netflix-case-linedin

September 12, 2024

0.1 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

- Dataset

Link: https://d2beiqkhq929f0.cloudfront.net/public_assets/assets/000/000/940/original/netflix.csv

(After clicking on the above link, you can download the files by right-clicking on the page and clicking on “Save As”, then naming the file as per your wish, with .csv as the extension.)

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

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

1 What we will do:

- Comparison of tv shows vs. movies.
- What is the best time to launch a TV show?
- Analysis of actors/directors of different types of shows/movies.
- Does Netflix has more focus on TV Shows than movies in recent years
- Understanding what content is available in different countries

[319]:
```
# Dependencies:

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

1.1 Data cleaning / Sanity Check

[320]:
```
df = pd.read_csv('netflix.csv')
```

[321]:
```
df.head(3)
```

[321]:
```
  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

                                              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

           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

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

                                         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…
```

2 Observation:

After seeing the datawe came across few issues that we need to take care before procedding with the analysis - check for the null values and best practice to impute the nulls - unnesting of nested columns (columns with the multiple values) - 2 types of date format are used here - for duration columns value varies with the type of content (for movies its mins and for series its season)

[322]:

```python
# check the value status for the df using info

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
```

[323]:

```python
# remove white spaces in the start and end of the elements of string columns
df['title'] = df['title'].str.strip()
df['director'] = df['director'].str.strip()
df['cast'] = df['cast'].str.strip()
df['country'] = df['country'].str.strip()
df['listed_in'] = df['listed_in'].str.strip()
df['date_added'] = df['date_added'].str.strip()
```

[324]:

```python
def parse_dates(date_str):
    formats = [
        '%d-%b-%y',
        '%B %d, %Y'
    ]
    for fmt in formats:
        try:
            return pd.to_datetime(date_str, format=fmt, errors='raise')
        except (ValueError, TypeError):
            continue
    return pd.NaT

# Apply the function to the 'date_added' column
df['date_added'] = df['date_added'].apply(parse_dates)
```

[325]:

```
df.head()
```

[325]:

```
  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 2021-09-25          2020  PG-13     90 min   
1 2021-09-24          2021  TV-MA  2 Seasons   
2 2021-09-24          2021  TV-MA   1 Season   
3 2021-09-24          2021  TV-MA   1 Season   
4 2021-09-24          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…  
```

[326]:

```
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   datetime64[ns]
 7   release_year  8807 non-null   int64
 8   rating        8803 non-null   object
 9   duration      8804 non-null   object
 10  listed_in     8807 non-null   object
 11  description   8807 non-null   object
dtypes: datetime64[ns](1), int64(1), object(10)
memory usage: 825.8+ KB
```

[327]:

```
df.to_csv('datecheck.csv')
```

[328]:

```
# Handle missing values: fill with 'Unknown' for simplicity in other columns
df['director'].fillna('Unknown', inplace=True)
df['cast'].fillna('Unknown', inplace=True)
df['country'].fillna('Unknown', inplace=True)
df['duration'].fillna('Unknown', inplace=True)
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\1868786555.py:2:
FutureWarning: A value is trying to be set on a copy of a DataFrame or Series
through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work
because the intermediate object on which we are setting values always behaves as
a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using
'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value)
instead, to perform the operation inplace on the original object.


  df['director'].fillna('Unknown', inplace=True)
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\1868786555.py:3:
FutureWarning: A value is trying to be set on a copy of a DataFrame or Series
through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work
because the intermediate object on which we are setting values always behaves as
a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using
'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value)
instead, to perform the operation inplace on the original object.


  df['cast'].fillna('Unknown', inplace=True)
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\1868786555.py:4:
FutureWarning: A value is trying to be set on a copy of a DataFrame or Series
```

```
through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work
because the intermediate object on which we are setting values always behaves as
a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using
'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value)
instead, to perform the operation inplace on the original object.


  df['country'].fillna('Unknown', inplace=True)
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\1868786555.py:5:
FutureWarning: A value is trying to be set on a copy of a DataFrame or Series
through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work
because the intermediate object on which we are setting values always behaves as
a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using
'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value)
instead, to perform the operation inplace on the original object.


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

[329]:

```
df.info()
df['date_added'].isnull().sum()
```

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

```
[329]: 10
```

```
[330]: df['date_added'].dt.year
```

```
[330]: 0       2021.0
       1       2021.0
       2       2021.0
       3       2021.0
       4       2021.0
                 …
       8802    2019.0
       8803    2019.0
       8804    2019.0
       8805    2020.0
       8806    2019.0
       Name: date_added, Length: 8807, dtype: float64
```

```
[331]: # Fill missing values in 'rating' column with mode
       rating_mode = df['rating'].mode()[0]
       df['rating'].fillna(rating_mode, inplace=True)
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\253231911.py:3: FutureWarning:
A value is trying to be set on a copy of a DataFrame or Series through chained
assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work
because the intermediate object on which we are setting values always behaves as
a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using
'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value)
instead, to perform the operation inplace on the original object.


  df['rating'].fillna(rating_mode, inplace=True)
```

```
[332]: # for few analysis separate movies and TV shows
       movies_df = df[df['type'] == 'Movie']
       tv_shows_df = df[df['type'] == 'TV Show']
```

```
[333]: '''
       Fill missing values in 'duration' column
       For movies, replace missing durations with the mean duration
       For TV shows, replace missing durations with the mode duration
       '''
       # Replace 'Unknown' with np.nan
       movies_df['duration'] = movies_df['duration'].replace('Unknown', np.nan)
```

```python
# Extract numeric part from the duration strings
movies_df['duration_value'] = movies_df['duration'].str.split().str[0].
 ↪astype(float)


# Calculate the mean duration, excluding NaN values
duration_mean_movie = movies_df['duration_value'].mean()

# Fill NaN values with the mean duration
movies_df['duration_value'].fillna(duration_mean_movie, inplace=True)
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\862902501.py:7:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  movies_df['duration'] = movies_df['duration'].replace('Unknown', np.nan)
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\862902501.py:10:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  movies_df['duration_value'] =
movies_df['duration'].str.split().str[0].astype(float)
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\862902501.py:17:
FutureWarning: A value is trying to be set on a copy of a DataFrame or Series
through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work
because the intermediate object on which we are setting values always behaves as
a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using
'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value)
instead, to perform the operation inplace on the original object.


  movies_df['duration_value'].fillna(duration_mean_movie, inplace=True)
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\862902501.py:17:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

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

```
  movies_df['duration_value'].fillna(duration_mean_movie, inplace=True)
```

[334]:

```
# Replace 'Unknown' with np.nan
tv_shows_df['duration'] = tv_shows_df['duration'].replace('Unknown', np.nan)

# Calculate the mode of the duration, excluding NaN values
duration_mode_tv = tv_shows_df['duration'].mode()[0]

# Fill NaN values with the mode duration
tv_shows_df['duration'].fillna(duration_mode_tv, inplace=True)

# Extract numeric part from the duration strings and convert to integer
tv_shows_df['duration_value'] = tv_shows_df['duration'].str.split().str[0]

# Convert the extracted numeric values to integer, handling any conversion␣
 ↪issues
tv_shows_df['duration_value'] = pd.to_numeric(tv_shows_df['duration_value'],␣
 ↪errors='coerce').astype('Int64')
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\3653445223.py:2:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  tv_shows_df['duration'] = tv_shows_df['duration'].replace('Unknown', np.nan)
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\3653445223.py:8:
FutureWarning: A value is trying to be set on a copy of a DataFrame or Series
through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work
because the intermediate object on which we are setting values always behaves as
a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using
'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value)
instead, to perform the operation inplace on the original object.


  tv_shows_df['duration'].fillna(duration_mode_tv, inplace=True)
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\3653445223.py:8:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  tv_shows_df['duration'].fillna(duration_mode_tv, inplace=True)
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\3653445223.py:11:
```

```
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  tv_shows_df['duration_value'] = tv_shows_df['duration'].str.split().str[0]
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\3653445223.py:14:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  tv_shows_df['duration_value'] = pd.to_numeric(tv_shows_df['duration_value'],
errors='coerce').astype('Int64')
```

[335]:

```
# Ensure the 'duration_value' column is now integer type
print(tv_shows_df['duration_value'].sum())
print(movies_df['duration_value'].sum())
```

```
4723
610507.7315600523
```

[336]:

```
movies_df.head(1)
```

[336]:

```
  show_id   type                 title         director     cast  \
0      s1  Movie  Dick Johnson Is Dead  Kirsten Johnson  Unknown

         country date_added  release_year rating duration      listed_in  \
0  United States 2021-09-25          2020  PG-13   90 min  Documentaries

                                         description  duration_value
0  As her father nears the end of his life, filmm…            90.0
```

[337]:

```
tv_shows_df.head(1)
```

[337]:

```
  show_id     type          title director  \
1      s2  TV Show  Blood & Water  Unknown

                                                cast       country date_added  \
1  Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…  South Africa 2021-09-24

   release_year rating   duration  \
1          2021  TV-MA  2 Seasons

                                         listed_in  \
1  International TV Shows, TV Dramas, TV Mysteries
```

```
                                         description  duration_value
1  After crossing paths at a party, a Cape Town t…               2
```

[338]:
```
# Combine the data back together
df = pd.concat([movies_df, tv_shows_df])
```

[339]:
```
# crosscheck
df['duration_value'].sum()
```

[339]:
```
615230.7315600523
```

[340]:
```
round(df.describe(),0)
```

[340]:
```
                          date_added  release_year  duration_value
count                           8797        8807.0          8807.0
mean   2019-05-17 05:59:08.436967168        2014.0            70.0
min              2008-01-01 00:00:00        1925.0             1.0
25%              2018-04-06 00:00:00        2013.0             2.0
50%              2019-07-02 00:00:00        2017.0            88.0
75%              2020-08-19 00:00:00        2019.0           106.0
max              2021-09-25 00:00:00        2021.0           312.0
std                              NaN           9.0            51.0
```

[341]:
```
# Unnest the 'listed_in' column
df = df.assign(listed_in=df['listed_in'].str.split(', ')).explode('listed_in')

# Unnest the 'cast' column
df = df.assign(cast=df['cast'].str.split(', ')).explode('cast')

# Unnest the 'director' column
df = df.assign(director=df['director'].str.split(', ')).explode('director')

# Unnest the 'country' column
df = df.assign(country=df['country'].str.split(', ')).explode('country')

# Display cleaned and unnested data
df.head(1)
```

[341]:
```
  show_id   type                 title          director     cast  \
0      s1  Movie  Dick Johnson Is Dead  Kirsten Johnson  Unknown

         country date_added  release_year rating duration      listed_in  \
0  United States 2021-09-25          2020  PG-13   90 min  Documentaries

                                         description  duration_value
0  As her father nears the end of his life, filmm…            90.0
```

```
[342]: # Remove trailing commas from all string values in the DataFrame
df = df.applymap(lambda x: x.rstrip(',') if isinstance(x, str) else x)
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\302504772.py:2: FutureWarning:
DataFrame.applymap has been deprecated. Use DataFrame.map instead.
  df = df.applymap(lambda x: x.rstrip(',') if isinstance(x, str) else x)
```

```
[343]: # remove white spaces in the start and end of the elements of string columns
df['title'] = df['title'].str.strip()
df['director'] = df['director'].str.strip()
df['cast'] = df['cast'].str.strip()
df['country'] = df['country'].str.strip()
df['listed_in'] = df['listed_in'].str.strip()
```

```
[344]: df.head(1)
df = df.drop('duration', axis = 1)
```

```
[345]: # For easy analysis add some values for date time
df['month_added'] = df['date_added'].dt.strftime('%b')
df['year_added'] = df['date_added'].dt.strftime('%Y')
df['day_added'] = df['date_added'].dt.day
```

```
[346]: df.head(2)
```

```
[346]:
  show_id   type                              title         director  \
0      s1  Movie               Dick Johnson Is Dead  Kirsten Johnson
6      s7  Movie  My Little Pony: A New Generation     Robert Cullen

             cast        country date_added  release_year rating  \
0         Unknown  United States 2021-09-25          2020  PG-13
6 Vanessa Hudgens        Unknown 2021-09-24          2021     PG

                listed_in  \
0           Documentaries
6 Children & Family Movies

                                        description  duration_value  \
0  As her father nears the end of his life, filmm…            90.0
6  Equestria's divided. But a bright-eyed hero be…            91.0

  month_added year_added  day_added
0         Sep       2021       25.0
6         Sep       2021       24.0
```

```
[347]: df = df.rename(columns= {'duration_value': 'duration'})
df.head(2)
```

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

                      cast        country date_added  release_year rating  \
        0          Unknown  United States 2021-09-25          2020  PG-13
        6  Vanessa Hudgens        Unknown 2021-09-24          2021     PG

                          listed_in  \
        0             Documentaries
        6  Children & Family Movies

                                                 description  duration month_added  \
        0  As her father nears the end of his life, filmm…      90.0         Sep
        6  Equestria's divided. But a bright-eyed hero be…      91.0         Sep

          year_added  day_added
        0       2021       25.0
        6       2021       24.0
```

[348]:
```
df =␣
 ↪df[['show_id','type','title','date_added','release_year','rating',        'duration',␣
 ↪'description','director','cast','country','listed_in',        'month_added',       'year_a
```

[349]:
```
df.head(2)
```

```
[349]:   show_id   type                             title date_added  release_year  \
        0      s1  Movie              Dick Johnson Is Dead 2021-09-25          2020
        6      s7  Movie  My Little Pony: A New Generation 2021-09-24          2021

          rating  duration                                      description  \
        0  PG-13      90.0  As her father nears the end of his life, filmm…
        6     PG      91.0  Equestria's divided. But a bright-eyed hero be…

                 director             cast        country                 listed_in  \
        0  Kirsten Johnson          Unknown  United States             Documentaries
        6    Robert Cullen  Vanessa Hudgens        Unknown  Children & Family Movies

          month_added year_added  day_added
        0         Sep       2021       25.0
        6         Sep       2021       24.0
```

[350]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 201991 entries, 0 to 8803
Data columns (total 15 columns):
 #   Column        Non-Null Count   Dtype
---  ------        --------------   -----
 0   show_id       201991 non-null  object
 1   type          201991 non-null  object
 2   title         201991 non-null  object
 3   date_added    201833 non-null  datetime64[ns]
 4   release_year  201991 non-null  int64
 5   rating        201991 non-null  object
 6   duration      201991 non-null  float64
 7   description   201991 non-null  object
 8   director      201991 non-null  object
 9   cast          201991 non-null  object
 10  country       201991 non-null  object
 11  listed_in     201991 non-null  object
 12  month_added   201833 non-null  object
 13  year_added    201833 non-null  object
 14  day_added     201833 non-null  float64
dtypes: datetime64[ns](1), float64(2), int64(1), object(11)
memory usage: 24.7+ MB
```

With this the data cleaning part is almost done and now we can start the EDA

```
[351]: df.head(100)
```

```
[351]:    show_id   type                             title date_added  release_year  \
       0       s1  Movie              Dick Johnson Is Dead 2021-09-25          2020
       6       s7  Movie  My Little Pony: A New Generation 2021-09-24          2021
       6       s7  Movie  My Little Pony: A New Generation 2021-09-24          2021
       6       s7  Movie  My Little Pony: A New Generation 2021-09-24          2021
       6       s7  Movie  My Little Pony: A New Generation 2021-09-24          2021
       ..      …     …                                 …        …             …
       7       s8  Movie                           Sankofa 2021-09-24          1993
       7       s8  Movie                           Sankofa 2021-09-24          1993
       7       s8  Movie                           Sankofa 2021-09-24          1993
       7       s8  Movie                           Sankofa 2021-09-24          1993
       7       s8  Movie                           Sankofa 2021-09-24          1993

          rating  duration                                        description  \
       0   PG-13      90.0  As her father nears the end of his life, filmm…
       6      PG      91.0  Equestria's divided. But a bright-eyed hero be…
       6      PG      91.0  Equestria's divided. But a bright-eyed hero be…
       6      PG      91.0  Equestria's divided. But a bright-eyed hero be…
       6      PG      91.0  Equestria's divided. But a bright-eyed hero be…
       ..    …         …                                               …
       7   TV-MA     125.0  On a photo shoot in Ghana, an American model s…
       7   TV-MA     125.0  On a photo shoot in Ghana, an American model s…
       7   TV-MA     125.0  On a photo shoot in Ghana, an American model s…
       7   TV-MA     125.0  On a photo shoot in Ghana, an American model s…
```

```
7   TV-MA     125.0  On a photo shoot in Ghana, an American model s…

           director             cast         country  \
0   Kirsten Johnson          Unknown   United States
6     Robert Cullen  Vanessa Hudgens         Unknown
6    José Luis Ucha  Vanessa Hudgens         Unknown
6     Robert Cullen     Kimiko Glenn         Unknown
6    José Luis Ucha     Kimiko Glenn         Unknown
..              …              …              …
7      Haile Gerima       Mutabaruka    Burkina Faso
7      Haile Gerima       Mutabaruka  United Kingdom
7      Haile Gerima       Mutabaruka         Germany
7      Haile Gerima       Mutabaruka        Ethiopia
7      Haile Gerima    Afemo Omilami   United States

                   listed_in month_added year_added  day_added
0              Documentaries         Sep       2021       25.0
6   Children & Family Movies         Sep       2021       24.0
6   Children & Family Movies         Sep       2021       24.0
6   Children & Family Movies         Sep       2021       24.0
6   Children & Family Movies         Sep       2021       24.0
..                       …         …        …         …
7         Independent Movies         Sep       2021       24.0
7         Independent Movies         Sep       2021       24.0
7         Independent Movies         Sep       2021       24.0
7         Independent Movies         Sep       2021       24.0
7         Independent Movies         Sep       2021       24.0

[100 rows x 15 columns]
```

2.1 Defining Problem Statement and Analysing basic metrics

[352]:

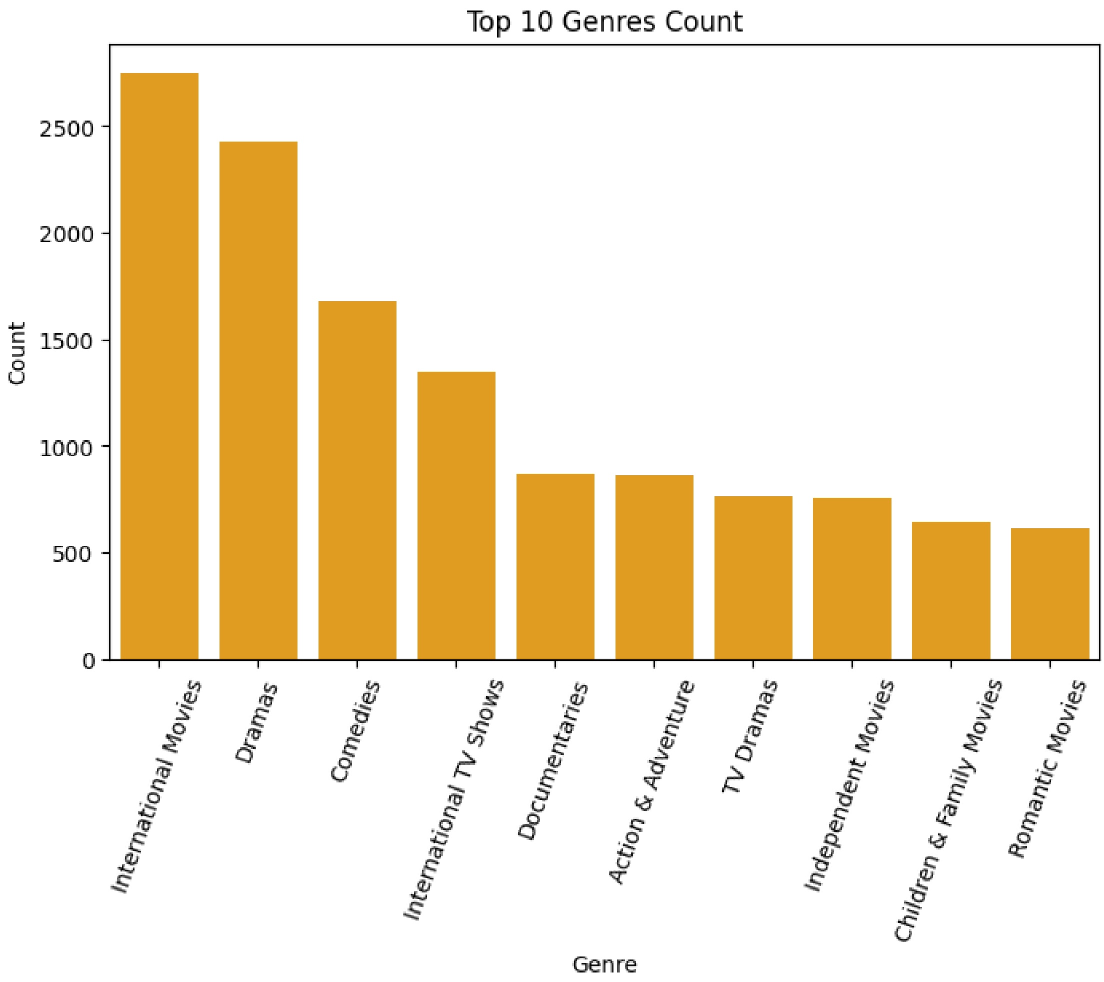
```
# Content Type Distribution: Determine the number of movies and TV shows.
df.head()
df.groupby(['type'])['title'].nunique().reset_index(name = 'count')
```

[352]:

```
      type  count
0    Movie   6130
1  TV Show   2676
```

[353]:

```
# Genre Distribution: Analyze the genres listed and their frequencies.
# Top 10 Genre
top_10_genre = df.groupby(['listed_in'])['title'].nunique().reset_index(name =␣
 ↪'count').sort_values('count', ascending= False).head(10)
plt.figure(figsize=(8, 5))
sns.barplot(data=top_10_genre, x='listed_in', y='count', color= 'orange')
plt.xticks(rotation=70)  # Optional: Rotate x-axis labels if they are long
plt.xlabel('Genre')
plt.ylabel('Count')
plt.title('Top 10 Genres Count')
plt.show()
```

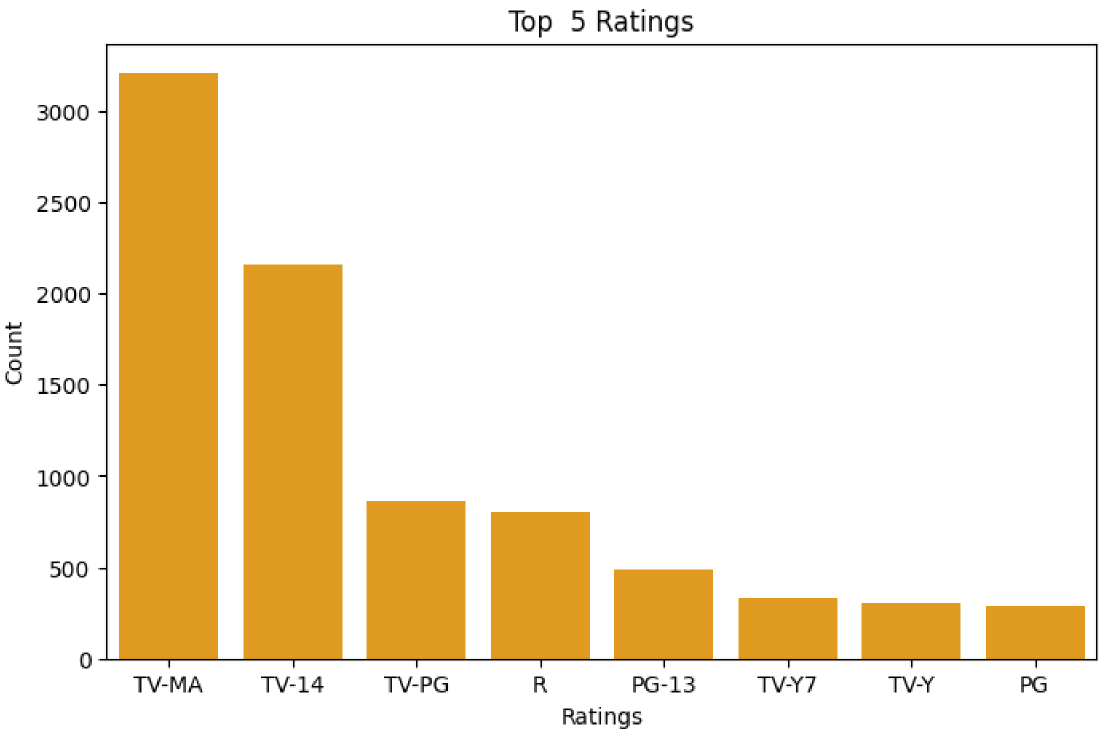


3 Observation:

Top genres that are majority in counts are "International Movies","dramas" and "comedy", which favours the descision of adding new content which is of the top genres will be possible

[354]:
```
# Rating Distribution: Examine the distribution of content ratings (e.g.,␣
↪PG-13, TV-MA).

top_5_rating = df.groupby(['rating'])['title'].nunique().reset_index(name =␣
↪'count').sort_values('count', ascending= False).head(8)
```

```
plt.figure(figsize=(8, 5))
sns.barplot(data=top_5_rating, x = 'rating', y = 'count', color= 'orange')
plt.xlabel('Ratings')
plt.ylabel('Count')
plt.title('Top  5 Ratings')
plt.show()
```



4 Observation:

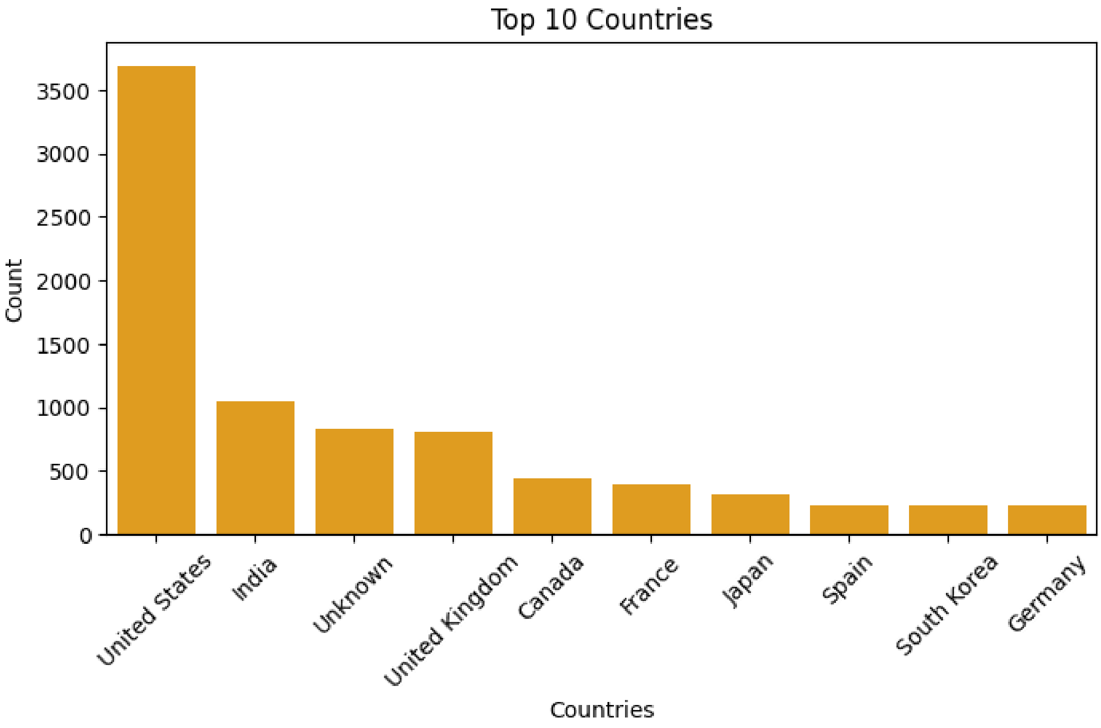
TV-MA and TV-14 are the frequent ratings, for adding content on Netflix So with this we can suggest the content with the top 3 genres and top 3 ratings are most favoured

[355]:

```
# Duration Analysis: For movies, analyze the distribution of durations. For TV␣
 ↪shows, analyze the number of seasons.

movies = df[df['type'] == 'Movie']
movie_mean = movies['duration'].mean()
tv_show = df[df['type'] == 'TV Show']
mode_season = tv_show['duration'].mode()
print(f" average length of movies added are {movie_mean//60} hours and␣
 ↪{movie_mean%60} mins.")
print(f" modal length of TV shows in terms of seasons is {mode_season[0]}")
```

```
average length of movies added are 1.0 hours and 46.856302541500455 mins.
modal length of TV shows in terms of seasons is 1.0
```

[356]:
```
# Geographical Distribution: Identify the countries represented in the dataset␣
 ↪and the number of entries from each country.

top_countries = df.groupby(['country'])['title'].nunique().reset_index(name =␣
 ↪'count').sort_values('count', ascending= False).head(10)
plt.figure(figsize=(8, 4))
sns.barplot(data = top_countries, x = 'country', y = 'count', color= 'orange')
plt.xlabel('Countries')
plt.ylabel('Count')
plt.title('Top 10 Countries')
plt.xticks(rotation=45)
plt.show()
```

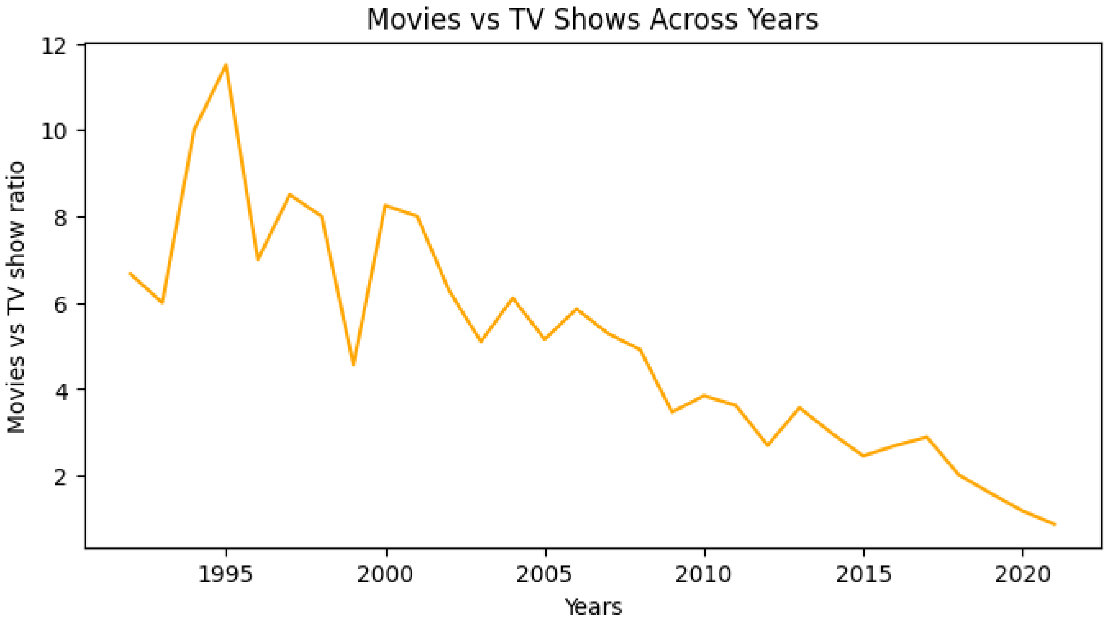


5 Observation:

mostly the TV shows that are added in Netflix are from US and India.

[357]:
```
# Yearly Release Trend: Analyze the number of releases per year.
No_movies_Show_per_year = df.groupby(['release_year', 'type'])['title'].
 ↪nunique().reset_index()
```

```
movieshows_per_year= No_movies_Show_per_year.pivot_table(index='release_year',␣
 ↪columns = 'type').reset_index().sort_index(ascending= False)
movieshows_per_year['movie_show_ratio'] = movieshows_per_year[('title',␣
 ↪'Movie')]/ movieshows_per_year[('title', 'TV Show')]
movieshows_per_year= movieshows_per_year.head(30)
plt.figure(figsize=(8, 4))
sns.lineplot(data = movieshows_per_year, x = 'release_year', y =␣
 ↪'movie_show_ratio', color = 'orange')
plt.xlabel('Years')
plt.ylabel('Movies vs TV show ratio')
plt.title('Movies vs TV Shows Across Years')
plt.show()
```



6 Observation:

- If we calculate the ratio of no of movies vs TV shows addition per year that will help us to understand the trend of adding movies vs TV shows
- Its interesting to see that the movies vs TV shaow ratio is on declining trnd in last 30 years e.i., the no of movies produced per year are declining if we compared with the no of TV shows.
- TV show share is increasing vs Movies

7 Director and Cast Analysis:

[358]:

```
# Determine the most frequent directors and cast members.

top_director = df.groupby(['director'])['title'].nunique().reset_index(name =␣
 ↪'count').sort_values('count', ascending= False).head(10)
top_cast = df.groupby(['cast'])['title'].nunique().reset_index(name = 'count').
 ↪sort_values('count', ascending= False).head(10)

# Modified df to pair the actor_director
df['dir_cast'] = df['director'] + " _ " + df['cast']
top_pair = df.groupby(['dir_cast'])['title'].nunique().reset_index(name =␣
 ↪'count').sort_values('count', ascending= False).head(10)

# Top directors that are with high counts of movies
top_director
```

[358]:

```
                  director  count
4744               Unknown   2634
3749         Rajiv Chilaka     22
1906             Jan Suter     21
3800           Raúl Campos     19
2866          Marcus Raboy     16
4457           Suhas Kadav     16
1954             Jay Karas     15
755    Cathy Garcia-Molina     13
1951           Jay Chapman     12
2945      Martin Scorsese      12
```

[359]:

```
# top 10 actors in terms of no of movies
top_cast
```

[359]:

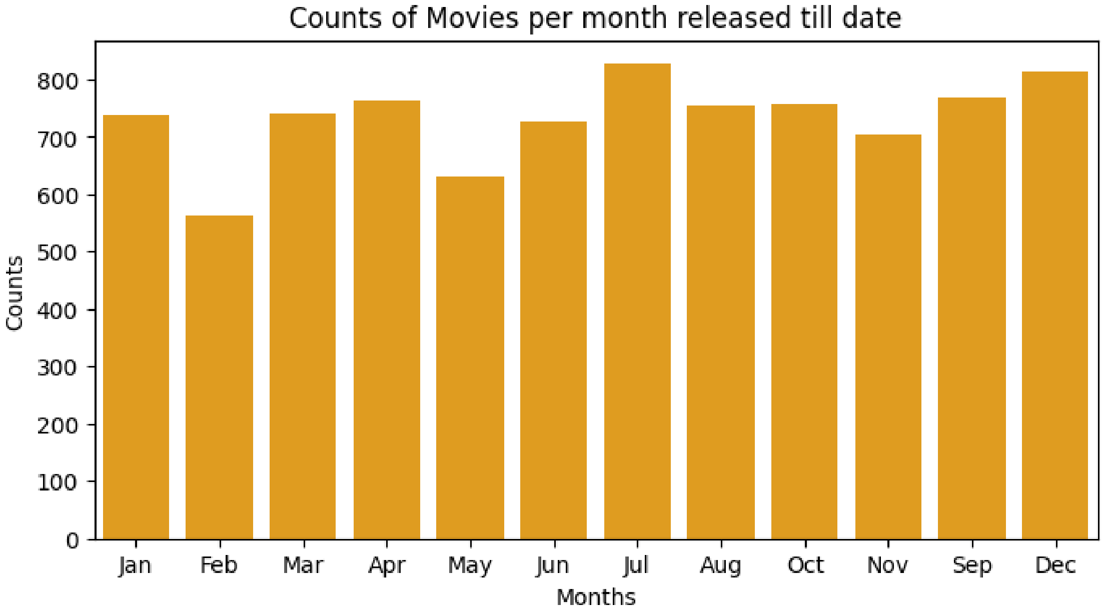
```
                     cast  count
34214             Unknown    825
2832          Anupam Kher     43
30489      Shah Rukh Khan     35
16697       Julie Tejwani     33
32591    Takahiro Sakurai     32
24215    Naseeruddin Shah     32
28974        Rupa Bhimani     31
845          Akshay Kumar     30
25424             Om Puri     30
35881           Yuki Kaji     29
```

8 Observation:

Top 10 director-actor pairs (to know which actor/directors having close affinity) in terms of no of movies : If we saw the top considerable pairs for the director_actors, then Rajiv Chilaka and Rajesh Kava and Julie Tejwani are in top, in terms of movies count. Which means they have the preference over the each other

[360]:

```
# Date Added: Explore the trend of when content was added to the platform.

# Whcih month is best/popular to add movie/TV show:

No_movies_per_month = df.groupby(['month_added'])['title'].nunique().
 ↪reset_index(name = 'count')

# Convert 'month_added' to categorical with desired order

month_order = ['Jan', 'Feb','Mar','Apr', 'May', 'Jun','Jul','Aug',␣
 ↪'Oct','Nov','Sep','Dec']
No_movies_per_month['month_added'] = pd.
 ↪Categorical(No_movies_per_month['month_added'], categories=month_order,␣
 ↪ordered=True)

plt.figure(figsize=(8, 4))
composit_month = sns.barplot(data= No_movies_per_month, x= 'month_added', y =␣
 ↪'count', color= 'orange')
plt.xlabel('Months')
plt.ylabel('Counts')
plt.title('Counts of Movies per month released till date')
plt.show()
```



9 Observation:

Using below generally we can cnclude that the conntetn addition is majorly favoured in the months of Jul followed by Dec

[361]:

```
# a.        Observations on the Shape of Data:
# What are the dimensions of the dataset (number of rows and columns)?
df.shape

print(f"df has the {df.shape[0]} number of rows and {df.shape[1]} number of␣
 ↪columns for analysis")
```

```
df has the 201991 number of rows and 16 number of columns for analysis
```

[362]:

```
# Are there any duplicated rows that need to be removed?
all_duplicates = df[df.duplicated(keep=False)]


# if there are the duplicates then: keep first
df = df.drop_duplicates(keep= 'first').reset_index()
```

[363]:

```
# Check if still duplicates are there:
all_duplicates = df[df.duplicated(keep=False)]
all_duplicates

'''
No duplicates present
'''
```

[363]:

```
'\nNo duplicates present\n'
```

[364]:

```
# b.Data Types of All Attributes:
# What are the data types of each column in the dataset?
df.info()

'''
All the columns are in respective data types like 'date_added' as "datetime",␣
 ↪'release_year' as nmerical data tyoe
and duration as 'float'.

'''
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 201936 entries, 0 to 201935
Data columns (total 17 columns):
 #   Column        Non-Null Count   Dtype
---  ------        --------------   -----
 0   index         201936 non-null  int64
 1   show_id       201936 non-null  object
 2   type          201936 non-null  object
 3   title         201936 non-null  object
 4   date_added    201778 non-null  datetime64[ns]
 5   release_year  201936 non-null  int64
 6   rating        201936 non-null  object
 7   duration      201936 non-null  float64
 8   description   201936 non-null  object
 9   director      201936 non-null  object
 10  cast          201936 non-null  object
 11  country       201936 non-null  object
 12  listed_in     201936 non-null  object
 13  month_added   201778 non-null  object
 14  year_added    201778 non-null  object
 15  day_added     201778 non-null  float64
 16  dir_cast      201936 non-null  object
dtypes: datetime64[ns](1), float64(2), int64(2), object(12)
memory usage: 26.2+ MB
```

[364]:

```
'\nAll the columns are in respective data types like \'date_added\' as
"datetime", \'release_year\' as nmerical data tyoe\nand duration as
\'float\'.\n\n'
```

[365]:

```python
# C.Conversion of Categorical Attributes to 'category':
# type and rating columns from the df are kind of categorical values, also we␣
 ↪can add country too, which will
# improve our space optimisations

# Convert categorical columns to 'category' data type
categorical_columns = ['type', 'rating', 'director', 'country', 'listed_in',␣
 ↪'month_added']

for column in categorical_columns:
    df[column] = df[column].astype('category')

# Display the DataFrame info to check the data types
print(df.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 201936 entries, 0 to 201935
Data columns (total 17 columns):
 #   Column        Non-Null Count   Dtype
---  ------        --------------   -----
 0   index         201936 non-null  int64
 1   show_id       201936 non-null  object
 2   type          201936 non-null  category
 3   title         201936 non-null  object
 4   date_added    201778 non-null  datetime64[ns]
 5   release_year  201936 non-null  int64
 6   rating        201936 non-null  category
 7   duration      201936 non-null  float64
 8   description   201936 non-null  object
 9   director      201936 non-null  category
 10  cast          201936 non-null  object
 11  country       201936 non-null  category
 12  listed_in     201936 non-null  category
 13  month_added   201778 non-null  category
 14  year_added    201778 non-null  object
 15  day_added     201778 non-null  float64
 16  dir_cast      201936 non-null  object
dtypes: category(6), datetime64[ns](1), float64(2), int64(2), object(6)
memory usage: 18.5+ MB
None
```

[366]:

```
# d.Missing Value Detection:

null_share =df.isnull().sum()
null_share
```

[366]:

```
index             0
show_id           0
type              0
title             0
date_added      158
release_year      0
rating            0
duration          0
description       0
director          0
cast              0
country           0
listed_in         0
month_added     158
year_added      158
day_added       158
dir_cast          0
dtype: int64
```

- major share of null is in directors, which will not impact much on to the analysis of the data, while rest all are already treated like:
  - RATING HAS BEEN TREATED WITH THE MODE ValueError
  - COUNTRY IS TREATED WITH THE ‘United States’ as the data is from US
  - duration is treated with the mean for movies and mode for the TV show

[367]:

```python
# e.Statistical Summary:
# What are the basic statistics (mean, median, mode, standard deviation, etc.)␣
 ↪for numerical columns?

round(df.describe(), 1)
```

[367]:

```
          index                     date_added  release_year  duration  \
count  201936.0                         201778      201936.0  201936.0   
mean     4372.9  2019-06-19 10:34:02.839160064        2013.5      77.7   
min         0.0            2008-01-01 00:00:00        1925.0       1.0   
25%      2121.0            2018-06-24 00:00:00        2012.0       4.0   
50%      4332.0            2019-09-01 00:00:00        2016.0      95.0   
75%      6678.0            2020-09-10 00:00:00        2019.0     112.0   
max      8806.0            2021-09-25 00:00:00        2021.0     312.0   
std      2592.9                            NaN           9.0      51.5   

       day_added  
count   201778.0  
mean        12.2  
min          1.0  
25%          1.0  
50%         12.0  
75%         20.0  
max         31.0  
std          9.8  
```

10 Observation:

duration column is showing the 312mins as duration for the movies which seems to be the outlier for the column

[368]:

```python
# What is the distribution of categorical data (frequency counts for each␣
 ↪category)?
object_description = df.describe(include=[object])
object_description
```

[368]:

```
        show_id                        title  \
count    201936                       201936   
unique     8807                         8806   
top       s7165  Kahlil Gibran's The Prophet   
freq        700                          700   

                                              description    cast year_added  \
count                                              201936  201936     201778   
unique                                               8775   36440         14   
top     A troubled young girl and her mother find sola…  Unknown       2019   
freq                                                  700    2146      46916   
```

```
                 dir_cast
count              201936
unique              62741
top     Unknown _ Unknown
freq                  738
```

[369]:

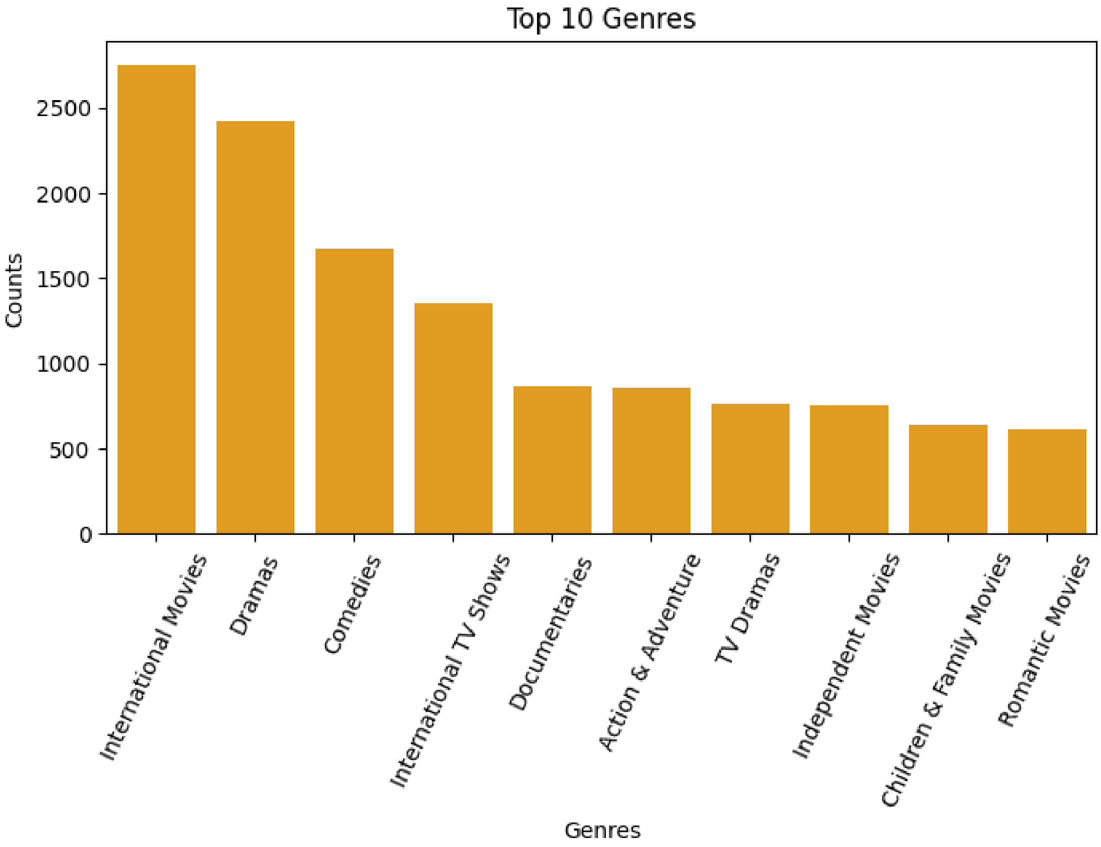
```
# What are the most common and least common values in each categorical column?
for column in df.select_dtypes(include=[object]).columns:
    value_counts = df[column].value_counts()
    most_common = value_counts.idxmax()
    most_common_count = value_counts.max()
    least_common = value_counts.idxmin()
    least_common_count = value_counts.min()
    print(f"Column: {column}")
    print(f"  Most common value: {most_common} (count: {most_common_count})")
    print(f"  Least common value: {least_common} (count: {least_common_count})")
    print()
```

```
Column: show_id
  Most common value: s7165 (count: 700)
  Least common value: s3694 (count: 1)

Column: title
  Most common value: Kahlil Gibran's The Prophet (count: 700)
  Least common value: Katherine Ryan: Glitter Room (count: 1)

Column: description
  Most common value: A troubled young girl and her mother find solace on a
journey with a subversive poet whose words captivate their hearts and
imaginations. (count: 700)
  Least common value: Stand-up comedian Colin Quinn calls out the hypocrisies of
the left and the right in this special based on his politically charged Off-
Broadway show. (count: 1)

Column: cast
  Most common value: Unknown (count: 2146)
  Least common value: Matt Shively (count: 1)

Column: year_added
  Most common value: 2019 (count: 46916)
  Least common value: 2008 (count: 19)

Column: dir_cast
  Most common value: Unknown _ Unknown (count: 738)
  Least common value: Chris Stokes _ Anton Peeples (count: 1)
```

[370]:
```
# How many movies and TV shows are there?

movies_count= movies['title'].nunique()
show_count = tv_show['title'].nunique()

print(f"total number of movies that are there in df are {movies_count} and␣
 ↪total number of showas are around {show_count} so total we have␣
 ↪{movies_count + show_count} elements")
```

```
total number of movies that are there in df are 6130 and total number of showas
are around 2676 so total we have 8806 elements
```

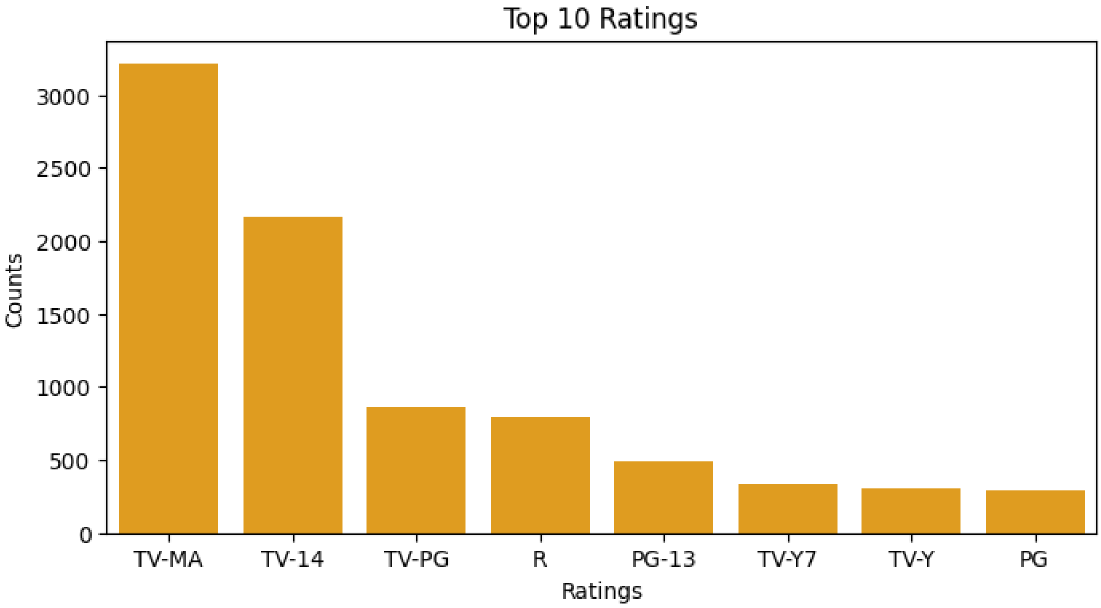
[371]:
```
# What are the most frequent genres?

plt.figure(figsize=(8, 4))
sns.barplot(data=top_10_genre, x = 'listed_in', y = 'count', color= 'orange')
plt.xlabel('Genres')
plt.ylabel('Counts')
plt.title('Top 10 Genres')
plt.xticks(rotation = 65)
plt.show()
```



International movies, drama and comedies are top consumed materials

[372]:
```
# What are the most common ratings assigned to the content?

top_rating = df.groupby(['rating'])['title'].nunique().reset_index(name =␣
↪'count').sort_values('count', ascending= False).head()
plt.figure(figsize=(8, 4))
sns.barplot(data=top_5_rating, x = 'rating', y = 'count', color= 'orange')
plt.xlabel('Ratings')
plt.ylabel('Counts')
plt.title('Top 10 Ratings')
plt.xticks(rotation = 0)
plt.show()
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\2184506117.py:3:
FutureWarning: The default of observed=False is deprecated and will be changed
to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  top_rating = df.groupby(['rating'])['title'].nunique().reset_index(name =
'count').sort_values('count', ascending= False).head()
```

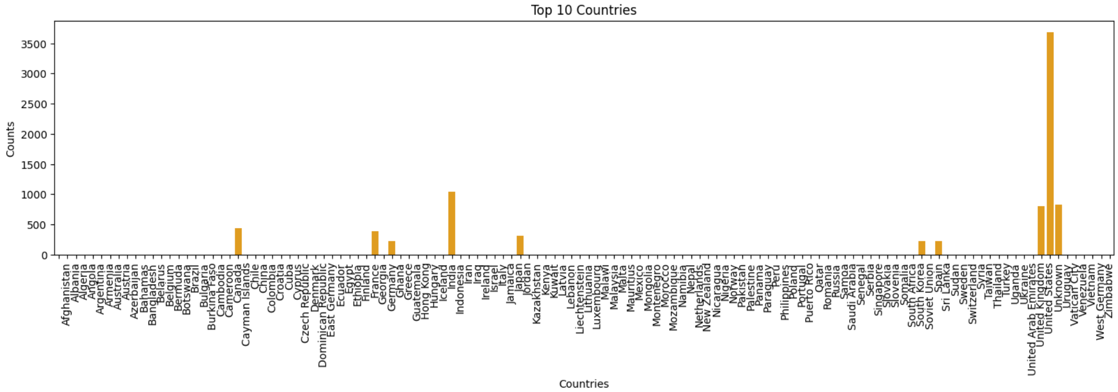


TV-MA is the most frequent rating given to the added content

[373]:
```
# How many entries are there for each country?

# Get the top 10 countries by count
```

```
top_countries = df.groupby(['country'])['title'].nunique().
 ↪reset_index(name='count').sort_values('count', ascending=False).head(10)

# Plot the top 10 countries
plt.figure(figsize=(18, 4))
sns.barplot(data=top_countries, x='country', y='count', color='orange')
plt.xlabel('Countries')
plt.ylabel('Counts')
plt.title('Top 10 Countries')
plt.xticks(rotation=90)  # Rotate x labels for better readability
plt.show()
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\654365514.py:4: FutureWarning:
The default of observed=False is deprecated and will be changed to True in a
future version of pandas. Pass observed=False to retain current behavior or
observed=True to adopt the future default and silence this warning.
  top_countries = df.groupby(['country'])['title'].nunique().reset_index(name='c
ount').sort_values('count', ascending=False).head(10)
```



USA, India and UK are the top 3 in geographical distribution of content production adopted by Netflix

[374]:
```
top_countries
```

[374]:
```
            country  count
116   United States   3690
46            India   1046
117         Unknown    831
115  United Kingdom    806
21           Canada    445
37           France    393
54            Japan    318
103           Spain    232
```

```
101     South Korea    231
39          Germany    226
```

[375]:

```
# How many unique values exist in each categorical column?

'''
this will give the columnwise unique values information
cast and dir_cast columns with the large numbers of the unique values

# Index and Show ID are with the max unique ids which is also necessary
# relaease year are having the 74 unique years data from 124 countries, which␣
 ↪we can check
# 1699 dates are there when the netflix added content to the platform and 12␣
 ↪years where nextfix added the contnt i.e roughly every on avg 3 days content␣
 ↪is added
'''
df.nunique()
```

[375]:

```
index              8807
show_id            8807
type                  2
title              8806
date_added         1714
release_year         74
rating               17
duration            211
description        8775
director           4994
cast              36440
country             124
listed_in            42
month_added          12
year_added           14
day_added            31
dir_cast          62741
dtype: int64
```

[376]:

```
# Few important columns with the count of unique values
df[['type', 'rating', 'country', 'listed_in', 'release_year', 'year_added']].
 ↪nunique()
```

[376]:

```
type              2
rating           17
country         124
listed_in        42
release_year     74
year_added       14
```

```
dtype: int64
```

Our dataset has 2 types of listed program, whcih are broadly classified into 17 ratings and has wide verity of 42 genres, which are from 142 countries and collection of the movies released in 74 past years.

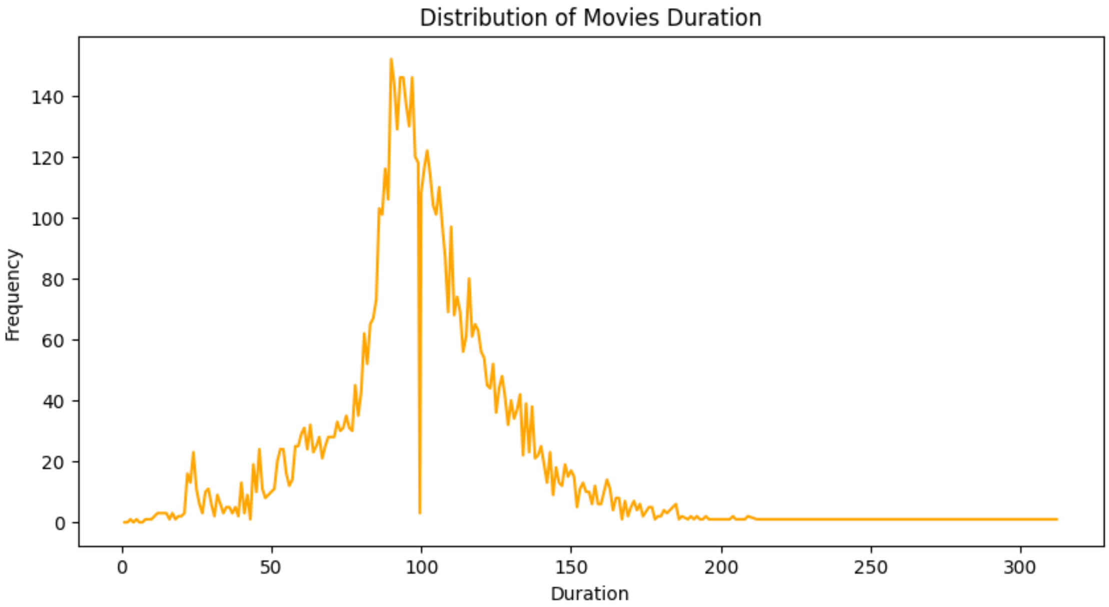
[377]:
```
'''
4.        Visual Analysis - Univariate, Bivariate after pre-processing of the␣
 ↪data
(Note: Pre-processing involves unnesting of the data in columns like Actor,␣
 ↪Director, Country)
4.1 For continuous variable(s): Distplot, countplot, histogram for univariate␣
 ↪analysis (10 Points)
4.2 For categorical variable(s): Boxplot (10 Points)
For correlation: Heatmaps, Pairplots (10 Points)
'''
```

[377]:
```
'\n4.\tVisual Analysis - Univariate, Bivariate after pre-processing of the
data\n(Note: Pre-processing involves unnesting of the data in columns like
Actor, Director, Country)\n4.1 For continuous variable(s): Distplot, countplot,
histogram for univariate analysis (10 Points)\n4.2 For categorical variable(s):
Boxplot (10 Points)\nFor correlation: Heatmaps, Pairplots (10 Points)\n'
```

11 Univariate analysis

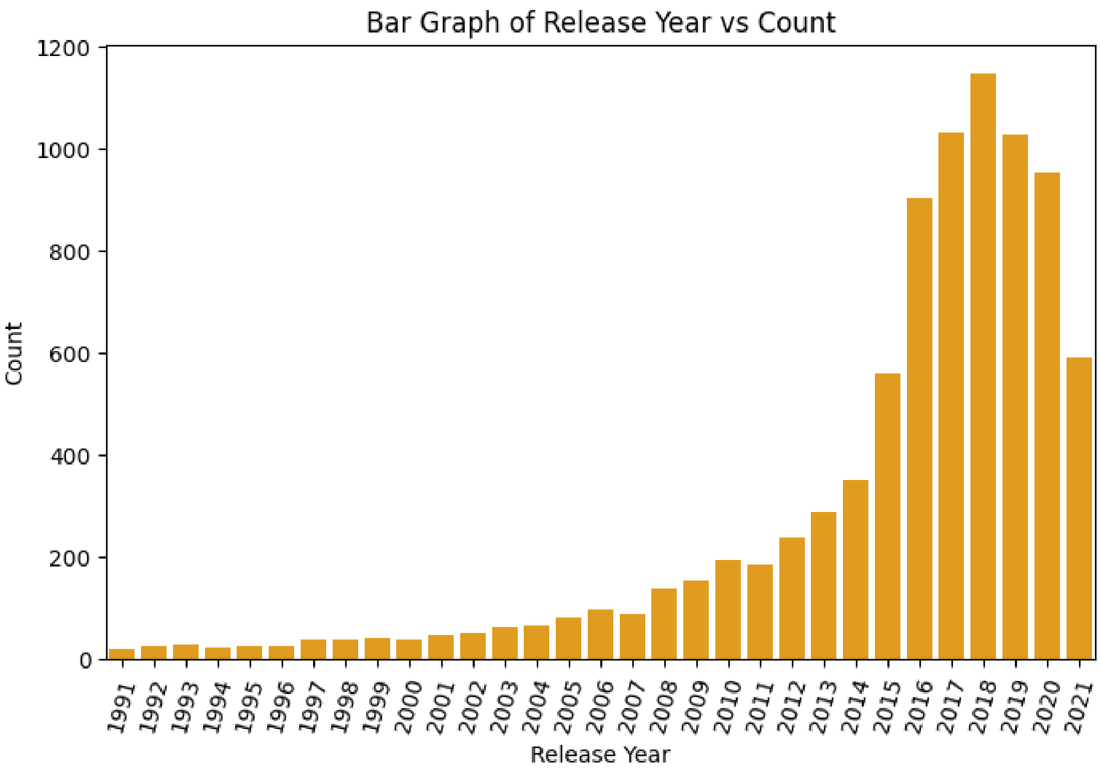
[378]:
```
# Distribution Plot (lineplot) for duration with customized colors

duration = df.groupby(['duration', 'type'])['title'].nunique().reset_index(name␣
 ↪= 'count')
duration = duration[duration['type'] == 'Movie']
plt.figure(figsize=(10, 5))
sns.lineplot(data= duration, x = 'duration', y = 'count', color = 'orange')
plt.title('Distribution of Movies Duration')
plt.xlabel('Duration')
plt.ylabel('Frequency')
plt.show()
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\3317213272.py:3:
FutureWarning: The default of observed=False is deprecated and will be changed
to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  duration = df.groupby(['duration',
'type'])['title'].nunique().reset_index(name = 'count')
```



Majority of the movies are having duration in teh range of 87 to 115mins long, which are mostly preffered by netflix in history.

[379]:
```
# Count Plot (bar plot for continuous variables)

release_year = df.groupby(['release_year'])['title'].nunique().reset_index(name␣
 ↪= 'count').sort_values('count', ascending= False)
release_year = release_year[release_year['release_year'] > 1990]
plt.figure(figsize=(8, 5))
sns.barplot(data = release_year, x = 'release_year', y = 'count',␣
 ↪color='orange')
plt.title('Bar Graph of Release Year vs Count')
plt.xlabel('Release Year')
plt.ylabel('Count')
plt.xticks(rotation=75)
plt.show()
```

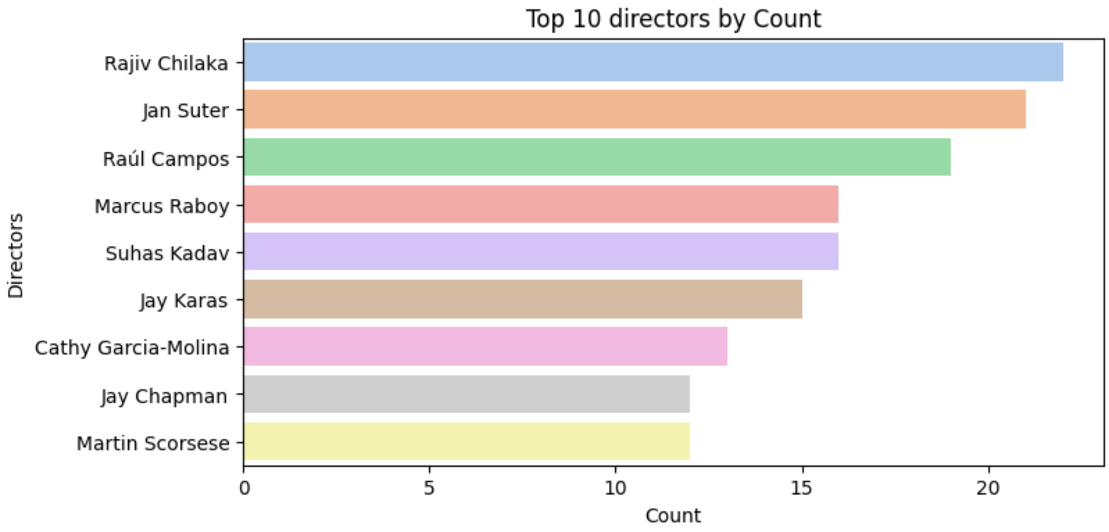


Data that we have is with the major share of programs or TV shows which are released after 2011/12 and we can see the inclining trend in addition for the content addition.

[380]:

```python
# Count Plot (Horizontal Bar Plot) for cast

# Filter out the rows where 'director' is 'Unknown'
filtered_top_dir = top_director[top_director['director'] != 'Unknown']

# Plotting
plt.figure(figsize=(8, 4))
sns.barplot(data=filtered_top_dir, y='director', x='count', palette='pastel')
plt.title('Top 10 directors by Count')
plt.xlabel('Count')
plt.ylabel('Directors')
plt.show()
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\955435671.py:8: FutureWarning:

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

  sns.barplot(data=filtered_top_dir, y='director', x='count', palette='pastel')
```

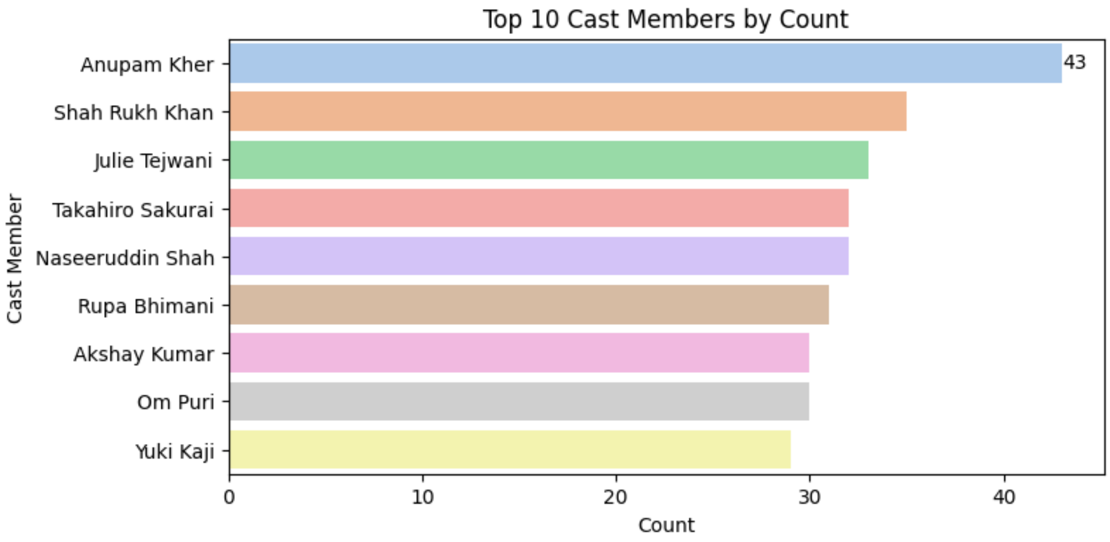


Rajiv Chilaka and Jan Suter are the top directors with the highest movies count

[381]:

```
# Count Plot (Horizontal Bar Plot) for cast

filtered_top_cast = top_cast[top_cast['cast'] != 'Unknown']

plt.figure(figsize=(8, 4))
ax = sns.barplot(data = filtered_top_cast, y='cast', x = 'count',␣
 ↪palette='pastel')
plt.title('Top 10 Cast Members by Count')
plt.xlabel('Count')
plt.ylabel('Cast Member')
ax.bar_label(ax.containers[0], fmt='%.0f')
plt.show()
```

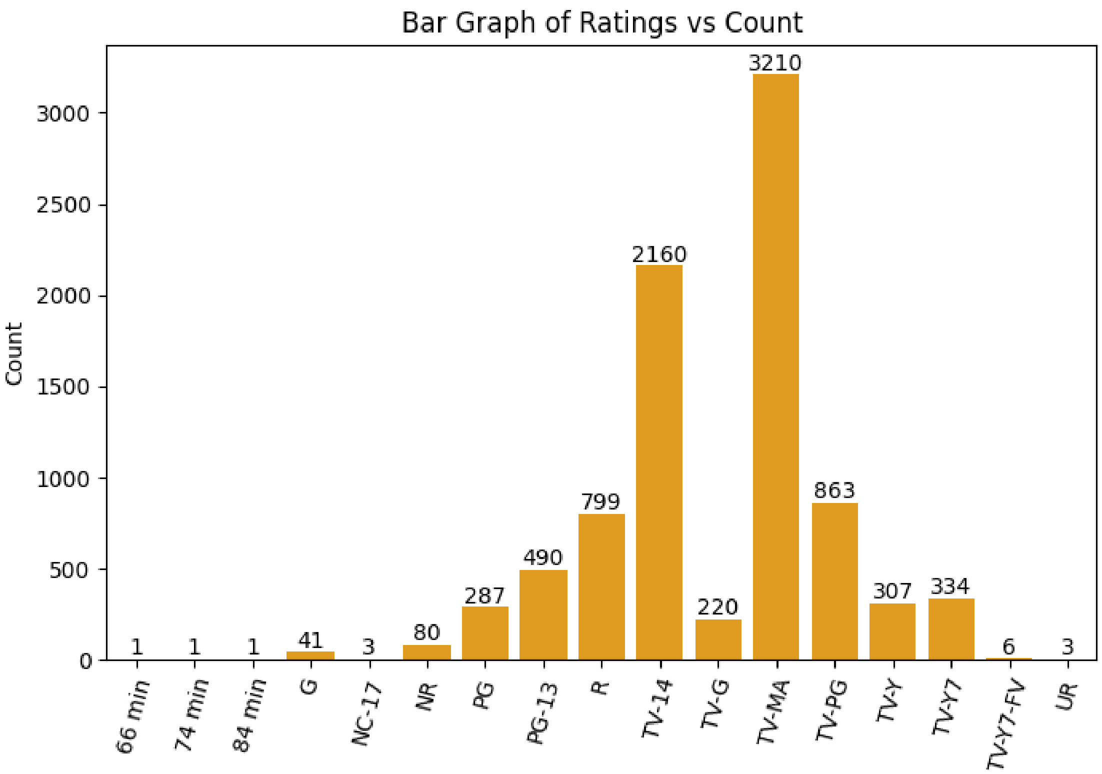
```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\3003383044.py:6:
FutureWarning:

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

  ax = sns.barplot(data = filtered_top_cast, y='cast', x = 'count',
palette='pastel')
```



Anupam Kher and Shah Rukh Khan has the highest numbers of movies/program enlisted in the netflix, which can also be considered as the most favoured cast for content addition

[382]:
```
# Which is the most favoured criteria of the content is favoured by the Netflix␣
↪to add it to the platform?
top_rating = df.groupby(['rating'])['title'].nunique().reset_index(name =␣
↪'count').sort_values('count', ascending= False)
top_rating
plt.figure(figsize=(8, 5))
ax = sns.barplot(data = top_rating, x = 'rating', y = 'count', color='orange')
plt.title('Bar Graph of Ratings vs Count')
plt.xlabel('Rating')
plt.ylabel('Count')
plt.xticks(rotation=75)
ax.bar_label(ax.containers[0], fmt='%.0f')
plt.show()
```

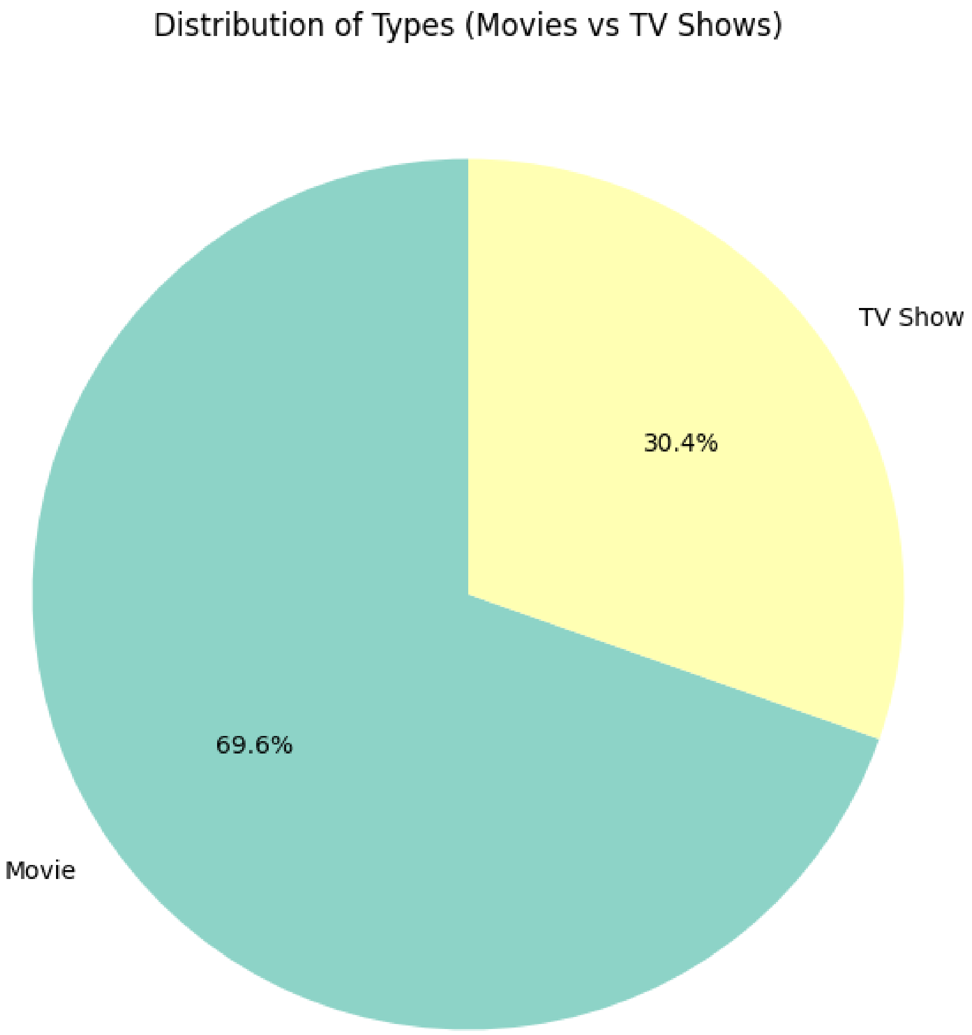
```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\2439044067.py:2:
FutureWarning: The default of observed=False is deprecated and will be changed
to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  top_rating = df.groupby(['rating'])['title'].nunique().reset_index(name =
'count').sort_values('count', ascending= False)
```



Basis the ratings of the available movies we can say that TV-MA and TV-14 are the top ratings that are favoured, which are basiscally for the >14 years age of people.

[383]:
```
# Count Plot (Pie Chart) for type:

plt.figure(figsize=(8, 8))
df.groupby(['type'])['title'].nunique().plot.pie(autopct='%1.1f%%', colors=sns.
  ↪color_palette('Set3'), startangle=90)
plt.title('Distribution of Types (Movies vs TV Shows)')
plt.ylabel('')
plt.show()
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\3972882556.py:4:
FutureWarning: The default of observed=False is deprecated and will be changed
to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  df.groupby(['type'])['title'].nunique().plot.pie(autopct='%1.1f%%',
colors=sns.color_palette('Set3'), startangle=90)
```



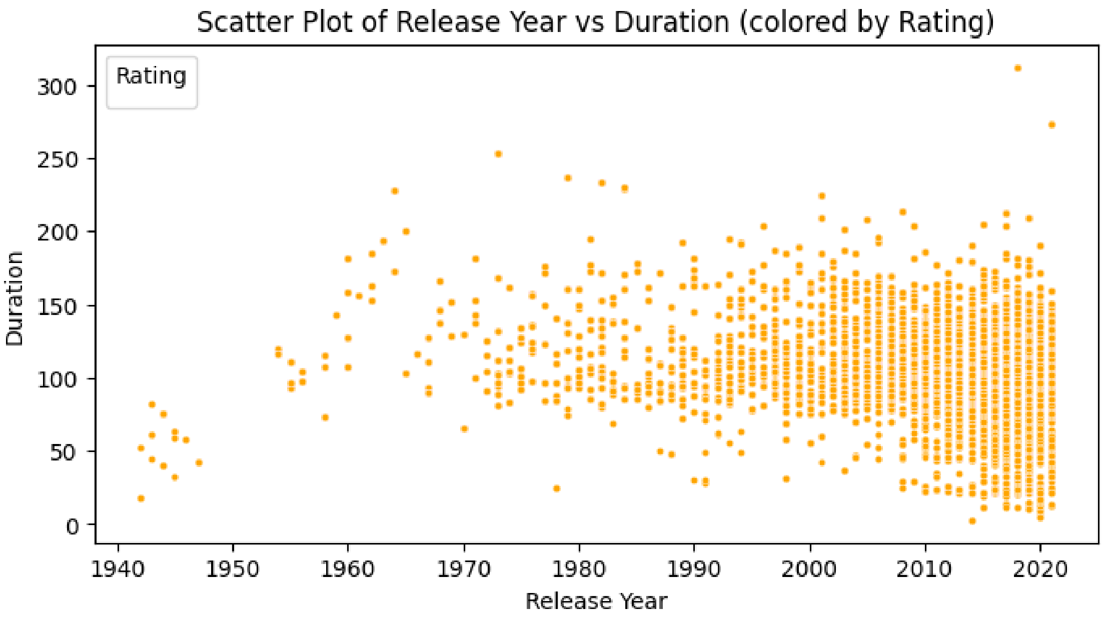
Out of total content we have 30% of TV shows and 69% of Movies, which shows movies share of in the total content is more.

12 Bivariate Analysis

[384]:

```
# Scatter plot of release_year vs duration

df1 = df[df['type'] != 'TV Show']
plt.figure(figsize=(8, 4))
sns.scatterplot(x='release_year', y='duration', data=df1, color='orange', s=10)
plt.title('Scatter Plot of Release Year vs Duration (colored by Rating)')
plt.xlabel('Release Year')
plt.ylabel('Duration')
plt.legend(title='Rating')
plt.show()
```

```
No artists with labels found to put in legend.  Note that artists whose label
start with an underscore are ignored when legend() is called with no argument.
```



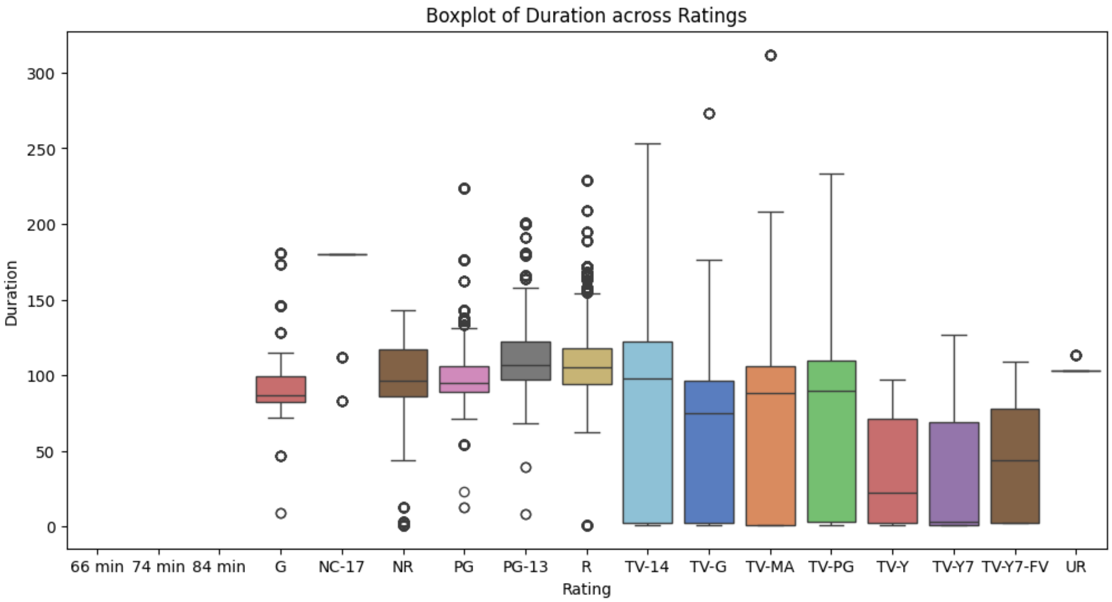
Above graph shows the spread of the movie duration across the years, if u observe the band between 50 and 150mins most of the movies in that duration with some higher or lower than that.

[385]:

```
# Boxplot for duration across different ratings

df2 = df[~df['rating'].isin(['66 min', '74 min', '84 min'])]
release_year = df2.groupby(['release_year'])['title'].nunique().
 ↪reset_index(name='count').sort_values('count', ascending=False)
plt.figure(figsize=(12, 6))
sns.boxplot(x='rating', y='duration', data=df2, palette='muted')
plt.title('Boxplot of Duration across Ratings')
plt.xlabel('Rating')
plt.ylabel('Duration')
plt.show()
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\3138176960.py:6:
FutureWarning:
```

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

  sns.boxplot(x='rating', y='duration', data=df2, palette='muted')
```

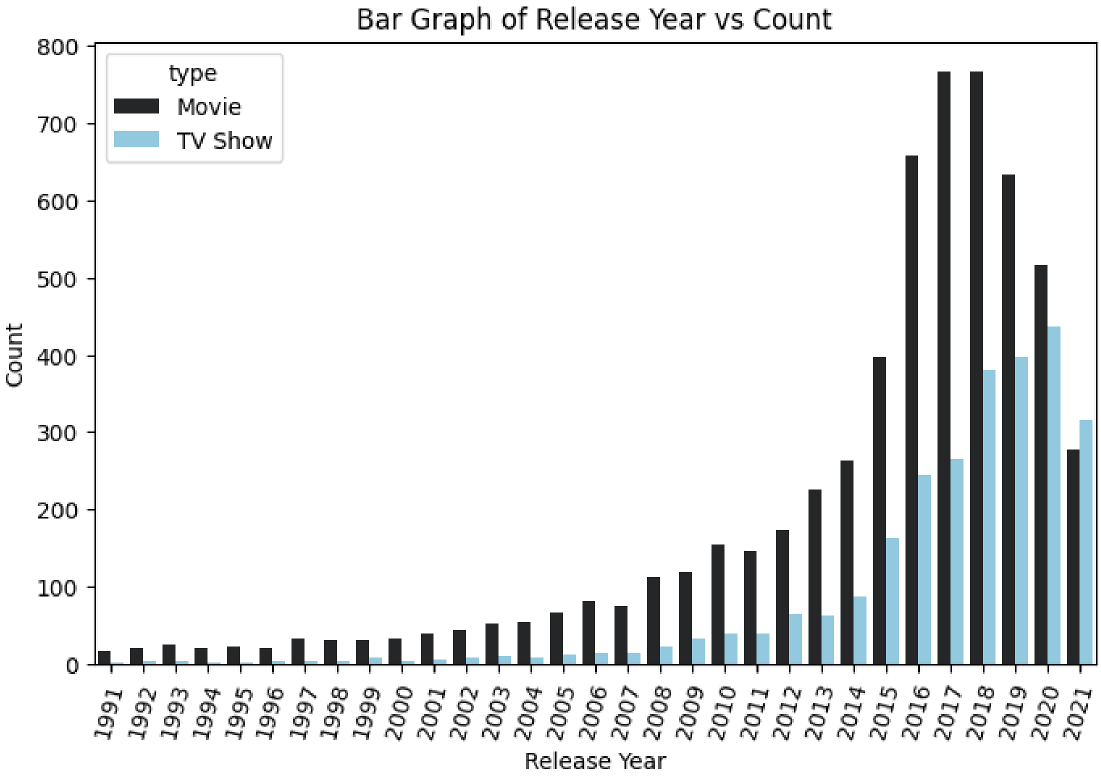


If we see the movies duration across their rating we can see that TV-14 long range in terms of duration with no outlier.

[386]:

```
# Count Plot (bar plot for continuous variables)-> Bivariate
release_year = df.groupby(['release_year', 'type'])['title'].nunique().
  ↪reset_index(name = 'count').sort_values('count', ascending= False)
release_year = release_year[release_year['release_year'] > 1990]
plt.figure(figsize=(8, 5))
sns.barplot(data = release_year, x = 'release_year', y = 'count', hue = 'type',␣
  ↪color='skyblue')
plt.title('Bar Graph of Release Year vs Count')
plt.xlabel('Release Year')
plt.ylabel('Count')
plt.xticks(rotation=75)
plt.show()
```

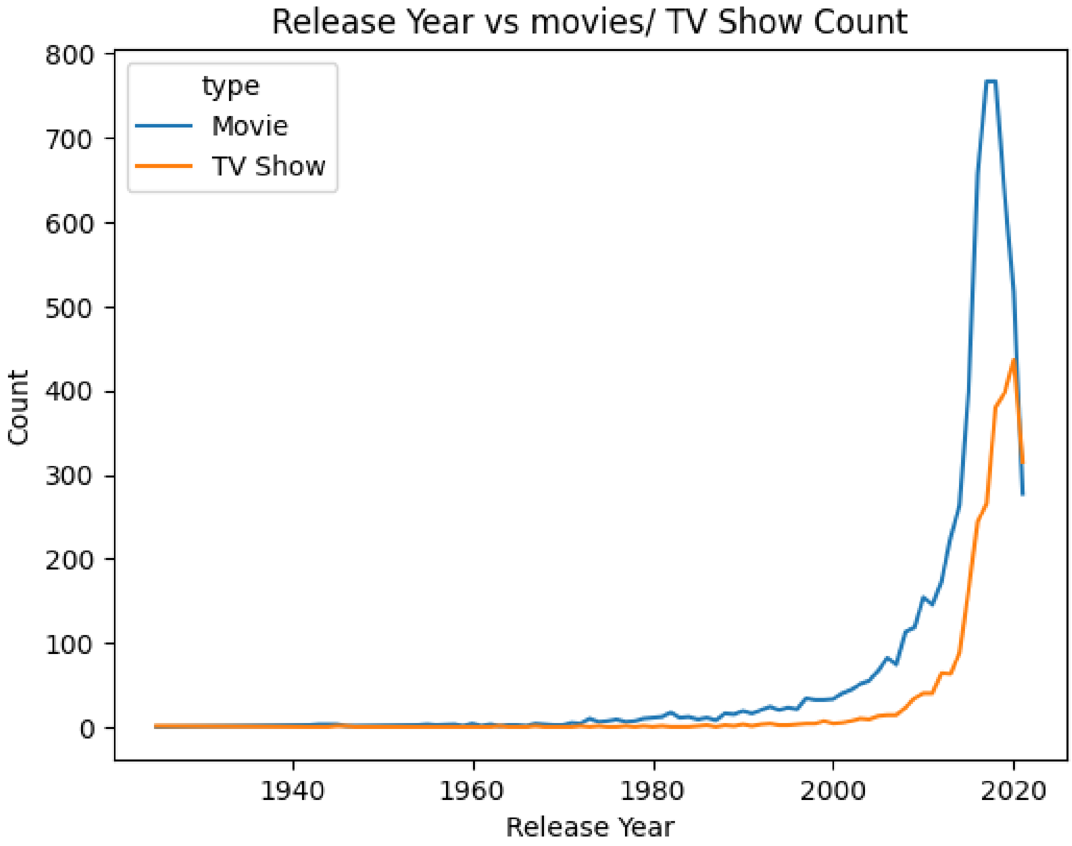
```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\1860365508.py:2:
FutureWarning: The default of observed=False is deprecated and will be changed
to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  release_year = df.groupby(['release_year',
'type'])['title'].nunique().reset_index(name = 'count').sort_values('count',
ascending= False)
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\1860365508.py:5:
FutureWarning:

Setting a gradient palette using color= is deprecated and will be removed in
v0.14.0. Set `palette='dark:skyblue'` for the same effect.

  sns.barplot(data = release_year, x = 'release_year', y = 'count', hue =
'type', color='skyblue')
```



Its evident that till 2017 the addition of movies were at inclining state while after that more focus turned towards the addition of TV shows after 2017 the gap between the movies and TV shows started narrowing where movies addition compare to TV shows started declining

[387]:
```
# No of movies/TV shows per year:
df['year_added'] = pd.to_numeric(df['year_added'], errors='coerce')
No_movies_per_year = df.groupby(['release_year', 'type'])['title'].nunique().
  ↪reset_index(name = 'count')
No_movies_per_year.head()
sns.lineplot(data=No_movies_per_year, x='release_year', y='count', hue = 'type')
plt.title('Release Year vs movies/ TV Show Count')
plt.xlabel('Release Year')
plt.ylabel('Count')
plt.xticks(rotation=0)
plt.show()
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\2471123030.py:3:
FutureWarning: The default of observed=False is deprecated and will be changed
to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  No_movies_per_year = df.groupby(['release_year',
'type'])['title'].nunique().reset_index(name = 'count')
```



Its evident that from 1940 to 2000 the trend for movie production increased significantly but after reaching to its peak it sterted declining again

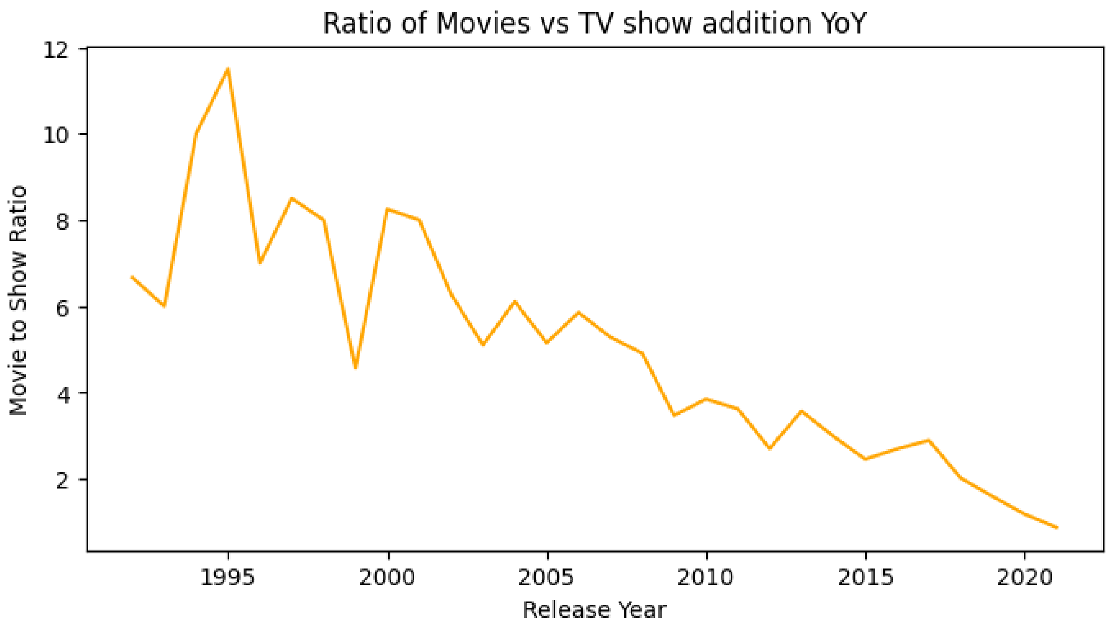
TV shows started getting attention more after 2008 onwards roghly and seen vertical growth with speed

There can be also one possible reason may be the data for 2021 can be incomplete so that the decline is seen in trend

[388]:

```python
# Comparison of tv shows vs. movies.
No_movies_Show_per_year = df.groupby(['release_year', 'type'])['title'].
  ↪nunique().reset_index()
movieshows_per_year= No_movies_Show_per_year.pivot_table(index='release_year',␣
  ↪columns = 'type').reset_index().sort_index(ascending= False)
movieshows_per_year['movie_show_ratio'] = movieshows_per_year[('title',␣
  ↪'Movie')]/ movieshows_per_year[('title', 'TV Show')]
movieshows_per_year= movieshows_per_year.head(30)
plt.figure(figsize=(8, 4))
sns.lineplot(data = movieshows_per_year, x = 'release_year', y =␣
  ↪'movie_show_ratio', color = 'orange')
plt.title('Ratio of Movies vs TV show addition YoY')
plt.xlabel('Release Year')
plt.ylabel('Movie to Show Ratio')
plt.xticks(rotation=0)
plt.show()
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\3107700198.py:2:
FutureWarning: The default of observed=False is deprecated and will be changed
to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  No_movies_Show_per_year = df.groupby(['release_year',
'type'])['title'].nunique().reset_index()
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\3107700198.py:3:
FutureWarning: The default value of observed=False is deprecated and will change
to observed=True in a future version of pandas. Specify observed=False to
silence this warning and retain the current behavior
  movieshows_per_year= No_movies_Show_per_year.pivot_table(index='release_year',
columns = 'type').reset_index().sort_index(ascending= False)
```

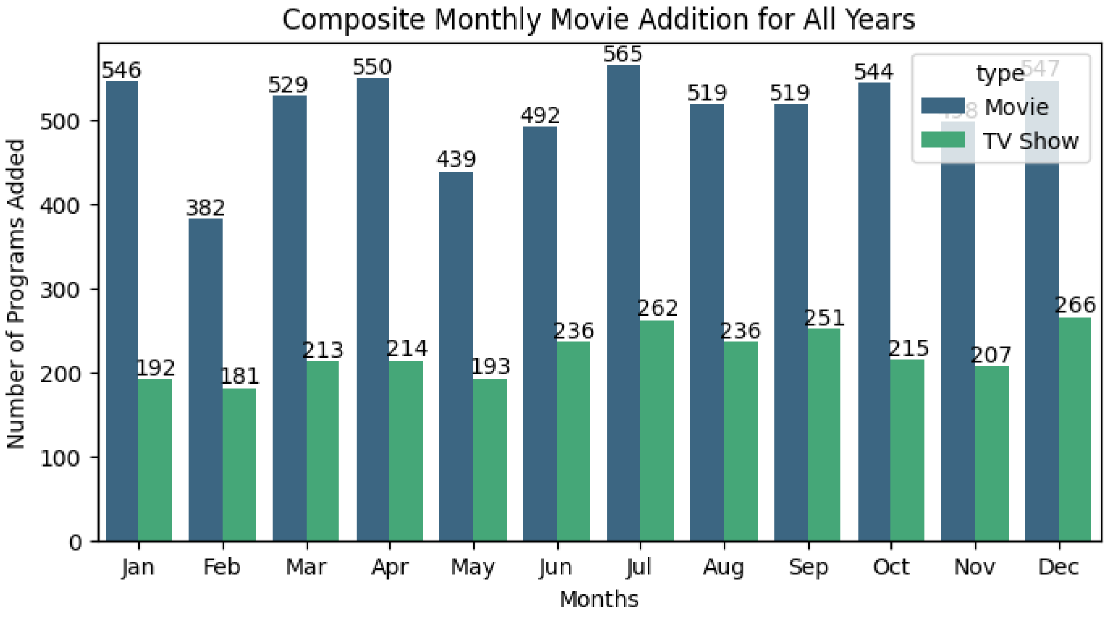


Its interesting to see that the movies vs TV shaow ratio is on declining trnd in last 30 years e.i.the no of movies produced per year are declining if we compared with the no of TV shows. TV show share is increasing vs Movies, which indicates the TV shows popularity is increasing

[389]:
```
# Whcih month is best/popular to add movie/TV show:

# Group the data by 'month_added' and 'type', counting unique titles
No_movies_per_month = df.groupby(['month_added', 'type'])['title'].nunique().
  ↪reset_index(name='count')

# Corrected the order of the months (Sep was out of order) and added 'Sep' in␣
  ↪the correct place
month_order = ['Jan', 'Feb', 'Mar', 'Apr', 'May', 'Jun', 'Jul', 'Aug', 'Sep',␣
  ↪'Oct', 'Nov', 'Dec']

# Convert 'month_added' to a categorical type with the correct order
No_movies_per_month['month_added'] = pd.
  ↪Categorical(No_movies_per_month['month_added'], categories=month_order,␣
  ↪ordered=True)

# Set the figure size
plt.figure(figsize=(8, 4))

# Create the bar plot, making sure to use the 'hue' parameter correctly
```

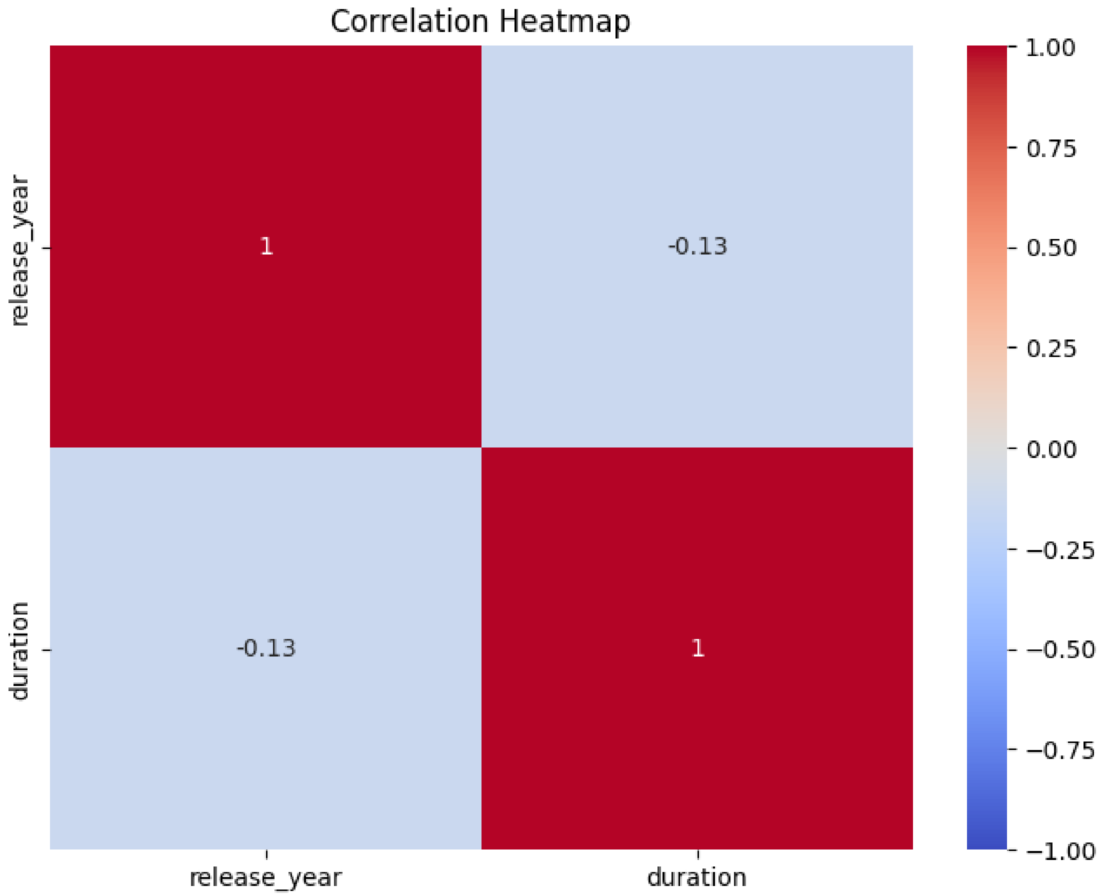
```
ax = sns.barplot(data=No_movies_per_month, x='month_added', y='count',␣
 ↪hue='type', palette='viridis')

# Add labels to the bars in the plot
for container in ax.containers:
    ax.bar_label(container, fmt='%.0f')

# Add titles and labels to the plot
plt.title('Composite Monthly Movie Addition for All Years')
plt.xlabel('Months')
plt.ylabel('Number of Programs Added')

# Rotate the x-axis labels for better readability
plt.xticks(rotation=0)

# Display the plot
plt.show()
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\513053496.py:4: FutureWarning:
The default of observed=False is deprecated and will be changed to True in a
future version of pandas. Pass observed=False to retain current behavior or
observed=True to adopt the future default and silence this warning.
  No_movies_per_month = df.groupby(['month_added',
'type'])['title'].nunique().reset_index(name='count')
```



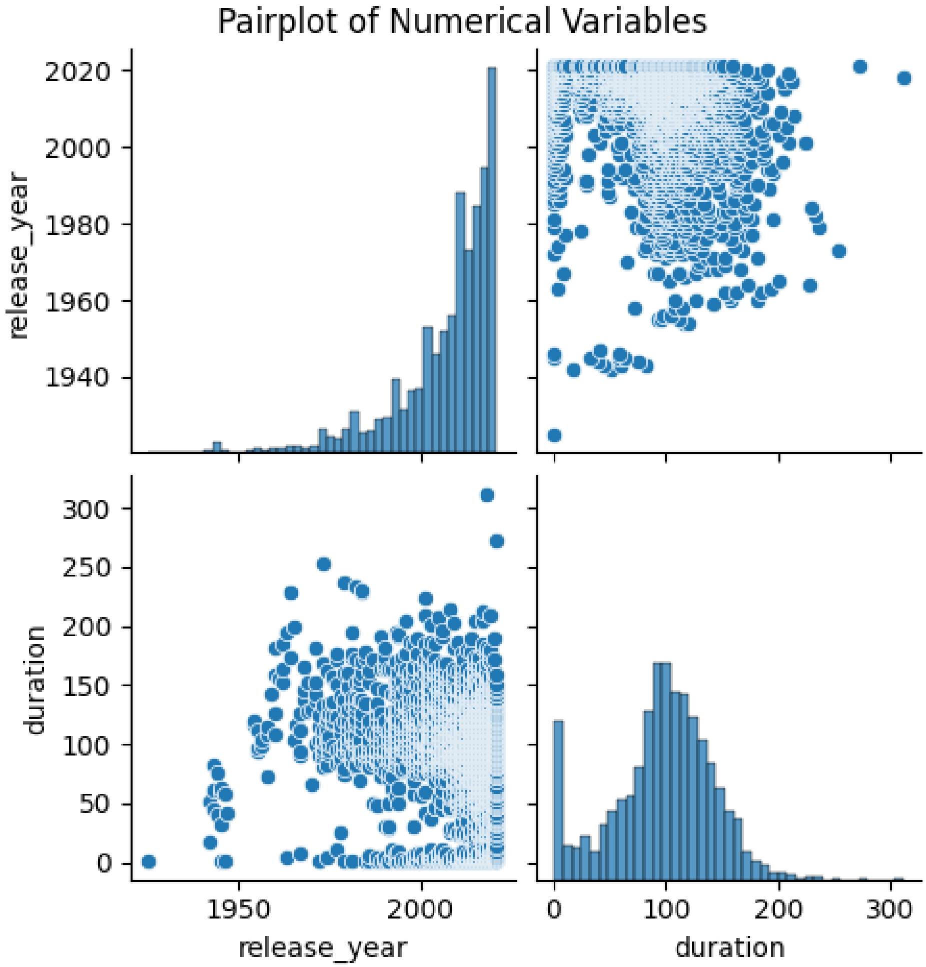
Using above table we can generally tell that the conntetn addition is majorly done in Jul months followed by Dec

[390]:
```
# Selecting numerical variables for correlation analysis
corr = df.groupby(['release_year', 'duration'])['title'].nunique().reset_index()
numerical_vars = ['release_year', 'duration']

# Create a correlation matrix
corr_matrix = corr[numerical_vars].corr()

# Plotting heatmap of correlation matrix
plt.figure(figsize=(8, 6))
sns.heatmap(corr_matrix, annot=True, cmap='coolwarm', vmin=-1, vmax=1)
plt.title('Correlation Heatmap')
plt.show()
```



[391]:
```
# Plotting pairplot for numerical variables
sns.pairplot(corr[numerical_vars], diag_kind='hist', kind='scatter',␣
 ↪palette='husl')
plt.suptitle('Pairplot of Numerical Variables', y=1.02)
plt.show()
```

```
C:\Users\chavad\AppData\Roaming\Python\Python310\site-
packages\seaborn\axisgrid.py:1513: UserWarning: Ignoring `palette` because no
`hue` variable has been assigned.
  func(x=vector, **plot_kwargs)
C:\Users\chavad\AppData\Roaming\Python\Python310\site-
packages\seaborn\axisgrid.py:1513: UserWarning: Ignoring `palette` because no
`hue` variable has been assigned.
  func(x=vector, **plot_kwargs)
C:\Users\chavad\AppData\Roaming\Python\Python310\site-
packages\seaborn\axisgrid.py:1615: UserWarning: Ignoring `palette` because no
`hue` variable has been assigned.
  func(x=x, y=y, **kwargs)
C:\Users\chavad\AppData\Roaming\Python\Python310\site-
packages\seaborn\axisgrid.py:1615: UserWarning: Ignoring `palette` because no
`hue` variable has been assigned.
  func(x=x, y=y, **kwargs)
```

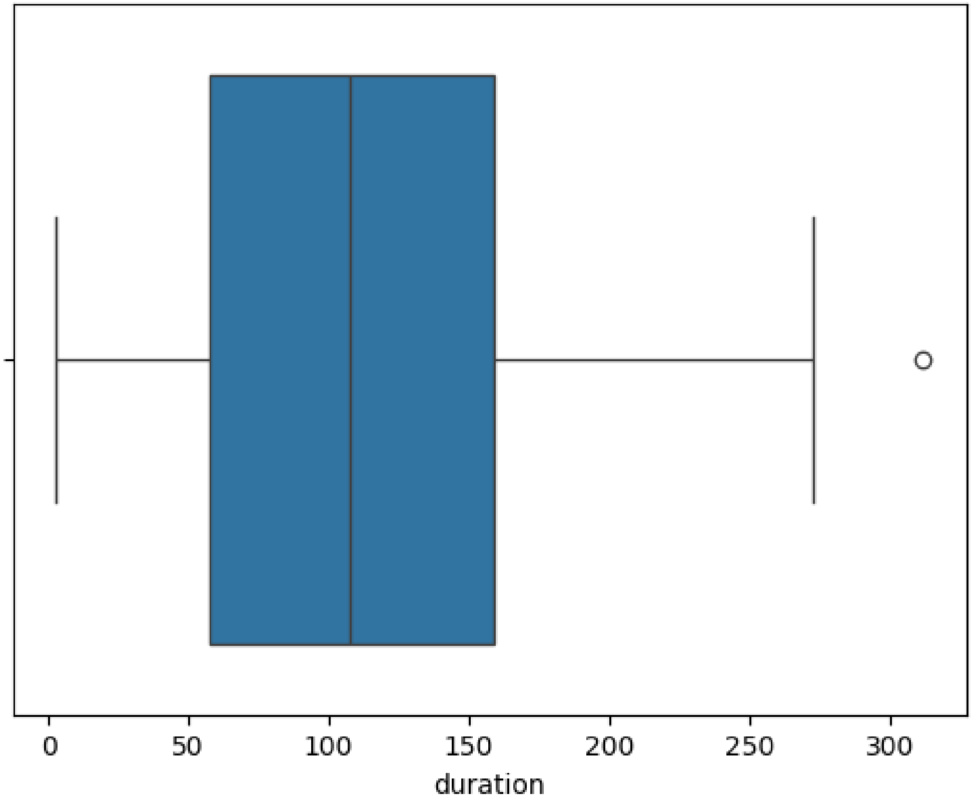


[393]:

```python
# Outlier Detection:

# Using Box Plot

m = movies.groupby('duration')['title'].unique().to_frame().reset_index()

sns.boxplot( data = m, x = 'duration')

'''
pointing the movie duration has one outlier having duration >300mins.
'''
```

[393]:

```
'\npointing the movie duration has one outlier having duration >300mins.\n'
```



[394]:

```python
# Outlier detection Using the function:

'''
As expecte outcome from the box plot indicating the outlier greater than 300mins and using calculations
```

```
we can see the oulier values = 312 mins, which is proving the points for each␣
 ↪other.

Results for both the calculations like boxplot and using formula are pointing␣
 ↪same thing of the Outlier that is falling as movie which is having length =␣
 ↪312mins,

which we have already guessed visually using box plot and calculated with the␣
 ↪formula

'''

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

# Define lower and upper bounds for outliers
lower_bound = Q1 - 1.5 * IQR
upper_bound = Q3 + 1.5 * IQR

# Identify outliers
outliers_iqr = m[(m['duration'] < lower_bound) | (m['duration'] > upper_bound)]

outliers_iqr
```

[394]:

```
     duration                        title
205     312.0   [Black Mirror: Bandersnatch]
```

[395]:

```
'''
6.1 Comments on the Range of Attributes

Countries:
o         The dataset includes content from a wide range of countries,␣
 ↪emphasizing its international appeal.
'''
```

[395]:

```
'\n6.1 Comments on the Range of Attributes\n\nCountries:\no\tThe dataset
includes content from a wide range of countries, emphasizing its international
appeal.\n'
```

[396]:

```
'''Release Year: '''

min_year= min(df['release_year'])
max_year = max(df['release_year'])
```

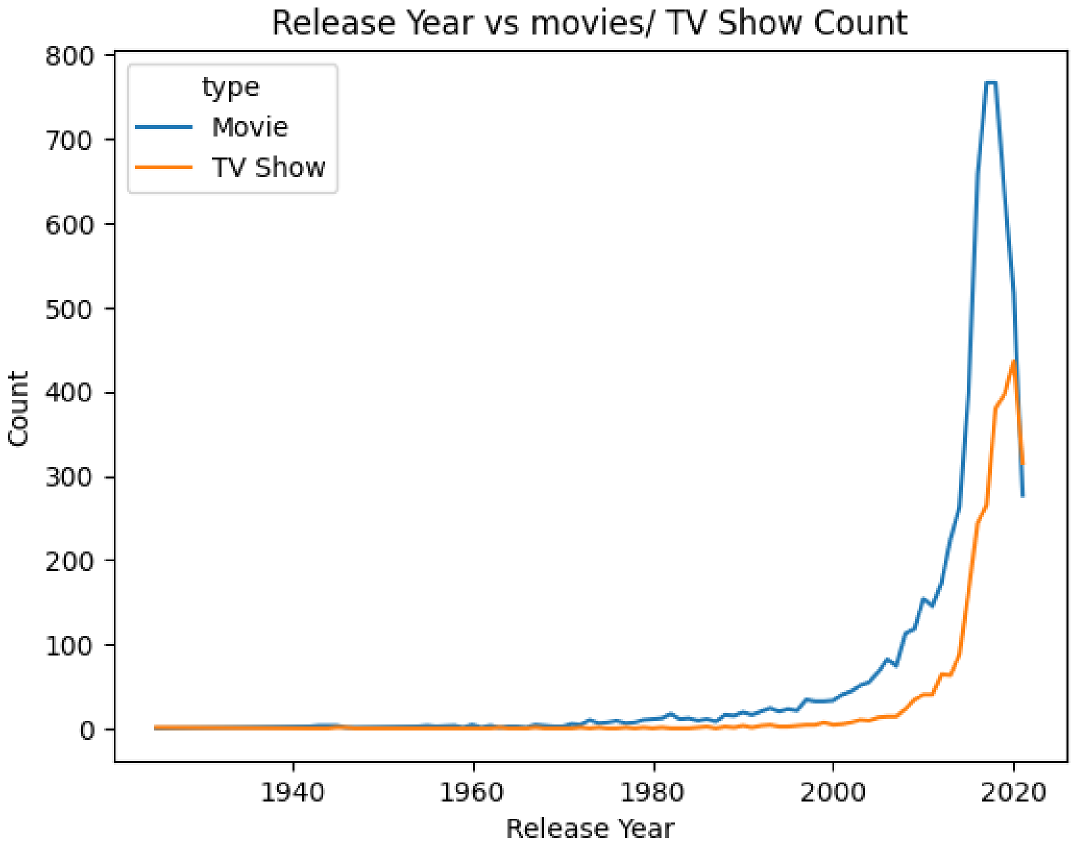
```
print(f"Data of release year ranges from {min_year} to {max_year} TV show and␣
 ↪movies ")
```

```
Data of release year ranges from 1925 to 2021 TV show and movies
```

[397]:

```
# No of movies/TV shows per year:
df['year_added'] = pd.to_numeric(df['year_added'], errors='coerce')
No_movies_per_year = df.groupby(['release_year', 'type'])['title'].nunique().
 ↪reset_index(name = 'count')
No_movies_per_year.head()
sns.lineplot(data=No_movies_per_year, x='release_year', y='count', hue = 'type')
plt.title('Release Year vs movies/ TV Show Count')
plt.xlabel('Release Year')
plt.ylabel('Count')
plt.xticks(rotation=0)
plt.show()
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\2471123030.py:3:
FutureWarning: The default of observed=False is deprecated and will be changed
to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  No_movies_per_year = df.groupby(['release_year',
'type'])['title'].nunique().reset_index(name = 'count')
```



Its evident that from 1940 to 2000 the trend for movie production increased significantly but after reaching to its peak it sterted declining again

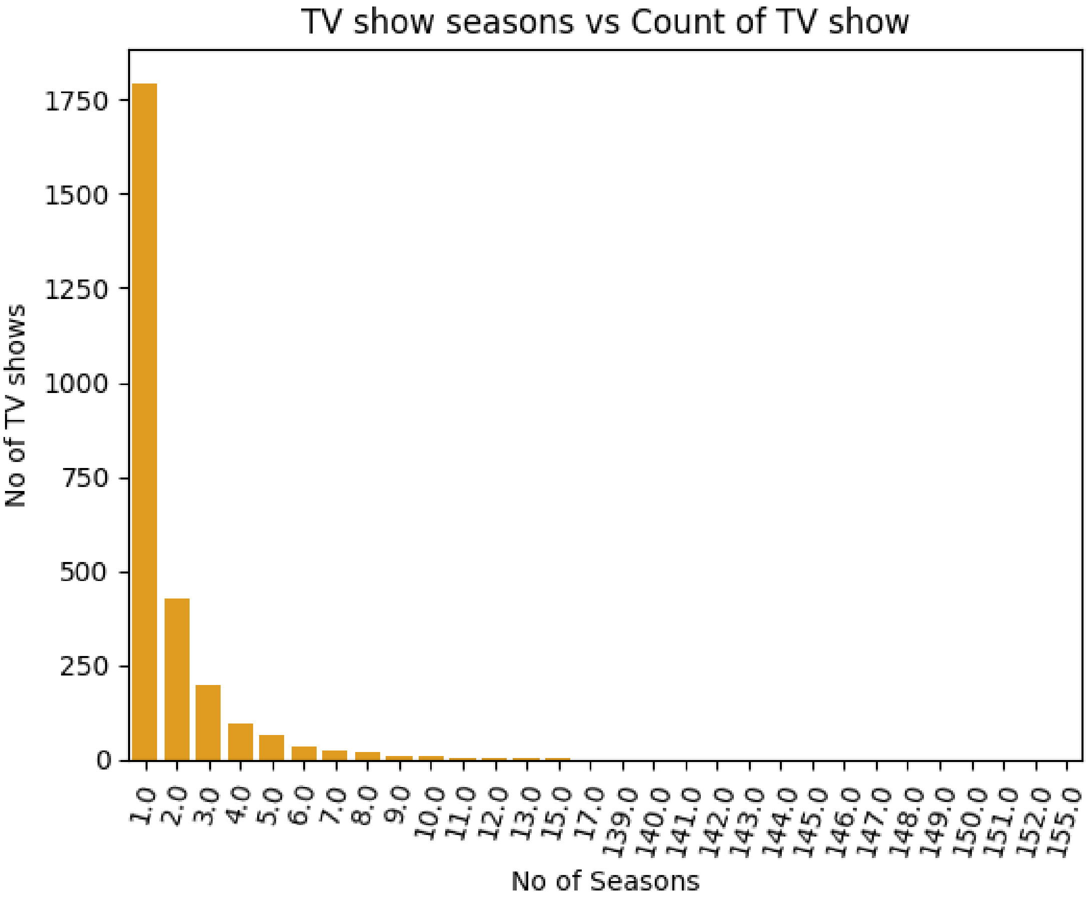
TV shows started getting attention more after 2008 onwards roghly and seen vertical growth with speed There can be also one possible reason may be the data for 2021 can be incomplete so that the decline is seen in trend

[398]:

```
'''Duration Comments:'''

duration_tv = df.groupby(['duration', 'type'])['title'].nunique().
 ↪reset_index(name = 'count')
duration_tv = duration_tv[duration_tv['type'] == 'TV Show']
d = duration_tv.sort_values('count', ascending = False).head(30)
sns.barplot(data = d, x = 'duration', y = 'count', color = 'orange')
plt.title('TV show seasons vs Count of TV show')
plt.xlabel('No of Seasons')
plt.ylabel('No of TV shows')
plt.xticks(rotation=75)
plt.show()
```

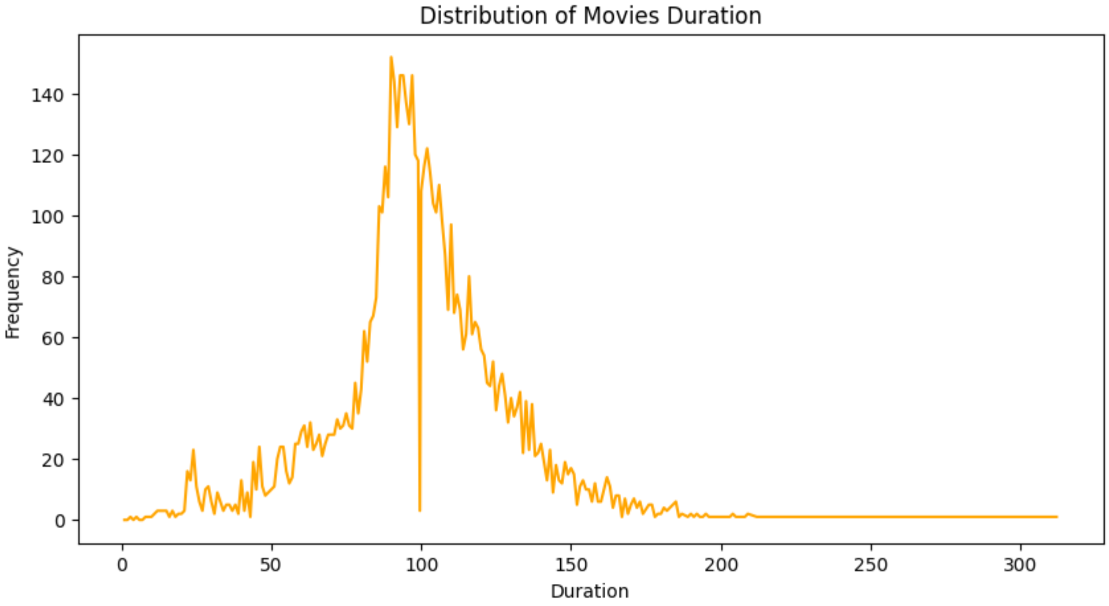
```
# Majority of having 1 season only, while few also ranges till 15 to 16 seasons␣
↪as visually we can see.
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\478326750.py:3: FutureWarning:
The default of observed=False is deprecated and will be changed to True in a
future version of pandas. Pass observed=False to retain current behavior or
observed=True to adopt the future default and silence this warning.
  duration_tv = df.groupby(['duration',
'type'])['title'].nunique().reset_index(name = 'count')
```



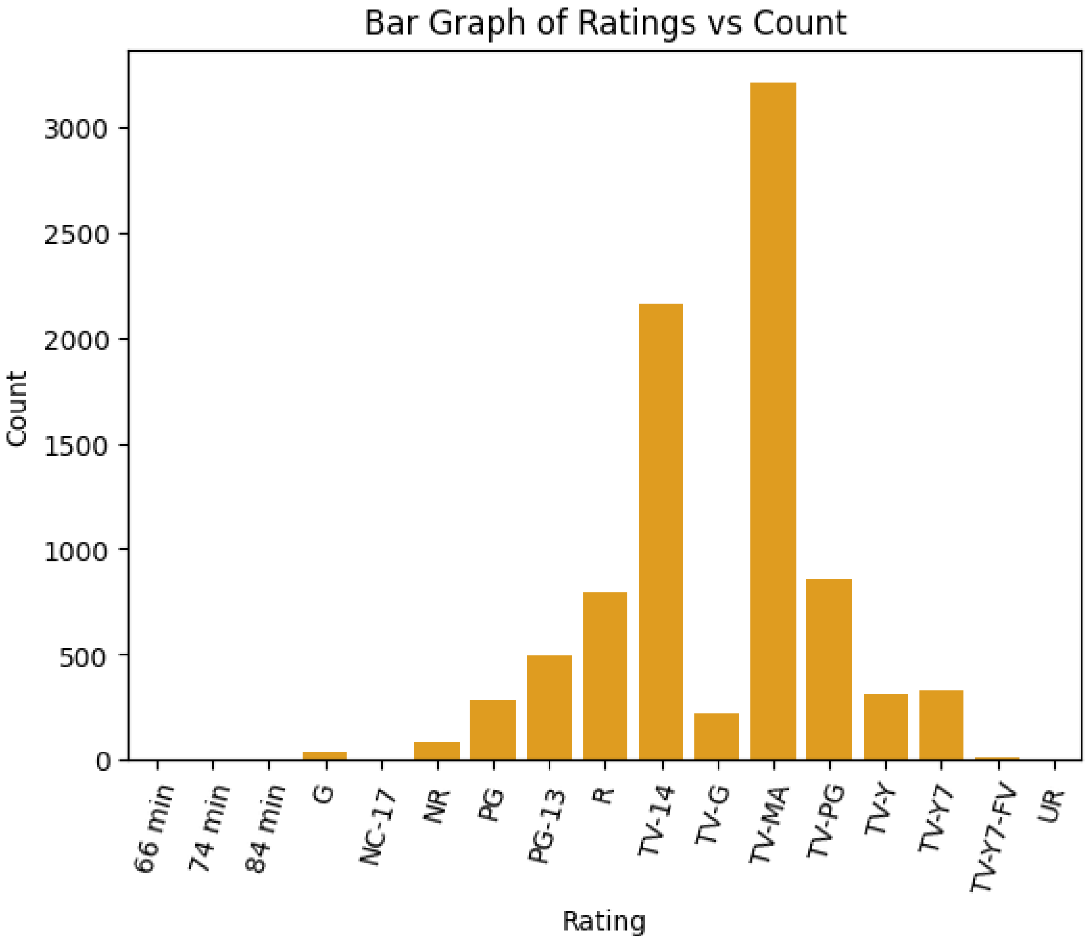
[399]:
```
duration = df.groupby(['duration', 'type'])['title'].nunique().reset_index(name␣
↪= 'count')
duration = duration[duration['type'] == 'Movie']
plt.figure(figsize=(10, 5))
sns.lineplot(data= duration, x = 'duration', y = 'count', color = 'orange')
plt.title('Distribution of Movies Duration')
plt.xlabel('Duration')
plt.ylabel('Frequency')
plt.show()
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\3353212124.py:1:
FutureWarning: The default of observed=False is deprecated and will be changed
to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  duration = df.groupby(['duration',
'type'])['title'].nunique().reset_index(name = 'count')
```



Majority of the movies are having duration in teh range of 87 to 115mins long, which are mostly preffered by netflix in history.

```
[400]: '''Rating Comments:'''
sns.barplot(data = top_rating, x = 'rating', y = 'count', color='orange')
plt.title('Bar Graph of Ratings vs Count')
plt.xlabel('Rating')
plt.ylabel('Count')
plt.xticks(rotation=75)
plt.show()
```

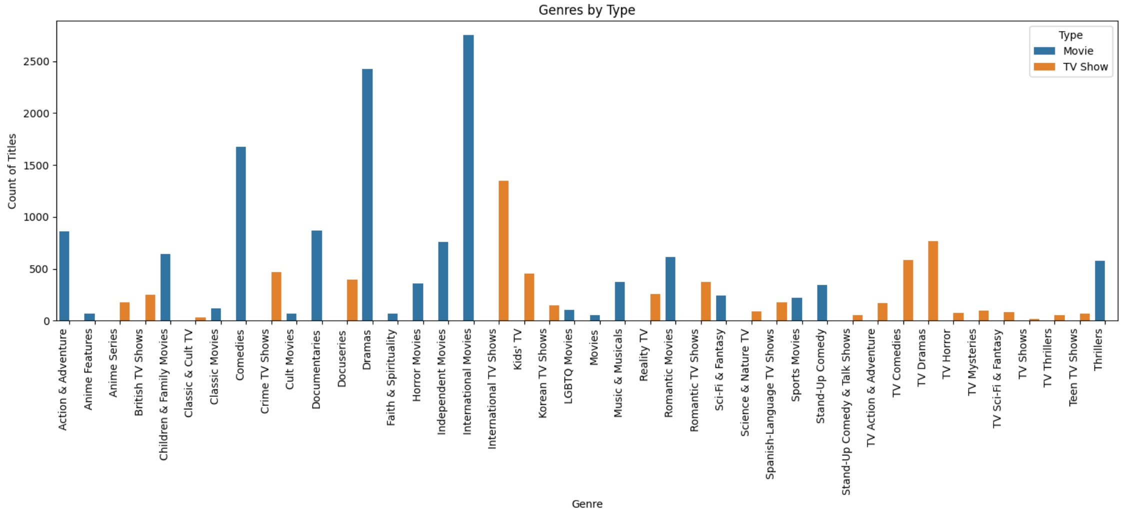


13 Observation:

1. Given plot for the rating distribution is enlightening us on the majority ratings that shows are having (For movies and TV shows both).
2. Majority shows are of: TV-MA and TV-14 i.e programs that are intended for >14 years
   - TV-MA–> intended for mature audience >17 years for television show
   - tv-14–> programs that are unsuitable for children <14years
   - tv-pg–>program contains material that parents may find unsuitable for younger children.
   - r –> unsuitable for <17 years

[401]:
```
# Genres by type of content
top_10_genre = df.groupby(['listed_in', 'type'])['title'].nunique().
↪reset_index(name = 'count').sort_values('count', ascending= False)
plt.figure(figsize=(15, 7))
sns.barplot(data=top_10_genre, x='listed_in', y='count', hue = 'type')
plt.title('Genres by Type')
plt.xlabel('Genre')
plt.ylabel('Count of Titles')
plt.xticks(rotation=90, ha='right')  # Adjust rotation for better readability
plt.legend(title='Type')
plt.tight_layout()
plt.show()
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\2270947038.py:2:
FutureWarning: The default of observed=False is deprecated and will be changed
to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  top_10_genre = df.groupby(['listed_in',
'type'])['title'].nunique().reset_index(name = 'count').sort_values('count',
ascending= False)
```



International Movie, Dramas and Comedy genres are top in number of contents of TV show and Movies in both the type.

14 Comments on the Range of Attributes

- Release Year:
  - The release_year attribute covers a broad range of years from 1925 to 2021, encompassing both older and more recent releases.
  - A significant portion of the content has been released in the last few years, indicating that Netflix is continually expanding its library with new releases.
- Duration:
  - Movies: The duration for movies varies from short films to full-length films. The majority of movie durations fall within the typical feature film length of 90-120 minutes,

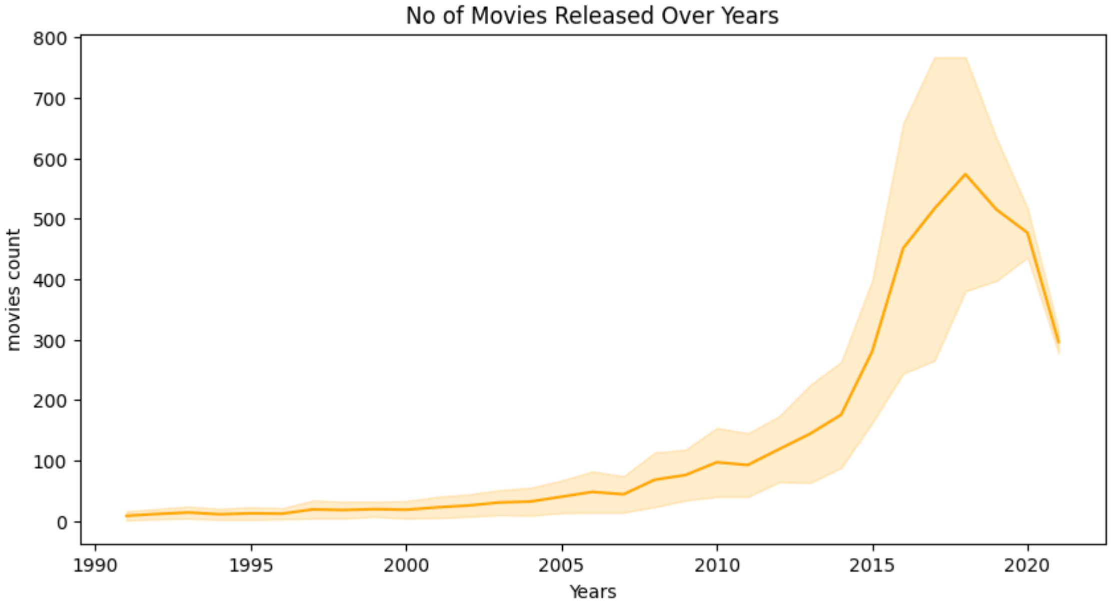
highlighting a focus on standard movie formats.

  - TV Shows: The duration for TV shows is represented by the number of seasons, which provides insight into the series' length but not individual episode durations. modal value for the most of the shows are 1 season.

- Rating/Genres:
  - The rating attribute showcases a wide range of audience classifications and verity of content available, ratings including "G" (General Audiences) to "NC-17" (Adults Only) and genres from Drama to International Shows,
  - But most of the shows fall under the TV-14 and TV-MA in terms of ratings and most favoured genres are International show followed by dramas followed by comedy.
  - This variety ensures that Netflix offers content suitable for different age groups and preferences, catering to a diverse audience.

- Geographic variability in content
  - Netflix has the varity of content available from around 140+ countries, which helps in keeping global appeal in terms of viewing experience and culturally diverse content to appeal world wide audience.

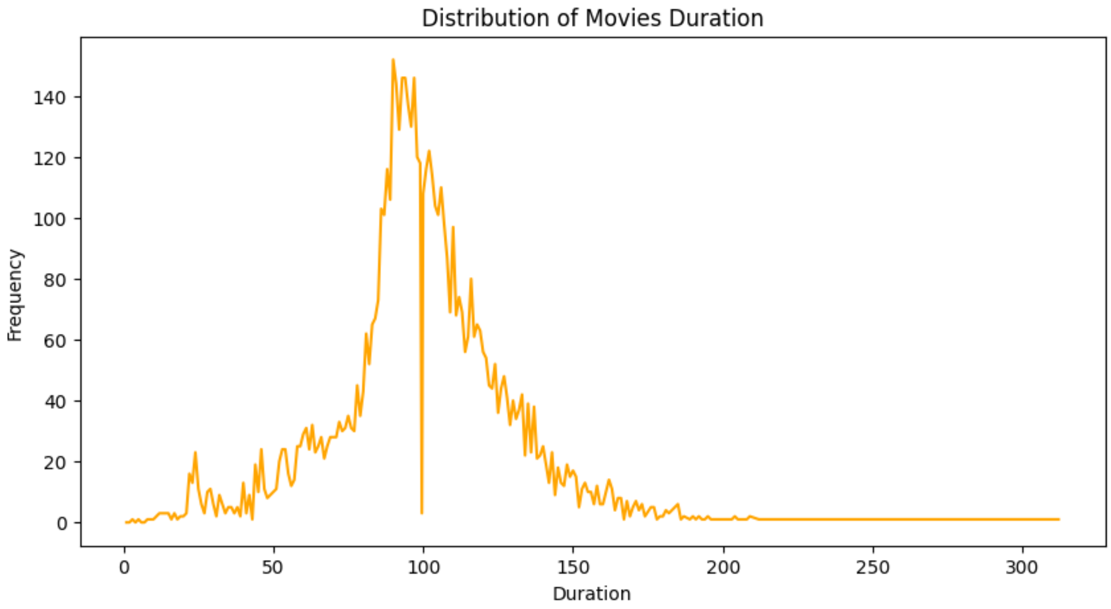
[403]:
```
rele_yr = df.groupby(['release_year'])['title'].nunique().reset_index(name =␣
  ↪'count')
plt.figure(figsize=(10, 5))
sns.lineplot(data= release_year, x = 'release_year', y = 'count', color =␣
  ↪'orange')
plt.title('No of Movies Released Over Years')
plt.xlabel('Years')
plt.ylabel('movies count')
plt.show()
```



Distribution of Release Year: - The release year distribution is left-skewed, with a noticeable increase in content production in recent years.

[404]:

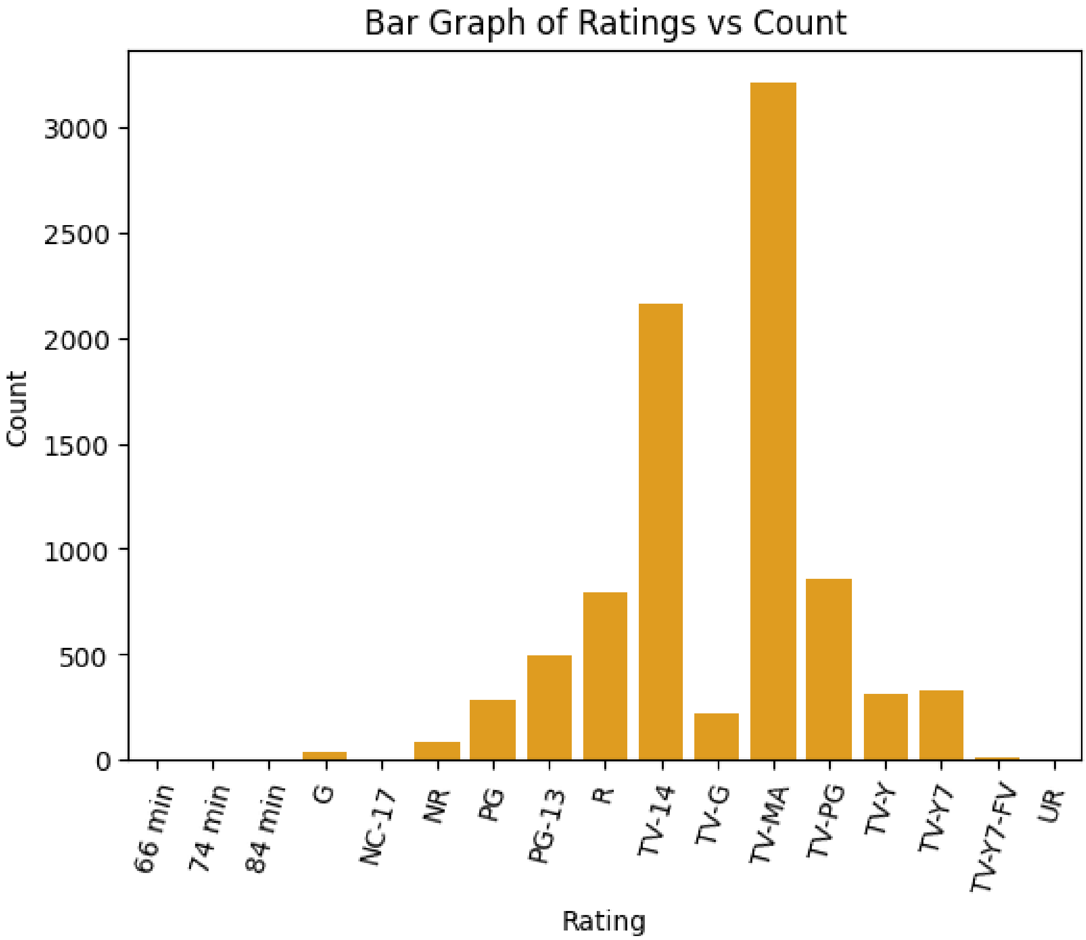
```
plt.figure(figsize=(10, 5))
sns.lineplot(data= duration, x = 'duration', y = 'count', color = 'orange')
plt.title('Distribution of Movies Duration')
plt.xlabel('Duration')
plt.ylabel('Frequency')
plt.show()
```



Distribution of Duration: The duration of movies typically falls within the 90-120 minute range. Outliers include very short and very long films, suggesting a few documentaries or specials.

[405]:

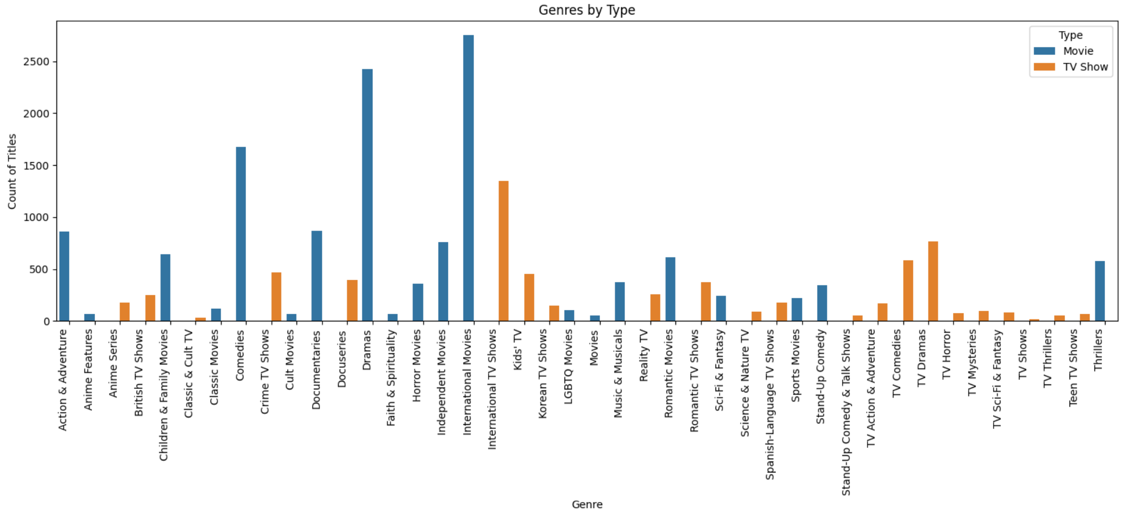
```
sns.barplot(data = top_rating, x = 'rating', y = 'count', color='orange')
plt.title('Bar Graph of Ratings vs Count')
plt.xlabel('Rating')
plt.ylabel('Count')
plt.xticks(rotation=75)
plt.show()
```



Distribution of Ratings: The countplot for ratings shows that TV-MA (Mature Audience) is the most common rating, reflecting a significant amount of content targeted at adults. The platform also has a substantial amount of content rated TV-14, indicating a focus on teenage and adult audiences.

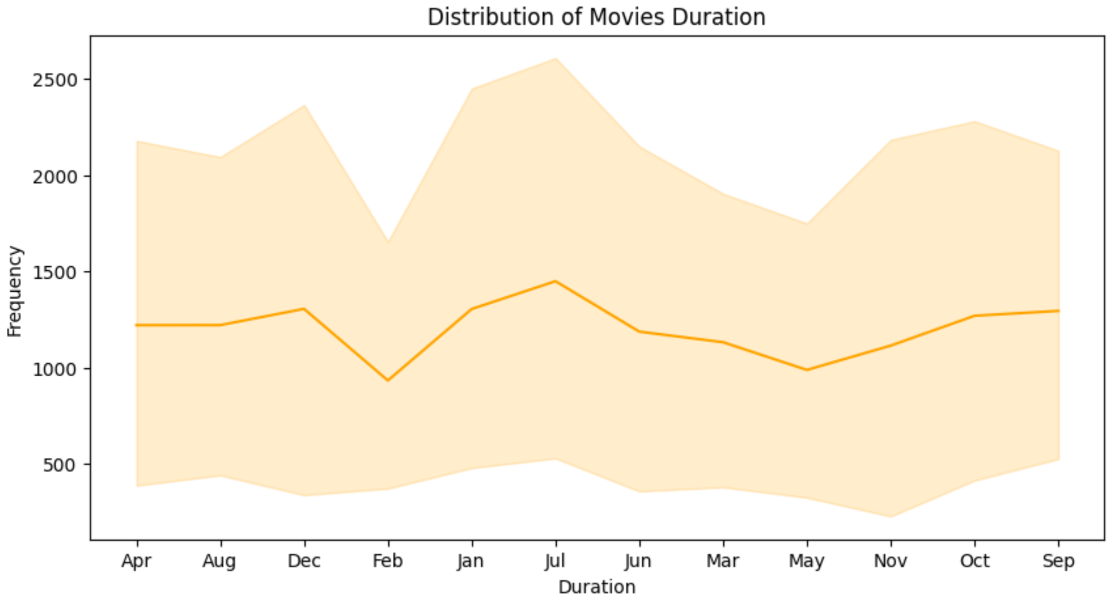
[406]:
```
'''
Genres Distribution:
Certain genres like International TV Shows, dramas and comedies are highly␣
 ↪represented, indicating the platform's focus on diverse and entertaining␣
 ↪content provision.
'''
top_10_genre = df.groupby(['listed_in', 'type'])['title'].nunique().
 ↪reset_index(name = 'count').sort_values('count', ascending= False)
plt.figure(figsize=(15, 7))
sns.barplot(data=top_10_genre, x='listed_in', y='count', hue = 'type')
plt.title('Genres by Type')
plt.xlabel('Genre')
plt.ylabel('Count of Titles')
plt.xticks(rotation=90, ha='right')  # Adjust rotation for better readability
plt.legend(title='Type')
plt.tight_layout()
plt.show()
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\1448635016.py:5:
FutureWarning: The default of observed=False is deprecated and will be changed
to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  top_10_genre = df.groupby(['listed_in',
'type'])['title'].nunique().reset_index(name = 'count').sort_values('count',
ascending= False)
```

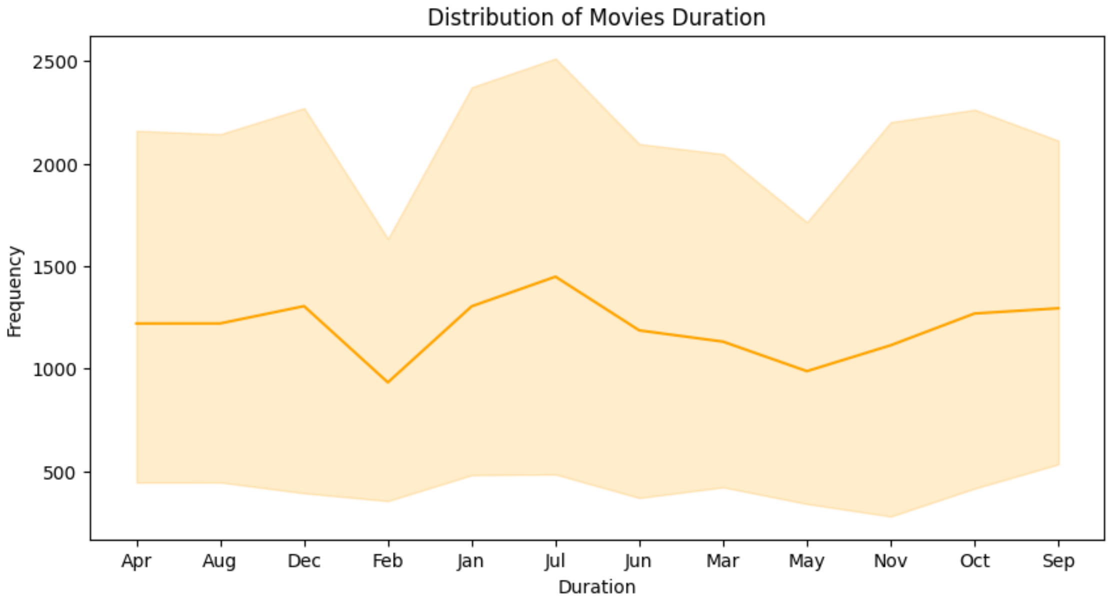


[407]:
```
titles_added_per_month = df.groupby(['year_added', 'month_added']).size().
  ↪reset_index(name='titles_added')
titles_added_per_month.sort_values('titles_added', ascending = False)
plt.figure(figsize=(10, 5))
sns.lineplot(data= titles_added_per_month, x = 'month_added', y =␣
  ↪'titles_added', color = 'orange')
plt.title('Distribution of Movies Duration')
plt.xlabel('Duration')
plt.ylabel('Frequency')
plt.show()
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\22020960.py:1: FutureWarning:
The default of observed=False is deprecated and will be changed to True in a
future version of pandas. Pass observed=False to retain current behavior or
observed=True to adopt the future default and silence this warning.
  titles_added_per_month = df.groupby(['year_added',
'month_added']).size().reset_index(name='titles_added')
```



```
[408]: movies_addition = titles_added_per_month.sort_values(by=['year_added',␣
        ↪'month_added'])
       plt.figure(figsize=(10, 5))
       sns.lineplot(data= movies_addition, x = 'month_added', y = 'titles_added',␣
        ↪color = 'orange')
       plt.title('Distribution of Movies Duration')
       plt.xlabel('Duration')
       plt.ylabel('Frequency')
       plt.show()
```



- Few KPI’s that we can track to get the insights:

1. Percent movies per TV shows
2. Top Genre (count wise)
3. Major Contributing Country
4. Per Year Movies Release
5. International Vs domestic content

[409]:

```
# 1. Percent movies per TV shows:

movieshows = df.groupby(['type'])['title'].nunique().reset_index(name =␣
 ↪'count').sort_values('count', ascending= False)
movies_per_show = movieshows.loc[1, 'count']/movieshows.loc[0, 'count']
print(f"The shows to movie ratio pointing that the rate of movies addidition is␣
 ↪{round(movies_per_show,2)} vs the rate of movies additions.")
```

```
The shows to movie ratio pointing that the rate of movies addidition is 0.44 vs
the rate of movies additions.
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\2914922760.py:3:
FutureWarning: The default of observed=False is deprecated and will be changed
to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  movieshows = df.groupby(['type'])['title'].nunique().reset_index(name =
'count').sort_values('count', ascending= False)
```

[410]:

```
# 2.Top Genre (count wise)
```

```
gnre = df.groupby(['listed_in'])['title'].nunique().reset_index(name = 'count').
  ↪sort_values('count', ascending= False)
gnre = gnre.head(1)
gnre
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\909156570.py:3: FutureWarning:
The default of observed=False is deprecated and will be changed to True in a
future version of pandas. Pass observed=False to retain current behavior or
observed=True to adopt the future default and silence this warning.
  gnre = df.groupby(['listed_in'])['title'].nunique().reset_index(name =
'count').sort_values('count', ascending= False)
```

```
[410]:                listed_in  count
       16  International Movies   2751
```

```
[411]: # 3.Major Contributing Country
        cntry = df.groupby(['country'])['title'].nunique().reset_index(name = 'count').
          ↪sort_values('count', ascending= False)
        cntry = cntry.head(1)
        cntry
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\2573820432.py:2:
FutureWarning: The default of observed=False is deprecated and will be changed
to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  cntry = df.groupby(['country'])['title'].nunique().reset_index(name =
'count').sort_values('count', ascending= False)
```

```
[411]:            country  count
       116  United States   3690
```

```
[412]: # 4. Year wise movie releases top 3 years
        rele_yr = df.groupby(['release_year'])['title'].nunique().reset_index(name =␣
          ↪'count').sort_values('count', ascending= False)
        top_3_rele_yr = rele_yr.head(3)
        top_3_rele_yr
```

```
[412]:     release_year  count
       70          2018   1147
       69          2017   1032
       71          2019   1030
```

```
[413]: # 5.International Vs domestic content

        dom = df[df['country'] == 'United States']
        Domestic = dom.groupby(['country'])['title'].nunique().reset_index(name =␣
          ↪'count').sort_values('count', ascending= False)
```

```python

intr = df[df['country'] != 'United States']
International = intr.groupby(['country'])['title'].nunique().reset_index(name =␣
 ↪'count').sort_values('count', ascending= False)

International['count'].sum()/Domestic['count'].sum()
```

```
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\1268077364.py:4:
FutureWarning: The default of observed=False is deprecated and will be changed
to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  Domestic = dom.groupby(['country'])['title'].nunique().reset_index(name =
'count').sort_values('count', ascending= False)
C:\Users\chavad\AppData\Local\Temp\ipykernel_5320\1268077364.py:7:
FutureWarning: The default of observed=False is deprecated and will be changed
to True in a future version of pandas. Pass observed=False to retain current
behavior or observed=True to adopt the future default and silence this warning.
  International = intr.groupby(['country'])['title'].nunique().reset_index(name
= 'count').sort_values('count', ascending= False)
```

```
[413]: 1.9387533875338754
```

15 Business Insights

1. Year on Year content release shows that platforms library is growing and when we compare that with the type, its seen that more focus diverted to shows than movies in recent year.
2. Ideal duration of movies are majorly lying in the range of 90 mins to 120 mins, so we can prefer to addd content in this range.
3. Plot on ratings indicates that TV-MA is the most frequent rating, showing the platform's focus on mature content.Ratings like G and PG have fewer entries, suggesting less content aimed solely at younger audiences.
4. The heatmap reveals weak correlations among numerical variables, suggesting that variables like release_year and duration are relatively independent of each other. The weak correlations indicate that other factors (like genre or audience preference) might play a larger role in determining content characteristics.
5. No clear trends observed in pairplot.

16 Suggestions/Recomendations:

1. No of movies addition trend seems to be declining from the 2016 while the trend for the movie shows addition has increased, which is showing focused approach towards the addition of shows vs movies while that surpassed no of movies added vs TV shows in 2021.

2. If we study the movies/shows carefully we can see the clear focus on the TV-MA and TV-14 type of content targeting teenage and adults for the content consumptions. Also Netflix has very low penetration for the below 13 years age content which Netflix can add more considering the children as next targets.

3. General movies length is ideally between 90 to 120mins which has clearly indicating that to careful while producing movie in the range of 90mins to 120mins, which will not make it too short or too lengthy.
4. Netflix can also target to cater the content in the genre segments of international movies, dramas and comedies.
5. Last 30 years its evident that movies addition to tv shows addition ratio is consistently falling, with indicating the Netflix increased focus towards the shows over the movies.
6. If we see the till date released movies/shows July is most favored for the release of movies/shows both, as that is the summer holiday time also has the independence day for US in July which makes it most favored time to release movies to increase the views.