Netflix_EDA

February 17, 2023

[111]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import math
import seaborn as sns
```

[112]:
```
df=pd.read_csv(r'C:\Users\raypr\OneDrive\Desktop\scaler_dataset\netflix.csv')
```

[113]:
```
df.head()
```

[113]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	September 25, 2021	2020	PG-13	90 min	Documentaries
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
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…
3	s4	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	September 24, 2021	2021	TV-MA	1 Season	Docuseries, Reality TV
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 …

```
                                                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…
```

[114]:
```
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
```

[115]:
```
df.describe()
```

[115]:
```
       release_year
count   8807.000000
mean    2014.180198
std        8.819312
min     1925.000000
25%     2013.000000
50%     2017.000000
75%     2019.000000
max     2021.000000
```

[116]:
```
df.shape
```

[116]: (8807, 12)

Lets Drop show_id and description columns as we dont need them for our analysis

[117]:
```
df.drop(columns=['show_id','description'],inplace=True)
df.head()
```

[117]:

	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in
0	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	September 25, 2021	2020	PG-13	90 min	Documentaries
1	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
2	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…
3	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	September 24, 2021	2021	TV-MA	1 Season	Docuseries, Reality TV
4	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 …

Remove Min and Season from Duration Columns as we dont need them for our analysis

[118]:
```
df['duration']=df['duration'].str.split(' ',expand=True)[0]
```

[119]:
```
df.head()
```

[119]:

	type	title	director	cast	country
0	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States
1	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…	South Africa
2	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi…	NaN
3	TV Show	Jailbirds New Orleans	NaN	NaN	NaN
4	TV Show	Kota Factory	NaN	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K…	India

	date_added	release_year	rating	duration	listed_in
0	September 25, 2021	2020	PG-13	90	Documentaries
1	September 24, 2021	2021	TV-MA	2	International TV Shows, TV Dramas, TV Mysteries
2	September 24, 2021	2021	TV-MA	1	Crime TV Shows, International TV Shows, TV Act…
3	September 24, 2021	2021	TV-MA	1	Docuseries, Reality TV
4	September 24, 2021	2021	TV-MA	2	International TV Shows, Romantic TV Shows, TV …

[119]:

	type	title	director	cast	country
0	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States
1	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…	South Africa

```
2  Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi…             NaN
3                                                 NaN             NaN
4  Mayur More, Jitendra Kumar, Ranjan Raj, Alam K…           India

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

                                          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 …
```

0.0.1 Treating Missing Value

[120]:
```
df.isna().sum()
```

[120]:
```
type              0
title             0
director       2634
cast            825
country         831
date_added       10
release_year      0
rating            4
duration          3
listed_in         0
dtype: int64
```

1.rating-For Rating column we can calculate mean of rating for that listed_in and cast and director columns 2.duration-mean based on type 3.date-mode of month and date and for year use release year column 4.country-for country we can use director name to filter out country 5.cast-use director and type to filter 6.director-mode of director filtering by listed_in

[121]:
```
df['duration']=df['duration'].astype('Int64')
```

[122]:
```
def func(x,TVshow_duration_value,movie_duration_value):
    if pd.isna(x['duration']):
        if x['type']=='Movie':
            return movie_duration_value
        else:
            return TVshow_duration_value
```

```
    return x
```

[123]:
```
movie_duration_value=math.ceil(df.groupby('type')['duration'].
↪aggregate('mean')[0])
movie_duration_value
```

[123]: 100

[124]:
```
TVshow_duration_value=math.ceil(df.groupby('type')['duration'].
↪aggregate('mean')[1])
TVshow_duration_value
```

[124]: 2

[125]:
```
df=df.apply(func,args=[TVshow_duration_value,movie_duration_value],axis=1)
```

Replacing null value in rating column with mode

[126]:
```
df[df['rating'].isna()]
```

[126]:

	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in
5989	Movie	13TH: A Conversation with Oprah Winfrey & Ava …	NaN	Oprah Winfrey, Ava DuVernay	NaN	January 26, 2017	2017	NaN	37	Movies
6827	TV Show	Gargantia on the Verdurous Planet	NaN	Kaito Ishikawa, Hisako Kanemoto, Ai Kayano, Ka…	Japan	December 1, 2016	2013	NaN	1	Anime Series, International TV Shows
7312	TV Show	Little Lunch	NaN	Flynn Curry, Olivia Deeble, Madison Lu, Oisín …	Australia	February 1, 2018	2015	NaN	1	Kids' TV, TV Comedies
7537	Movie	My Honor Was Loyalty	Alessandro Pepe	Leone Frisa, Paolo Vaccarino, Francesco Miglio…	Italy	March 1, 2017	2015	NaN	115	Dramas

[127]:
```
#Director is also not present where rating is null so we will replace Null␣
↪value in Rating column with Mode
```

[128]:
```
df['rating'].fillna(df['rating'].mode()[0], inplace = True)
```

[129]:
```
df['rating'].isna().sum()
```

[129]:
```
0
```

converting Date to correct format

[130]:
```
df.head()
```

[130]:
```
      type                  title         director  \
0    Movie   Dick Johnson Is Dead  Kirsten Johnson
1  TV Show          Blood & Water              NaN
2  TV Show              Ganglands  Julien Leclercq
3  TV Show  Jailbirds New Orleans              NaN
4  TV Show           Kota Factory              NaN

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

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

                                      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 …
```

[131]:
```
temp={'January':'01','December':'12','September':'09','April':'04','February':
↪'02','June':'06','October':'10','May':'05','August':'08','March':'03','July':
↪'7','November':'11'}
```

[132]:
```
def func1(x):
    try:
        return pd.to_datetime(x.split(', ')[1]+'-'+str(temp[x.split(', ')[0].
↪split(' ')[0]])+'-'+x.split(', ')[0].split(' ')[1])
    except:
```

```
        return None
```

[133]:
```
df['date']=df.date_added.apply(func1)
```

[134]:
```
df['date']=df.date.fillna(df.date.mode()[0])
```

[135]:
```
df.date.isna().sum()
```

[135]: 0

[136]:
```
df.drop(columns='date_added',inplace=True)
```

[137]:
```
df.head()
```

[137]:

	type	title	director	cast	country	release_year	rating	duration	listed_in	date
0	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2020	PG-13	90	Documentaries	2021-09-25
1	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…	South Africa	2021	TV-MA	2	International TV Shows, TV Dramas, TV Mysteries	2021-09-24
2	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi…	NaN	2021	TV-MA	1	Crime TV Shows, International TV Shows, TV Act…	2021-09-24
3	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	2021	TV-MA	1	Docuseries, Reality TV	2021-09-24
4	TV Show	Kota Factory	NaN	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K…	India	2021	TV-MA	2	International TV Shows, Romantic TV Shows, TV …	2021-09-24

unnesting director for each title

[138]:
```
df_td=df[['title','director']]
df1=df_td['director'].str.split(',',expand=True).reset_index()
df_td=df_td.reset_index()
```

```
df_td=df_td.merge(df1,on='index')
df_td=pd.melt(frame=df_td,id_vars =['index','title','director'])
df_td.drop('variable',axis=1,inplace=True)
```

[139]:
```
def func(x):
    if x['value'].isna().sum()==13:
        x=x.drop_duplicates()
    else:
        x=x[~x['value'].isna()]
    return x
```

[140]:
```
df_td=df_td.groupby('title').apply(func)
df_td.drop('director',axis=1,inplace=True)
df_td=df_td.reset_index(drop=True)
df_td.columns=['index','title','directors']
df_td
```

[140]:

	index	title	directors
0	2036	#Alive	Cho Il
1	2304	#AnneFrank - Parallel Stories	Sabina Fedeli
2	2304	#AnneFrank - Parallel Stories	Anna Migotto
3	2481	#FriendButMarried	Rako Prijanto
4	2324	#FriendButMarried 2	Rako Prijanto
…	…	…	…
9604	6177		NaN
9605	4914		NaN
9606	7101		NaN
9607	5022		Hong-seon Kim
9608	7108	:	Young Jun Lee

[9609 rows x 3 columns]

unnesting Genre for each title

[141]:
```
df_tg=df[['title','listed_in']]
df1=df_tg['listed_in'].str.split(',',expand=True).reset_index()
df_tg=df_tg.reset_index()
df_tg=df_tg.merge(df1,on='index')
df_tg=pd.melt(frame=df_tg,id_vars =['index','title','listed_in'])
df_tg.drop('variable',axis=1,inplace=True)
```

[142]:
```
def func(x):
    if x['value'].isna().sum()==3:
        x=x.drop_duplicates()
    else:
        x=x[~x['value'].isna()]
    return x
```

[143]:
```
df_tg=df_tg.groupby('title').apply(func)
df_tg.drop('listed_in',axis=1,inplace=True)
df_tg=df_tg.reset_index(drop=True)
df_tg.columns=['index','title','genres']
df_tg
```

[143]:

	index	title	genres
0	2036	#Alive	Horror Movies
1	2036	#Alive	International Movies
2	2036	#Alive	Thrillers
3	2304	#AnneFrank - Parallel Stories	Documentaries
4	2304	#AnneFrank - Parallel Stories	International Movies
…	…	…	…
19315	7101		Stand-Up Comedy & Talk Shows
19316	5022		Dramas
19317	5022		International Movies
19318	5022		Thrillers
19319	7108	:	Children & Family Movies

[19320 rows x 3 columns]

unnesting cast for each title

[144]:
```
df_tc=df[['title','cast']]
df1=df_tc['cast'].str.split(',',expand=True).reset_index()
df_tc=df_tc.reset_index()
df_tc=df_tc.merge(df1,on='index')
df_tc=pd.melt(frame=df_tc,id_vars =['index','title','cast'])
df_tc.drop('variable',axis=1,inplace=True)
```

[145]:
```
def func(x):
    if x['value'].isna().sum()==50:
        x=x.drop_duplicates()
    else:
        x=x[~x['value'].isna()]
    return x
```

[146]:
```
df_tc=df_tc.groupby('title').apply(func)
df_tc.drop('cast',axis=1,inplace=True)
df_tc=df_tc.reset_index(drop=True)
df_tc.columns=['index','title','cast']
df_tc
```

[146]:

	index	title	cast
0	2036	#Alive	Yoo Ah-in
1	2036	#Alive	Park Shin-hye
2	2304	#AnneFrank - Parallel Stories	Helen Mirren

```
3       2304  #AnneFrank - Parallel Stories    Gengher Gatti
4       2481              #FriendButMarried   Adipati Dolken
…       …                              …              …
64943   7108                      :        Yang Jeong-hwa
64944   7108                      :         Jeon Tae-yeol
64945   7108                      :         Shin Yong-woo
64946   7108                      :          Lee So-young
64947   7108                      :               So-yeon

[64948 rows x 3 columns]
```

unnesting Country for each title

[147]:
```
df_tcc=df[['title','country']]
df1=df_tcc['country'].str.split(',',expand=True).reset_index()
df_tcc=df_tcc.reset_index()
df_tcc=df_tcc.merge(df1,on='index')
df_tcc=pd.melt(frame=df_tcc,id_vars =['index','title','country'])
df_tcc.drop('variable',axis=1,inplace=True)
```

[148]:
```
def func(x):
    if x['value'].isna().sum()==12:
        x=x.drop_duplicates()
    else:
        x=x[~x['value'].isna()]
    return x
```

[149]:
```
df_tcc=df_tcc.groupby('title').apply(func)
df_tcc.drop('country',axis=1,inplace=True)
df_tcc=df_tcc.reset_index(drop=True)
df_tcc.columns=['index','title','country']
df_tcc
```

[149]:
```
       index                          title      country
0       2036                         #Alive  South Korea
1       2304  #AnneFrank - Parallel Stories        Italy
2       2481              #FriendButMarried    Indonesia
3       2324           #FriendButMarried 2    Indonesia
4       5973                         #Roxy       Canada
…       …                              …           …
10842   6177                                      Japan
10843   4914                                         NaN
10844   7101                                 South Korea
10845   5022                                South Korea
10846   7108                      :               NaN

[10847 rows x 3 columns]
```

Avg Duration for TV-Show and Movies

[150]:
```
avg_duration=df[['type','duration']]
```

[151]:
```
avg_duration.type.unique()
```

[151]:
```
array(['Movie', 'TV Show', 100], dtype=object)
```

[152]:
```
avg_duration = avg_duration.drop(avg_duration[avg_duration['type']==100].index)
```

[153]:
```
avg_duration.groupby('type')['duration'].mean().reset_index()
```

[153]:

	type	duration
0	Movie	99.577187
1	TV Show	1.764948

0.0.2 Non-Graphical Analysis: Value counts and unique attributes

[154]:
```
df_tc.cast.value_counts()
```

[154]:
```
 Anupam Kher          39
 Rupa Bhimani         31
 Takahiro Sakurai     30
 Julie Tejwani        28
 Om Puri              27
                      ..
 Surbhi Mahendru       1
 Gerson Da Cunha       1
 Subhashini Ali        1
 Umesh Mehra           1
 So-yeon               1
Name: cast, Length: 39295, dtype: int64
```

[155]:
```
len(df_tc.cast.unique())        # No of Unique cast
```

[155]:
```
39296
```

[156]:
```
df_td.directors.value_counts()
```

[156]:
```
Rajiv Chilaka     22
 Jan Suter        18
Raúl Campos       18
Marcus Raboy      16
Suhas Kadav       16
                  ..
André Odendaal     1
 Johan Vorster     1
John Whitesell     1
```

```
Neri Parenti       1
Young Jun Lee      1
Name: directors, Length: 5119, dtype: int64
```

[157]:
```
len(df_td.directors.unique())      # No of Unique directors
```

[157]:
```
5120
```

[158]:
```
df_tcc['country'].value_counts()
```

[158]:
```
United States     3208
India             1008
United Kingdom     628
 United States     479
Canada             271
                   …
 Ecuador             1
 Botswana            1
Puerto Rico          1
 Vatican City        1
 Montenegro          1
Name: country, Length: 197, dtype: int64
```

[159]:
```
len(df_tcc.country.unique())      # No of Unique country
```

[159]:
```
198
```

[160]:
```
df_tg.genres.value_counts()
```

[160]:
```
 International Movies        2624
Dramas                       1600
Comedies                     1210
Action & Adventure            859
Documentaries                 829
                              …
Romantic Movies                 3
Spanish-Language TV Shows       2
Sports Movies                   1
TV Sci-Fi & Fantasy             1
LGBTQ Movies                    1
Name: genres, Length: 73, dtype: int64
```

[161]:
```
len(df_tg.genres.unique())      # No of Unique genre
```

[161]:
```
73
```

Merging all individual dataset

[162]:
```
df_tdc=df_td.merge(df_tc,on='title')
df_tdcg=df_tdc.merge(df_tg,on='title')
df_tdcgc=df_tdcg.merge(df_tcc,on='title')
```

```
C:\Users\raypr\AppData\Local\Temp\ipykernel_6324\1895487294.py:3: FutureWarning:
Passing 'suffixes' which cause duplicate columns {'index_x'} in the result is
deprecated and will raise a MergeError in a future version.
  df_tdcgc=df_tdcg.merge(df_tcc,on='title')
```

[163]:
```
df.drop(['director','cast','listed_in','country'],axis=1,inplace=True)
```

[164]:
```
df_combined=df_tdcgc.merge(df,on='title')
```

[165]:
```
df_combined.drop(['index_x','index_y'],axis=1,inplace=True)
```

[166]:
```
df_combined
```

[166]:

	title	directors	cast	genres	country	type	release_year	rating	duration	date
0	#Alive	Cho Il	Yoo Ah-in	Horror Movies	South Korea	Movie	2020	TV-MA	99	2020-09-08
1	#Alive	Cho Il	Yoo Ah-in	International Movies	South Korea	Movie	2020	TV-MA	99	2020-09-08
2	#Alive	Cho Il	Yoo Ah-in	Thrillers	South Korea	Movie	2020	TV-MA	99	2020-09-08
3	#Alive	Cho Il	Park Shin-hye	Horror Movies	South Korea	Movie	2020	TV-MA		
4	#Alive	Cho Il	Park Shin-hye	International Movies	South Korea	Movie	2020	TV-MA		
…	…	…	…	…	…	…	…	…		
202057	:	Young Jun Lee	Yang Jeong-hwa	Children & Family Movies	NaN	Movie	2018	TV-Y7		
202058	:	Young Jun Lee	Jeon Tae-yeol	Children & Family Movies	NaN	Movie	2018	TV-Y7		
202059	:	Young Jun Lee	Shin Yong-woo	Children & Family Movies	NaN	Movie	2018	TV-Y7		
202060	:	Young Jun Lee	Lee So-young	Children & Family Movies	NaN	Movie	2018	TV-Y7		
202061	:	Young Jun Lee	So-yeon	Children & Family Movies	NaN	Movie	2018	TV-Y7		

```
3              99 2020-09-08
4              99 2020-09-08
…           …         …
202057         68 2018-09-01
202058         68 2018-09-01
202059         68 2018-09-01
202060         68 2018-09-01
202061         68 2018-09-01

[202062 rows x 10 columns]
```

[167]:
```
df_combined[['country']].isna().sum()
```

[167]:
```
country    11897
dtype: int64
```

Fill Missing value in Cast and director column with mode

[168]:
```
df_combined['cast'].fillna(df_combined['cast'].mode()[0], inplace = True)
```

[169]:
```
df_combined['directors'].fillna(df_combined['directors'].mode()[0], inplace =␣
↪True)
```

Multiple Imputation for Country column

[170]:
```
df_temp=df_combined[['country','cast']]
df_temp=df_temp.groupby('cast', group_keys=False)['country'].agg(pd.Series.
↪mode).reset_index()
```

[171]:
```
def func(x,y,z):
    try:
        value=y.loc[y[y['cast']==x['cast']]['country'].index[0]]['country']
        if type(value)==str:
            x['country']=value
        elif type(value)==list and len(value)>0:
            x['country']=value[0]
        else:
            x['country']=z
    except:
        x['country']=z
    return x
```

[172]:
```
z=df_combined['country'].mode()[0]
df_combined[['cast','country']]=df_combined[['cast','country']].apply(lambda x:
↪func(x,df_temp,z) if(str(x[1]) == 'nan') else x, axis = 1)
```

[173]:
```
df_combined.isna().sum()
```

[173]:
```
title           0
directors       0
cast            0
genres          0
country         0
type            0
release_year    0
rating          0
duration        0
date            0
dtype: int64
```

[174]:
```
df_combined.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 202062 entries, 0 to 202061
Data columns (total 10 columns):
 #   Column        Non-Null Count   Dtype
---  ------        --------------   -----
 0   title         202062 non-null  object
 1   directors     202062 non-null  object
 2   cast          202062 non-null  object
 3   genres        202062 non-null  object
 4   country       202062 non-null  object
 5   type          202062 non-null  object
 6   release_year  202062 non-null  int64
 7   rating        202062 non-null  object
 8   duration      202062 non-null  int64
 9   date          202062 non-null  datetime64[ns]
dtypes: datetime64[ns](1), int64(2), object(7)
memory usage: 17.0+ MB
```

[175]:
```
df_combined.describe()
```

[175]:

	release_year	duration
count	202062.000000	202062.000000
mean	2013.448941	77.687873
std	9.013675	51.482097
min	1925.000000	1.000000
25%	2012.000000	4.000000
50%	2016.000000	95.000000
75%	2019.000000	112.000000
max	2021.000000	312.000000

[176]:
```
# we dont have features like Revenue,Views,other customer details so we will␣
↪use rating column in our analysis
```

0.0.3 Number of movies released per year

[177]:
```
df_movie=df_combined[['title','release_year','type','duration','rating']].
↪drop_duplicates()
```

[178]:
```
df_title_count=df_movie.groupby(['release_year','type'])['title'].nunique().
↪reset_index()
```

Converting Release_year to bins having 10 year gap

[179]:
```
def year_bin(df_title_count,cut_points,labels):
    ma=df_title_count.release_year.max()
    mi=df_title_count.release_year.min()
    break_points=[mi]+cut_points+[ma]
    Bin=pd.cut(df_title_count.
↪release_year,bins=break_points,labels=labels,include_lowest=True)
    return Bin
```

[180]:
```
cut_points=[1935,1945,1955,1965,1975,1985,1995,2005,2015]
labels=['1925-1935','1935-1945','1945-1955','1955-1965','1965-1975','1975-1985','1985-1995','1
df_title_count['bin_year']=year_bin(df_title_count,cut_points,labels)
```

[181]:
```
df_bin=df_title_count.groupby(['bin_year','type'])['title'].sum().reset_index()
```

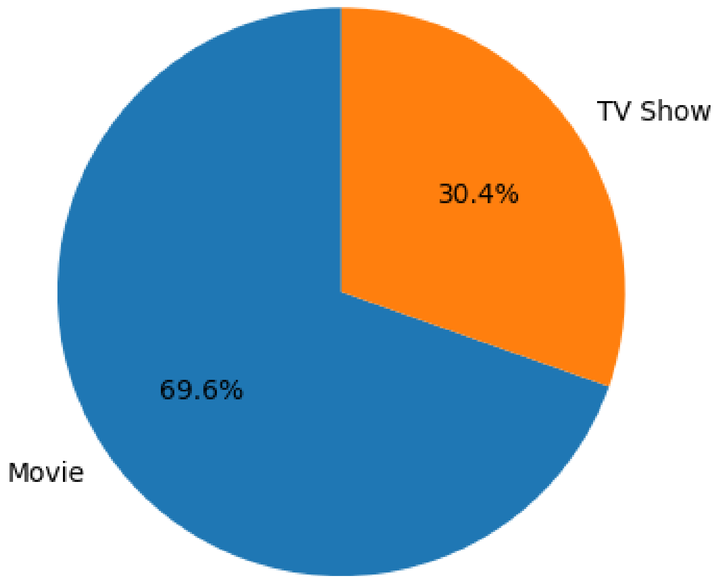
0.0.4 Comparison of tv shows vs. movies

[182]:
```
x=df_combined[['title','type']].drop_duplicates()
x=x.groupby('type')['title'].nunique().reset_index()
x
```

[182]:

	type	title
0	Movie	6128
1	TV Show	2676

[183]:
```
plt.pie(x['title'], labels = x['type'], autopct='%1.1f%%', startangle=90)
plt.show()
```



Here if we compare 2005-2015 with 2015-2023 movie has increased 107% and Tv show has increased 275%

[184]:
```
df_bin.pivot(index='type', columns='bin_year', values='title')
```

[184]:
```
bin_year  1925-1935  1935-1945  1945-1955  1955-1965  1965-1975  1975-1985  \
type
Movie             0         11          7         19         44        104
TV Show           1          1          1          1          3          4

bin_year  1985-1995  1995-2005  2005-2015  2015-2023
type
Movie           172        409       1744       3618
TV Show          20         66        542       2037
```

->>

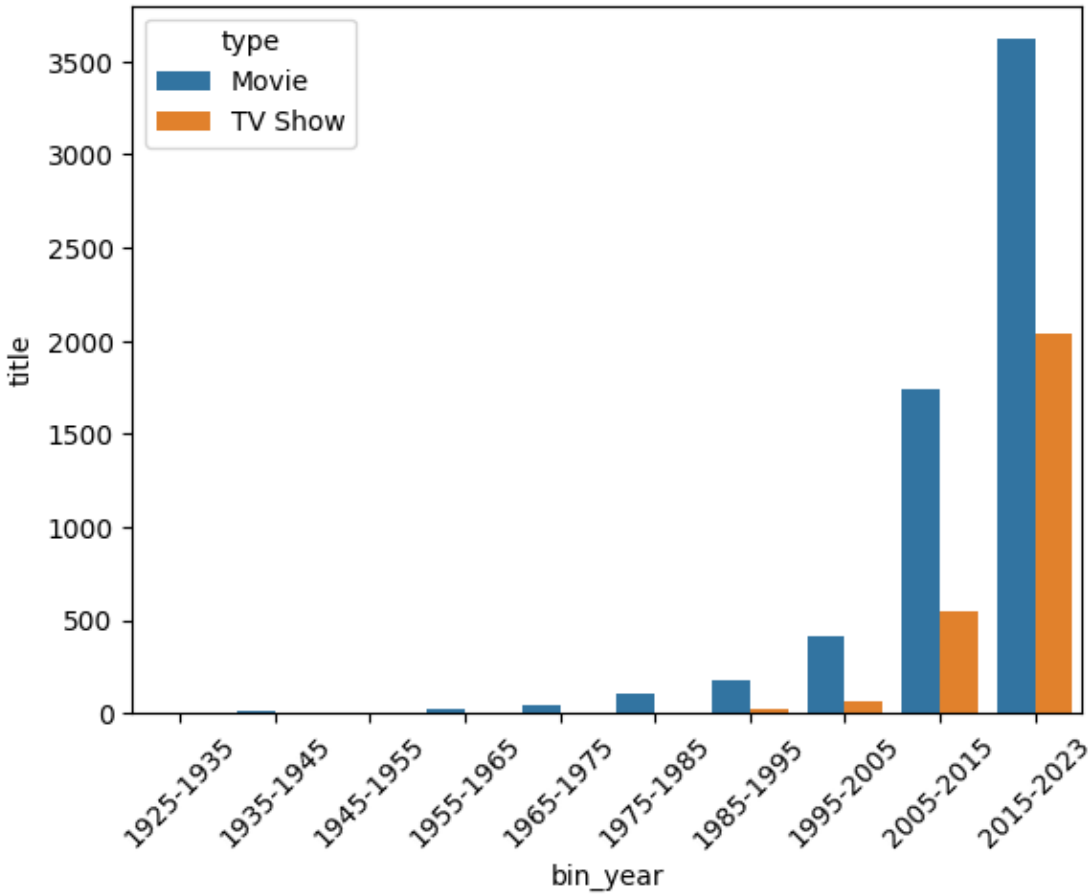
[185]:
```
movie_percentage_increment=(3618-1744)/1744*100
movie_percentage_increment
```

[185]:
```
107.45412844036697
```

[186]:
```
Tvshow_percentage_increment=(2037-542)/542*100
Tvshow_percentage_increment
```

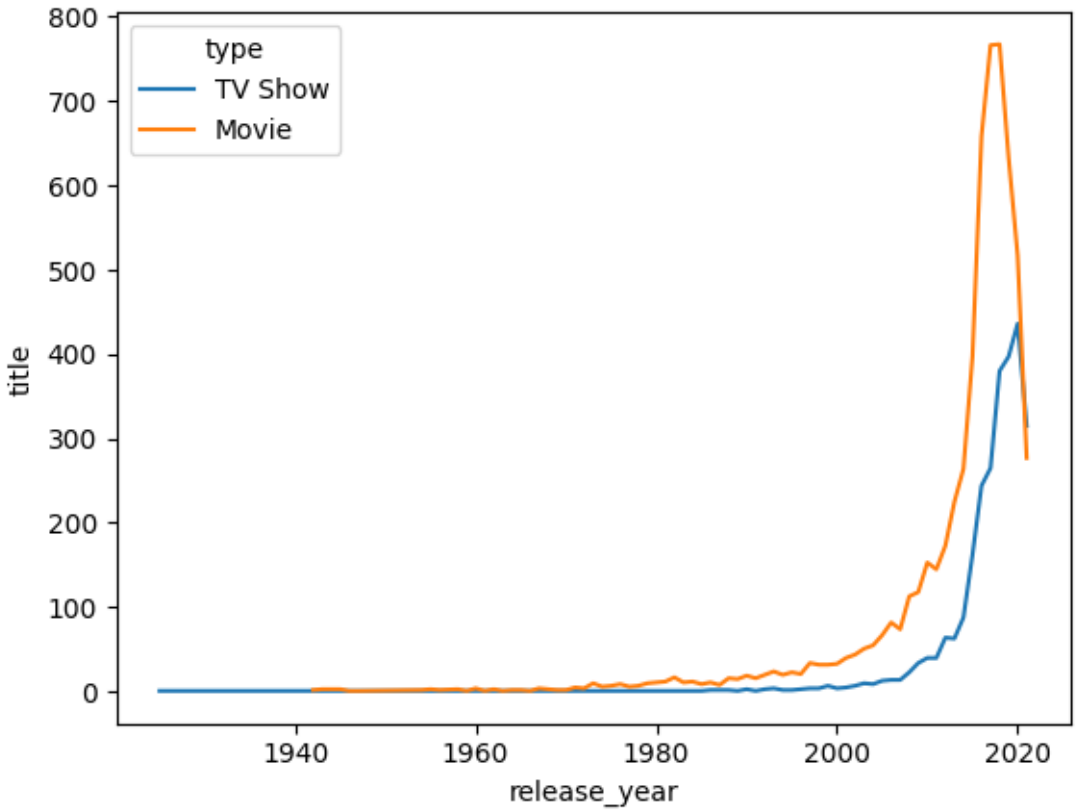
[186]: 275.83025830258305

[187]:
```
sns.barplot(data=df_bin, x='bin_year', y='title', hue='type')
plt.xticks(rotation=45)
plt.show()
```



In recent year TV Show has increased 275% and Movies has increased 107% that means Netflix has more focus on TV Shows than movies in recent years

[188]:
```
sns.lineplot(data=df_title_count, x='release_year', y="title",hue='type')
plt.show()
```



Best time to launch a TV show

Netflix is Launching maximum of TV Show in January and december

[189]:
```
df_combined[df_combined['type']=='TV Show']['date'].dt.month.
↪reset_index(drop=True).value_counts()
```

[189]:
```
1     5687
12    5341
7     5129
8     5029
6     4959
9     4818
4     4460
11    4428
3     4201
10    4199
5     4111
2     3786
Name: date, dtype: int64
```

0.0.5 Understanding what content is available in different countries

According to the data that india has high demand for international Movies.

[190]:
```
data_cg=df_combined.groupby(['country','genres'])['title'].nunique().
↪reset_index()
data_cg.columns=['country','genres','movie_count']
data_cg.sort_values('movie_count',ascending=False).head(10)
```

[190]:

	country	genres	movie_count
1560	India	International Movies	837
2423	United States	Documentaries	496
2425	United States	Dramas	495
2420	United States	Comedies	433
1589	India	Dramas	415
2417	United States	Children & Family Movies	406
2413	United States	Action & Adventure	357
2388	United States	Independent Movies	329
2385	United States	Dramas	275
1584	India	Comedies	274

Demands in United States

[191]:
```
data_cg[data_cg['country']=='United States'].
↪sort_values('movie_count',ascending=False).head()
```

[191]:

	country	genres	movie_count
2423	United States	Documentaries	496
2425	United States	Dramas	495
2420	United States	Comedies	433
2417	United States	Children & Family Movies	406
2413	United States	Action & Adventure	357

Highest demands in each Country

[192]:
```
temp=data_cg.groupby('country')['movie_count'].max().reset_index()
temp.sort_values('movie_count',ascending=False).head()
```

[192]:

	country	movie_count
141	India	837
191	United States	496
190	United Kingdom	219
148	Japan	154
179	South Korea	138

[193]:
```
data_cg.groupby('country',as_index=False).max().
↪sort_values('movie_count',ascending=False).head()
```

[193]:
```
             country           genres  movie_count
141            India         TV Shows          837
191    United States        Thrillers          496
190   United Kingdom        Thrillers          219
148            Japan         TV Shows          154
179      South Korea  Stand-Up Comedy          138
```

0.0.6 which rating show increasing these days

[194]:
```
df_movie['rating'].unique()
```

[194]:
```
array(['TV-MA', 'TV-14', 'TV-G', 'TV-PG', 'NR', 'PG-13', 'TV-Y', 'R',
       'TV-Y7', 'PG', 'G', 'NC-17', 'TV-Y7-FV', 'UR'], dtype=object)
```

[195]:
```
df_title_count_rating=df_movie.groupby(['release_year','rating'])['title'].
↪count().reset_index()
df_title_count_rating.sort_values('title',ascending=False)
```

[195]:
```
     release_year rating  title
403          2018  TV-MA    549
414          2019  TV-MA    500
424          2020  TV-MA    469
391          2017  TV-MA    452
378          2016  TV-MA    341
..            …    …     …
199          1997  TV-Y7      1
103          1983     PG      1
97           1981  TV-Y7      1
96           1981  TV-PG      1
0            1925  TV-14      1

[437 rows x 3 columns]
```

[196]:
```
df_title_count_rating['bin_year']=year_bin(df_title_count_rating,cut_points,labels)
```

[197]:
```
df_title_count_rating
```

[197]:
```
     release_year rating  title   bin_year
0            1925  TV-14      1  1925-1935
1            1942  TV-14      2  1935-1945
2            1943  TV-PG      3  1935-1945
3            1944  TV-14      2  1935-1945
4            1944  TV-PG      1  1935-1945
..            …    …     …        …
432          2021   TV-G     21  2015-2023
433          2021  TV-MA    270  2015-2023
434          2021  TV-PG     45  2015-2023
```

```
435          2021    TV-Y     26  2015-2023
436          2021   TV-Y7     33  2015-2023

[437 rows x 4 columns]
```

[198]:
```
df_rating_bin=df_title_count_rating.groupby(['bin_year','rating'])['title'].
↪sum().reset_index()
```

[199]:
```
df_rating_bin.pivot(index='rating', columns='bin_year', values='title').
↪sort_values('2015-2023',ascending=False)
```

[199]:

rating	1925-1935	1935-1945	1945-1955	1955-1965	1965-1975	1975-1985
TV-MA	0	2	0	1	7	17
TV-14	1	6	3	9	11	38
TV-PG	0	4	3	4	6	11
R	0	0	0	1	10	15
TV-Y	0	0	0	0	0	0
TV-Y7	0	0	0	0	0	1
TV-G	0	0	1	0	1	1
PG-13	0	0	1	1	1	2
PG	0	0	0	0	4	20
NR	0	0	0	1	1	2
G	0	0	0	3	5	1
TV-Y7-FV	0	0	0	0	0	0
NC-17	0	0	0	0	0	0
UR	0	0	0	0	1	0

rating	1985-1995	1995-2005	2005-2015	2015-2023
TV-MA	22	51	530	2581
TV-14	43	104	631	1314
TV-PG	19	39	241	536
R	41	111	302	319
TV-Y	1	3	65	238
TV-Y7	2	17	94	220
TV-G	4	6	44	163
PG-13	34	95	206	150
PG	19	35	111	98
NR	3	2	48	23
G	4	12	8	8
TV-Y7-FV	0	0	3	3
NC-17	0	0	2	1
UR	0	0	1	1

TV-MA and TV-14 has increased 386% and 108% in recent years *TV-MA is specifically designed to be viewed by adults and therefore may be unsuitable for children under 17

[200]:
```
(2581-530)/530*100   #using value of TV-MA in year 2005-2023 from above table
```

[200]:
```
386.9811320754717
```

[201]:
```
(1314-631)/631*100   #using value of TV-14 in year 2005-2023 from above table
```

[201]:
```
108.24088748019018
```

Actor and Directors

[202]:
```
# Top 5 Cast
df_combined.groupby('cast')['title'].nunique().reset_index().
 ↪sort_values('title',ascending=False).head()
```

[202]:

	cast	title
1205	Alfred Molina	841
2612	Anupam Kher	39
26941	Rupa Bhimani	31
30303	Takahiro Sakurai	30
15541	Julie Tejwani	28

[203]:
```
#Top 5 Directors
df_combined.groupby('directors')['title'].nunique().reset_index().
 ↪sort_values('title',ascending=False).head()
```

[203]:

	directors	title
3305	Martin Scorsese	2646
4019	Rajiv Chilaka	22
261	Jan Suter	18
4066	Raúl Campos	18
4650	Suhas Kadav	16

[204]:
```
# Top 5 Cast for each country
df_combined.groupby(['country','cast'])['title'].nunique().reset_index().
 ↪sort_values('title',ascending=False).head()
```

[204]:

	country	cast	title
42243	United States	Alfred Molina	531
38836	United Kingdom	Alfred Molina	82
12008	United States	Alfred Molina	46
24008	India	Anupam Kher	36
23818	India	Alfred Molina	32

[205]:
```
# Top 5 directors for each country
df_combined.groupby(['directors','country'])['title'].nunique().reset_index().
 ↪sort_values('title',ascending=False).head()
```

[205]:
```
            directors         country  title
4860  Martin Scorsese   United States   1267
4859  Martin Scorsese  United Kingdom    252
4829  Martin Scorsese           Japan    190
4850  Martin Scorsese     South Korea    179
4824  Martin Scorsese           India    101
```

[206]:
```
# Top 5 geners for each country
df_combined.groupby(['genres','country'])['title'].nunique().reset_index().
↪sort_values('title',ascending=False).head()
```

[206]:
```
                    genres        country  title
533    International Movies          India    837
1917          Documentaries  United States    496
2094                Dramas  United States    495
1741               Comedies  United States    433
2055                Dramas          India    415
```

[207]:
```
#Top 5 Actor and Director Combination
df_combined.groupby(['directors','cast'])['title'].nunique().reset_index().
↪sort_values('title',ascending=False).head()
```

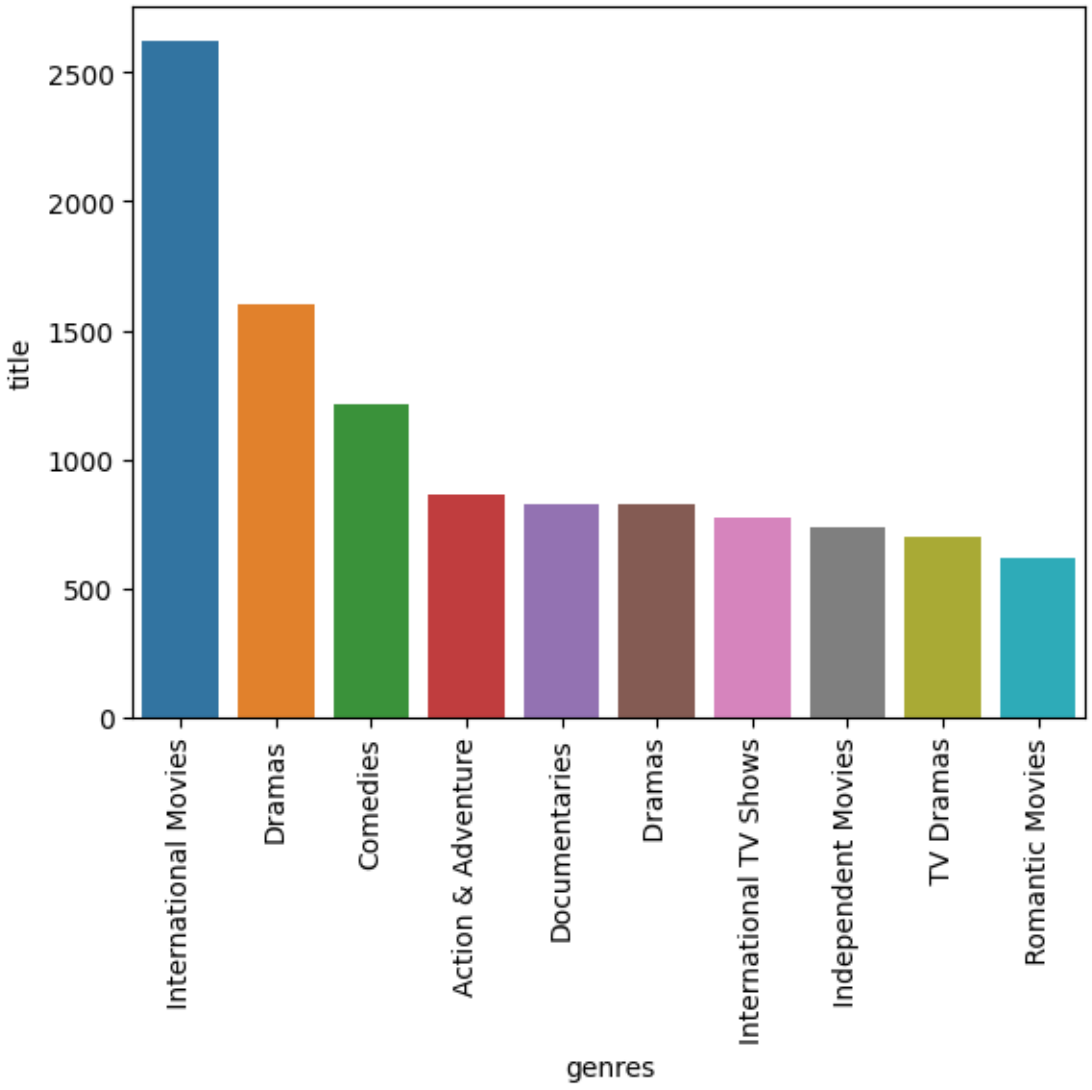
[207]:
```
            directors              cast  title
30625  Martin Scorsese     Alfred Molina    353
41525  Martin Scorsese   Takahiro Sakurai     23
52124    Rajiv Chilaka     Julie Tejwani     19
52128    Rajiv Chilaka       Rajesh Kava     19
52129    Rajiv Chilaka      Rupa Bhimani     18
```

0.0.7 which genre has howmany no of movie

[208]:
```
# Top 5 geners for each country
x1=df_combined.groupby('genres')['title'].nunique().reset_index().
↪sort_values('title',ascending=False).head(10)
x1
```

[208]:
```
                    genres  title
13    International Movies   2624
49                  Dramas   1600
44                Comedies   1210
37     Action & Adventure    859
47           Documentaries    829
9                   Dramas    827
53  International TV Shows    774
12     Independent Movies    736
30               TV Dramas    696
20         Romantic Movies    613
```

[209]:
```
sns.barplot(data=x1, x="genres", y="title")
plt.xticks(rotation=90)
plt.show()
```



[210]:
```
# Top 5 geners for each country
x1=df_combined.groupby(['country','genres'])['title'].nunique().reset_index().
 ↪sort_values('title',ascending=False)
x_india=x1[x1['country']=='India'].head(10)
x_us=x1[x1['country']=='United States'].head(10)
```

[211]:
```
x_india
```

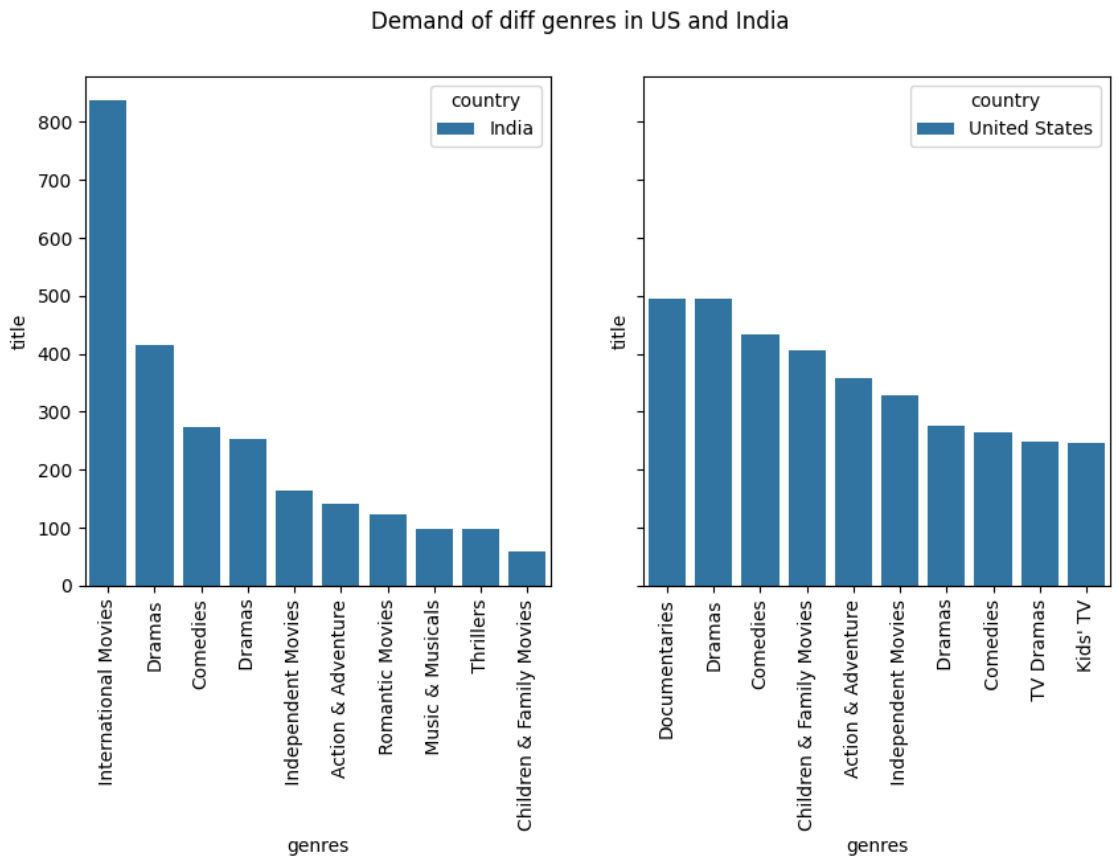
[211]:

	country	genres	title
1560	India	International Movies	837
1589	India	Dramas	415
1584	India	Comedies	274
1556	India	Dramas	254
1559	India	Independent Movies	163
1580	India	Action & Adventure	141
1565	India	Romantic Movies	122
1563	India	Music & Musicals	98
1579	India	Thrillers	98
1582	India	Children & Family Movies	60

[212]:
```
fig, axes = plt.subplots(1, 2, figsize=(10, 5), sharey=True)
fig.suptitle('Demand of diff genres in US and India')

sns.barplot(ax=axes[0],data=x_india, x="genres", y="title",hue='country')
axes[0].set_xticklabels(x_india['genres'],rotation=90)

sns.barplot(ax=axes[1],data=x_us, x="genres", y="title",hue='country')
axes[1].set_xticklabels(x_us['genres'],rotation=90)
plt.show()
```



0.0.8 Which genres increased these Years

[213]:
```
df_genre=df_combined[['title','release_year','genres']].drop_duplicates()
```

[214]:
```
df_genre_count=df_genre.groupby(['release_year','genres'])['title'].nunique().
↪reset_index()
```

[215]:
```
df_genre_count['bin_year']=year_bin(df_genre_count,cut_points,labels)
```

[216]:
```
df_bin=df_genre_count.groupby(['bin_year','genres'])['title'].sum().
↪reset_index()
```

[217]:
```
df_genre_bin=df_bin.pivot(index='genres', columns='bin_year', values='title').
↪sort_values('2015-2023',ascending=False).head()
df_genre_bin
```

[217]:
```
bin_year               1925-1935  1935-1945  1945-1955  1955-1965  1965-1975  \
genres
 International Movies          0          0          1          7         20
Dramas                         0          0          0          1          4
Comedies                       0          0          0          2          4
Documentaries                  0          2          0          0          2
International TV Shows         0          0          0          0          1

bin_year               1975-1985  1985-1995  1995-2005  2005-2015  2015-2023
genres
 International Movies         54         46        145        802       1549
Dramas                        20         36         99        479        961
Comedies                      19         23        110        409        643
Documentaries                  3          4         12        165        641
International TV Shows         0          0         16        191        566
```

->>

Documentaries and international TV Shows has increased 288% and 196% recent years

[218]:
```
(641-165)/165*100
```

[218]: 288.4848484848485

[219]:
```
(566-191)/191*100
```

[219]: 196.3350785340314

[220]:
```
df_genre_bin.index
```

[220]:
```
Index([' International Movies', 'Dramas', 'Comedies', 'Documentaries',
       'International TV Shows'],
      dtype='object', name='genres')
```

0.0.9 Recomendation

*As we dont have Production Budget,Revenue,Views,Rating etc. so we will assume that whatever data we have is working for netflix

1.We should focus on Documentaries and international TV Shows as it has increased 288% and 196% recent years

2.In US demand for Documentaries has increased these recent years

3.TV-MA and TV-14 has increased 386% and 108% in recent years

4.In India high demand for international Movies

5.TV_Shows Increased 275% in 10 years

6.Duration for movies should be 99 min and tv_shows must be of 2 seasons

7.Director Martin Scorsese must make more movies

8.Actor Alfred Molina has more movies

9.Director Martin Scorsese,Actor Alfred Molina has more movies

[ ]: