that the dataset contains the information of 8807 unique Movies or TV Shows streaming on Netflix

[ ]:
```
#size
df.size
```

[ ]:
```
105684
```

[ ]:
```
#duplicates
df.duplicated().sum()
```

[ ]:
```
0
```

This shows that there are no duplicates in the dataset

[ ]:
```
#check nulls
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
```

From this, we can say that there are some null values across director, cast, country, date_added, rating and duration columns

We can handle these null values by data imputation

1.4 Profile Report of Netflix Dataset

[ ]:
```
ProfileReport(df)
```

```
Summarize dataset:   0%|          | 0/5 [00:00<?, ?it/s]

Generate report structure:   0%|          | 0/1 [00:00<?, ?it/s]

Render HTML:   0%|          | 0/1 [00:00<?, ?it/s]
```

```
<IPython.core.display.HTML object>
```

[ ]:

This is the profile report of given dataset. Here we can get the entire report of the dataset i.e., statistics, correlations, Missing values count etc.

1.5 Inspecting Missing Values

[ ]:
```
#check nulls
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
```

[ ]:
```
#checking null percentage
round(df.isna().sum()/df.shape[0]*100,2)
```

[ ]:
```
show_id          0.00
type             0.00
title            0.00
director        29.91
cast             9.37
country          9.44
date_added       0.11
release_year     0.00
rating           0.05
duration         0.03
listed_in        0.00
description      0.00
dtype: float64
```

Here, we can see that null value percentage of any column does not exceed 50%. We can drop columns only if it has either large or negligible null value percentage. But we can fill those missing nulls with appropriate data.

Let's focus on 3 nulls in duration

```
[ ]: df[df['duration'].isna()]
```

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

                cast        country          date_added  release_year  rating  \
     5541  Louis C.K.  United States       April 4, 2017          2017  74 min
     5794  Louis C.K.  United States  September 16, 2016          2010  84 min
     5813  Louis C.K.  United States     August 15, 2016          2015  66 min

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

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

```
[ ]: array(['PG-13', 'TV-MA', 'PG', 'TV-14', 'TV-PG', 'TV-Y', 'TV-Y7', 'R',
            'TV-G', 'G', 'NC-17', '74 min', '84 min', '66 min', 'NR', nan,
            'TV-Y7-FV', 'UR'], dtype=object)
```

If you observe, there are 3 null values in duration at indices 5541, 5794, 5813 and these duration values are mistakenly added to rating. So replacing null values with rating values

```
[ ]: df['duration']=df['duration'].fillna(df['rating'])
```

```
[ ]: df.loc[[5541,5794,5813]]
```

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

                cast        country          date_added  release_year  rating  \
     5541  Louis C.K.  United States       April 4, 2017          2017  74 min
     5794  Louis C.K.  United States  September 16, 2016          2010  84 min
     5813  Louis C.K.  United States     August 15, 2016          2015  66 min

          duration listed_in                                    description
     5541   74 min    Movies  Louis C.K. muses on religion, eternal love, gi…
     5794   84 min    Movies  Emmy-winning comedy writer Louis C.K. brings h…
     5813   66 min    Movies  The comic puts his trademark hilarious/thought…
```

Duration values are successfully filled. Now we have to replace rating values with best suitable rating since these are unappropriate rating values

If you observe the director for these values is same (Louis C.K.). We can check with that director's movies or shows so that we can take rating that is given to most of his works

[ ]:
```
df[df['director'] == 'Louis C.K.']
```

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

             cast        country          date_added  release_year  rating  \
5541  Louis C.K.  United States       April 4, 2017          2017  74 min
5794  Louis C.K.  United States  September 16, 2016          2010  84 min
5813  Louis C.K.  United States     August 15, 2016          2015  66 min

     duration listed_in                                          description
5541   74 min    Movies  Louis C.K. muses on religion, eternal love, gi…
5794   84 min    Movies  Emmy-winning comedy writer Louis C.K. brings h…
5813   66 min    Movies  The comic puts his trademark hilarious/thought…
```

we got the same data i.e., this director only did these 3 movies. Now we have to check for another similarity.. We can see that the titles contains 'Hilarious', 'comedy' i.e., it is a comedy centric film and country is 'United States'. So we can check for the rating that is given to most of the comedy movies in United States

[ ]:
```
df[(df['listed_in'].apply(lambda x : 'Comedy' in str(x))) & (df['country'] ==␣
↪'United States') & (df['type'] == 'Movie')]['rating'].value_counts()
```

[ ]:
```
rating
TV-MA    174
TV-14     21
R          7
TV-PG      6
NR         4
TV-G       2
PG-13      1
Name: count, dtype: int64
```

See, we got rating 'TV-MA' for most of the comedy movies in United States. So we can use this rating

[ ]:
```
df['rating'][[5541,5794,5813]] = 'TV-MA'
```

[ ]:
```
df.loc[[5541,5794,5813]]
```

[ ]:
```
     show_id   type                                title    director  \
5541   s5542  Movie                       Louis C.K. 2017  Louis C.K.
5794   s5795  Movie                   Louis C.K.: Hilarious  Louis C.K.
```

```
5813   s5814  Movie  Louis C.K.: Live at the Comedy Store  Louis C.K.

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

     duration listed_in                                          description
5541   74 min    Movies  Louis C.K. muses on religion, eternal love, gi…
5794   84 min    Movies  Emmy-winning comedy writer Louis C.K. brings h…
5813   66 min    Movies  The comic puts his trademark hilarious/thought…
```

We have successfully replaced rating and duration with appropriate values

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

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

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

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

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

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

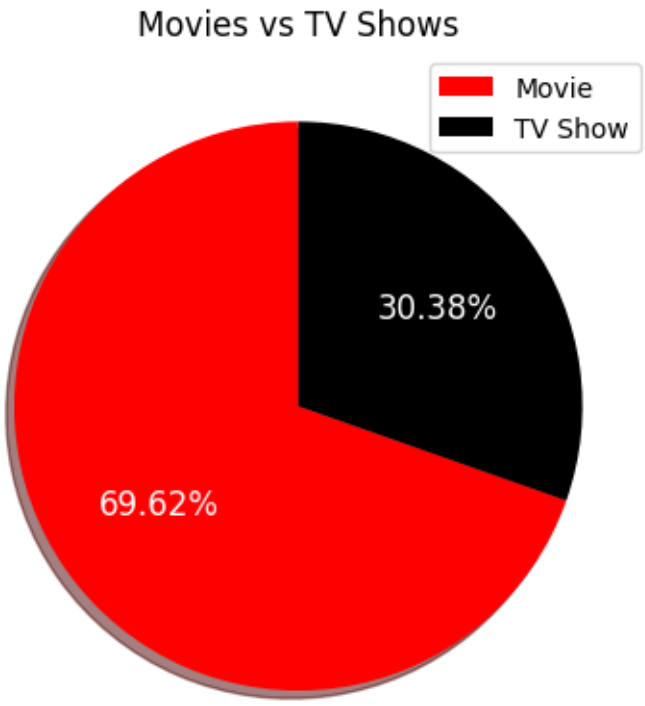
Here we can't do much validation as we don't find much similarities

1.6 Movies vs TV Shows

[ ]:
```
#count of content types on netflix
df['type'].value_counts()
```

[ ]:
```
type
Movie      6131
TV Show    2676
Name: count, dtype: int64
```

[ ]:
```
#pie chart for content percentage
plt.pie( df['type'].value_counts().values,
         labels = df['type'].value_counts().index,
         colors = ('red','black'),
         autopct = '%.2f%%',
         textprops = {'color':"w", 'fontsize':12},
         shadow = True,
         startangle = 90)
plt.title('Movies vs TV Shows')
plt.legend()
plt.show()
```



From this pie chart, we can say that most of the content streaming on netflix are movies i.e., over

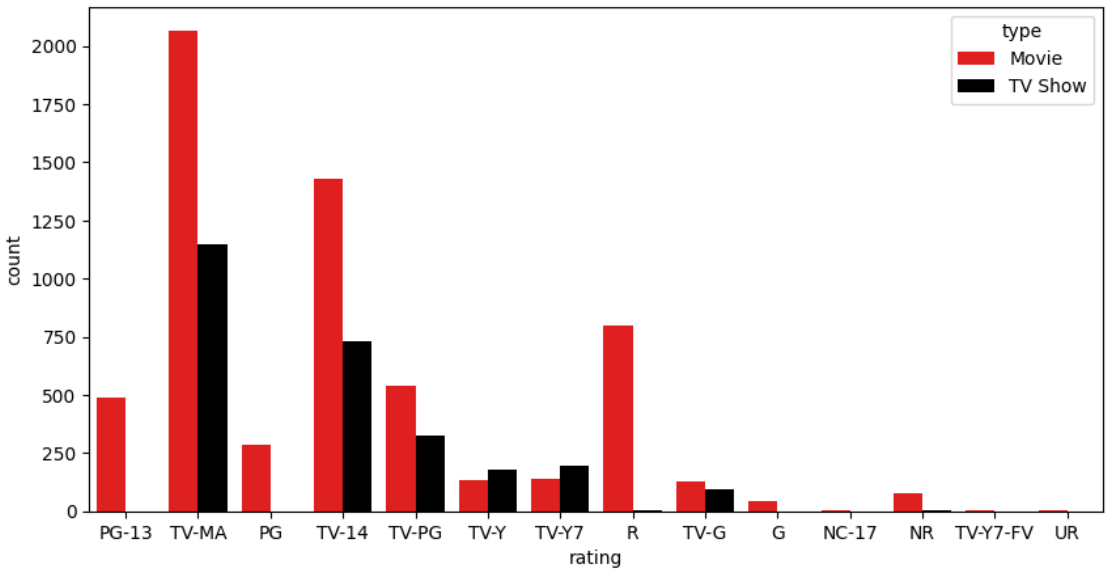
69% of the content streaming on netflix are movies and rest of the content are TV Shows

1.6.1 Rating wise Count

[ ]:
```
#rating count
df['rating'].value_counts()
```

[ ]:
```
rating
TV-MA       3210
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
Name: count, dtype: int64
```

[ ]:
```
#countplot for rating
plt.figure(figsize=(10,5))
sns.countplot(df, x = 'rating', hue='type', palette = {'Movie':'red','TV Show':
 ↪'black'})
plt.show()
```



From this graph, we can observe that most of the content were given rating 'TV-14'

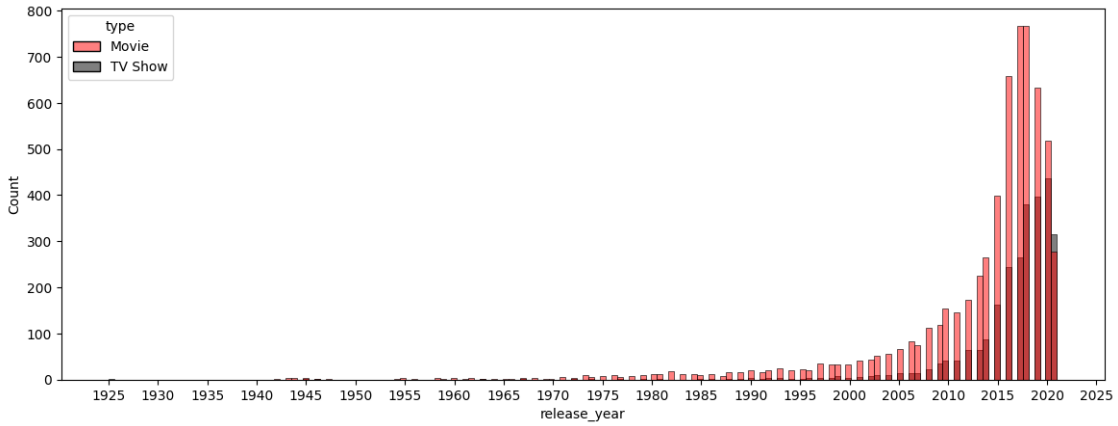
- Top 3 ratings given for Movies are TV-MA, TV-14 and R.
- Top 3 ratings given for TV Shows are TV-MA, TV-14 and TV-PG.
- TV-14 rating means unsuitable for under 14 years old
- TV-MA rating means unsuitable for under 17 years old
- So most of the content on Netflix can be watched by people above 17 years old.

1.6.2 Year wise count

[ ]:
```
#count of content released on specific year
df['release_year'].value_counts()
```

[ ]:
```
release_year
2018    1147
2017    1032
2019    1030
2020     953
2016     902
        …
1959       1
1925       1
1961       1
1947       1
1966       1
Name: count, Length: 74, dtype: int64
```

[ ]:
```
#histogram for year wise content
plt.figure(figsize=(14,5))
sns.histplot(df, x = 'release_year', hue='type', palette = {'Movie':'red','TV␣
↪Show':'black'})
y = df['release_year'].sort_values().unique()
plt.xticks(np.arange(y[0], y[-1]+5, 5))
plt.show()
```

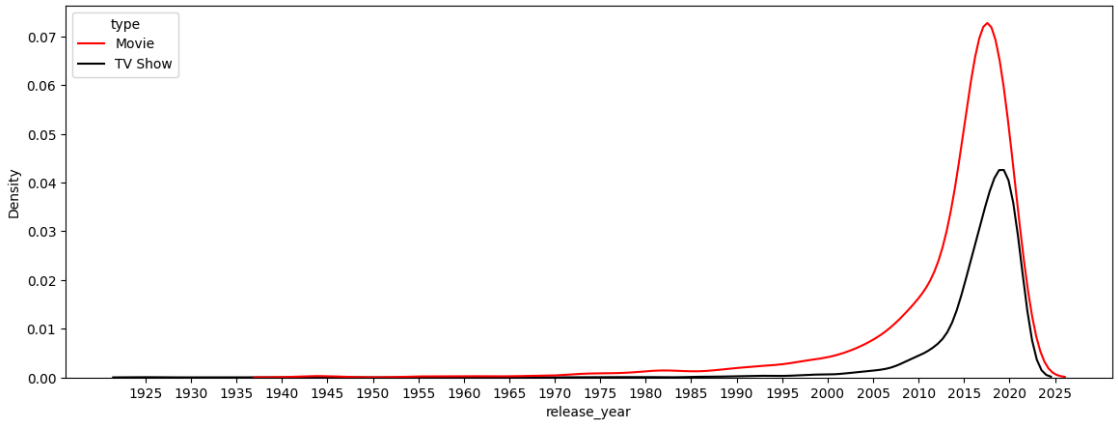


This histogram plot represents content released per year.

Netflix uploaded most of the content that were released in the years ranges from 2015 to 2020.

This can be understood better after observing density plot.

[ ]:
```
#kde plot for year wise content
plt.figure(figsize=(14,5))
sns.kdeplot(df, x = 'release_year', hue='type', palette = {'Movie':'red','TV␣
 ↪Show':'black'})
y = df['release_year'].sort_values().unique()
plt.xticks(np.arange(y[0], y[-1]+5, 5))
plt.show()
```



- The number of movies released per year appears to be increasing slowly after 1970s while the number of TV shows released per year starts increasing after 1990s.
- Also number of movies released per year peaked after 2010 and observed peak at 2018 while the number of TV shows released per year peaked after 2012 and observed peak at 2019
- It is possible that the increase in television production is due to the rise of cable and satellite television, which provided more channels for new shows.
- The data suggests that the movie industry is older than the television industry.

1.7 Handling missing values in nested columns

[ ]:
```
#checking null percentage
round(df.isna().sum()/df.shape[0]*100,2)
```

[ ]:
```
show_id          0.00
type             0.00
title            0.00
director        29.91
```

```
cast            9.37
country         9.44
date_added      0.11
release_year    0.00
rating          0.05
duration        0.00
listed_in       0.00
description     0.00
dtype: float64
```

Here, we can see that null value percentage of any column does not exceed 50%. We can drop columns only if it has either large or negligible null value percentage. But we can fill those missing nulls with appropriate data.

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

[ ]:
```
  show_id     type                  title         director  \
0      s1    Movie   Dick Johnson Is Dead  Kirsten Johnson
1      s2  TV Show          Blood & Water              NaN
2      s3  TV Show              Ganglands  Julien Leclercq
3      s4  TV Show  Jailbirds New Orleans              NaN
4      s5  TV Show           Kota Factory              NaN

                                                cast        country  \
0                                                NaN  United States
1  Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…   South Africa
2  Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi…            NaN
3                                                NaN            NaN
4  Mayur More, Jitendra Kumar, Ranjan Raj, Alam K…          India

          date_added  release_year rating   duration  \
0  September 25, 2021          2020  PG-13     90 min
1  September 24, 2021          2021  TV-MA  2 Seasons
2  September 24, 2021          2021  TV-MA   1 Season
3  September 24, 2021          2021  TV-MA   1 Season
4  September 24, 2021          2021  TV-MA  2 Seasons

                                        listed_in  \
0                                   Documentaries
1    International TV Shows, TV Dramas, TV Mysteries
2  Crime TV Shows, International TV Shows, TV Act…
3                             Docuseries, Reality TV
4  International TV Shows, Romantic TV Shows, TV …

                                        description
0  As her father nears the end of his life, filmm…
1  After crossing paths at a party, a Cape Town t…
```

```
2  To protect his family from a powerful drug lor…
3  Feuds, flirtations and toilet talk go down amo…
4  In a city of coaching centers known to train I…
```

In this data, we can observe that some columns have nested values. For further analysis, we have to unnest the nested values. Before that, we need to check which columns are nested

1.7.1 Finding Nested Columns

[ ]:
```
#function to check nested values
def isNested(x):
  for i in x.values:
    if ", " in str(i):
      return True
  return False
```

[ ]:
```
isNested(df['show_id'])
```

[ ]:
```
False
```

- In the dataset, columns show_id , title are unique and type represents title is either movie or a TV show. So these columns cannot be nested.
- Also columns release_year, rating and duration also cannot be nested.
- Columns date_added, description has ‘,’ in it which doesn’t mean that they are nested

[ ]:
```
isNested(df['director'])
```

[ ]:
```
True
```

[ ]:
```
isNested(df['cast'])
```

[ ]:
```
True
```

[ ]:
```
isNested(df['country'])
```

[ ]:
```
True
```

[ ]:
```
isNested(df['listed_in'])
```

[ ]:
```
True
```

We can see that columns director, cast, country and genre are nested. So we have to un-nest these values to decrease null values by merging to form a new dataset

1.7.2 Un-nesting Nested Columns

[ ]:
```
#function to un-nest nested values
def unNesting(x):
  col = x.columns[1]
  unnestedCol = 'unnested_' + col
  x[unnestedCol] = x[col].apply(lambda y: str(y).split(", "))
  return x.explode(unnestedCol)
```

[ ]:
```
director_df = df[['title','director']]
director_df['director'] = director_df['director'].fillna('Unknown_Director')
director_df = unNesting(director_df)
director_df.head()
```

[ ]:
```
                   title          director unnested_director
0   Dick Johnson Is Dead   Kirsten Johnson   Kirsten Johnson
1          Blood & Water  Unknown_Director  Unknown_Director
2              Ganglands   Julien Leclercq   Julien Leclercq
3  Jailbirds New Orleans  Unknown_Director  Unknown_Director
4           Kota Factory  Unknown_Director  Unknown_Director
```

[ ]:
```
cast_df = df[['title', 'cast']]
cast_df['cast'] = cast_df['cast'].fillna('Unknown_Cast')
cast_df = unNesting(cast_df)
cast_df.head()
```

[ ]:
```
                  title                                                cast  \
0  Dick Johnson Is Dead                                        Unknown_Cast
1         Blood & Water  Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…
1         Blood & Water  Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…
1         Blood & Water  Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…
1         Blood & Water  Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…

    unnested_cast
0    Unknown_Cast
1      Ama Qamata
1     Khosi Ngema
1   Gail Mabalane
1  Thabang Molaba
```

[ ]:
```
country_df = df[['title', 'country']]
country_df['country'] = country_df['country'].fillna('Unknown_Country')
country_df = unNesting(country_df)
country_df.head()
```

[ ]:
```
                   title         country unnested_country
0   Dick Johnson Is Dead   United States    United States
```

```
1          Blood & Water     South Africa     South Africa
2              Ganglands  Unknown_Country  Unknown_Country
3  Jailbirds New Orleans  Unknown_Country  Unknown_Country
4           Kota Factory            India            India
```

[ ]:
```
genre_df = df[['title', 'listed_in']]
genre_df['listed_in'] = genre_df['listed_in'].fillna('Unknown_Genre')
genre_df = unNesting(genre_df)
genre_df.rename({'listed_in':'genre', 'unnested_listed_in' : 'unnested_genre'},␣
↪axis=1, inplace=True )
genre_df.head()
```

[ ]:
```
                 title                                              genre  \
0  Dick Johnson Is Dead                                      Documentaries
1         Blood & Water    International TV Shows, TV Dramas, TV Mysteries
1         Blood & Water    International TV Shows, TV Dramas, TV Mysteries
1         Blood & Water    International TV Shows, TV Dramas, TV Mysteries
2             Ganglands  Crime TV Shows, International TV Shows, TV Act…

           unnested_genre
0           Documentaries
1  International TV Shows
1              TV Dramas
1            TV Mysteries
2          Crime TV Shows
```

We have to merge these dataframes further to make analysis on them.

1.7.3 Merging Unnested DataFrames

[ ]:
```
#merging director_df
new_df = pd.merge(left=df, right=director_df, on="title", how="inner")
```

[ ]:
```
#merging cast_df
new_df = pd.merge(left=new_df, right=cast_df, on='title', how='inner')
```

[ ]:
```
#merging country_df
new_df = pd.merge(left=new_df, right=country_df, on='title', how='inner')
```

[ ]:
```
#merging genre_df
new_df = pd.merge(left=new_df, right=genre_df, on='title', how='inner')
```

[ ]:
```
new_df.head(1)
```

[ ]:
```
  show_id   type                 title       director_x cast_x      country_x  \
0      s1  Movie  Dick Johnson Is Dead  Kirsten Johnson    NaN  United States
```

```
          date_added  release_year rating duration      listed_in  \
0  September 25, 2021          2020  PG-13   90 min  Documentaries

                                        description       director_y  \
0  As her father nears the end of his life, filmm…  Kirsten Johnson

  unnested_director        cast_y unnested_cast      country_y  \
0   Kirsten Johnson  Unknown_Cast  Unknown_Cast  United States

  unnested_country          genre unnested_genre
0    United States  Documentaries  Documentaries
```

All the un-nested dataframes got merged. Now, we need to drop the unnecessary columns and rename the columns to appropriate names.

[ ]:
```
#dropping unnessesary columns
new_df.drop(columns =␣
 ↪['director_x','cast_x','country_x','listed_in','director_y','cast_y','country_y','genre'],␣
 ↪inplace = True)
new_df.head(1)
```

[ ]:
```
  show_id   type                 title          date_added  release_year  \
0      s1  Movie  Dick Johnson Is Dead  September 25, 2021          2020

  rating duration                                          description  \
0  PG-13   90 min  As her father nears the end of his life, filmm…

  unnested_director unnested_cast unnested_country unnested_genre
0   Kirsten Johnson  Unknown_Cast    United States  Documentaries
```

[ ]:
```
#renaming columns
new_df.rename(columns ={'unnested_director':'director', 'unnested_cast':'cast',␣
 ↪'unnested_country':'country', 'unnested_genre':'genre'}, inplace=True)
new_df.head()
```

[ ]:
```
  show_id     type                 title          date_added  release_year  \
0      s1    Movie  Dick Johnson Is Dead  September 25, 2021          2020
1      s2  TV Show         Blood & Water  September 24, 2021          2021
2      s2  TV Show         Blood & Water  September 24, 2021          2021
3      s2  TV Show         Blood & Water  September 24, 2021          2021
4      s2  TV Show         Blood & Water  September 24, 2021          2021

  rating   duration                                          description  \
0  PG-13     90 min  As her father nears the end of his life, filmm…
1  TV-MA  2 Seasons  After crossing paths at a party, a Cape Town t…
2  TV-MA  2 Seasons  After crossing paths at a party, a Cape Town t…
3  TV-MA  2 Seasons  After crossing paths at a party, a Cape Town t…
```

```
4  TV-MA  2 Seasons  After crossing paths at a party, a Cape Town t…
```

	director	cast	country	genre
0	Kirsten Johnson	Unknown_Cast	United States	Documentaries
1	Unknown_Director	Ama Qamata	South Africa	International TV Shows
2	Unknown_Director	Ama Qamata	South Africa	TV Dramas
3	Unknown_Director	Ama Qamata	South Africa	TV Mysteries
4	Unknown_Director	Khosi Ngema	South Africa	International TV Shows

Now, we have to heck for null value rows and duplicates and have to drop them.

[ ]:
```
#checking nulls
new_df.isna().sum()
```

[ ]:
```
show_id          0
type             0
title            0
date_added     158
release_year     0
rating          67
duration         0
description      0
director         0
cast             0
country          0
genre            0
dtype: int64
```

[ ]:
```
#dropping null rows
new_df.drop(index = new_df[new_df['date_added'].isna()].index, inplace=True)
new_df.drop(index = new_df[new_df['rating'].isna()].index, inplace=True)
```

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

[ ]:
```
show_id         0
type            0
title           0
date_added      0
release_year    0
rating          0
duration        0
description     0
director        0
cast            0
country         0
genre           0
dtype: int64
```

[ ]:
```
#checking duplicates
new_df.duplicated().sum()
```

[ ]:
```
55
```

[ ]:
```
#remobing duplicates
new_df.drop_duplicates(keep='first',inplace=True)
```

[ ]:
```
new_df.duplicated().sum()
```

[ ]:
```
0
```

Now, This new dataset is ready for the analysis.

1.8 Analyzing the top 5 on Netflix Movies & TV Shows

[ ]:
```
#top 5 directors
dir = new_df.drop(index = new_df[new_df['director'] == 'Unknown_Director'].
 ↪index)
m_dir = dir[dir['type'] == 'Movie']
m_dir = m_dir[m_dir['director'].isin(m_dir['director'].value_counts().head().
 ↪index)]
tv_dir = dir[dir['type'] == 'TV Show']
tv_dir = tv_dir[tv_dir['director'].isin(tv_dir['director'].value_counts().
 ↪head().index)]

#top 5 cast
cas = new_df.drop(index = new_df[new_df['cast'] == 'Unknown_Cast'].index)
m_cas = cas[cas['type'] == 'Movie']
m_cas = m_cas[m_cas['cast'].isin(m_cas['cast'].value_counts().head().index)]
tv_cas = cas[cas['type'] == 'TV Show']
tv_cas = tv_cas[tv_cas['cast'].isin(tv_cas['cast'].value_counts().head().index)]

#top 5 country
con = new_df.drop(index = new_df[new_df['country'] == 'Unknown_Country'].index)
m_con = con[con['type'] == 'Movie']
m_con = m_con[m_con['country'].isin(m_con['country'].value_counts().head().
 ↪index)]
tv_con = con[con['type'] == 'TV Show']
tv_con = tv_con[tv_con['country'].isin(tv_con['country'].value_counts().head().
 ↪index)]

#top 5 genre
gen = new_df.drop(index = new_df[new_df['genre'] == 'Unknown_Genre'].index)
m_gen = gen[gen['type'] == 'Movie']
m_gen = m_gen[m_gen['genre'].isin(m_gen['genre'].value_counts().head().index)]
tv_gen = gen[gen['type'] == 'TV Show']
```

```
tv_gen = tv_gen[tv_gen['genre'].isin(tv_gen['genre'].value_counts().head().
↪index)]
```

[ ]:
```
#top 5 Movie directors
m_dir['director'].value_counts().reset_index()
```

[ ]:
	director	count
0	Martin Scorsese	419
1	Youssef Chahine	409
2	Cathy Garcia-Molina	356
3	Steven Spielberg	355
4	Lars von Trier	336

[ ]:
```
#top 5 TV Show directors
tv_dir['director'].value_counts().reset_index()
```

[ ]:
	director	count
0	Noam Murro	189
1	Thomas Astruc	160
2	Houda Benyamina	104
3	Laïla Marrakchi	104
4	Alan Poul	104

[ ]:
```
#top 5 Movie cast
m_cas['cast'].value_counts().reset_index()
```

[ ]:
	cast	count
0	Liam Neeson	161
1	Alfred Molina	157
2	John Krasinski	138
3	Salma Hayek	130
4	Frank Langella	128

[ ]:
```
#top 5 TV Show cast
tv_cas['cast'].value_counts().reset_index()
```

[ ]:
	cast	count
0	David Attenborough	82
1	Takahiro Sakurai	56
2	Yuki Kaji	45
3	Junichi Suwabe	39
4	Ai Kayano	39

[ ]:
```
#top 5 countries for Movies
m_con['country'].value_counts().reset_index()
```

[ ]:

	country	count
0	United States	45791
1	India	21411
2	United Kingdom	8560
3	France	6605
4	Canada	5738

[ ]:
```
#top 5 countries for TV Shows
tv_con['country'].value_counts().reset_index()
```

[ ]:

	country	count
0	United States	13449
1	Japan	5074
2	United Kingdom	4358
3	South Korea	3754
4	Canada	2177

[ ]:
```
#top 5 genre for Movies
m_gen['genre'].value_counts().reset_index()
```

[ ]:

	genre	count
0	Dramas	29749
1	International Movies	28192
2	Comedies	20829
3	Action & Adventure	12216
4	Independent Movies	9818

[ ]:
```
#top 5 genre for TV Shows
tv_gen['genre'].value_counts().reset_index()
```

[ ]:

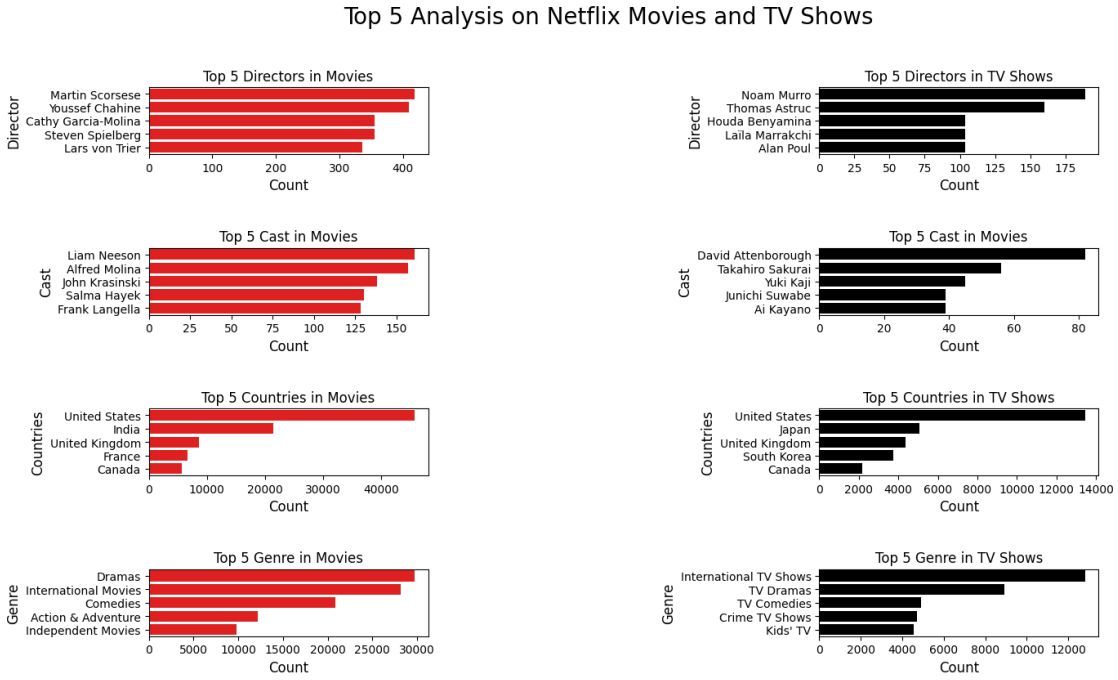
	genre	count
0	International TV Shows	12815
1	TV Dramas	8933
2	TV Comedies	4907
3	Crime TV Shows	4715
4	Kids' TV	4555

Now, lets plot the top 5 director, cast, country and genre analysis for Movies and TV Shows

[ ]:
```
plt.figure(figsize=(15,10)).suptitle("Top 5 Analysis on Netflix Movies and TV␣
 ↪Shows",fontsize=20)

#Top 5 Directors in Movies
plt.subplot(8, 3, 1)
sns.countplot(m_dir, y='director', order = m_dir['director'].value_counts().
 ↪index, color = 'red')
plt.title('Top 5 Directors in Movies', fontsize=12)
```

```
plt.xlabel('Count', fontsize=12)
plt.ylabel('Director', fontsize=12)

#Top 5 Directors in TV Shows
plt.subplot(8, 3, 3)
sns.countplot(tv_dir, y='director', order = tv_dir['director'].value_counts().
 ↪index, color = 'black')
plt.title('Top 5 Directors in TV Shows', fontsize=12)
plt.xlabel('Count', fontsize=12)
plt.ylabel('Director', fontsize=12)

#Top 5 Cast in Movies
plt.subplot(8, 3, 7)
sns.countplot(m_cas, y='cast', order = m_cas['cast'].value_counts().index,␣
 ↪color = 'red')
plt.title('Top 5 Cast in Movies', fontsize=12)
plt.xlabel('Count', fontsize=12)
plt.ylabel('Cast', fontsize=12)

#Top 5 Cast in TV Shows
plt.subplot(8, 3, 9)
sns.countplot(tv_cas, y='cast', order = tv_cas['cast'].value_counts().index,␣
 ↪color = 'black')
plt.title('Top 5 Cast in Movies', fontsize=12)
plt.xlabel('Count', fontsize=12)
plt.ylabel('Cast', fontsize=12)

#Top 5 Countries in Movies
plt.subplot(8, 3, 13)
sns.countplot(m_con, y='country', order = m_con['country'].value_counts().
 ↪index, color = 'red')
plt.title('Top 5 Countries in Movies', fontsize=12)
plt.xlabel('Count', fontsize=12)
plt.ylabel('Countries', fontsize=12)

#Top 5 Countries in TV Shows
plt.subplot(8, 3, 15)
sns.countplot(tv_con, y='country', order = tv_con['country'].value_counts().
 ↪index, color = 'black')
plt.title('Top 5 Countries in TV Shows', fontsize=12)
plt.xlabel('Count', fontsize=12)
plt.ylabel('Countries', fontsize=12)

#Top 5 Genre in Movies
plt.subplot(8, 3, 19)
sns.countplot(m_gen, y='genre', order = m_gen['genre'].value_counts().index,␣
 ↪color = 'red')
```

```
plt.title('Top 5 Genre in Movies', fontsize=12)
plt.xlabel('Count', fontsize=12)
plt.ylabel('Genre', fontsize=12)

#Top 5 Genre in TV Shows
plt.subplot(8, 3, 21)
sns.countplot(tv_gen, y='genre', order = tv_gen['genre'].value_counts().index,␣
 ↪color = 'black')
plt.title('Top 5 Genre in TV Shows', fontsize=12)
plt.xlabel('Count', fontsize=12)
plt.ylabel('Genre', fontsize=12)

plt.show()
```

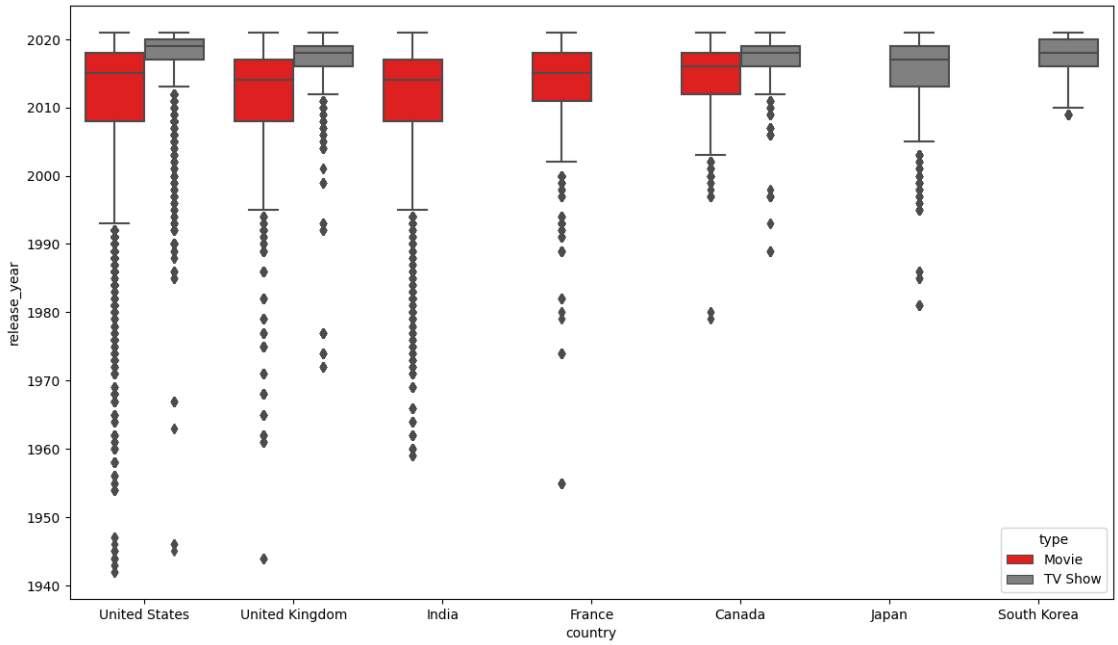


- The chart shows a predominance of North American and European directors. This might be due to a bias in the data source or a reflection of the global reach of these film industries
- Similar to the movie directors, TV Shows directors category leans towards North American and European directors.
- 4 (Takahiro Sakurai, Yuki Kaji, Junichi Suwabe, and Ai Kayano) out of top 5 cast in TV Shows are Japanese actors might be from Japanese Anime.
- Top cast in Movies 'Liam Neeson' is an Irish Actor who usually acts in action movies that means he acted in most of the action movies that netflix has.
- Most of the Movies and TV shows that netflix contains are from USA only. India lies on 2nd place on movies where as Japan lies on 2nd place in TV Shows.
- Most of the movies in Netflix are Dramas and International Movies where as most of the TV

Shows in Netflix are Internation TV Shows and TV Dramas

1.8.1 Movies and TV Shows across top countries

[ ]:
```
plt.figure(figsize=(14,8))
sns.boxplot(pd.concat([m_con,tv_con]), x='country', y='release_year',␣
 ↪hue='type', palette = {'Movie':'red','TV Show':'grey'})
plt.show()
```



This box plot represents Movies and TV Shows across different countries

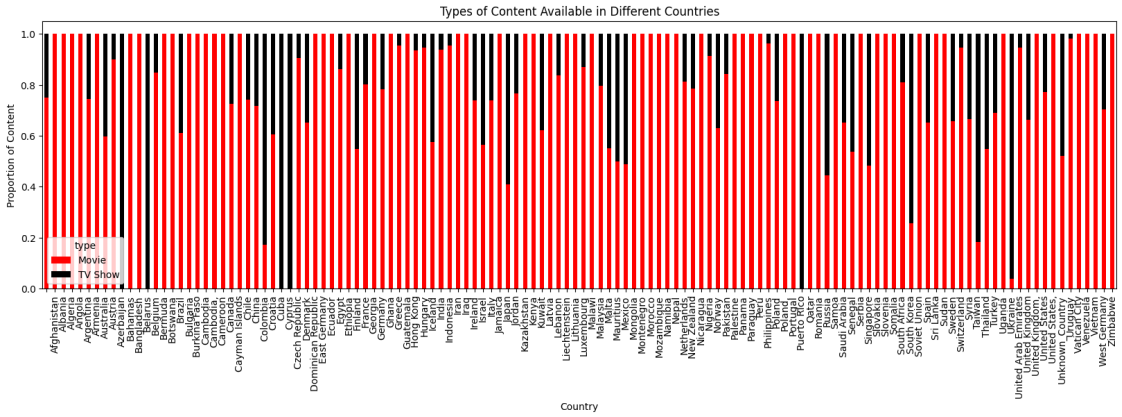
The median for most of the movies is at 2015 and median for most of the tv shows is 2018

1.9 Country wise Analysis

1.9.1 Proportion of content available in different countries

[ ]:
```
# Group by country and count the no.of movies and TV shows
country_content = new_df.groupby(['country', 'type']).size().unstack().fillna(0)

# Normalize the data
country_content['Total'] = country_content['Movie'] + country_content['TV Show']
country_content['Movie'] /= country_content['Total']
country_content['TV Show'] /= country_content['Total']

#plot
```

```
country_content[['Movie', 'TV Show']].plot(kind = 'bar', stacked = True,␣
 ↪figsize = (20,5), color = {'Movie':'red','TV Show':'black'})
plt.title('Types of Content Available in Different Countries')
plt.xlabel('Country')
plt.ylabel('Proportion of Content')
plt.xticks(rotation=90)
plt.show()
```



This plot gives the proportion of content on Netflix per Country.

Countries like Azerbaijan, Belarus, Cuba, Cyprus and Puerto Rico produces only TV Shows.

Countries like Albania, Algeria, Angola, Argnetina, Brazil etc. produces only Movies.

1.9.2 Popular Genre accross countries

[ ]:
```
country_genre = new_df.groupby(['country', 'genre']).size().
 ↪unstack(fill_value=0).reset_index()
country_genre.drop(index = country_genre[country_genre['country'] == ''].index,␣
 ↪inplace=True)
country_genre
```

[ ]:
```
genre       country  Action & Adventure  Anime Features  Anime Series  \
1       Afghanistan                   0               0             0
2           Albania                   0               0             0
3           Algeria                   0               0             0
4            Angola                  16               0             0
5         Argentina                  41               0             0
..              …                   …               …             …
123    Vatican City                   0               0             0
124       Venezuela                   0               0             0
125         Vietnam                  11               0             0
126    West Germany                   0               0             0
```

```
127        Zimbabwe                    0               0             0

genre  British TV Shows  Children & Family Movies  Classic & Cult TV  \
1                      0                         0                  0
2                      0                         0                  0
3                      0                         0                  0
4                      0                         0                  0
5                      0                        45                 10
..                   …                         …                  …
123                    0                         0                  0
124                    0                         0                  0
125                    0                         0                  0
126                    0                        10                  0
127                    0                         0                  0

genre  Classic Movies  Comedies  Crime TV Shows  …  TV Action & Adventure  \
1                    0         0               0  …                      0
2                    0         0               0  …                      0
3                   11         0               0  …                      0
4                    0         0               0  …                      0
5                   10       139              75  …                      0
..                 …         …               …  …                      …
123                  0         0               0  …                      0
124                  0         0               0  …                      0
125                  0        10               0  …                      0
126                 10        10               0  …                      0
127                  0        12               0  …                      0

genre  TV Comedies  TV Dramas  TV Horror  TV Mysteries  TV Sci-Fi & Fantasy  \
1                0          0          0             0                    0
2                0          0          0             0                    0
3                0          0          0             0                    0
4                0          0          0             0                    0
5               11         19          8             0                    0
..             …          …          …             …                    …
123              0          0          0             0                    0
124              0          0          0             0                    0
125              0          0          0             0                    0
126              6         15          0             0                    0
127              0          0          0             0                    0

genre  TV Shows  TV Thrillers  Teen TV Shows  Thrillers
1              0             0              0          0
2              0             0              0          0
3              0             0              0          0
4              0             0              0          0
5              0             0             11         64
```

```
..          …           …             …         …
123          0           0             0         0
124          0           0             0         7
125          0           0             0         6
126          0           0             0        10
127          0           0             0         0

[127 rows x 43 columns]
```

This data shows the genre of the content across different countries.

[ ]:
```
country_top_genre = new_df.groupby('country')['genre'].agg(pd.Series.mode).
↪to_frame().reset_index()
country_top_genre.drop(index = country_top_genre[country_top_genre['country']␣
↪== '' ].index, inplace=True)
country_top_genre
```

[ ]:
```
          country                                                genre
1     Afghanistan              [Documentaries, International Movies]
2         Albania                     [Dramas, International Movies]
3         Algeria                     [Dramas, International Movies]
4          Angola         [Action & Adventure, International Movies]
5       Argentina                                International Movies
..            …                                                   …
123  Vatican City  [Documentaries, Faith & Spirituality, Internat…
124     Venezuela                                International Movies
125       Vietnam                                International Movies
126  West Germany                                          TV Dramas
127      Zimbabwe                                International Movies

[127 rows x 2 columns]
```

This data shows the top or most viewing genre of the content across different countries.

1.10 Duration Analysis

1.10.1 Movies

[ ]:
```
#movies dataframe
movies = df[df['type'] == 'Movie']
movies.head(2)
```

[ ]:
```
  show_id   type                            title  \
0      s1  Movie             Dick Johnson Is Dead
6      s7  Movie  My Little Pony: A New Generation

                      director  \
0               Kirsten Johnson
```

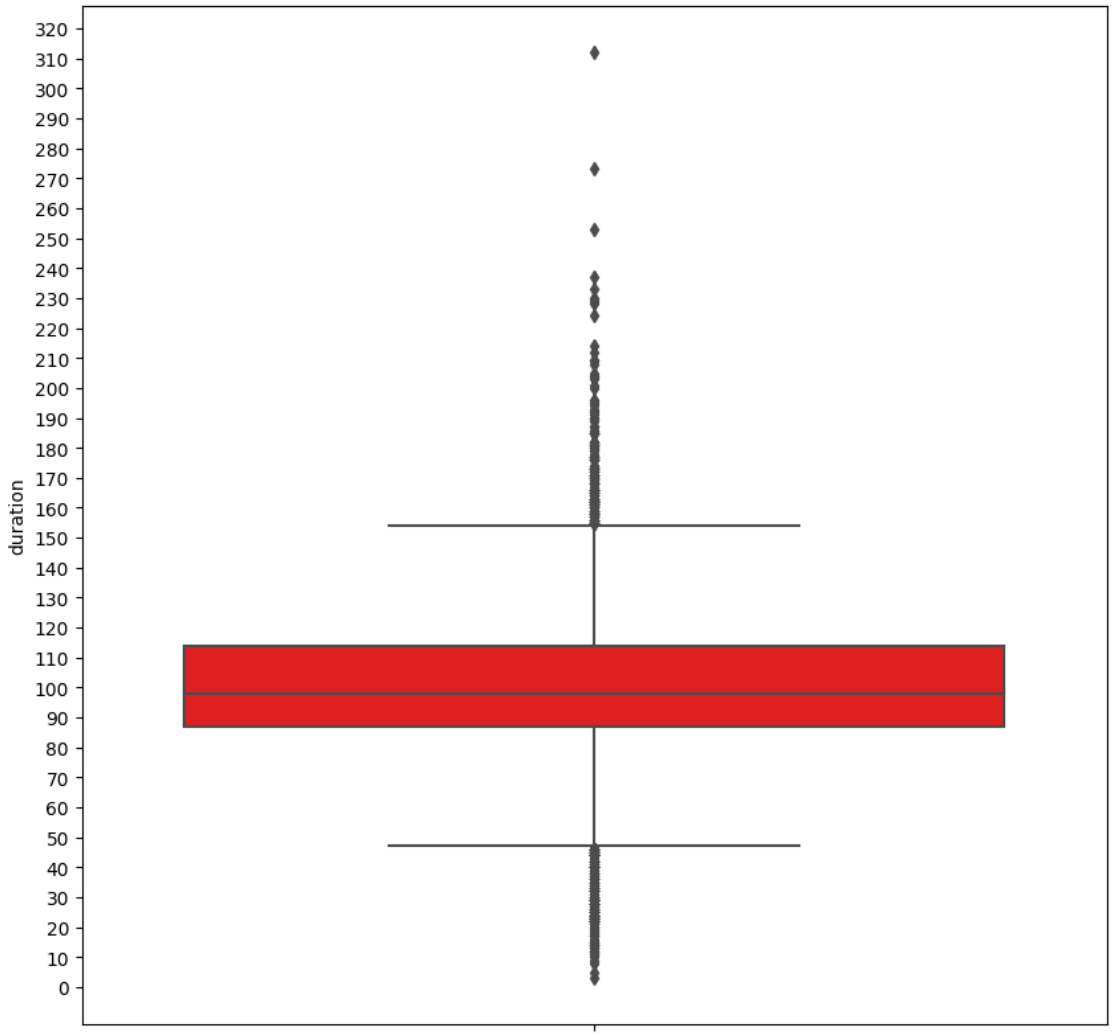
```
6  Robert Cullen, José Luis Ucha

                                                cast        country  \
0                                                NaN  United States
6  Vanessa Hudgens, Kimiko Glenn, James Marsden, …            NaN

          date_added  release_year rating duration                 listed_in  \
0  September 25, 2021          2020  PG-13   90 min              Documentaries
6  September 24, 2021          2021     PG   91 min  Children & Family Movies

                                        description
0  As her father nears the end of his life, filmm…
6  Equestria's divided. But a bright-eyed hero be…
```

```
[ ]: #removing min in duration for movies
movies['duration'] = movies['duration'].apply(lambda x : int(x.replace('␣
 ↪min','')))
movies.head(2)
```

```
[ ]:   show_id   type                             title  \
0      s1  Movie              Dick Johnson Is Dead
6      s7  Movie  My Little Pony: A New Generation

                       director  \
0               Kirsten Johnson
6  Robert Cullen, José Luis Ucha

                                                cast        country  \
0                                                NaN  United States
6  Vanessa Hudgens, Kimiko Glenn, James Marsden, …            NaN

          date_added  release_year rating  duration  \
0  September 25, 2021          2020  PG-13        90
6  September 24, 2021          2021     PG        91

                  listed_in                                        description
0             Documentaries  As her father nears the end of his life, filmm…
6  Children & Family Movies  Equestria's divided. But a bright-eyed hero be…
```

Duration of all movies

```
[ ]: plt.figure(figsize=(10,10))
sns.boxplot(movies, y='duration', color='red')
plt.yticks(np.arange(0,np.max(movies['duration'])+10,10))
plt.show()
```



This box plot shows the duration of all movies. * The median line of this box plot is just below 100 i.e., the average duration lies between 95 to 100. * 25% of the movies have duration less than 90. * 75% of the movies have duration less than 120. * By observing outliers, the duration ranges from 1 to 320.

Longest Movie

[ ]:
```
longest_movie = movies.loc[movies[movies['duration'] == np.
  ↪max(movies['duration'])].index]
longest_movie
```

[ ]:
```
     show_id   type                        title director  \
4253   s4254  Movie  Black Mirror: Bandersnatch      NaN

                                                cast        country  \
4253  Fionn Whitehead, Will Poulter, Craig Parkinson…  United States
```

```
             date_added  release_year rating  duration  \
4253  December 28, 2018          2018  TV-MA       312

                                        listed_in  \
4253  Dramas, International Movies, Sci-Fi & Fantasy

                                         description
4253  In 1984, a young programmer begins to question…
```

By seeing this data, we can say that 'Black Mirror: Bandersnatch' is the longest movie on Netflix

[ ]:
```
longest_movies = movies.loc[movies[movies['duration'] >100].index]
longest_movies
```

[ ]:
```
     show_id   type                          title                director  \
7         s8  Movie                         Sankofa            Haile Gerima
9        s10  Movie                     The Starling          Theodore Melfi
12       s13  Movie                     Je Suis Karl     Christian Schwochow
22       s23  Movie                 Avvai Shanmughi           K.S. Ravikumar
24       s25  Movie                           Jeans               S. Shankar
…        …    …                                …                   …
8790   s8791  Movie  You Don't Mess with the Zohan             Dennis Dugan
8798   s8799  Movie                       Zed Plus  Chandra Prakash Dwivedi
8799   s8800  Movie                          Zenda           Avadhoot Gupte
8802   s8803  Movie                         Zodiac            David Fincher
8806   s8807  Movie                         Zubaan              Mozez Singh

                                                  cast  \
7     Kofi Ghanaba, Oyafunmike Ogunlano, Alexandra D…
9     Melissa McCarthy, Chris O'Dowd, Kevin Kline, T…
12    Luna Wedler, Jannis Niewöhner, Milan Peschel, …
22    Kamal Hassan, Meena, Gemini Ganesan, Heera Raj…
24    Prashanth, Aishwarya Rai Bachchan, Sri Lakshmi…
…                                                   …
8790  Adam Sandler, John Turturro, Emmanuelle Chriqu…
8798  Adil Hussain, Mona Singh, K.K. Raina, Sanjay M…
8799  Santosh Juvekar, Siddharth Chandekar, Sachit P…
8802  Mark Ruffalo, Jake Gyllenhaal, Robert Downey J…
8806  Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan…

                                              country          date_added  \
7     United States, Ghana, Burkina Faso, United Kin…  September 24, 2021
9                                       United States  September 24, 2021
12                           Germany, Czech Republic  September 23, 2021
22                                               NaN  September 21, 2021
24                                             India  September 21, 2021
```

```
…                                                 …                …
8790                                    United States   September 1, 2019
8798                                            India   December 31, 2019
8799                                            India   February 15, 2018
8802                                    United States   November 20, 2019
8806                                            India       March 2, 2019

      release_year rating  duration  \
7             1993  TV-MA       125
9             2021  PG-13       104
12            2021  TV-MA       127
22            1996  TV-PG       161
24            1998  TV-14       166
…              …    …        …
8790          2008     UR       113
8798          2014  TV-MA       131
8799          2009  TV-14       120
8802          2007      R       158
8806          2015  TV-14       111

                                          listed_in  \
7     Dramas, Independent Movies, International Movies
9                                   Comedies, Dramas
12                      Dramas, International Movies
22                    Comedies, International Movies
24     Comedies, International Movies, Romantic Movies
…                                                 …
8790                      Action & Adventure, Comedies
8798            Comedies, Dramas, International Movies
8799                      Dramas, International Movies
8802                    Cult Movies, Dramas, Thrillers
8806    Dramas, International Movies, Music & Musicals

                                         description
7     On a photo shoot in Ghana, an American model s…
9     A woman adjusting to life after a loss contend…
12    After most of her family is murdered in a terr…
22    Newly divorced and denied visitation rights wi…
24    When the father of the man she loves insists t…
…                                                 …
8790  An Israeli counterterrorism soldier with a sec…
8798  A philandering small-town mechanic's political…
8799  A change in the leadership of a political part…
8802  A political cartoonist, a crime reporter and a…
8806  A scrappy but poor boy worms his way into a ty…

[2814 rows x 12 columns]
```

This data shows the movies having duration greater than 100 mins duration.

Shortest Movie

```
[ ]: shortest_movie = movies.loc[movies['duration'] == np.
     ↪min(movies['duration'])].index]
     shortest_movie
```

```
[ ]:      show_id   type   title                          director cast  \
     3777   s3778  Movie  Silent  Limbert Fabian, Brandon Oldenburg  NaN

               country    date_added  release_year rating  duration  \
     3777  United States  June 4, 2019          2014   TV-Y         3

                                       listed_in  \
     3777  Children & Family Movies, Sci-Fi & Fantasy

                                             description
     3777  "Silent" is an animated short film created by …
```

By seeing this data, we can say that 'Limbert Fabian, Brandon Oldenburg' is the shortest movie on Netflix

```
[ ]: shortest_movies = movies.loc[movies['duration'] < 10].index]
     shortest_movies
```

```
[ ]:      show_id   type             title                           director  \
     1484   s1485  Movie  Cops and Robbers     Arnon Manor, Timothy Ware-Hill
     1557   s1558  Movie            Canvas                  Frank E. Abney III
     2713   s2714  Movie       Sol Levante                       Akira Saitoh
     3777   s3778  Movie            Silent  Limbert Fabian, Brandon Oldenburg

                       cast        country         date_added  release_year  \
     1484  Timothy Ware-Hill  United States  December 28, 2020          2020
     1557                NaN  United States  December 11, 2020          2020
     2713                NaN          Japan      April 2, 2020          2020
     3777                NaN  United States       June 4, 2019          2014

          rating  duration                                          listed_in  \
     1484  PG-13         8                                             Dramas
     1557      G         9                   Children & Family Movies, Dramas
     2713  TV-14         5  Action & Adventure, Anime Features, Internatio…
     3777   TV-Y         3         Children & Family Movies, Sci-Fi & Fantasy

                                             description
     1484  Animation and activism unite in this multimedi…
     1557  After a heartbreaking loss, a grandfather stru…
     2713  A young warrior and her familiar search for th…
```

```
3777  "Silent" is an animated short film created by …
```

This data shows the movies having duration lesser than 10 mins duration.

1.10.2 TV Shows

[ ]:
```
#TV Shows dataframe
tv_shows = df[df['type'] == 'TV Show']
tv_shows.head(2)
```

[ ]:
```
  show_id     type          title         director  \
1      s2  TV Show  Blood & Water              NaN
2      s3  TV Show      Ganglands  Julien Leclercq

                                                 cast       country  \
1  Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…  South Africa
2  Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi…           NaN

           date_added  release_year rating   duration  \
1  September 24, 2021          2021  TV-MA  2 Seasons
2  September 24, 2021          2021  TV-MA   1 Season

                                        listed_in  \
1    International TV Shows, TV Dramas, TV Mysteries
2  Crime TV Shows, International TV Shows, TV Act…

                                        description
1  After crossing paths at a party, a Cape Town t…
2  To protect his family from a powerful drug lor…
```

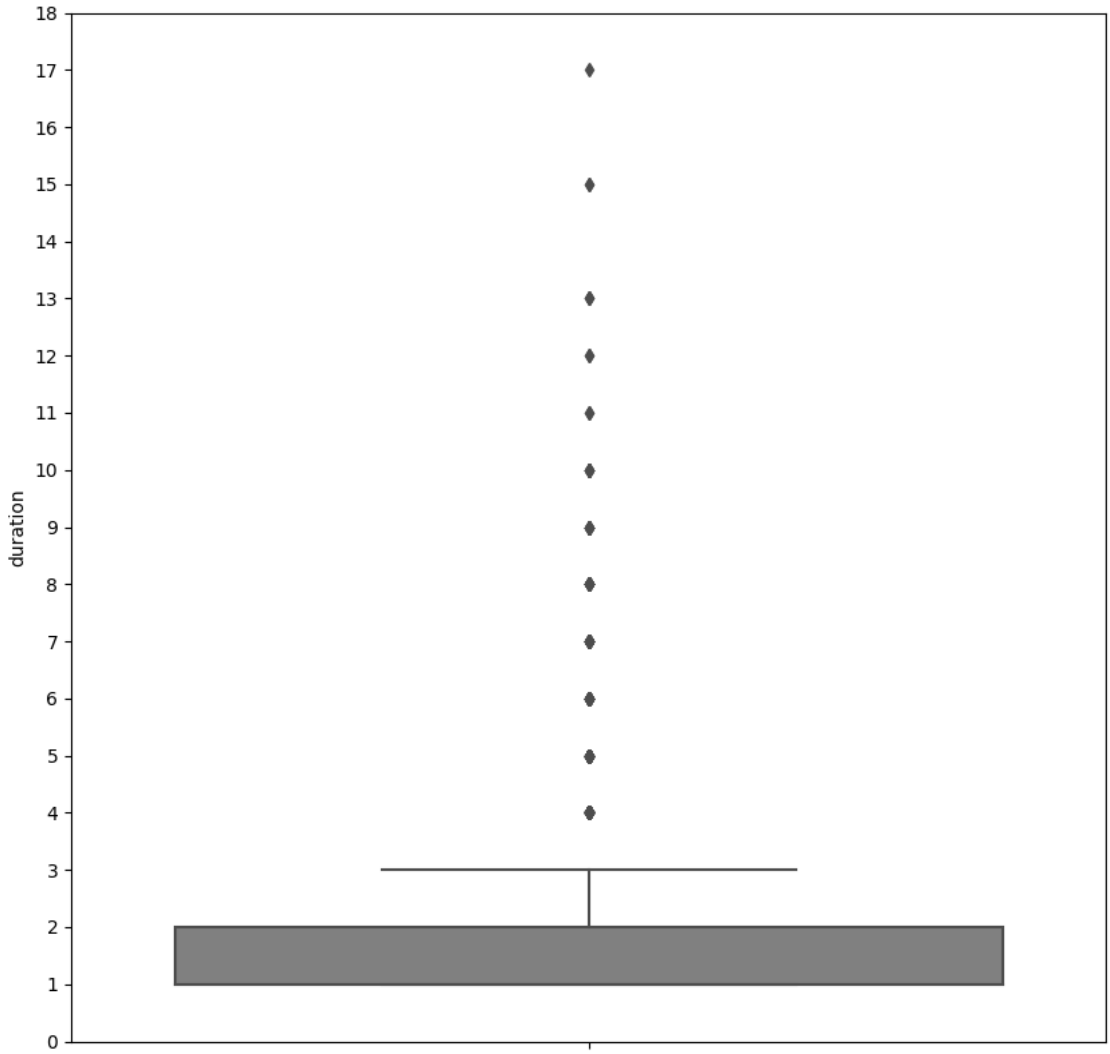
[ ]:
```
#removing seasons in duration for tv shows
tv_shows['duration'] = tv_shows['duration'].apply(lambda x : int(x.replace('␣
↪Seasons','').replace(' Season','')))
tv_shows.head(2)
```

[ ]:
```
  show_id     type          title         director  \
1      s2  TV Show  Blood & Water              NaN
2      s3  TV Show      Ganglands  Julien Leclercq

                                                 cast       country  \
1  Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…  South Africa
2  Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi…           NaN

           date_added  release_year rating  duration  \
1  September 24, 2021          2021  TV-MA         2
2  September 24, 2021          2021  TV-MA         1
```

```
                                              listed_in  \
1    International TV Shows, TV Dramas, TV Mysteries
2  Crime TV Shows, International TV Shows, TV Act…

                                          description
1  After crossing paths at a party, a Cape Town t…
2  To protect his family from a powerful drug lor…
```

Number of seasons of all TV shows

[ ]:
```
plt.figure(figsize=(10,10))
sns.boxplot(tv_shows,  y='duration', color='grey')
plt.yticks(np.arange(0,np.max(tv_shows['duration'])+2,1))
plt.show()
```



This box plot shows the number of seasons for all TV Shows. * The median line and 75% quartile of this box plot is intersected and is at 2 i.e., 75% of TV Shows have 2 seasons and average is also 2 seasons * 25% of the TV Shows have only 1 season. * By observing outliers, the number of seasons for TV Shows ranges from 1 to 17.

Shows with highest number of seasons

[ ]:
```
longest_show = tv_shows.loc[tv_shows[tv_shows['duration'] == np.
 ↪max(tv_shows['duration'])].index]
longest_show
```

[ ]:
```
    show_id     type           title director  \
548    s549  TV Show  Grey's Anatomy      NaN

                                                cast        country  \
548  Ellen Pompeo, Sandra Oh, Katherine Heigl, Just…  United States

       date_added  release_year rating  duration  \
548  July 3, 2021          2020  TV-14        17

                        listed_in  \
548  Romantic TV Shows, TV Dramas

                                          description
548  Intern (and eventual resident) Meredith Grey f…
```

By seeing this data, we can say that 'Grey's Anatomy' is the TV Show having highest number of seasons i.e., 17

Shows with lowest number of seasons

[ ]:
```
shortest_show = tv_shows.loc[tv_shows[tv_shows['duration'] == np.
 ↪min(tv_shows['duration'])].index]
shortest_show
```

[ ]:
```
     show_id     type                                 title           director  \
2         s3  TV Show                             Ganglands    Julien Leclercq
3         s4  TV Show                 Jailbirds New Orleans                NaN
5         s6  TV Show                          Midnight Mass      Mike Flanagan
10       s11  TV Show  Vendetta: Truth, Lies and The Mafia                NaN
11       s12  TV Show                       Bangkok Breaking  Kongkiat Komesiri
…        …    …                                         …                …
8775   s8776  TV Show                       Yeh Meri Family                NaN
8780   s8781  TV Show                          Yo-Kai Watch                NaN
8783   s8784  TV Show                                  Yoko                NaN
8785   s8786  TV Show                                   YOM                NaN
8800   s8801  TV Show                    Zindagi Gulzar Hai                NaN

                                                  cast        country  \
```

```
2     Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi…            NaN
3                                                    NaN           NaN
5     Kate Siegel, Zach Gilford, Hamish Linklater, H…            NaN
10                                                   NaN           NaN
11    Sukollawat Kanarot, Sushar Manaying, Pavarit M…            NaN
…                                                     …             …
8775  Vishesh Bansal, Mona Singh, Akarsh Khurana, Ah…          India
8780  Johnny Yong Bosch, J.W. Terry, Alicyn Packard,…  United States
8783  Eileen Stevens, Alyson Leigh Rosenfeld, Sarah …            NaN
8785  Sairaj, Devyani Dagaonkar, Ketan Singh, Mayur …            NaN
8800  Sanam Saeed, Fawad Khan, Ayesha Omer, Mehreen …       Pakistan

              date_added  release_year rating  duration  \
2     September 24, 2021          2021  TV-MA         1
3     September 24, 2021          2021  TV-MA         1
5     September 24, 2021          2021  TV-MA         1
10    September 24, 2021          2021  TV-MA         1
11    September 23, 2021          2021  TV-MA         1
…                    …           …    …       …
8775     August 31, 2018          2018  TV-PG         1
8780       April 1, 2016          2015  TV-Y7         1
8783       June 23, 2018          2016   TV-Y         1
8785        June 7, 2018          2016  TV-Y7         1
8800   December 15, 2016          2012  TV-PG         1

                                              listed_in  \
2     Crime TV Shows, International TV Shows, TV Act…
3                                Docuseries, Reality TV
5                     TV Dramas, TV Horror, TV Mysteries
10    Crime TV Shows, Docuseries, International TV S…
11    Crime TV Shows, International TV Shows, TV Act…
…                                                    …
8775                International TV Shows, TV Comedies
8780                             Anime Series, Kids' TV
8783                                          Kids' TV
8785                                          Kids' TV
8800  International TV Shows, Romantic TV Shows, TV …

                                            description
2     To protect his family from a powerful drug lor…
3     Feuds, flirtations and toilet talk go down amo…
5     The arrival of a charismatic young priest brin…
10    Sicily boasts a bold "Anti-Mafia" coalition. B…
11    Struggling to earn a living in Bangkok, a man …
…                                                   …
8775  In the summer of 1998, middle child Harshu bal…
8780  Nate frees a mythical being trapped in a magic…
```

```
8783  Friends Mai, Oto and Vik's games at the park b…
8785  With the mind of a human being, and the body o…
8800  Strong-willed, middle-class Kashaf and carefre…

[1793 rows x 12 columns]
```

This data shows the TV Shows having lowest number of seasons i.e., 1,

1.11 Analysis based on Date Added

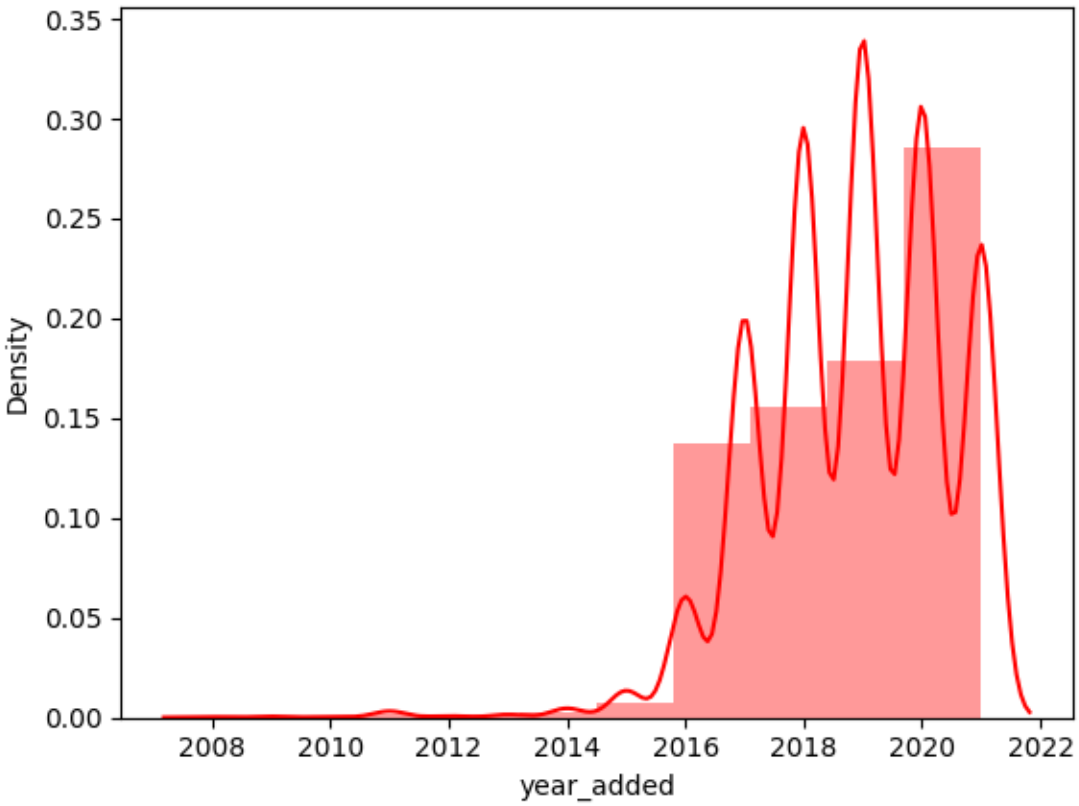
1.11.1 Netflix Movies uploaded on day, month and year analysis

[ ]:
```
movies_date_df = movies[['show_id','date_added','duration']]
movies_date_df['date_added'] = pd.to_datetime(movies_date_df['date_added'])
movies_date_df['day_added']=movies_date_df['date_added'].dt.day
movies_date_df['month_added']=movies_date_df['date_added'].dt.month
movies_date_df['year_added']=movies_date_df['date_added'].dt.year
movies_date_df['day_name'] = movies_date_df['date_added'].dt.strftime('%A')
movies_date_df['month_name'] = movies_date_df['date_added'].dt.strftime('%B')
movies_date_df
```

[ ]:
```
     show_id date_added  duration  day_added  month_added  year_added  \
0         s1 2021-09-25        90         25            9        2021
6         s7 2021-09-24        91         24            9        2021
7         s8 2021-09-24       125         24            9        2021
9        s10 2021-09-24       104         24            9        2021
12       s13 2021-09-23       127         23            9        2021
…        …          …         …          …            …           …
8801   s8802 2016-03-09        96          9            3        2016
8802   s8803 2019-11-20       158         20           11        2019
8804   s8805 2019-11-01        88          1           11        2019
8805   s8806 2020-01-11        88         11            1        2020
8806   s8807 2019-03-02       111          2            3        2019

       day_name month_name
0      Saturday  September
6        Friday  September
7        Friday  September
9        Friday  September
12     Thursday  September
…           …          …
8801  Wednesday      March
8802  Wednesday   November
8804     Friday   November
8805   Saturday    January
8806   Saturday      March

[6131 rows x 8 columns]
```

This data gives the duration and date at which movies having different show ids were added to netflix.

[ ]:
```
sns.distplot(movies_date_df['year_added'], kde = True, color ='red', bins = 10)
plt.show()
```



This Distribution plot represents the year wise count of the movies that were added to netflix.

By seeing this plot, we can say that netflix has added most of its movies in the year 2019.

[ ]:
```
month_order = ['January', 'February', 'March', 'April', 'May', 'June', 'July',␣
 ↪'August', 'September', 'October', 'November', 'December']
movies_uploaded = movies_date_df.groupby('year_added')['month_name'].
 ↪value_counts().unstack().fillna(0)[month_order].T
movies_uploaded
```

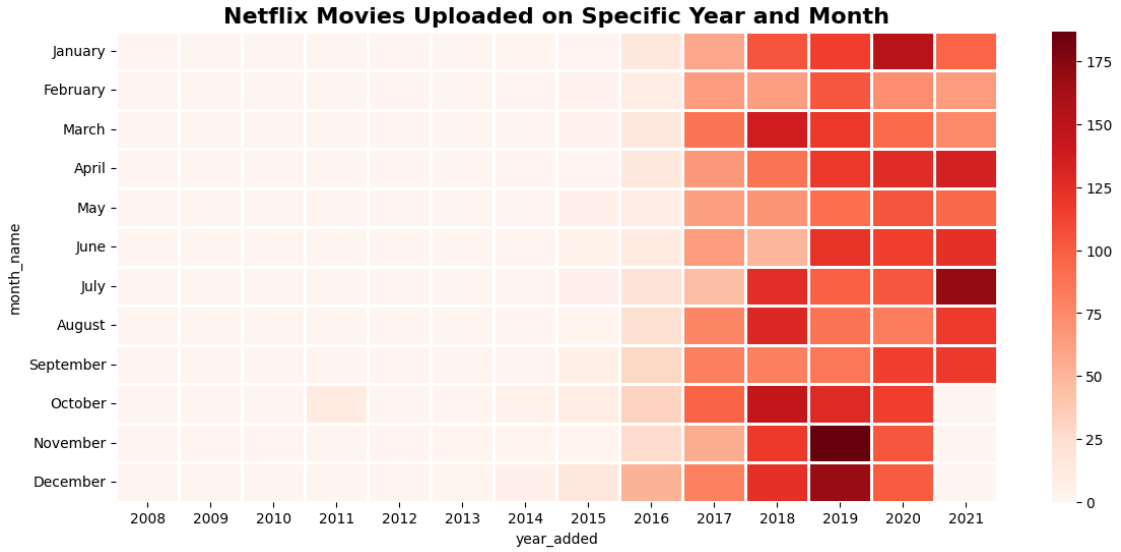
[ ]:
```
year_added   2008  2009  2010  2011  2012  2013  2014  2015  2016  2017   2018  \
month_name
January       1.0   0.0   0.0   0.0   0.0   0.0   2.0   1.0  15.0  58.0  105.0
February      0.0   0.0   0.0   0.0   1.0   0.0   1.0   3.0   9.0  65.0   63.0
March         0.0   0.0   0.0   0.0   0.0   0.0   0.0   3.0  14.0  87.0  138.0
April         0.0   0.0   0.0   0.0   0.0   0.0   1.0   1.0  14.0  66.0   87.0
```

May	0.0	1.0	0.0	1.0	0.0	0.0	0.0	5.0	9.0	63.0	70.0
June	0.0	0.0	0.0	0.0	0.0	0.0	1.0	4.0	11.0	65.0	50.0
July	0.0	0.0	0.0	0.0	0.0	0.0	1.0	5.0	19.0	45.0	125.0
August	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	23.0	77.0	130.0
September	0.0	0.0	0.0	1.0	0.0	1.0	1.0	6.0	29.0	81.0	81.0
October	0.0	0.0	0.0	11.0	0.0	1.0	4.0	10.0	32.0	97.0	146.0
November	0.0	1.0	1.0	0.0	1.0	2.0	2.0	2.0	26.0	55.0	118.0
December	0.0	0.0	0.0	0.0	1.0	2.0	5.0	14.0	52.0	80.0	124.0

year_added	2019	2020	2021
month_name			
January	116.0	152.0	96.0
February	103.0	72.0	65.0
March	119.0	93.0	75.0
April	119.0	127.0	135.0
May	91.0	105.0	94.0
June	122.0	115.0	124.0
July	98.0	103.0	169.0
August	87.0	82.0	117.0
September	86.0	115.0	118.0
October	128.0	116.0	0.0
November	187.0	103.0	0.0
December	168.0	101.0	0.0

This data gives the count of the movies that were added to netflix on specific year and month

[ ]:
```
plt.figure(figsize = (14,6))
sns.heatmap(movies_uploaded, cmap='Reds', edgecolors = 'white', linewidths=2)
plt.title('Netflix Movies Uploaded on Specific Year and Month', fontsize = 16,␣
 ↪fontweight = 'bold')

plt.show()
```



This plot represents the count of the movies that were added to netflix on specific year and month

By seeing this plot, we can say that in November 2019, netflix has added most of its movies followed by July 2021

[ ]:
```
movies_date_df.groupby('day_name')['show_id'].nunique().
↪sort_values(ascending=False).reset_index(name='movies_count')
```

[ ]:

	day_name	movies_count
0	Friday	1566
1	Thursday	1053
2	Wednesday	906
3	Tuesday	852
4	Monday	628
5	Sunday	569
6	Saturday	557

This data represents the day wise count of the movies added to netflix.

By seeing this data, we can say that netflix has uploaded most of its movies on Friday since its a weekend so that people can catch time to watch content.

[ ]:
```
movies_date_df.groupby('month_name')['show_id'].nunique().
↪sort_values(ascending=False).reset_index(name='movies_count')
```

[ ]:

	month_name	movies_count
0	July	565
1	April	550
2	December	547
3	January	546

```
4     October          545
5       March          529
6      August          519
7   September          519
8    November          498
9        June          492
10        May          439
11   February          382
```

This data represents the month wise count of the movies added to netflix.

By seeing this data, we can say that netflix has uploaded most of its movies on July month.

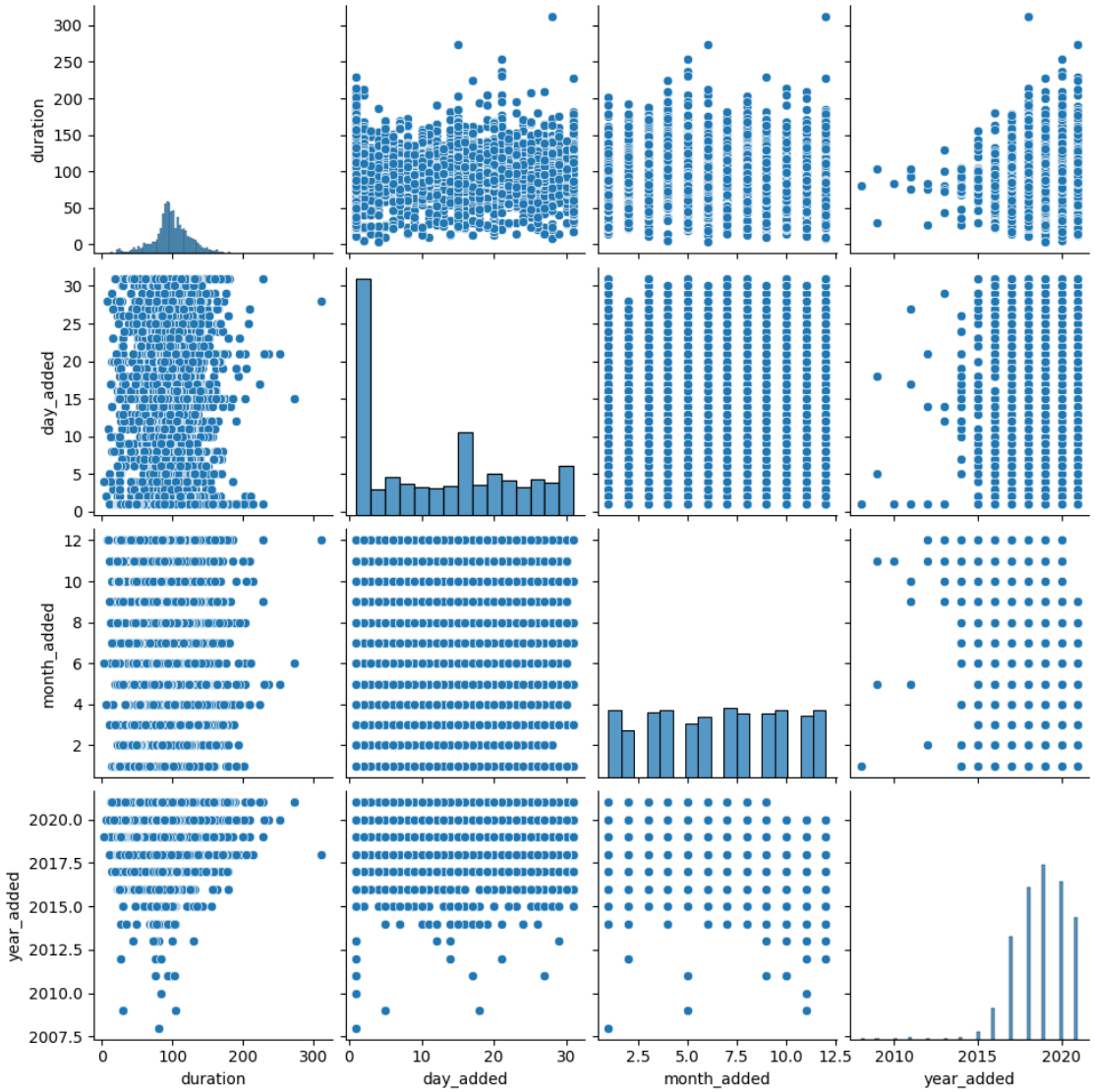
[ ]:
```
movies_date_df.groupby('year_added')['show_id'].nunique().
↪sort_values(ascending=False).reset_index(name='movies_count')
```

[ ]:
```
    year_added  movies_count
0         2019          1424
1         2020          1284
2         2018          1237
3         2021           993
4         2017           839
5         2016           253
6         2015            56
7         2014            19
8         2011            13
9         2013             6
10        2012             3
11        2009             2
12        2008             1
13        2010             1
```

This data represents the year wise count of the movies added to netflix.

By seeing this data, we can say that netflix has uploaded most of its movies on year 2019.

[ ]:
```
#Pair Plot
sns.pairplot(movies_date_df)
plt.show()
```



This is the pair plot that do analysis on all numerical columns in movies dataframe.

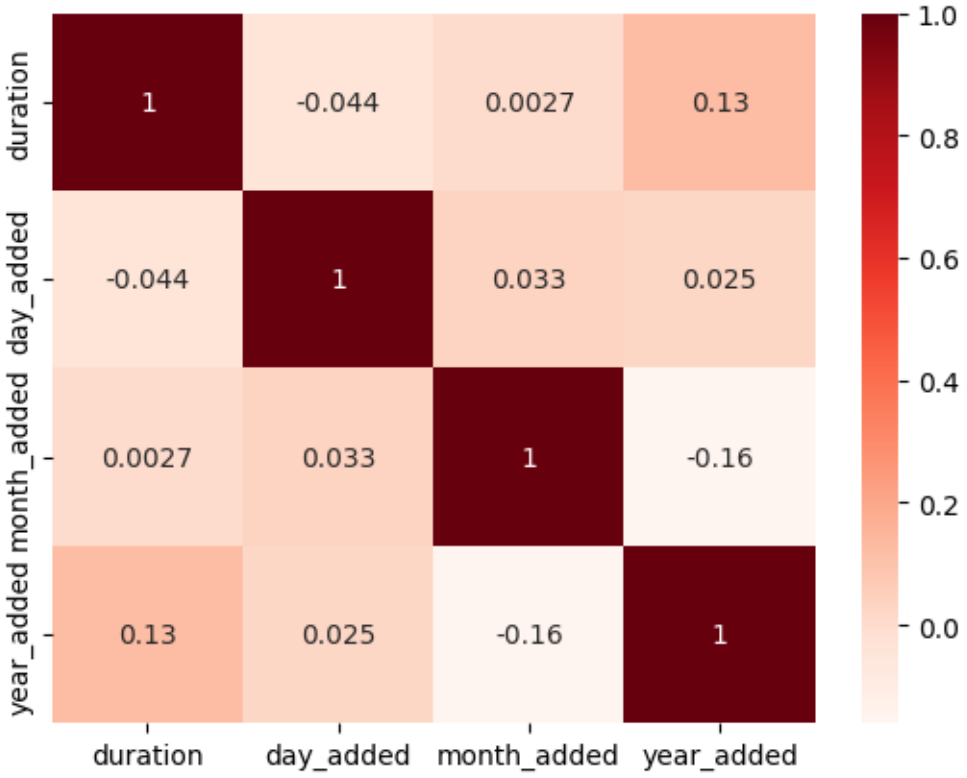
[ ]:
```
movies_corr = movies_date_df.select_dtypes(include=['number'])
movies_corr.corr()
```

[ ]:

	duration	day_added	month_added	year_added
duration	1.000000	-0.044245	0.002709	0.125020
day_added	-0.044245	1.000000	0.033242	0.024731
month_added	0.002709	0.033242	1.000000	-0.160306
year_added	0.125020	0.024731	-0.160306	1.000000

This is a correlation table that represents the coefficients among all numerical columns in moves dataframe.

[ ]:
```
#Heat Map
sns.heatmap(movies_corr.corr(), cmap= "Reds", annot=True)
plt.show()
```



This is a heat map of correlation table.

1.11.2 Netflix TV Shows uploaded on day, month and year analysis

[ ]:
```
shows_date_df = tv_shows[['show_id','date_added','duration']]
shows_date_df['date_added']= pd.to_datetime(shows_date_df['date_added'],␣
 ↪errors='coerce', infer_datetime_format=True)
shows_date_df.dropna(axis=0,inplace=True)
shows_date_df['day_added']=shows_date_df['date_added'].dt.day
shows_date_df['month_added']=shows_date_df['date_added'].dt.month
shows_date_df['year_added']=round(shows_date_df['date_added'].dt.year)
shows_date_df['day_name'] = shows_date_df['date_added'].dt.strftime('%A')
shows_date_df['month_name'] = shows_date_df['date_added'].dt.strftime('%B')
shows_date_df
```

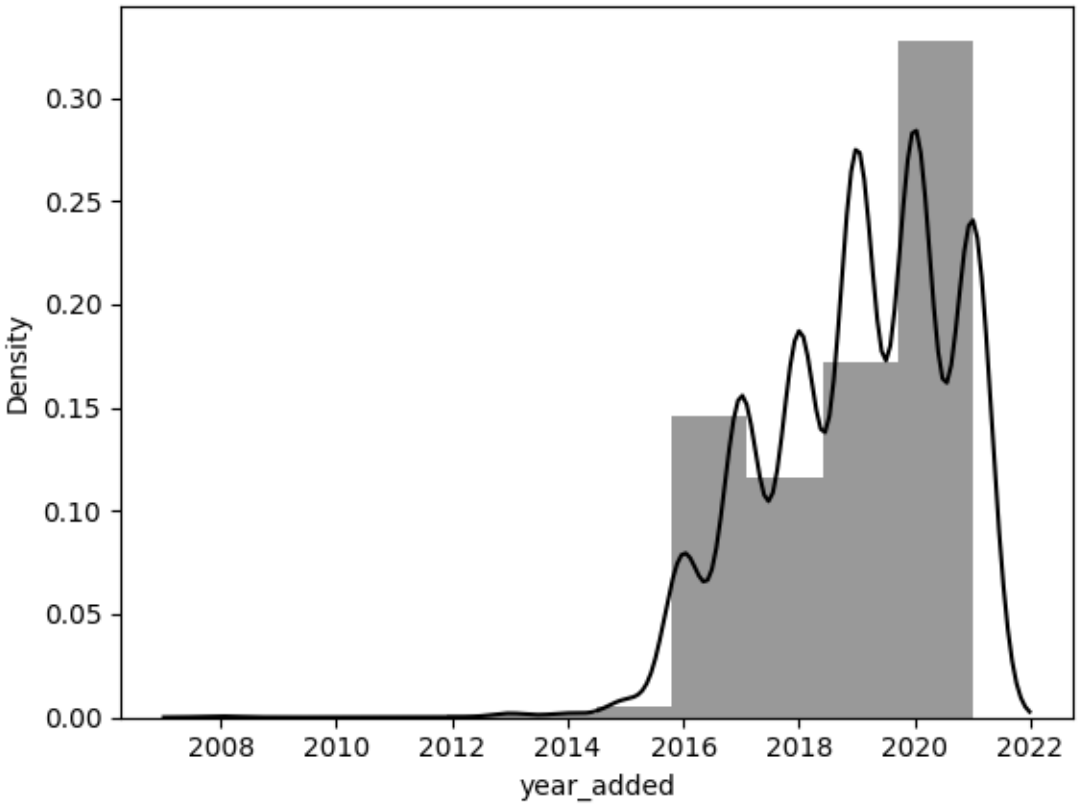
[ ]:

	show_id	date_added	duration	day_added	month_added	year_added	\
1	s2	2021-09-24	2	24	9	2021	
2	s3	2021-09-24	1	24	9	2021	

```
3          s4 2021-09-24         1          24              9         2021
4          s5 2021-09-24         2          24              9         2021
5          s6 2021-09-24         1          24              9         2021
…       …         …        …          …            …           …
8795    s8796 2018-05-01         2           1              5         2018
8796    s8797 2017-01-17         2          17              1         2017
8797    s8798 2018-09-13         3          13              9         2018
8800    s8801 2016-12-15         1          15             12         2016
8803    s8804 2019-07-01         2           1              7         2019

      day_name month_name
1       Friday  September
2       Friday  September
3       Friday  September
4       Friday  September
5       Friday  September
…         …         …
8795   Tuesday        May
8796   Tuesday    January
8797  Thursday  September
8800  Thursday   December
8803    Monday       July

[2578 rows x 8 columns]
```

This data gives the duration and date at which TV Shows having different show ids were added to netflix.

[ ]:
```
sns.distplot(shows_date_df['year_added'], kde = True, color ='black', bins = 10)
plt.show()
```



This Distribution plot represents the year wise count of the TV Shows that were added to netflix. By seeing this plot, we can say that netflix has added most of its TV Shows in the year 2020.

[ ]:
```
month_order = ['January', 'February', 'March', 'April', 'May', 'June', 'July',␣
 ↪'August', 'September', 'October', 'November', 'December']
shows_uploaded = shows_date_df.groupby('year_added')['month_name'].
 ↪value_counts().unstack().fillna(0)[month_order].T
shows_uploaded
```

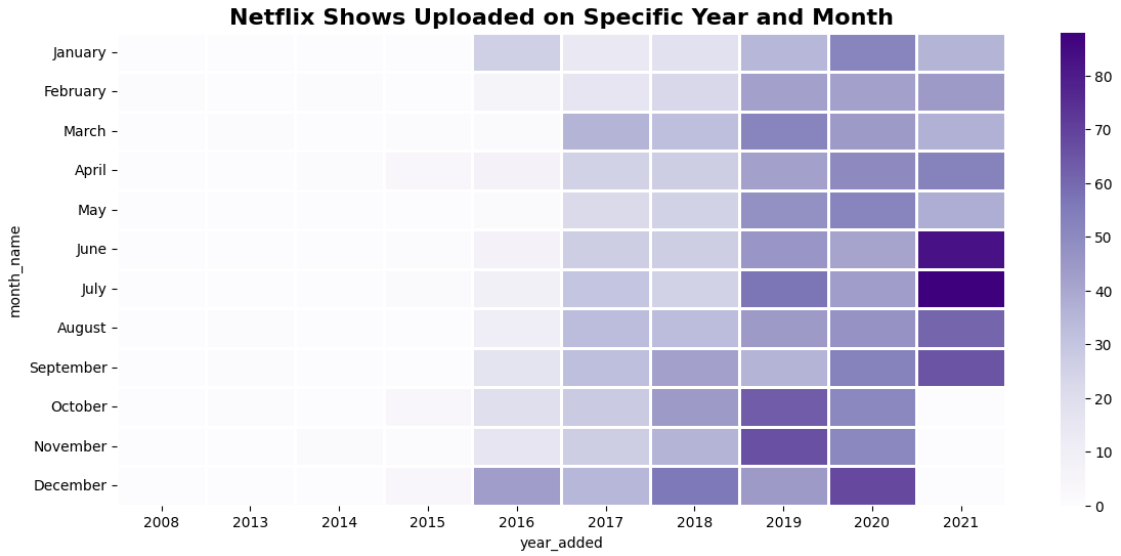
[ ]:

year_added	2008	2013	2014	2015	2016	2017	2018	2019	2020	2021
month_name										
January	0.0	0.0	0.0	0.0	26.0	14.0	18.0	35.0	52.0	36.0
February	1.0	0.0	1.0	0.0	6.0	16.0	23.0	42.0	42.0	44.0
March	0.0	1.0	0.0	1.0	2.0	36.0	32.0	52.0	44.0	37.0
April	0.0	0.0	1.0	4.0	7.0	25.0	27.0	42.0	50.0	53.0
May	0.0	0.0	0.0	0.0	2.0	22.0	25.0	48.0	52.0	38.0
June	0.0	0.0	0.0	1.0	7.0	27.0	27.0	46.0	41.0	83.0
July	0.0	0.0	0.0	2.0	9.0	30.0	25.0	57.0	43.0	88.0
August	0.0	1.0	0.0	0.0	11.0	33.0	33.0	44.0	47.0	61.0
September	0.0	1.0	0.0	0.0	17.0	32.0	42.0	36.0	53.0	65.0
October	0.0	1.0	0.0	4.0	19.0	28.0	44.0	63.0	51.0	0.0

November	0.0	0.0	2.0	1.0	16.0	27.0	36.0	66.0	51.0	0.0
December	0.0	0.0	0.0	4.0	43.0	35.0	56.0	44.0	68.0	0.0

This data gives the count of the TV Shows that were added to netflix on specific year and month

[ ]:
```
plt.figure(figsize = (14,6))
sns.heatmap(shows_uploaded, cmap='Purples', edgecolors = 'white', linewidths=2)
plt.title('Netflix Shows Uploaded on Specific Year and Month', fontsize = 16,␣
 ↪fontweight = 'bold')

plt.show()
```



This plot represents the count of the TV Shows that were added to netflix on specific year and month

By seeing this plot, we can say that in July and June of 2019, netflix has added most of its TV Shows.

[ ]:
```
shows_date_df.groupby('day_name')['show_id'].nunique().
 ↪sort_values(ascending=False).reset_index(name='tv_shows_count')
```

[ ]:

	day_name	tv_shows_count
0	Friday	910
1	Wednesday	370
2	Thursday	334
3	Tuesday	330
4	Saturday	246
5	Monday	217
6	Sunday	171

This data represents the day wise count of the TV Shows added to netflix.

By seeing this data, we can say that netflix has uploaded most of its TV Shows on Friday since its a weekend so that people can catch time to watch content.

[ ]:
```
shows_date_df.groupby('month_name')['show_id'].nunique().
↪sort_values(ascending=False).reset_index(name='tv_shows_count')
```

[ ]:

	month_name	tv_shows_count
0	July	254
1	December	250
2	September	246
3	June	232
4	August	230
5	October	210
6	April	209
7	March	205
8	November	199
9	May	187
10	January	181
11	February	175

This data represents the month wise count of the TV Shows added to netflix.

By seeing this data, we can say that netflix has uploaded most of its TV Shows on July month.

[ ]:
```
shows_date_df.groupby('year_added')['show_id'].nunique().
↪sort_values(ascending=False).reset_index(name='tv_shows_count')
```

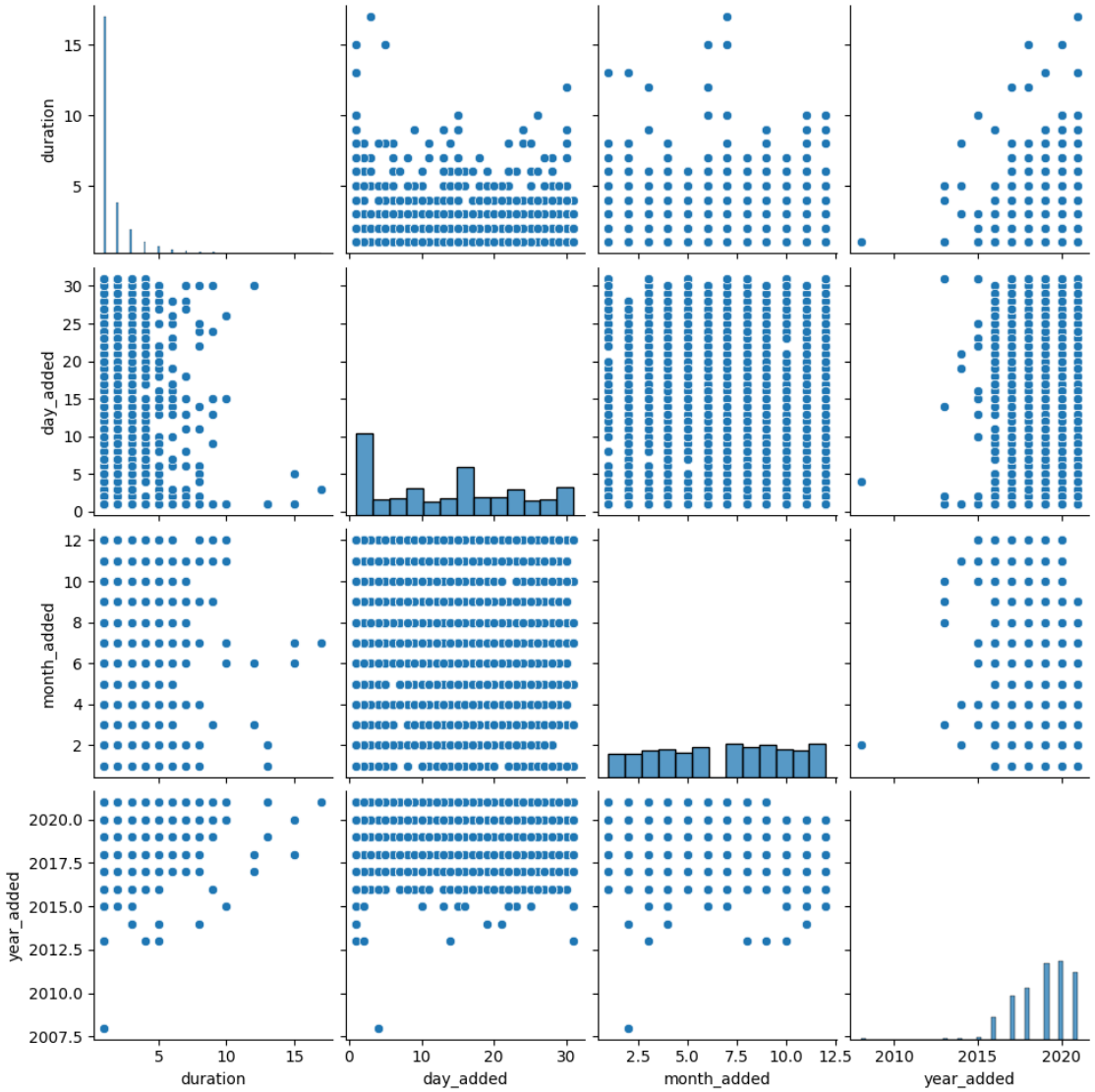
[ ]:

	year_added	tv_shows_count
0	2020	594
1	2019	575
2	2021	505
3	2018	388
4	2017	325
5	2016	165
6	2015	17
7	2013	4
8	2014	4
9	2008	1

This data represents the year wise count of the TV Shows added to netflix.

By seeing this data, we can say that netflix has uploaded most of its TV Shows in the year 2020.

[ ]:
```
#Pair Plot
sns.pairplot(shows_date_df)
plt.show()
```



This is the pair plot that do analysis on all numerical columns in movies dataframe.

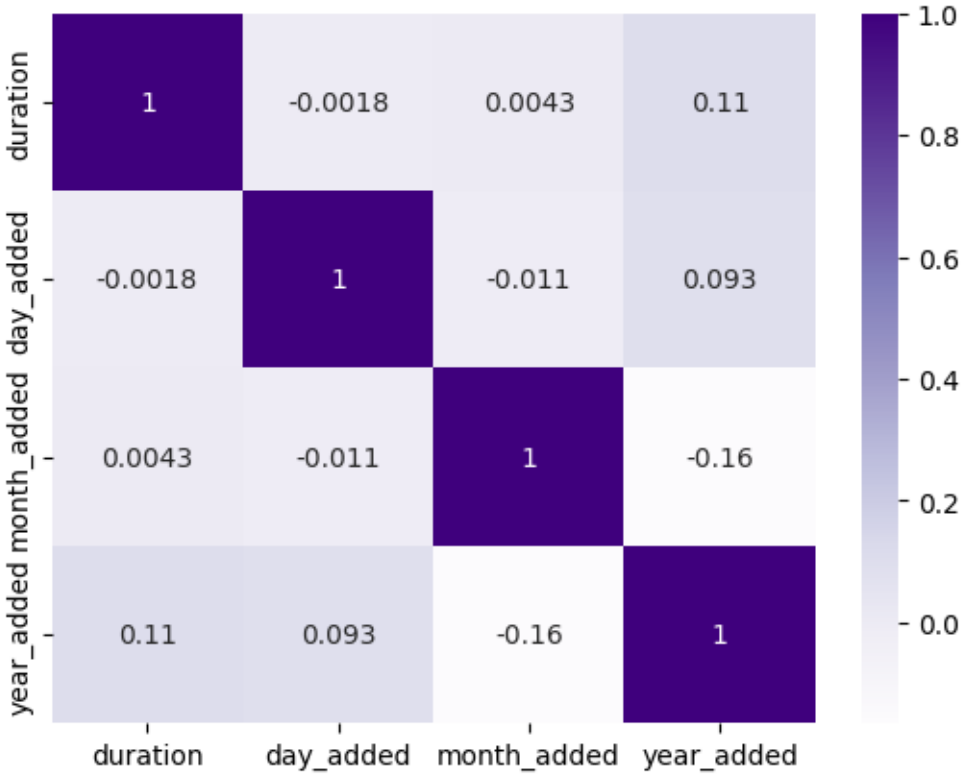
[ ]:
```
shows_corr = shows_date_df.select_dtypes(include=['number'])
shows_corr.corr()
```

[ ]:

	duration	day_added	month_added	year_added
duration	1.000000	-0.001793	0.004340	0.106543
day_added	-0.001793	1.000000	-0.011141	0.093224
month_added	0.004340	-0.011141	1.000000	-0.164357
year_added	0.106543	0.093224	-0.164357	1.000000

This is a correlation table that represents the coefficients among all numerical columns in TV Shows dataframe.

```
[ ]: #Heat Map
sns.heatmap(shows_corr.corr(), cmap= "Purples", annot=True)
plt.show()
```



This is the heat map of correlation table.

1.12 Insights

- Netflix prioritizes the addition of Movies over TV shows.
- Netflix targets the audiences aged 17 and above, constitutes a significant portion of the movie ratings added to Netflix.
- The majority of movies available on Netflix were released between approximately 2008 and 2022 and released most in 2019, while TV shows primarily span from around 2012 to 2022 and released most in 2020.
- The United States emerges as the leading producer of both movies and TV shows on Netflix.
- Since most of the content in Netflix is from United States, most of the cast on Netflix content are also from United States.
- International movies and dramas are prevalent among the content added to Netflix.
- Similarly, international TV shows and dramas dominate the selection of TV shows added to Netflix.
- July is the preferred month whereas Fridays are the preferred day for adding content to Netflix.

- About half of the movies available on Netflix have durations ranging from 90 to 110 minutes.
- Most of the TV Shows available on Netflix have 2 Seasons.

1.13 Recommendations

- **Content Acquisition Strategy:** Netflix should continue prioritizing the addition of movies over TV shows, as it aligns with their audience preferences.

But also they should keep it in mind that some people likes movies over shows and some like genre based whether it a movie or a show. So, Netflix have to conduct survey regarding this.

- **Target Audience Engagement:** Since audiences aged 17 and above constitute a significant portion of Netflix's viewership and ratings, the platform should continue catering to their preferences while also exploring ways to attract and retain this demographic.
- **Content Release Strategy:** Netflix should focus on top actors and directors whose content are most liked by the audience.
- **International Content Expansion:** Given the popularity of international movies, dramas, and TV shows, Netflix should continue to invest in acquiring and producing content from diverse regions to cater to a global audience and expand its international subscriber base.
- **Diverse Casting Approach:** While the majority of Netflix content is from the United States, Netflix should Look beyond the US to source talented actors, directors, and other creative professionals. This can lead to fresh perspectives and content that appeals to a wider demographic.
- **Strategic Release Timing:** Netflix should schedule content additions primarily on Fridays since its a weekend so that people can catch time to watch content.
- **Content Duration Optimization:** Since about half of the movies on Netflix have durations ranging from 90 to 110 minutes, the platform should continue to acquire content within this duration range while also diversifying to cater to varying viewer preferences.

  This also applies for TV shows.