In [1]:
```
!gdown "https://d2beiqkhq929f0.cloudfront.net/public_assets/assets/000/000/940/original/netflix.csv"
```

```
Downloading...
From: https://d2beiqkhq929f0.cloudfront.net/public_assets/assets/000/000/940/original/netflix.csv
To: /Users/girl_intransition/netflix.csv
100%|████████████████████████████████████████| 3.40M/3.40M [00:00<00:00, 10.3MB/s]
```

In [2]:
```
import numpy as np
from matplotlib import pyplot as plt
import seaborn as sns
import pandas as pd
nflix = pd.read_csv("/Users/girl_intransition/netflix.csv")
```

In [3]:
```
import warnings
warnings.filterwarnings('ignore')
```

In [4]:
```
df = nflix
```

How to grow the business, what kind of shows to produce, which genres / nationality movies are trending,

> Assumptions made:
>
> 1. Whatever data is given for each movie/TV show is correct.
> 2. The data given is a reflection of the fact that this kind of content worked in favor of the company

Because we do not have any quantifiable measures like revenue of the movie/tv show, user rating or critic rating and views etc, we are going to take fields like genres, director, actors and analyse what is contributing to the current success and make recommendations accordingly.

In [5]:
```
df.head()
```

Out[5]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	September 25, 2021	2020	PG-13	90 min	Documentaries	As her father nears the end of his life, filmm...
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	International TV Shows, TV Dramas, TV Mysteries	After crossing paths at a party, a Cape Town t...
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	NaN	September 24, 2021	2021	TV-MA	1 Season	Crime TV Shows, International TV Shows, TV Act...	To protect his family from a powerful drug lor...
3	s4	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	September 24, 2021	2021	TV-MA	1 Season	Docuseries, Reality TV	Feuds, flirtations and toilet talk go down amo...
4	s5	TV Show	Kota Factory	NaN	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	September 24, 2021	2021	TV-MA	2 Seasons	International TV Shows, Romantic TV Shows, TV ...	In a city of coaching centers known to train I...

>> Basic observations about the data

In [6]:
```
df.shape
```

Out[6]:
```
(8807, 12)
```

> We have 8807 shows/movies in out netflix database as on

In [8]:
```
nflix.info()
```

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

In [9]:
```
nflix.shape
```

Out[9]:
```
(8807, 12)
```

In [10]:
```
# no of rows with 0,1,2 and 3 null values

nflix.isna().sum(axis=1).value_counts()
```

Out[10]:
```
0    5332
1    2741
2     636
3      98
dtype: int64
```

In [11]:
```
nflix.loc[nflix.isna().sum(axis=1) == 3]
```

Out[11]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description
3	s4	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	September 24, 2021	2021	TV-MA	1 Season	Docuseries, Reality TV	Feuds, flirtations and toilet talk go down amo...
10	s11	TV Show	Vendetta: Truth, Lies and The Mafia	NaN	NaN	NaN	September 24, 2021	2021	TV-MA	1 Season	Crime TV Shows, Docuseries, International TV S...	Sicily boasts a bold "Anti-Mafia" coalition. B...
14	s15	TV Show	Crime Stories: India Detectives	NaN	NaN	NaN	September 22, 2021	2021	TV-MA	1 Season	British TV Shows, Crime TV Shows, Docuseries	Cameras following Bengaluru police on the job ...
74	s75	TV Show	The World's Most Amazing Vacation Rentals	NaN	NaN	NaN	September 14, 2021	2021	TV-PG	2 Seasons	Reality TV	With an eye for every budget, three travelers ...
123	s124	TV Show	Luv Kushh	NaN	NaN	NaN	September 2, 2021	2012	TV-Y7	1 Season	Kids' TV	Based on the last book of the epic Ramayana,

												t...
...	...	...	...	...	...	...	...	...	...	...	...	...
7812	s7813	TV Show	Queens of Comedy	NaN	NaN	NaN	May 1, 2018	2017	TV-MA	1 Season	International TV Shows, Stand-Up Comedy & Talk...	Eight women perform in front of celebrity judg...
8109	s8110	TV Show	Strongland	NaN	NaN	NaN	January 18, 2019	2018	TV-PG	1 Season	Docuseries, International TV Shows	From Spain's countryside to Scotland's stony t...
8199	s8200	TV Show	The Bachelor	NaN	NaN	NaN	December 1, 2019	2009	TV-14	1 Season	Reality TV, Romantic TV Shows	A single man searches for his soulmate through...
8609	s8610	TV Show	Towies	NaN	NaN	NaN	December 27, 2017	2016	TV-MA	1 Season	International TV Shows, Reality TV	Australia's toughest tow truck operators work ...
8803	s8804	TV Show	Zombie Dumb	NaN	NaN	NaN	July 1, 2019	2018	TV-Y7	2 Seasons	Kids' TV, Korean TV Shows, TV Comedies	While living alone in a spooky town, a young g...

98 rows × 12 columns

Notes:

1. We are not deleting rows with three null values because we could use the data present in other fields like genre/listed_in, release year and duration to do analysis

2. They could be deleted if required when specifically working with director, cast and country variables

In [12]:
```
# no of null values in each column
nflix.isna().sum()
```

Out[12]:
```
show_id            0
type               0
title              0
director        2634
cast             825
country          831
date_added        10
release_year       0
rating             4
duration           3
listed_in          0
description        0
dtype: int64
```

In [13]:
```
nflix.describe(include='all')
```

Out[13]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description
count	8807	8807	8807	6173	7982	7976	8797	8807.000000	8803	8804	8807	8807
unique	8807	2	8807	4528	7692	748	1767	NaN	17	220	514	8775
top	s1	Movie	Dick Johnson Is Dead	Rajiv Chilaka	David Attenborough	United States	January 1, 2020	NaN	TV-MA	1 Season	Dramas, International Movies	Paranormal activity at a lush, abandoned prope...
freq	1	6131	1	19	19	2818	109	NaN	3207	1793	362	4
mean	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2014.180198	NaN	NaN	NaN	NaN
std	NaN	NaN	NaN	NaN	NaN	NaN	NaN	8.819312	NaN	NaN	NaN	NaN
min	NaN	NaN	NaN	NaN	NaN	NaN	NaN	1925.000000	NaN	NaN	NaN	NaN
25%	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2013.000000	NaN	NaN	NaN	NaN
50%	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2017.000000	NaN	NaN	NaN	NaN
75%	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2019.000000	NaN	NaN	NaN	NaN
max	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2021.000000	NaN	NaN	NaN	NaN

In [14]:
```
nflix.director.value_counts()
```

Out[14]:
```
Rajiv Chilaka                     19
Raúl Campos, Jan Suter            18
Marcus Raboy                      16
Suhas Kadav                       16
Jay Karas                         14
                                  ..
Raymie Muzquiz, Stu Livingston     1
Joe Menendez                       1
Eric Bross                         1
Will Eisenberg                     1
Mozez Singh                        1
Name: director, Length: 4528, dtype: int64
```

In [15]:
```
nflix['country'].value_counts()
```

Out[15]:
```
United States                                2818
India                                         972
United Kingdom                                419
Japan                                         245
South Korea                                   199
                                             ...
Romania, Bulgaria, Hungary                      1
Uruguay, Guatemala                              1
France, Senegal, Belgium                        1
Mexico, United States, Spain, Colombia          1
United Arab Emirates, Jordan                    1
Name: country, Length: 748, dtype: int64
```

In [16]:
```
nflix['cast'].value_counts()
```

Out[16]:
```
David Attenborough
19
Vatsal Dubey, Julie Tejwani, Rupa Bhimani, Jigna Bhardwaj, Rajesh Kava, Mousam, Swapnil
14
Samuel West
10
Jeff Dunham
7
David Spade, London Hughes, Fortune Feimster
6

..
Michael Peña, Diego Luna, Tenoch Huerta, Joaquin Cosio, José María Yazpik, Matt Letscher, Alyssa Diaz
1
Nick Lachey, Vanessa Lachey
1
Takeru Sato, Kasumi Arimura, Haru, Kentaro Sakaguchi, Takayuki Yamada, Kendo Kobayashi, Ken Yasuda, Arata Furuta
, Suzuki Matsuo, Koichi Yamadera, Arata Iura, Chikako Kaku, Kotaro Yoshida     1
Toyin Abraham, Sambasa Nzeribe, Chioma Chukwuka Akpotha, Chioma Omeruah, Chiwetalu Agu, Dele Odule, Femi Adebayo
, Bayray McNwizu, Biodun Stephen                                               1
Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanana, Manish Chaudhary, Meghna Malik, Malkeet Rauni, Anita Shabdish,
Chittaranjan Tripathy                                                          1
Name: cast, Length: 7692, dtype: int64
```

In [17]:
```
nflix['listed_in'].value_counts()
```

Out[17]:
```
Dramas, International Movies                        362
Documentaries                                       359
Stand-Up Comedy                                     334
Comedies, Dramas, International Movies              274
Dramas, Independent Movies, International Movies    252
                                                   ...
Kids' TV, TV Action & Adventure, TV Dramas            1
TV Comedies, TV Dramas, TV Horror                     1
Children & Family Movies, Comedies, LGBTQ Movies      1
Kids' TV, Spanish-Language TV Shows, Teen TV Shows    1
Cult Movies, Dramas, Thrillers                        1
Name: listed_in, Length: 514, dtype: int64
```

In [ ]:

preprocessing of data - (unnesting fields like actor, director and country)

1. We have a lot of nested data in 4 columns, so we'll unnest/split the values in to more rows while all the other data remains same.
2. Strip all the processed columns of any white spaces.
3. We will convert the dtype of release_year to float (because we have null values),date_added to datetime format and extract numeric values from the duration column and convert to float value(we have null values).

In [18]:
```
nflix['cast'] = nflix['cast'].str.split(',')
nflix = nflix.explode(['cast'],ignore_index=True)
nflix['cast']
```

Out[18]:
```
0                          NaN
1                  Ama Qamata
2                  Khosi Ngema
3                Gail Mabalane
4               Thabang Molaba
                    ...
64946          Manish Chaudhary
64947              Meghna Malik
64948             Malkeet Rauni
64949            Anita Shabdish
64950     Chittaranjan Tripathy
Name: cast, Length: 64951, dtype: object
```

In [19]:
```
nflix['director'] = nflix['director'].str.split(',')
nflix = nflix.explode(['director'],ignore_index=True)
nflix['director']
```

Out[19]:
```
0        Kirsten Johnson
1                    NaN
2                    NaN
3                    NaN
4                    NaN
              ...
70807        Mozez Singh
70808        Mozez Singh
70809        Mozez Singh
70810        Mozez Singh
70811        Mozez Singh
Name: director, Length: 70812, dtype: object
```

In [20]:
```
nflix['country'] = nflix['country'].str.split(',')
nflix = nflix.explode(['country'],ignore_index=True)
nflix['country']
```

Out[20]:
```
0        United States
1         South Africa
2         South Africa
3         South Africa
4         South Africa
             ...
89410            India
89411            India
89412            India
89413            India
89414            India
Name: country, Length: 89415, dtype: object
```

In [21]:
```
nflix['country'].str.strip()
```

Out[21]:
```
0         United States
1          South Africa
2          South Africa
3          South Africa
4          South Africa
              ...
89410             India
89411             India
89412             India
89413             India
89414             India
Name: country, Length: 89415, dtype: object
```

In [22]:
```
nflix['listed_in'] = nflix['listed_in'].str.split(',')
nflix = nflix.explode(['listed_in'],ignore_index=True)
nflix['listed_in']
```

Out[22]:
```
0                  Documentaries
1          International TV Shows
2                      TV Dramas
3                    TV Mysteries
4          International TV Shows
                   ...
202060       International Movies
202061           Music & Musicals
202062                    Dramas
202063       International Movies
202064           Music & Musicals
Name: listed_in, Length: 202065, dtype: object
```

In [31]:
```
nflix['listed_in'] = nflix['listed_in'].str.strip()
nflix['director'] = nflix['director'].str.strip()
nflix['cast'] = nflix['cast'].str.strip()
nflix['country'] = nflix['country'].str.strip()
```

In [ ]:
```
# --> converting the duration to numeric dtype
```

In [35]:
```
nflix['duration'] = nflix['duration'].str.extract('(\d+)')
nflix['duration'] = pd.to_numeric(nflix['duration'])
```

In [ ]:
```
# --> converting date and year in to respective dtype
```

In [40]:
```
nflix['date_added'] = pd.to_datetime(nflix['date_added'],errors='coerce')
```

In [42]:
```
nflix['release_year'] = pd.to_numeric(nflix['release_year'])
```

In [44]:
```
nflix.head()   ## reflection of changes made to the dataset
```

Out[44]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13	90.0	Documentaries	As her father nears the end of his life, filmm...
1	s2	TV Show	Blood & Water	NaN	Ama Qamata	South Africa	2021-09-24	2021	TV-MA	2.0	International TV Shows	After crossing paths at a party, a Cape Town t...
2	s2	TV Show	Blood & Water	NaN	Ama Qamata	South Africa	2021-09-24	2021	TV-MA	2.0	TV Dramas	After crossing paths at a party, a Cape Town t...
3	s2	TV Show	Blood & Water	NaN	Ama Qamata	South Africa	2021-09-24	2021	TV-MA	2.0	TV Mysteries	After crossing paths at a party, a Cape Town t...
4	s2	TV Show	Blood & Water	NaN	Khosi Ngema	South Africa	2021-09-24	2021	TV-MA	2.0	International TV Shows	After crossing paths at a party, a Cape Town t...

In [45]:
```
nflix.info()    ## reflection of changes made to the dataset
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 202065 entries, 0 to 202064
Data columns (total 12 columns):
 #   Column        Non-Null Count   Dtype         
---  ------        --------------   -----         
 0   show_id       202065 non-null  object        
 1   type          202065 non-null  object        
 2   title         202065 non-null  object        
 3   director      151422 non-null  object        
 4   cast          199916 non-null  object        
 5   country       190168 non-null  object        
 6   date_added    201907 non-null  datetime64[ns]
 7   release_year  202065 non-null  int64         
 8   rating        201998 non-null  object        
 9   duration      202062 non-null  float64       
 10  listed_in     202065 non-null  object        
 11  description   202065 non-null  object        
dtypes: datetime64[ns](1), float64(1), int64(1), object(9)
memory usage: 18.5+ MB
```

In [49]:
```
print(nflix['release_year'].min())
print(nflix['release_year'].max())
```

```
1925
2021
```

In [51]:
```
print(nflix['date_added'].min())
print(nflix['date_added'].max())
```

```
2008-01-01 00:00:00
2021-09-25 00:00:00
```

In [ ]:
```
nflix['Actors'].replace(['nan'],['Unknown Actor'],inplace=True)
nflix['Directors'].replace(['nan'],['Unknown Director'],inplace=True)
nflix['country'].replace(['nan'],[np.nan],inplace=True)
nflix.head()
```

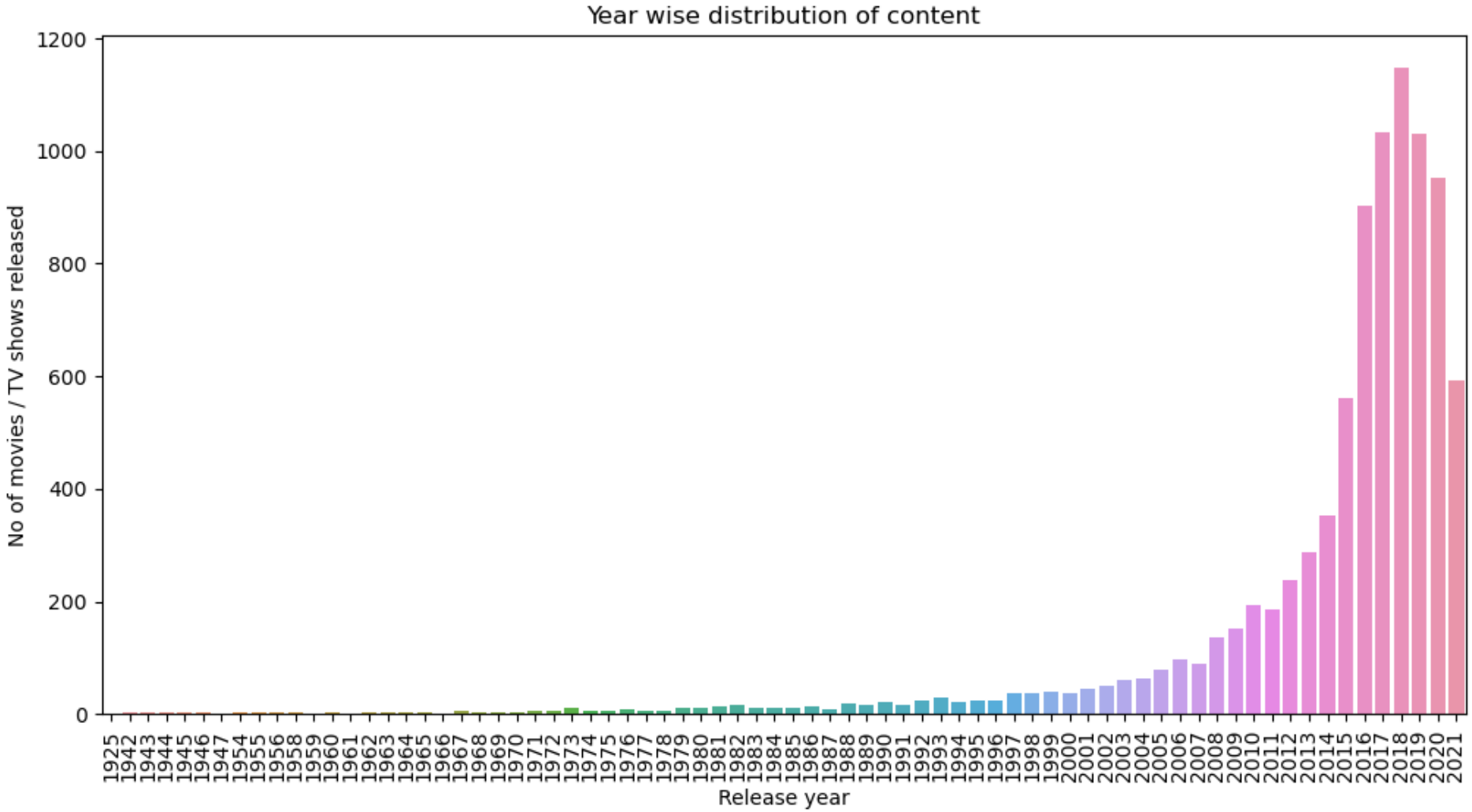
Note:

1. After splitting nested values we have 202065 rows
2. Our data ranges from Jan 2008 to Sept 2021 (we dont have the complete data for the year 2021)

univariate analysis

>> year wise distribution of content

In [33]:
```
# How has the number of movies released per year changed over the last 20-30 years?

year_df = nflix.groupby(['release_year'])['title'].nunique().reset_index()

fig=plt.figure(figsize=(12,6))
sns.barplot(data=year_df,x='release_year',y='title')
plt.xlabel('Release year')
plt.ylabel('No of movies / TV shows released')
plt.xticks(rotation=90)
plt.title("Year wise distribution of content")
plt.show()
```



Insights:

1. We can observe that the movies/tv shows released steadily increased initially and then exponentially from 2015.
2. Quantity of movies released decreased comparitively after 2018.

>> distribution of duration

In [52]:
```
#  (should be done for tv and movies saperately)

movie_df = nflix.loc[nflix['type'] == 'Movie']
tv_df = nflix.loc[nflix['type'] == 'TV Show']
```

In [53]:
```
movie_df.head()
```

Out[53]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13	90.0	Documentaries	As her father nears the end of his life, filmm...
159	s7	Movie	My Little Pony: A New Generation	Robert Cullen	Vanessa Hudgens	NaN	2021-09-24	2021	PG	91.0	Children & Family Movies	Equestria's divided. But a bright-eyed hero be...
160	s7	Movie	My Little Pony: A New Generation	José Luis Ucha	Vanessa Hudgens	NaN	2021-09-24	2021	PG	91.0	Children & Family Movies	Equestria's divided. But a bright-eyed hero be...
161	s7	Movie	My Little Pony: A New Generation	Robert Cullen	Kimiko Glenn	NaN	2021-09-24	2021	PG	91.0	Children & Family Movies	Equestria's divided. But a bright-eyed hero be...
162	s7	Movie	My Little Pony: A New Generation	José Luis Ucha	Kimiko Glenn	NaN	2021-09-24	2021	PG	91.0	Children & Family Movies	Equestria's divided. But a bright-eyed hero be...

In [54]:
```
movie_df.shape
```

Out[54]:
```
(145917, 12)
```

In [55]:
```
movie_df.info()
```

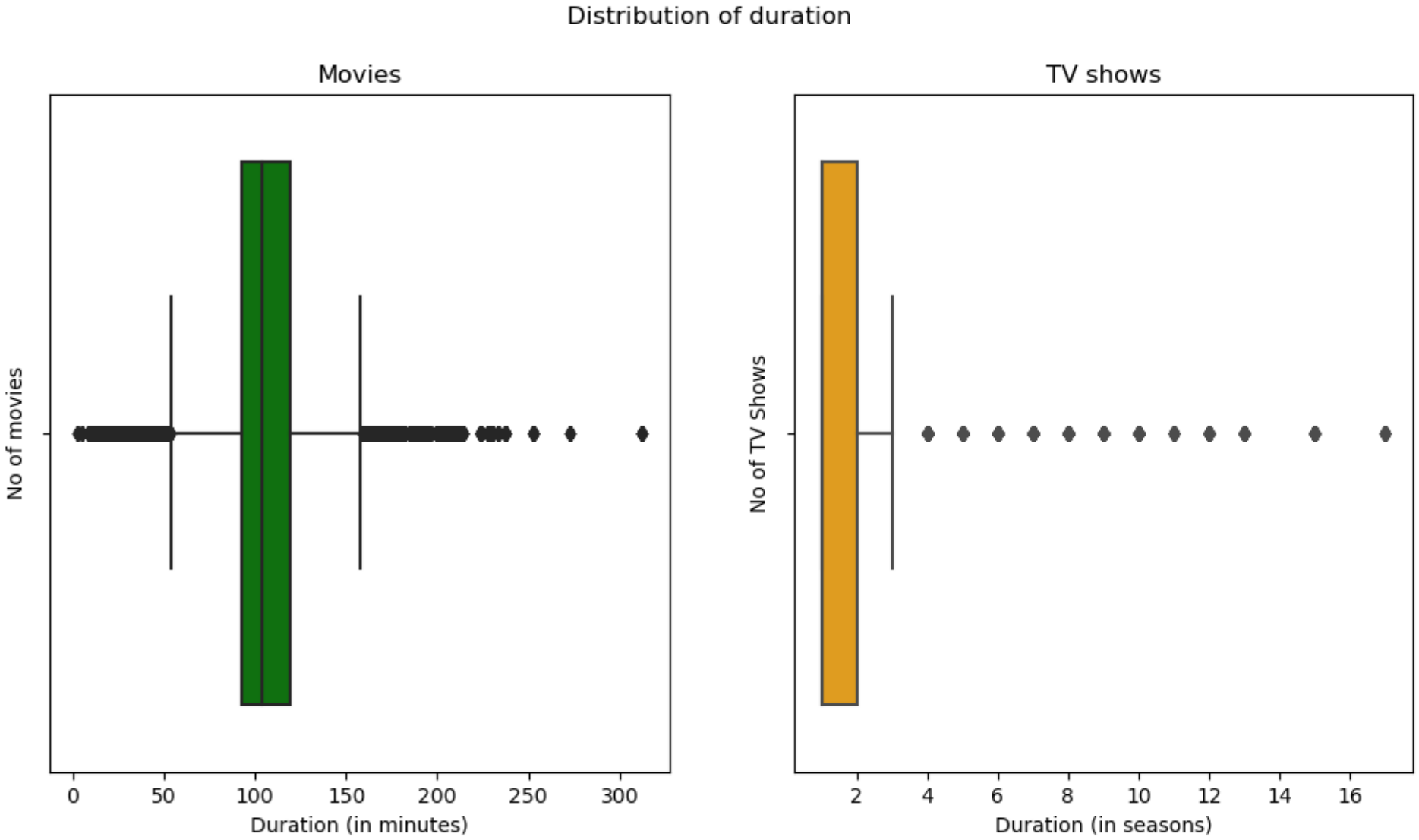
```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 145917 entries, 0 to 202064
Data columns (total 12 columns):
 #   Column        Non-Null Count   Dtype         
---  ------        --------------   -----         
 0   show_id       145917 non-null  object        
 1   type          145917 non-null  object        
 2   title         145917 non-null  object        
 3   director      144632 non-null  object        
 4   cast          144586 non-null  object        
 5   country       139718 non-null  object        
 6   date_added    145917 non-null  datetime64[ns]
 7   release_year  145917 non-null  int64         
 8   rating        145908 non-null  object        
 9   duration      145914 non-null  float64       
 10  listed_in     145917 non-null  object        
 11  description   145917 non-null  object        
dtypes: datetime64[ns](1), float64(1), int64(1), object(9)
memory usage: 14.5+ MB
```

In [56]:
```
median = movie_df['duration'].median()
nof_movies = movie_df['duration'].loc[movie_df['duration'] == median].count()
```

In [57]:
```
nof_movies
```

Out[57]:
```
2822
```

In [58]:
```
fig = plt.figure(figsize=(12,6))

plt.subplot(1,2,1)
sns.boxplot(data=movie_df,x='duration',color='green')
plt.xlabel('Duration (in minutes)')
plt.ylabel('No of movies')
plt.title("Movies")

plt.subplot(1,2,2)
sns.boxplot(data=tv_df,x='duration',color='orange')
plt.xlabel('Duration (in seasons)')
plt.ylabel('No of TV Shows')
plt.title("TV shows")
plt.suptitle("Distribution of duration")
plt.show()
```


Distribution of duration
Movies
No of movies
0
50
100
150
200
250
300
Duration (in minutes)
TV shows
No of TV Shows
2
4
6
8
10
12
14
16
Duration (in seasons)

Insights:

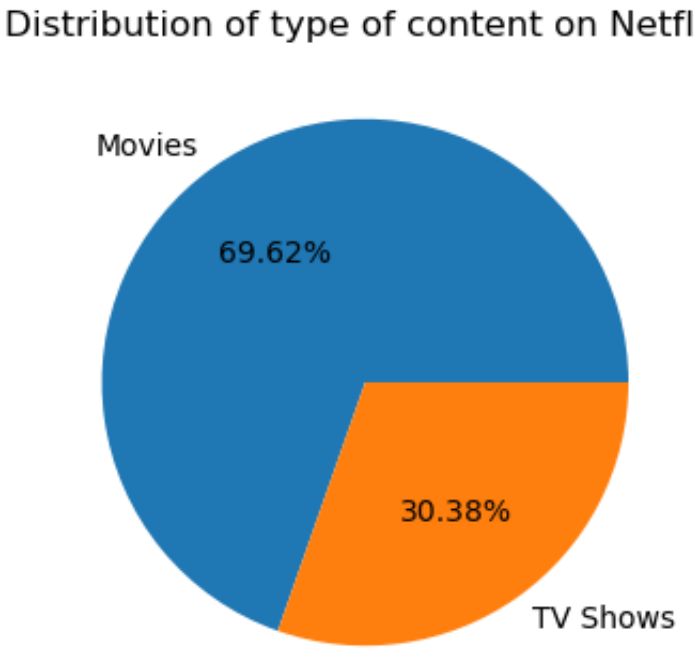
1. The median duration for movies is a little more than 100 minutes while the minimum and maximum is at 50 mins and 160 mins respectively.
2. The median duration for TV shows is 1 season.
3. There are a lot of outliers for the movies depending on what kind of content it is(example: documentaries).

>> content distribution pie chart (movie vs tv show)

In [59]:
```
type_count = nflix.groupby(['type'])['title'].nunique()
labels = ['Movies',"TV Shows"]
total_ = type_count.loc['Movie']+type_count.loc['TV Show']
```

In [60]:
```
m_percent = ((type_count.loc['Movie']/total_)*100).round(2)
tv_percent = ((type_count.loc['TV Show']/total_)*100).round(2)
```

In [61]:
```
plt.figure(figsize=(8,4))
plt.pie([m_percent,tv_percent],labels=labels,autopct='%1.2f%%')
plt.title('Distribution of type of content on Netflix')
plt.show()
```



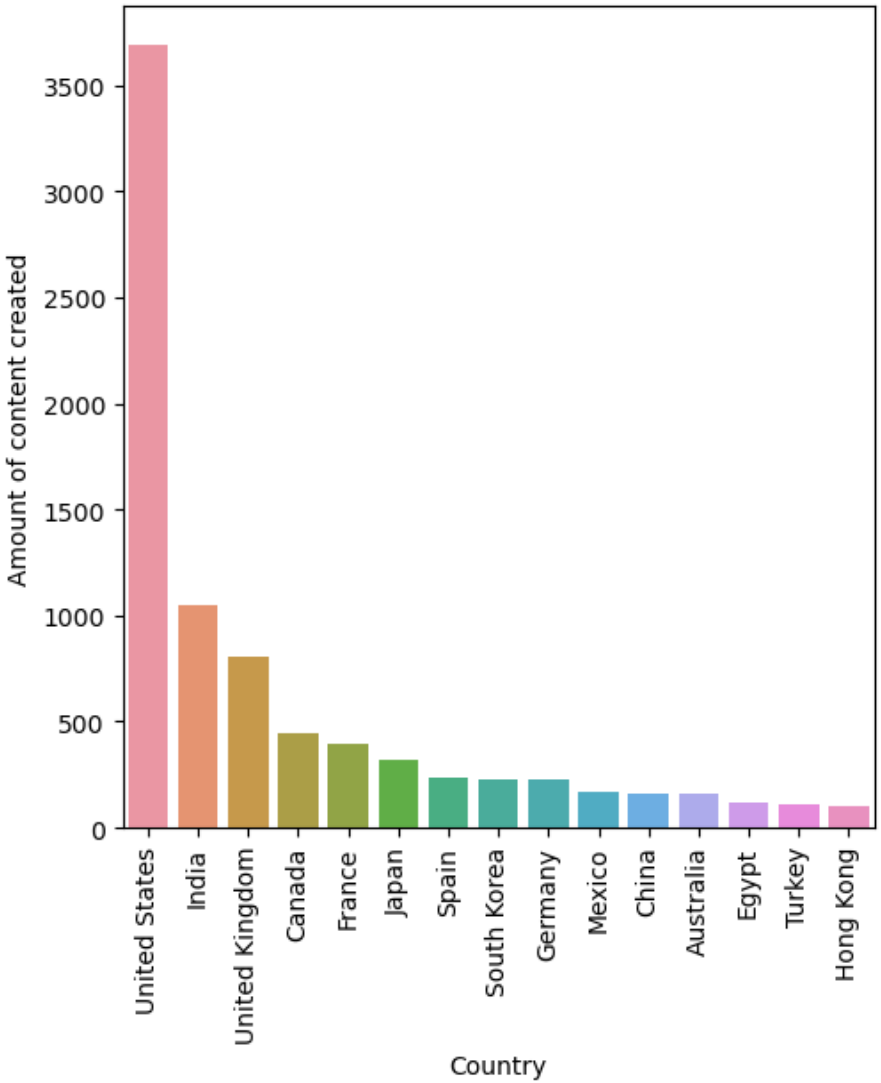
Insights:

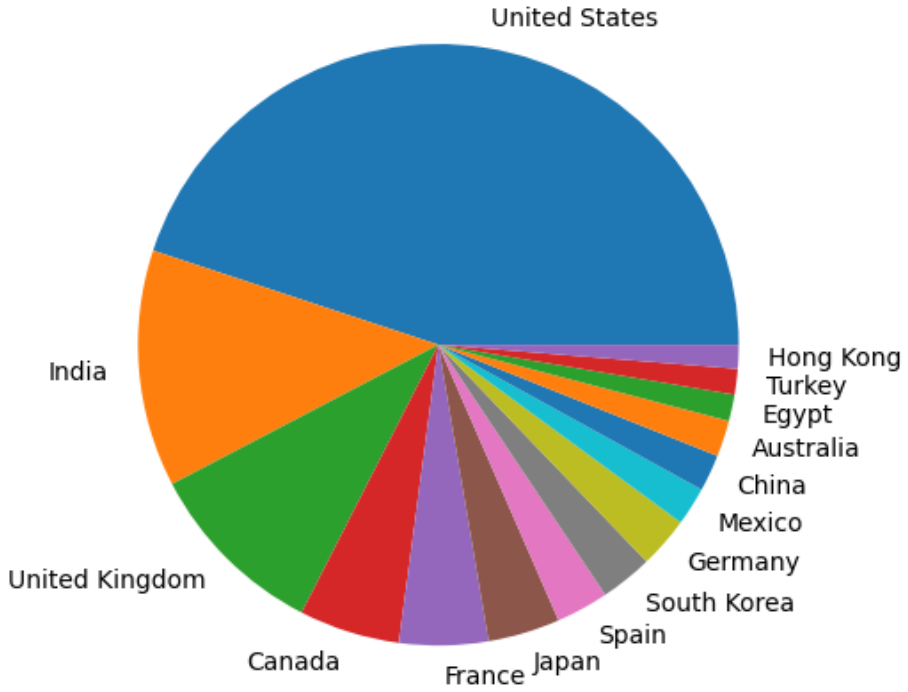
1. Movies make up approximately 70% of content on Netflix where as TV shows make up 30% of the content.

>> country wise distribution of data

In [71]:
```
# - x axis(country list), y axis(title count)

country_dist = nflix.groupby(['country'])['title'].nunique().reset_index().sort_values(by='title',ascending=False

fig=plt.figure(figsize=(12,6))

plt.subplot(1,2,1)
sns.barplot(data=country_dist,x='country',y='title')
plt.xticks(rotation=90)
plt.xlabel('Country')
plt.ylabel('Amount of content created')


plt.subplot(1,2,2)
plt.pie(country_dist['title'],labels=country_dist['country'])

plt.suptitle('Country wise distribution (Movies and TV shows)')
plt.show()
```

Country wise distribution (Movies and TV shows)





Insights:

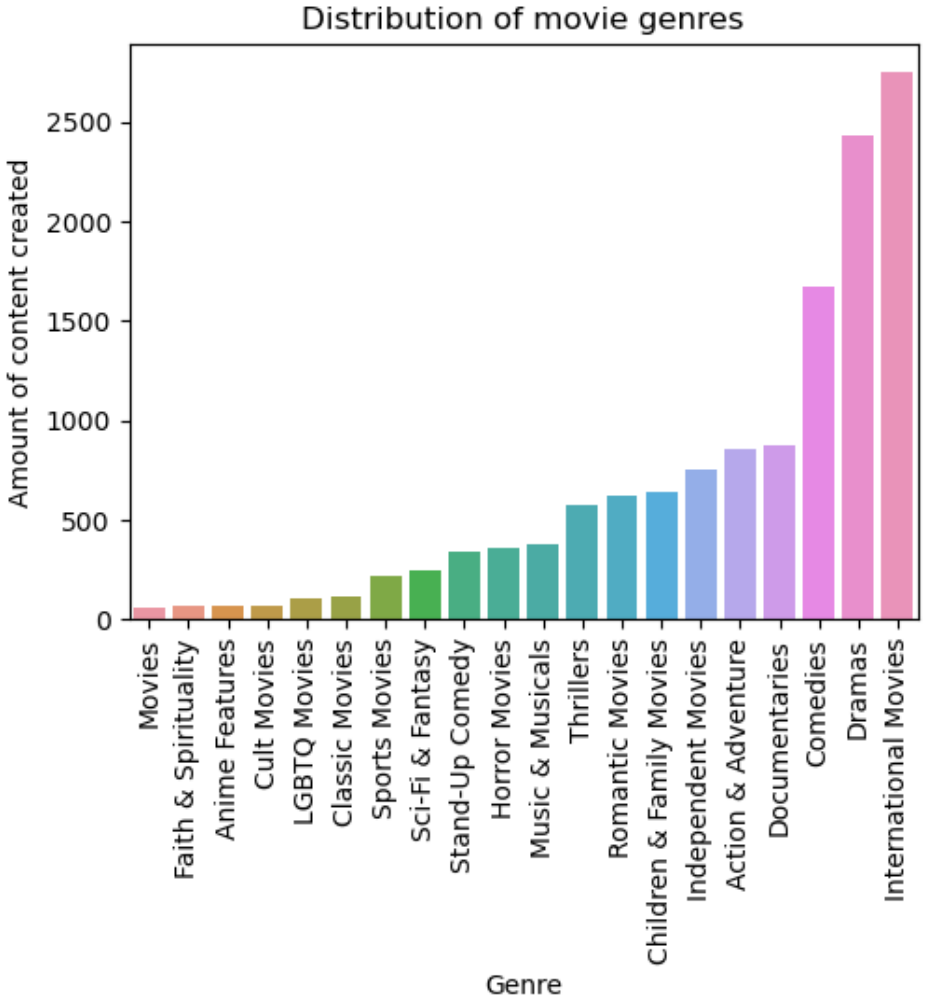
1. The content that belongs to USA's artists is a little less than 50% (45% approximately).
2. After the US, India, UK, France and Canada contributes the most data to the Netflix platform.

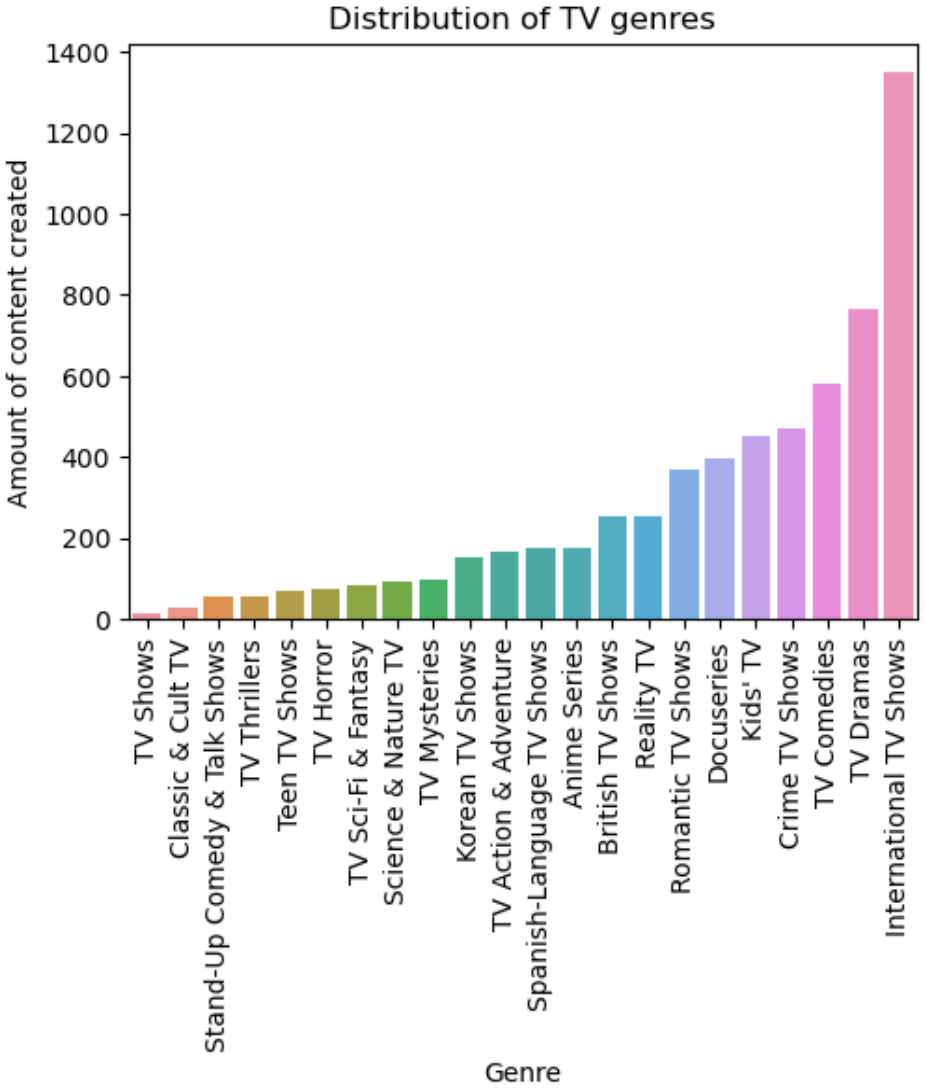
Note: this data includes both movies and TV shows for each country

>> distribution of movies created across genres

In [75]:
```
genre = movie_df.groupby(['listed_in'])['show_id'].nunique().reset_index().sort_values(by='show_id')

genre_tv = tv_df.groupby(['listed_in'])['show_id'].nunique().reset_index().sort_values(by='show_id')
```

In [78]:
```
fig = plt.figure(figsize=(12,4))

plt.subplot(1,2,1)
sns.barplot(data=genre,x='listed_in',y='show_id')
plt.xticks(rotation=90)
plt.xlabel('Genre')
plt.ylabel('Amount of content created')
plt.title('Distribution of movie genres')

plt.subplot(1,2,2)
sns.barplot(data=genre_tv,x='listed_in',y='show_id')
plt.xticks(rotation=90)
plt.xlabel('Genre')
plt.ylabel('Amount of content created')
plt.title('Distribution of TV genres')

plt.show()
```


Distribution of movie genres
Amount of content created
0
500
1000
1500
2000
2500
Movies
Faith & Spirituality
Anime Features
Cult Movies
LGBTQ Movies
Classic Movies
Sports Movies
Sci-Fi & Fantasy
Stand-Up Comedy
Horror Movies
Music & Musicals
Thrillers
Romantic Movies
Children & Family Movies
Independent Movies
Action & Adventure
Documentaries
Comedies
Dramas
International Movies
Genre


Distribution of TV genres
Amount of content created
0
200
400
600
800
1000
1200
1400
TV Shows
Classic & Cult TV
Stand-Up Comedy & Talk Shows
TV Thrillers
Teen TV Shows
TV Horror
TV Sci-Fi & Fantasy
Science & Nature TV
TV Mysteries
Korean TV Shows
TV Action & Adventure
Spanish-Language TV Shows
Anime Series
British TV Shows
Reality TV
Romantic TV Shows
Docuseries
Kids' TV
Crime TV Shows
TV Comedies
TV Dramas
International TV Shows
Genre

Insights:

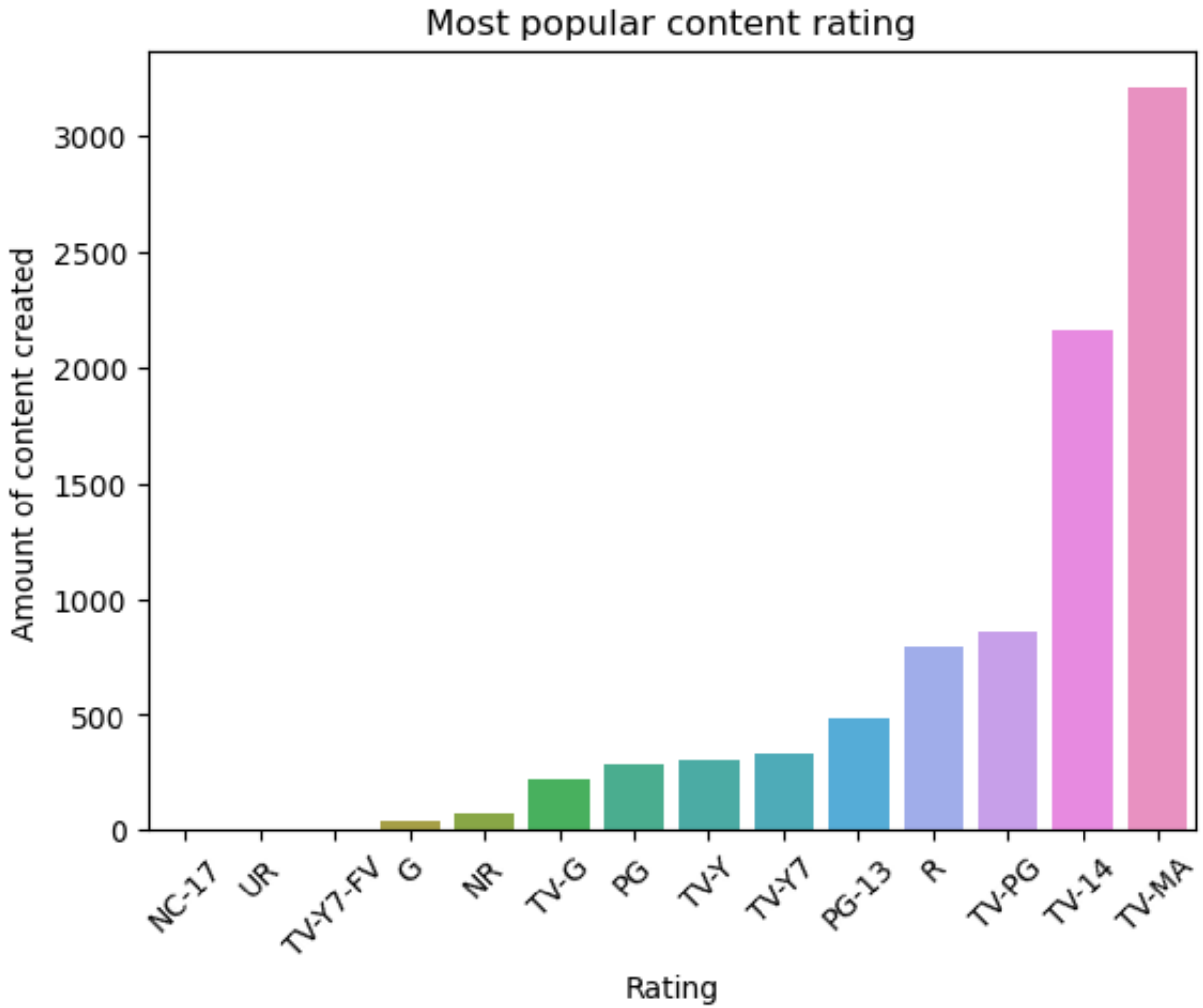
1. Dramas and comedy as the genre thats trending in both movie type and TV show type of content.
2. International show/movie is any movie that is made outside of the USA and in the local language, so we cannot consider this genre to identify the kind of content that audience like to watch.
3. Documentaries is one genre that is fairly popular in both types.
4. Crime TV and kids TV shows seem to be at neck with each other in the amount of content being added (or trending for this business case).
5. Action and adventure movies are also mildly popular.

>> distribution of Rating

In [79]:
```
# (across all content - movies/TV shows)

rating = nflix.groupby(['rating'])['title'].nunique().reset_index().sort_values(by='title')
```

In [80]:
```
temp = rating.loc[rating['rating'].isin(['74 min','84 min','66 min'])].index
rating.drop(temp,inplace=True)
```

In [81]:
```
sns.barplot(data=rating,x='rating',y='title')
plt.xticks(rotation=45)
plt.xlabel('Rating')
plt.ylabel('Amount of content created')
plt.title("Most popular content rating")
plt.show()
```


Most popular content rating
Amount of content created
3000
2500
2000
1500
1000
500
0
NC-17
UR
TV-Y7-FV
G
NR
TV-G
PG
TV-Y
TV-Y7
PG-13
R
TV-PG
TV-14
TV-MA
Rating

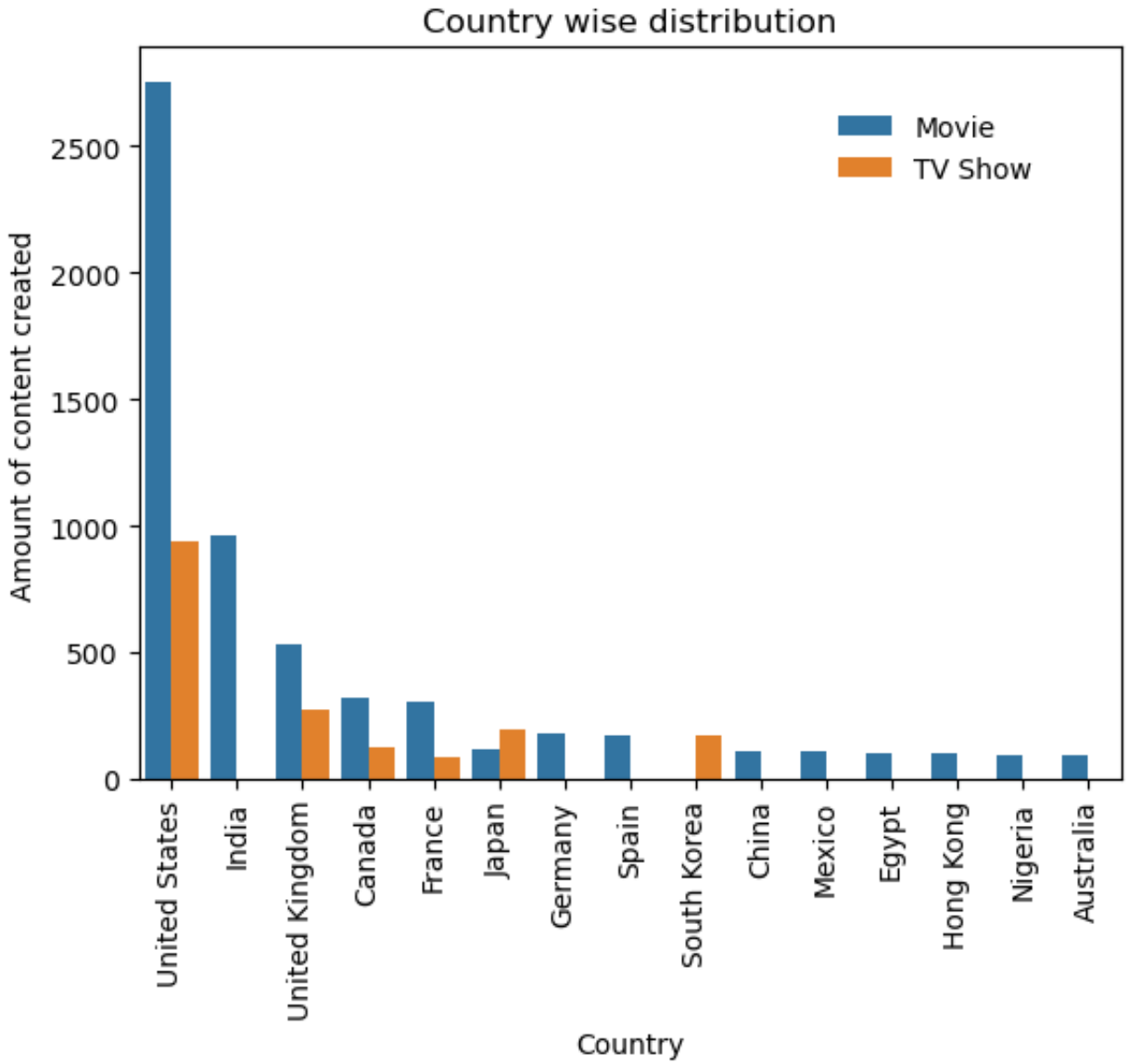
Insights:

1. TV-MA and TV-14 are the rating categories that are most popular with the content in Netflix.TV-MA refers to mature and adult content that may not be suitable for ages under 17 and TV-14 refers to shows that are unsuitable for ages under 14.
2. TV-PG and R are the next two rating categories that are popular. R represents Restricted and TV-PG represents recommended parental guidence.

Bivariate analysis

>> What type of content is available in different countries

In [82]:
```
# how many movies and TV shows each country has released
# or


country_hue = nflix.groupby(['country','type'])['title'].nunique().reset_index().sort_values(by='title',ascending

sns.barplot(data=country_hue,x='country',y='title',hue='type')
plt.xticks(rotation=90)
plt.xlabel('Country')
plt.ylabel('Amount of content created')
plt.legend(loc=(0.7,0.8),frameon=False)
plt.title('Country wise distribution')
plt.show()
```


Country wise distribution
Movie
TV Show
Amount of content created
0
500
1000
1500
2000
2500
United States
India
United Kingdom
Canada
France
Japan
Germany
Spain
South Korea
China
Mexico
Egypt
Hong Kong
Nigeria
Australia
Country

Insights:

1. Movie content created in most countries is significantly more than TV content. Japan and South Korea are the exceptions to this observation.
2. TV show content from the countries from Germany to Australia have minimal to none (with the exception of South Korea).
3. India doesnt have any TV shows on Netflix.

Inferences:

1. It is possible that Indian webseries or TV shows not being on Netflix might be the reason for no TV series content from India.
2. South Korea and Japan is popular for TV series.

>> Trend of TV and movie genres

In [83]:
```
# pick top 5 genres
# genre vs release year () - line plot with count of titles on y axis and year on x axis and genre as hue

top5_movie_genre_list = movie_df['listed_in'].value_counts().reset_index()['index'].head()
top5_movie_genre_df = movie_df.loc[movie_df['listed_in'].isin(top5_movie_genre_list)]

genre_trnd = top5_movie_genre_df.groupby(['release_year','listed_in'])['title'].nunique().reset_index().sort_valu
```

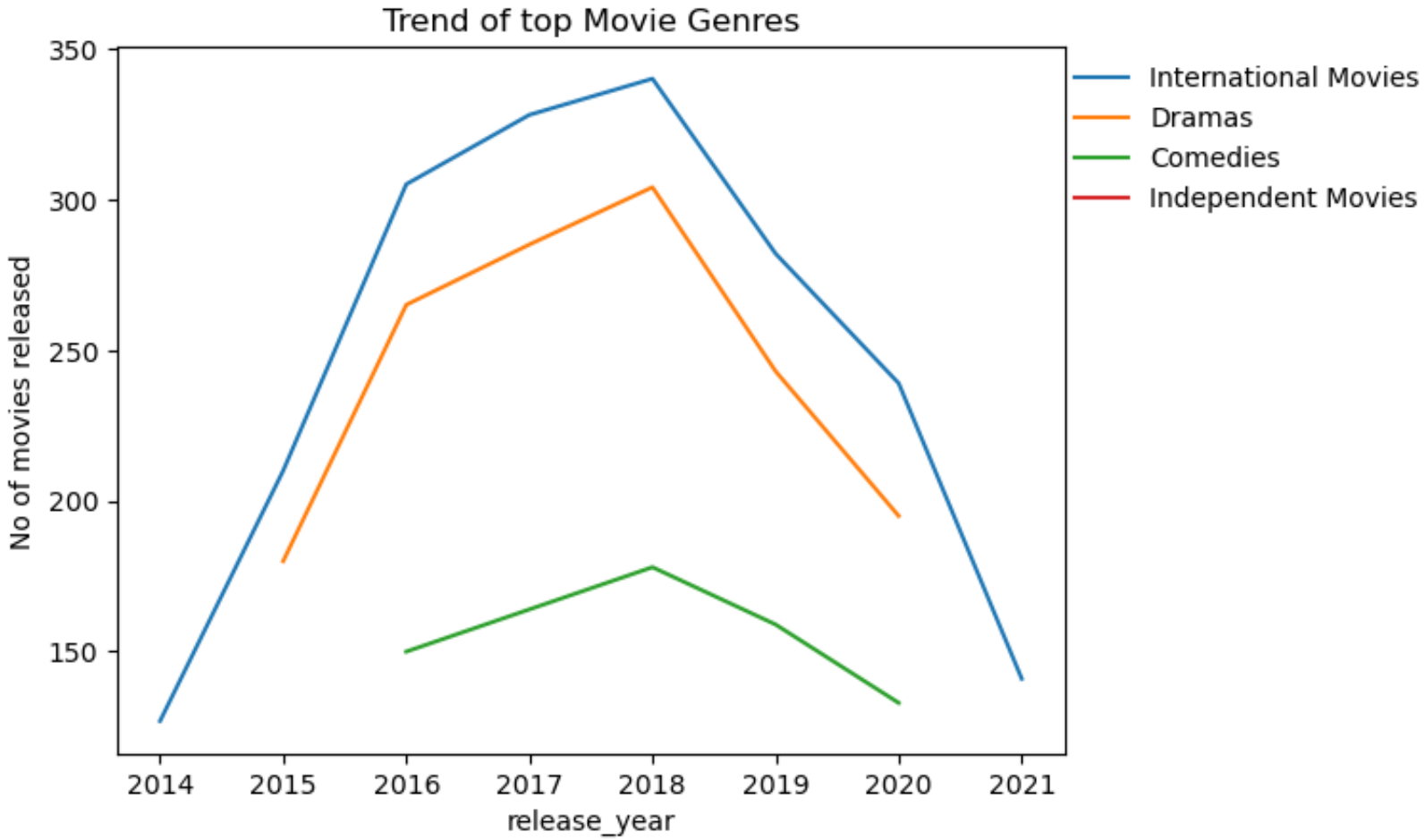
In [84]:
```
genre_trnd.head()
```

Out[84]:

	release_year	listed_in	title
267	2018	International Movies	340
262	2017	International Movies	328
257	2016	International Movies	305
265	2018	Dramas	304
260	2017	Dramas	285

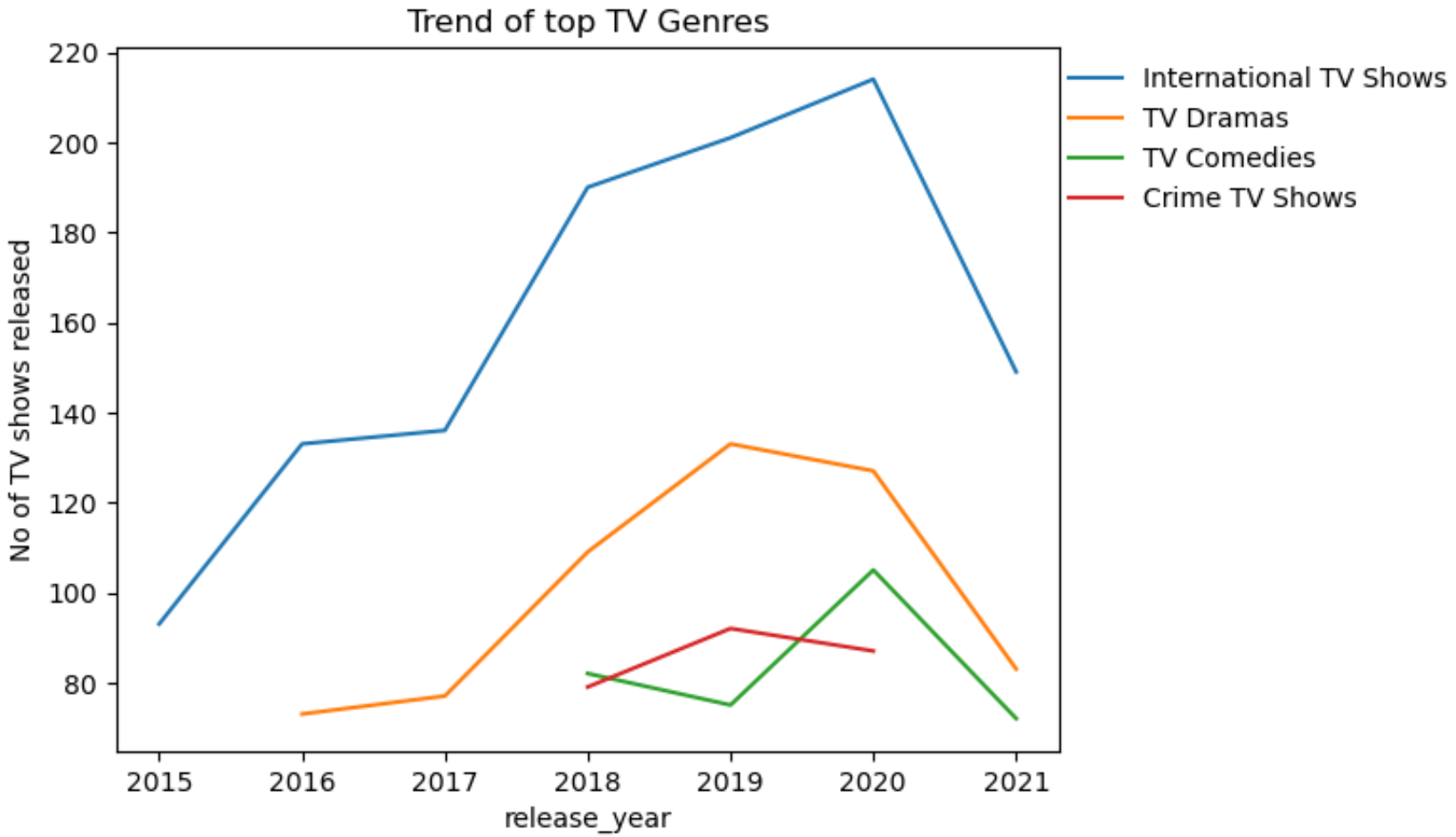
In [85]:

```
sns.lineplot(data = genre_trnd,x='release_year',y='title',hue='listed_in',ci=None)
plt.legend(loc=(1,0.75),frameon=False,ncol=1)
plt.ylabel('No of movies released')
plt.title('Trend of top Movie Genres')
plt.show()
```



In [86]:
```
top5_tv_genre_list = tv_df['listed_in'].value_counts().reset_index()['index'].head()
top5_tv_genre_df = tv_df.loc[tv_df['listed_in'].isin(top5_tv_genre_list)]

tv_genre_trnd = top5_tv_genre_df.groupby(['release_year','listed_in'])['title'].nunique().reset_index().sort_valu
```

In [87]:
```
sns.lineplot(data = tv_genre_trnd,x='release_year',y='title',hue='listed_in',ci=None)
plt.legend(loc=(1,0.75),frameon=False,ncol=1)
plt.ylabel('No of TV shows released')
plt.title('Trend of top TV Genres')
plt.show()
```



Insights:

TV

1. Trend of the genre Dramas in both movie and TV categories have always been popular.
2. Meanwhile comedy genre has seen slow decline from 2018 to 2019 but steadily picked up after 2019.
3. Crime genre saw and overall increase in demand.
4. All the content being released saw a dip after the year 2020.

Movies

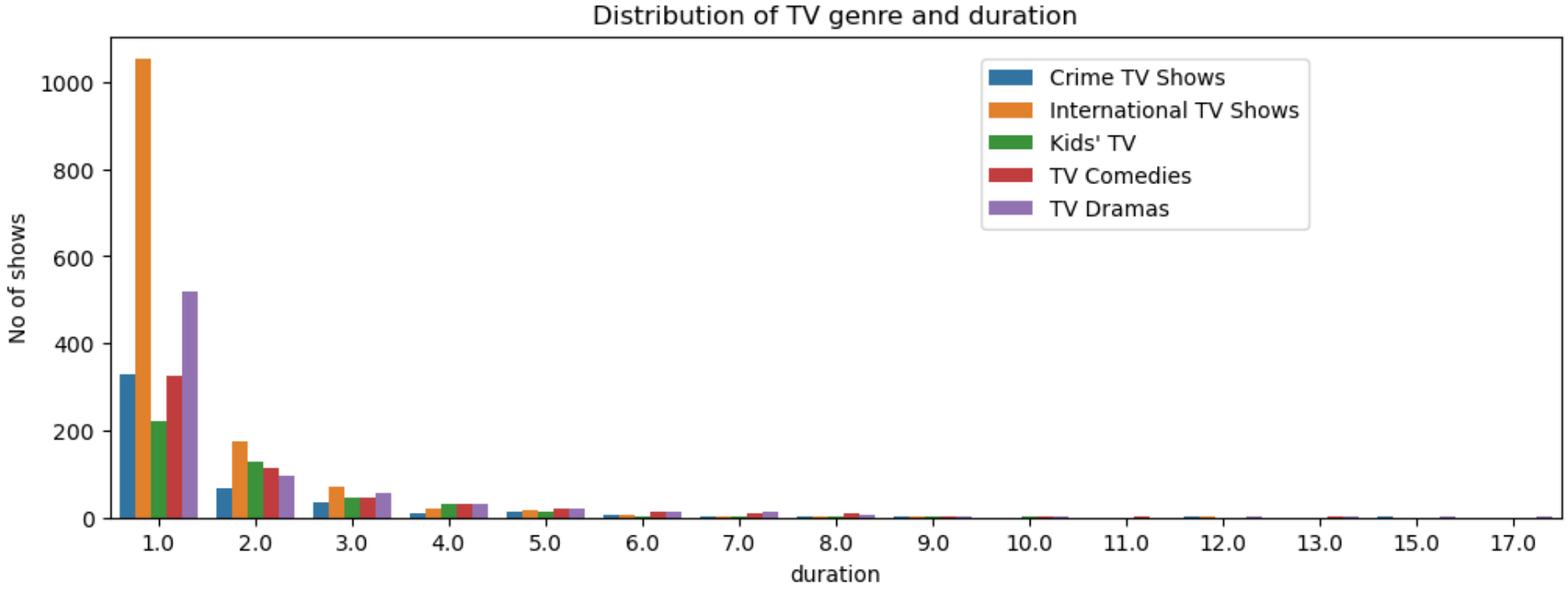
1. Dramas and comedy is the top genre.
2. Movie releases for these genres have decreased after 2018.

>> Distribution of duration with respect to genre

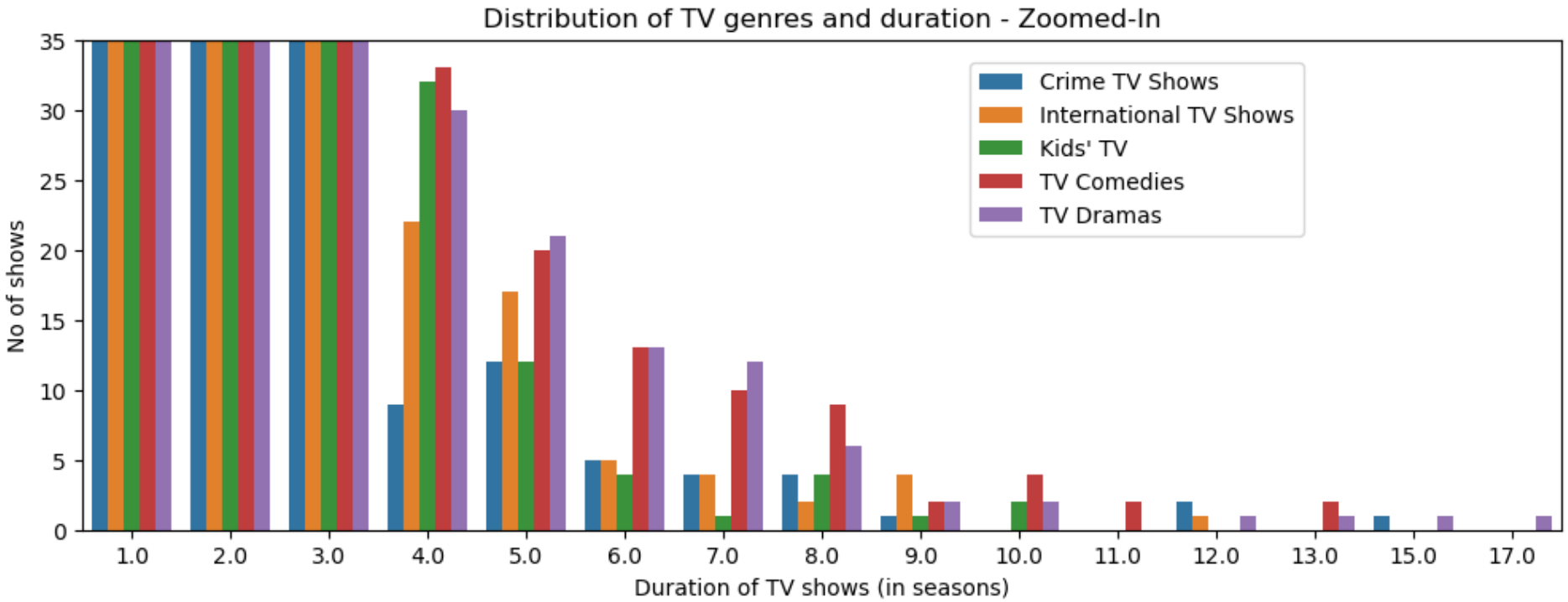
In [ ]:
```
# duration vs genre - duration on x axis and count of titles on y axis, hue=genre
```

In [90]:
```
top5_tv_genre_list = tv_df['listed_in'].value_counts().reset_index()['index'].head()
top5_tv_genre_df = tv_df.loc[tv_df['listed_in'].isin(top5_tv_genre_list)]

duration_genre = top5_tv_genre_df.groupby(['duration','listed_in'])['title'].nunique().reset_index()
```

In [91]:
```
plt.figure(figsize=(12,4))
sns.barplot(data = duration_genre,x='duration',y='title',hue='listed_in')
plt.ylabel('No of shows')
plt.legend(loc=(0.6,0.6))
plt.title('Distribution of TV genre and duration')
plt.show()
```



In [92]:
```
plt.figure(figsize=(12,4))
sns.barplot(data = duration_genre,x='duration',y='title',hue='listed_in')
plt.ylabel('No of shows')
plt.xlabel("Duration of TV shows (in seasons)")
plt.legend(loc=(0.6,0.6))
plt.ylim(0,35)
plt.title("Distribution of TV genres and duration - Zoomed-In")
plt.show()
```



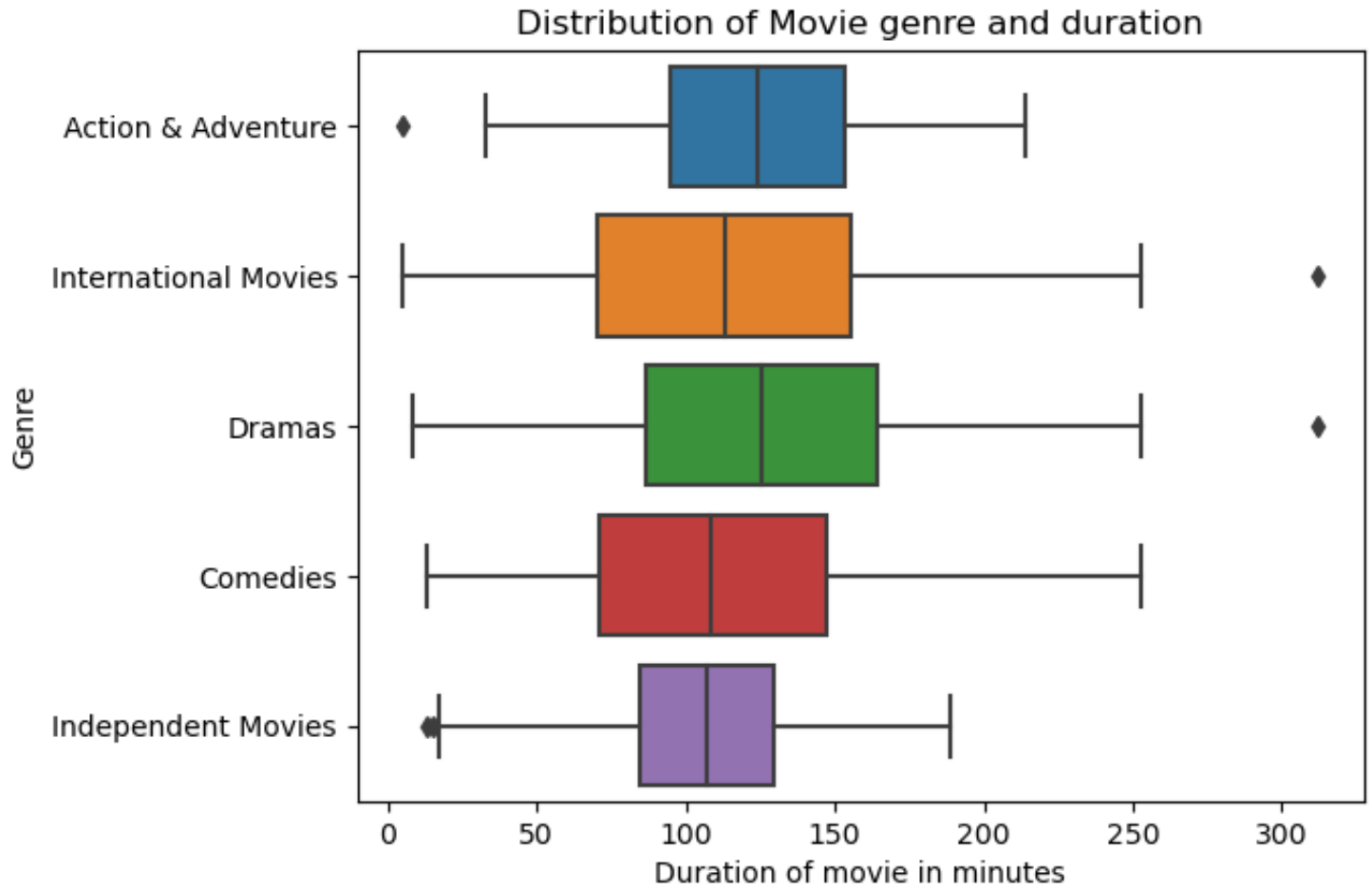
We are assuming that the TV series which have more seasons released are more popular compared to tv shoes with 1 or 2 sesons.

Insights:

1. We can see that the comedy, drama and Internation TV genres are the most popular and sustain for longer time.
2. If we internally compare between genres, the no of shows that came to sixth season are equal in number where as more no of comedy shows 8th, 10th and 13th seasons.

In [93]:
```
duration_genre_movie = top5_movie_genre_df.groupby(['duration','listed_in'])['title'].nunique().reset_index()
```

In [94]:
```
sns.boxplot(data=duration_genre_movie,x='duration',y = 'listed_in')
plt.xlabel('Duration of movie in minutes')
plt.ylabel('Genre')
plt.title("Distribution of Movie genre and duration")
plt.show()
```



Insight:

1. most movies range between 75 mins to 175 mins and the median duration of different genres lies between 105 mins to 125 mins.

>> Does Netflix has more focus on TV Shows than movies in recent years

In [96]:
```
type_trend = nflix.groupby(['release_year','type'])['title'].nunique().reset_index()
```

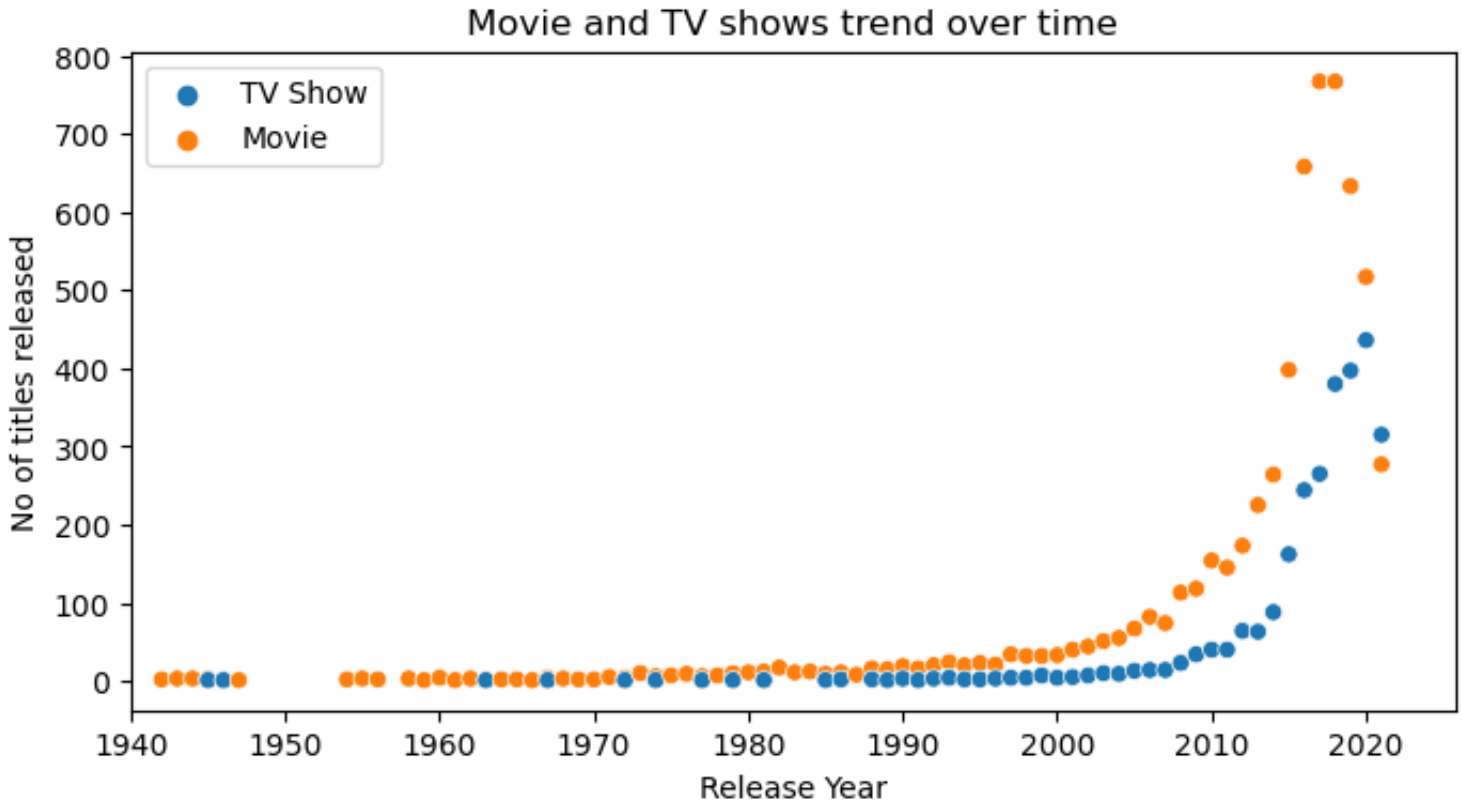
In [99]:
```
type_trend
```

Out[99]:

	release_year	type	title
0	1925	TV Show	1
1	1942	Movie	2
2	1943	Movie	3
3	1944	Movie	3
4	1945	Movie	3
...	...	...	...
114	2019	TV Show	397
115	2020	Movie	517
116	2020	TV Show	436
117	2021	Movie	277
118	2021	TV Show	315

119 rows × 3 columns

In [98]:
```
plt.figure(figsize=(8,4))
sns.scatterplot(data=type_trend,x='release_year',y='title',hue='type')
plt.ylabel("No of titles released")
plt.xlabel("Release Year")
plt.title('Movie and TV shows trend over time')
plt.legend(title=None)
plt.xlim(1940)
plt.show()
```



Insigts:

1. adding Movies and TV shows to Netflix picked up pace after 2000 and grew exponentially after 2010.
2. the rate of growth of movies slowed down after 2018 while tv content started to slow only after 2020.
3. The data from 2019 and 2020 also suggests that the no of movies dropped significantly but more tv shows were lauched compared to its previous years.

Inference :

1. Netflix not only adds existing content but also produces under the name of 'Netflix Originals'.These started in 2011, which may have marked the growth of content since then. We can infer from the graph that more movies than TV shows have been added thoughout except in the year 2021.
2. Although we do not have the entire data of the year 2021, we could say that from Jan to Sept 2021, the no of TV shows added were greater than movies.
3. There was good amount of focus in launching TV shows.

-> What is the best time to launch a TV show?

In [100…

```
tv_df.head()
```

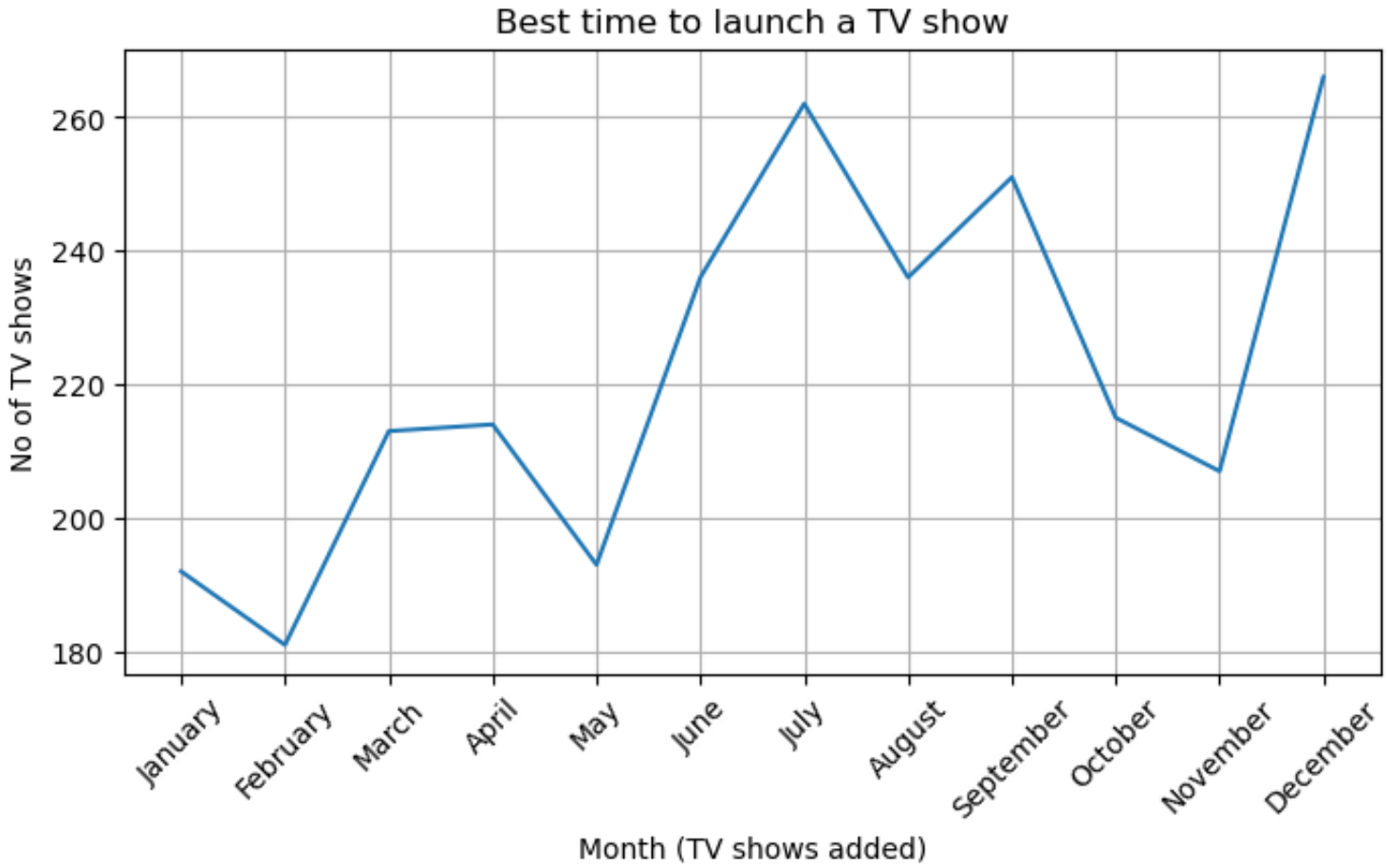
Out[100]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description
1	s2	TV Show	Blood & Water	NaN	Ama Qamata	South Africa	2021-09-24	2021	TV-MA	2.0	International TV Shows	After crossing paths at a party, a Cape Town t...
2	s2	TV Show	Blood & Water	NaN	Ama Qamata	South Africa	2021-09-24	2021	TV-MA	2.0	TV Dramas	After crossing paths at a party, a Cape Town t...
3	s2	TV Show	Blood & Water	NaN	Ama Qamata	South Africa	2021-09-24	2021	TV-MA	2.0	TV Mysteries	After crossing paths at a party, a Cape Town t...
4	s2	TV Show	Blood & Water	NaN	Khosi Ngema	South Africa	2021-09-24	2021	TV-MA	2.0	International TV Shows	After crossing paths at a party, a Cape Town t...
5	s2	TV Show	Blood & Water	NaN	Khosi Ngema	South Africa	2021-09-24	2021	TV-MA	2.0	TV Dramas	After crossing paths at a party, a Cape Town t...

In [101…
```
tv_df['date_added'] = pd.to_datetime(tv_df['date_added'])
```

In [102…
```
tv_df['month_added'] = tv_df['date_added'].dt.month
month_names = ['January','February','March','April','May','June','July','August','September','October','November'
monthly_data = tv_df.groupby('month_added')['title'].nunique().reset_index()
```

In [103…
```
plt.figure(figsize=(8,4))
sns.lineplot(data=monthly_data,x='month_added',y='title')
plt.title('Best time to launch a TV show')
plt.grid()
plt.xlabel('Month (TV shows added)')
plt.ylabel('No of TV shows')
plt.xticks([i for i in range(1,13)],month_names,rotation=45)

plt.show()
```


Best time to launch a TV show
No of TV shows
260
240
220
200
180
January
February
March
April
May
June
July
August
September
October
November
December
Month (TV shows added)

Insights:

1. Most number of TV shows were added in July or December

Inference:

1. Although having viewership data of the TV shows that ran each month would give more evidence to suggest an inference, from the popularity in no of tv shows being added each months we can deduce that Dec and July are the best months to launch TV shows.

>> What type of content is available in different countries?

genre vs country

as there are a lot of values in each of these fields, it is not possible to check the contribution of all genres for each country. For simplicity we are going to pick the top 5 genres generated by the top countries

In [104…
```
top5_tv_genre_list = tv_df['listed_in'].value_counts().reset_index()['index'].head()
top5_tv_genre_df = tv_df.loc[tv_df['listed_in'].isin(top5_tv_genre_list)]
tv_genre_cntry = top5_tv_genre_df.groupby(['country','listed_in'])['title'].nunique().reset_index().sort_values(b
```

In [105…
```
tv_genre_cntry.head()
```

Out[105]:

	country	listed_in	title
235	United States	TV Comedies	258
236	United States	TV Dramas	232
234	United States	Kids' TV	214
190	South Korea	International TV Shows	152
112	Japan	International TV Shows	151

In [106…

```
top5_movie_genre_list = movie_df['listed_in'].value_counts().reset_index()['index'].head()
top5_movie_genre_df = movie_df.loc[movie_df['listed_in'].isin(top5_movie_genre_list)]

genre_country_trnd = top5_movie_genre_df.groupby(['country','listed_in'])['title'].nunique().reset_index().sort_v
```

In [107…

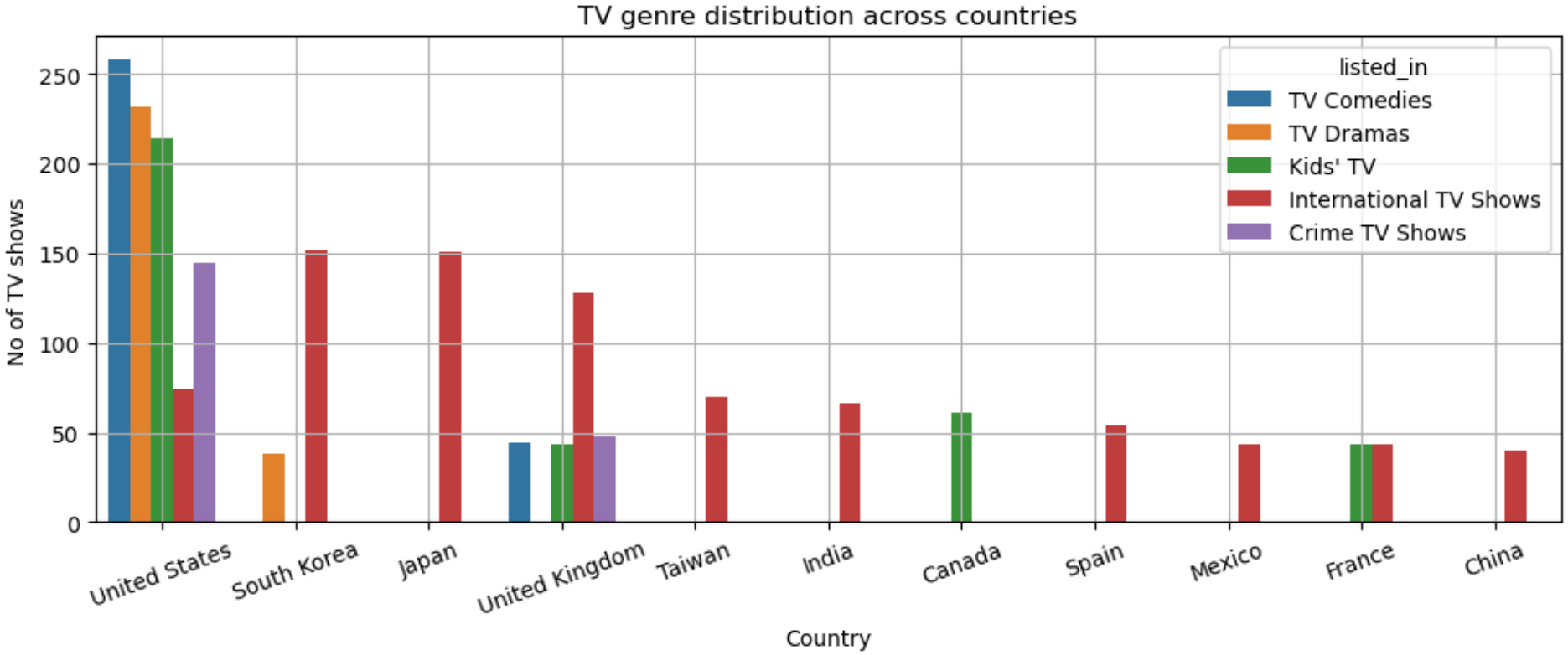
```
genre_country_trnd.head()
```

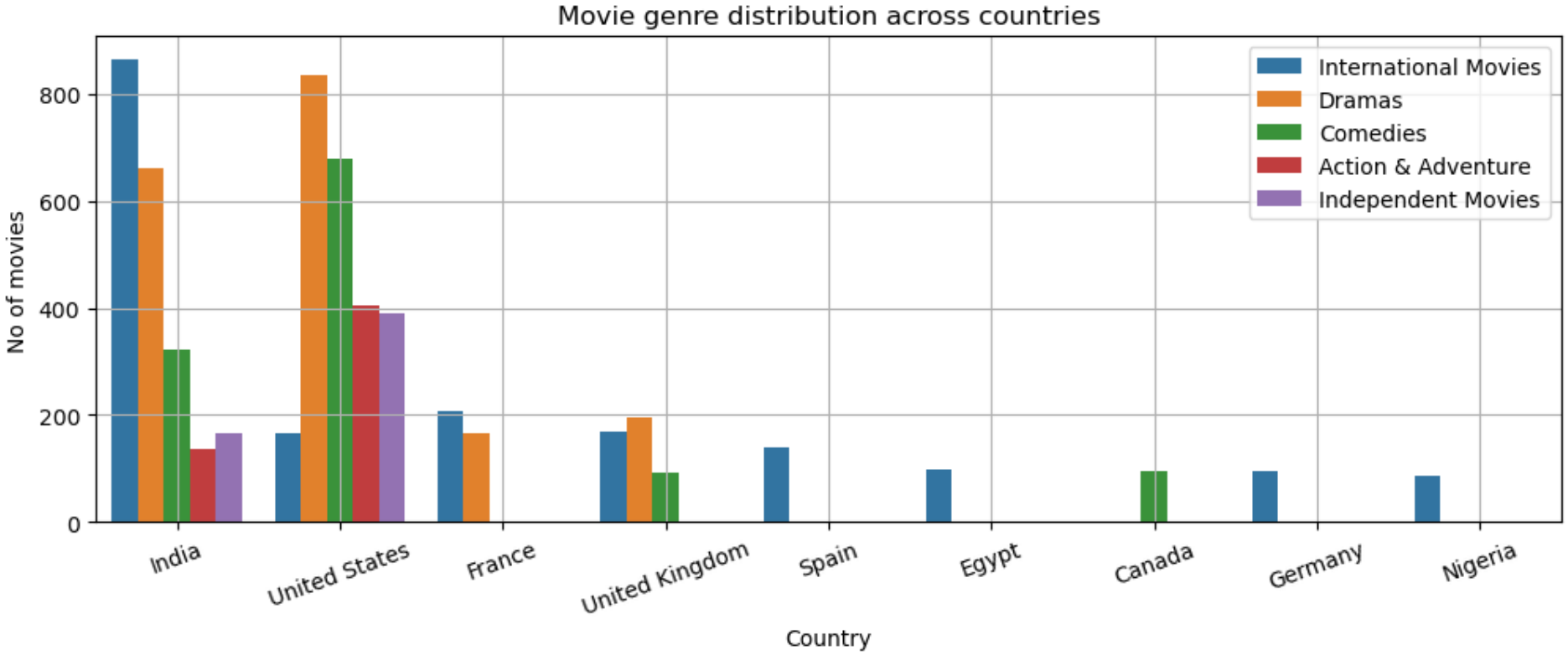
Out[107]:

	country	listed_in	title
143	India	International Movies	864
368	United States	Dramas	835
367	United States	Comedies	680
141	India	Dramas	662
366	United States	Action & Adventure	404

In [108…

```
plt.figure(figsize=(12,4))
sns.barplot(data=tv_genre_cntry,x='country',y='title',hue='listed_in')
plt.xlabel('Country')
plt.ylabel("No of TV shows")
plt.title('TV genre distribution across countries')
plt.xticks(rotation=20)
plt.grid()


plt.figure(figsize=(12,4))
sns.barplot(data=genre_country_trnd,x='country',y='title',hue='listed_in')
plt.legend(loc='upper right')
plt.xlabel('Country')
plt.ylabel("No of movies")
plt.title('Movie genre distribution across countries')
plt.xticks(rotation=20)
plt.grid()

plt.show()
```


TV genre distribution across countries
listed_in
TV Comedies
TV Dramas
Kids' TV
International TV Shows
Crime TV Shows
No of TV shows
0
50
100
150
200
250
United States
South Korea
Japan
United Kingdom
Taiwan
India
Canada
Spain
Mexico
France
China
Country



Insights:

1. If any foreign movie made in its local language is being classified as an International movie, there wont be any scope to compare genres with country to understand what type of content is available in dirrerent countries.
2. We can see that in the top 4 countries, Dramas takes the lead with no of movies released, followed by comedy.

Inference:

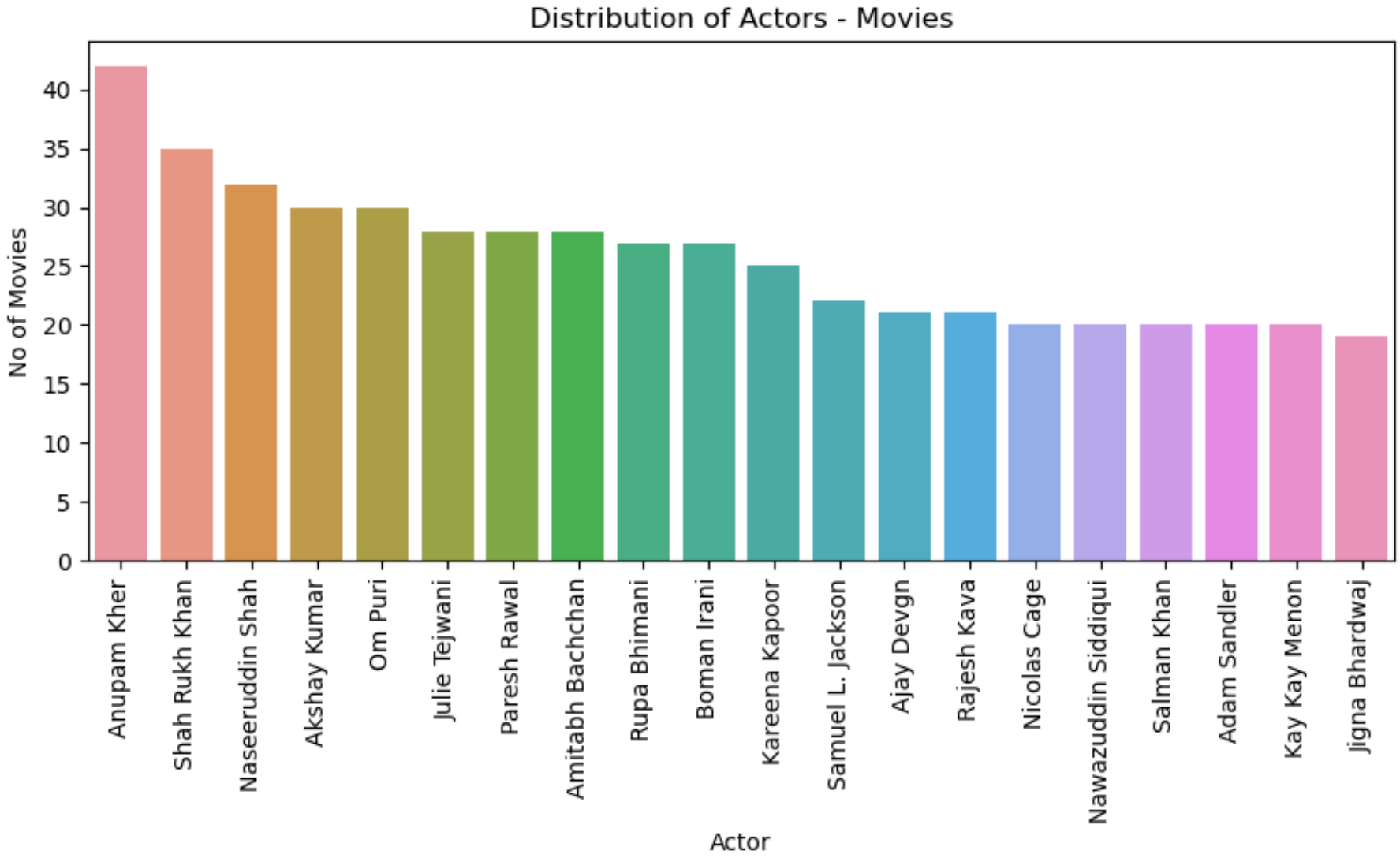
1. Comedy is popular with India, US and UK whereas Drama is the type of content that popular with the the top 4 countries.

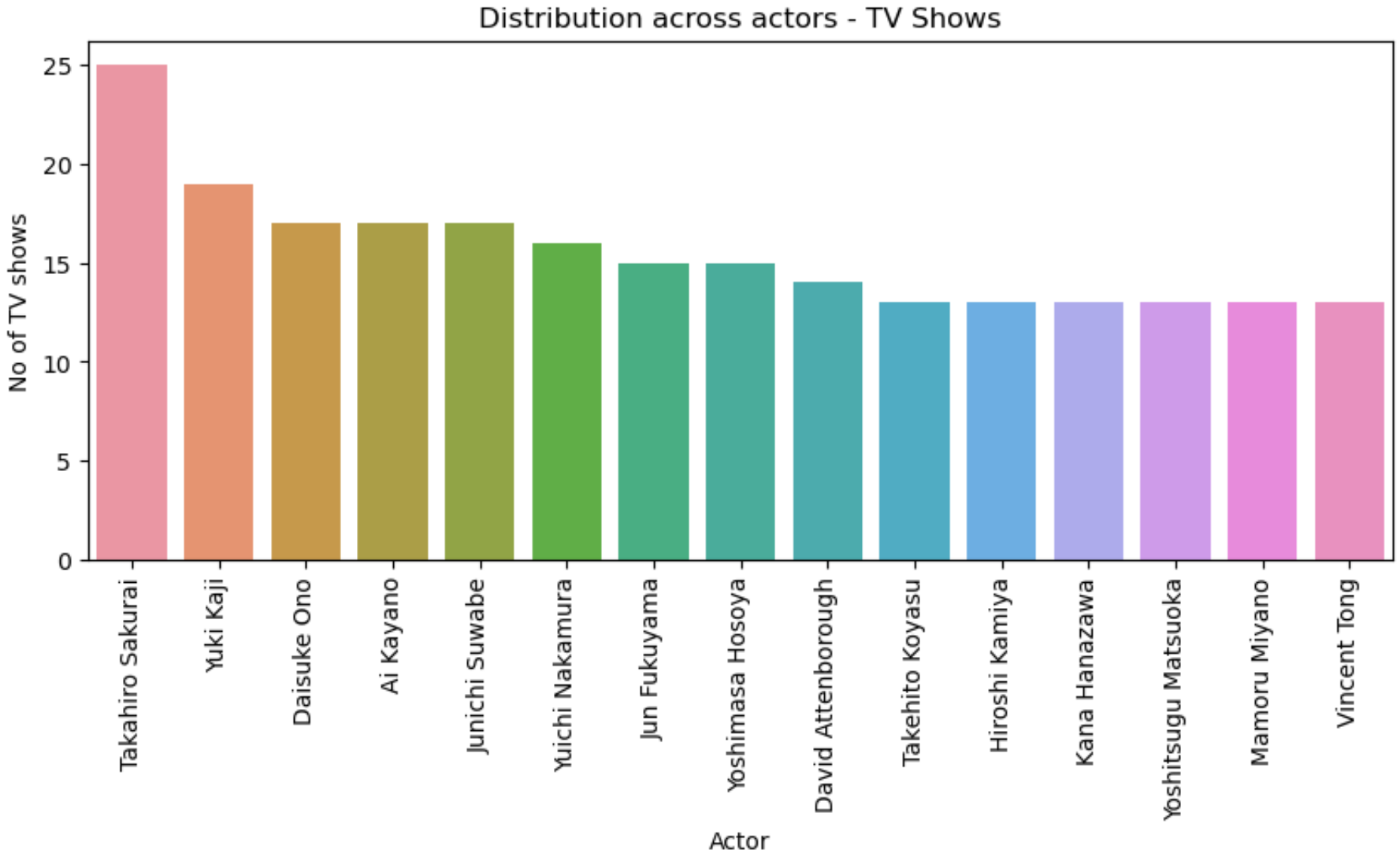
>> Analysis of actors/directors of different types of shows/movies.

In [109…
```
top15_tvcast = tv_df.groupby(['cast'])['title'].nunique().sort_values(ascending=False).reset_index().head(15)
```

In [110…
```
top20_cast = movie_df.groupby(['cast'])['title'].nunique().sort_values(ascending=False).reset_index().head(20)
```

In [111…
```
plt.figure(figsize=(10,4))
sns.barplot(data=top20_cast,x='cast',y='title')
plt.xticks(rotation=90)
plt.xlabel("Actor")
plt.ylabel("No of Movies")
plt.title("Distribution of Actors - Movies")


plt.figure(figsize=(10,4))
sns.barplot(data=top15_tvcast,x='cast',y='title')
plt.xticks(rotation=90)
plt.xlabel("Actor")
plt.ylabel("No of TV shows")
plt.title("Distribution across actors - TV Shows")

plt.show()
```


Distribution of Actors - Movies
No of Movies
0
5
10
15
20
25
30
35
40
Anupam Kher
Shah Rukh Khan
Naseeruddin Shah
Akshay Kumar
Om Puri
Julie Tejwani
Paresh Rawal
Amitabh Bachchan
Rupa Bhimani
Boman Irani
Kareena Kapoor
Samuel L. Jackson
Ajay Devgn
Rajesh Kava
Nicolas Cage
Nawazuddin Siddiqui
Salman Khan
Adam Sandler
Kay Kay Menon
Jigna Bhardwaj
Actor


Distribution across actors - TV Shows
No of TV shows
0
5
10
15
20
25
Takahiro Sakurai
Yuki Kaji
Daisuke Ono
Ai Kayano
Junichi Suwabe
Yuichi Nakamura
Jun Fukuyama
Yoshimasa Hosoya
David Attenborough
Takehito Koyasu
Hiroshi Kamiya
Kana Hanazawa
Yoshitsugu Matsuoka
Mamoru Miyano
Vincent Tong
Actor