```
from google.colab import files
files.upload()
```

```
!unzip netflix_titles.zip
```

```
Archive:  netflix_titles.zip
  inflating: netflix_titles.csv
```

Exploratory Analysis

import library and read csv file

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

df=pd.read_csv('netflix_titles.csv')
df.head()
```

	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...

```
df.info() # checking datatype  and row count
```

```
<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
```

```
df.loc[df.duplicated()] # checking duplicate data
```

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description

```
# we didnt find any duplicated data , now checking unique value per coulmn
for i in df.columns:
  print(i,':',df[i].nunique())
```

```
show_id : 8807
type : 2
title : 8807
director : 4528
cast : 7692
country : 748
date_added : 1767
release_year : 74
rating : 17
duration : 220
listed_in : 514
description : 8775
```

checking null values in data

```
df.isnull().sum()
```

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

unnesting the directors column, i.e- creating separate lines for each director in a movie

```
d1= df['director'].apply(lambda x: str(x).split(',')).tolist()
df1= pd.DataFrame(d1,index=df['title'])
df1=df1.stack()
directordf= pd.DataFrame(df1.reset_index())
directordf.rename(columns={0:'Directors'},inplace=True)
directordf.drop(['level_1'],axis=1,inplace=True)
directordf.head()
```

	title	Directors
0	Dick Johnson Is Dead	Kirsten Johnson
1	Blood & Water	nan
2	Ganglands	Julien Leclercq
3	Jailbirds New Orleans	nan
4	Kota Factory	nan

unnesting the cast column, i.e- creating separate lines for each cast member in a movie

```
castdf = df['cast'].apply(lambda x:str(x).split(',')).tolist()
castdf = pd.DataFrame(castdf,index=df['title'])
castdf = castdf.stack()
castdf = pd.DataFrame(castdf.reset_index())
castdf.rename(columns={0:'Actors'},inplace=True)
castdf.drop(['level_1'],axis=1,inplace=True)
castdf.head()
```

	title	Actors
0	Dick Johnson Is Dead	nan
1	Blood & Water	Ama Qamata
2	Blood & Water	Khosi Ngema
3	Blood & Water	Gail Mabalane
4	Blood & Water	Thabang Molaba

unnesting the listed_in column, i.e- creating separate lines for each genre in a movie

```
genredf = df['listed_in'].apply(lambda x: str(x).split(',')).tolist()
genredf = pd.DataFrame(genredf,index=df['title'])
genredf = genredf.stack()
genredf = pd.DataFrame(genredf.reset_index())
genredf.rename(columns={0:'Genre'},inplace=True)
genredf.drop(['level_1'],axis=1,inplace=True)
genredf.head()
```

	title	Genre
0	Dick Johnson Is Dead	Documentaries
1	Blood & Water	International TV Shows
2	Blood & Water	TV Dramas
3	Blood & Water	TV Mysteries
4	Ganglands	Crime TV Shows

unnesting the country column, i.e- creating separate lines for each country in a movie

```
countrydf = df['country'].apply(lambda x: str(x).split(',')).tolist()
countrydf = pd.DataFrame(countrydf,index=df['title'])
countrydf = countrydf.stack()
countrydf = pd.DataFrame(countrydf.reset_index())
countrydf.rename(columns={0:'Country'},inplace=True)
countrydf.drop(['level_1'],axis=1,inplace=True)
countrydf.head()
```

	title	Country
0	Dick Johnson Is Dead	United States
1	Blood & Water	South Africa
2	Ganglands	nan
3	Jailbirds New Orleans	nan
4	Kota Factory	India

merging the unnested director data with unnested actors data, country, genre data

```
from functools import reduce
dfs =[directordf,castdf,genredf,countrydf]
df_merged = reduce(lambda  x,y: pd.merge(x,y,on=['title'],how='inner'), dfs)
df_merged.head()
```

	title	Directors	Actors	Genre	Country
0	Dick Johnson Is Dead	Kirsten Johnson	nan	Documentaries	United States
1	Blood & Water	nan	Ama Qamata	International TV Shows	South Africa
2	Blood & Water	nan	Ama Qamata	TV Dramas	South Africa
3	Blood & Water	nan	Ama Qamata	TV Mysteries	South Africa
4	Blood & Water	nan	Khosi Ngema	International TV Shows	South Africa

merge with original data by selecting required columns

```
final_df = df_merged.merge(df[['show_id','type','date_added','release_year','title','rating','duration','description']],on=['title'],how='le
final_df.head()
```

	title	Directors	Actors	Genre	Country	show_id	type	date_added	release_year	rating	duration	description
0	Dick Johnson Is Dead	Kirsten Johnson	nan	Documentaries	United States	s1	Movie	September 25, 2021	2020	PG-13	90 min	As her father nears the end of his life, filmm...
1	Blood & Water	nan	Ama Qamata	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
2	Blood & Water	nan	Ama Qamata	TV Dramas	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
3	Blood & Water	nan	Ama Qamata	TV Mysteries	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
4	Blood & Water	nan	Khosi Ngema	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...

```
final_df.isnull().sum() # checking null values now
```

```
title             0
Directors         0
Actors            0
Genre             0
Country           0
show_id           0
type              0
date_added      158
release_year      0
rating           67
duration          3
description       0
dtype: int64
```

In duration column, it was observed that the nulls had values which were written in corresponding ratings column, i.e- you can't expect ratings to be in min. So the duration column nulls are replaced by corresponding values in ratings column

```
final_df['rating'].unique()
```

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

we have observed that few values of duration are shited to rating columns respectively , so we are getting back those duration value into duration column from rating column.

```
final_df.loc[final_df['duration'].isnull(),'duration'] = final_df.loc[final_df['duration'].isnull(),'duration'].fillna(final_df['rating']) #
final_df.loc[final_df['rating'].str.contains('min',na=False),'rating'] ='NR' # replacing value in place min to NR
final_df.isnull().sum()
```

```
title             0
Directors         0
Actors            0
Genre             0
Country           0
show_id           0
type              0
date_added      158
release_year      0
rating           67
duration          0
description       0
dtype: int64
```

```
#Ratings can't be in min, so it has been made NR(i.e- Non Rated)
final_df.loc[final_df['rating'].str.contains('min', na=False),'rating']='NR'
final_df['rating'].fillna('NR',inplace=True)
pd.set_option('display.max_rows',None)
```

```
final_df.isnull().sum()
```

```
title             0
Directors         0
Actors            0
Genre             0
Country           0
show_id           0
type              0
date_added      158
release_year      0
rating            0
duration          0
description       0
dtype: int64
```

```
#just an attempt to observe nulls in date_added column
final_df[final_df['date_added'].isnull()].head()
```

	title	Directors	Actors	Genre	Country	show_id	type	date_added	release_year	rating	duration	description
136940	A Young Doctor's Notebook and Other Stories	nan	Daniel Radcliffe	British TV Shows	United Kingdom	s6067	TV Show	NaN	2013	TV-MA	2 Seasons	Set during the Russian Revolution, this comic ...
136941	A Young Doctor's Notebook and Other Stories	nan	Daniel Radcliffe	TV Comedies	United Kingdom	s6067	TV Show	NaN	2013	TV-MA	2 Seasons	Set during the Russian Revolution, this comic ...
136942	A Young Doctor's Notebook and Other Stories	nan	Daniel Radcliffe	TV Dramas	United Kingdom	s6067	TV Show	NaN	2013	TV-MA	2 Seasons	Set during the Russian Revolution, this comic ...
136943	A Young Doctor's Notebook and Other Stories	nan	Jon Hamm	British TV Shows	United Kingdom	s6067	TV Show	NaN	2013	TV-MA	2 Seasons	Set during the Russian Revolution, this comic ...
136944	A Young Doctor's Notebook and Other Stories	nan	Jon Hamm	TV Comedies	United Kingdom	s6067	TV Show	NaN	2013	TV-MA	2 Seasons	Set during the Russian Revolution, this comic ...

date_added filling null with imputed data

```
#date added column is imputed on the basis of release year,i.e- suppose there's a null for date_added
#when release year was 2013.So below piece of code just checks the mode of date added for release year=2013
# and imputes in place of nulls the corresponding mode

for i in final_df.loc[final_df['date_added'].isnull()]['release_year'].unique():

  imp = final_df.loc[final_df['release_year']==i]['date_added'].mode().values[0]
  final_df.loc[final_df['release_year']==i,'date_added'] = final_df.loc[final_df['release_year']==i,'date_added'].fillna(imp)


#country column is imputed on the basis of director,i.e- suppose there's a null for country
#when we have a director whose other movies have a country given.So below piece of code just checks the mode of
#country for the director
# and imputes in place of nulls the corresponding mode

for i in final_df[final_df['Country'].isnull()]['Directors'].unique():
  if i in final_df[~final_df['Country'].isnull()]['Directors'].unique():
    imp=final_df[final_df['Directors']==i]['Country'].mode().values[0]
    final_df.loc[final_df['Directors']==i,'Country']=final_df.loc[final_df['Directors']==i,'Country'].fillna(imp)



# filling country data with impute
for i in final_df[final_df['Country'].isnull()]['Actors'].unique():
  if i in final_df[~final_df['Country'].isnull()]['Actors'].unique():
    imp=final_df[final_df['Actors']==i]['Country'].mode().values[0]
    final_df.loc[final_df['Actors']==i,'Country']=final_df.loc[final_df['Actors']==i,'Country'].fillna(imp)
#If there are still nulls, I just replace it by Unknown Country
final_df['Country'].fillna('Unknown Country',inplace=True)
final_df.isnull().sum()
```

```
title           0
Directors       0
Actors          0
Genre           0
Country         0
show_id         0
type            0
date_added      0
release_year    0
rating          0
duration        0
description     0
dtype: int64
```

replace NAN value in actors , director columns

```
final_df['Actors'].isna().sum()
```

```
0
```

```
final_df['Actors'].fillna('Unknown Actor',inplace=True)
final_df.head()
```

	title	Directors	Actors	Genre	Country	show_id	type	date_added	release_year	rating	duration	description
0	Dick Johnson Is Dead	Kirsten Johnson	nan	Documentaries	United States	s1	Movie	September 25, 2021	2020	PG-13	90 min	As her father nears the end of his life, filmm...
1	Blood & Water	nan	Ama Qamata	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
2	Blood & Water	nan	Ama Qamata	TV Dramas	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
3	Blood & Water	nan	Ama Qamata	TV Mysteries	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
4	Blood & Water	nan	Khosi Ngema	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...

```
final_df['Actors'].replace('nan','Unknown Actor',inplace=True) # replaced 'nan' with unknown actor
final_df['Directors'].replace('nan','Unkown Director', inplace=True) # replaced 'nan' with unkown director
final_df['Country'].replace('nan','Unkown Country',inplace=True) # replaced 'nan' with unkown country
```

```
final_df.isnull().sum() # finally null value handled
```

```
title           0
Directors       0
Actors          0
Genre           0
Country         0
show_id         0
type            0
date_added      0
release_year    0
rating          0
duration        0
description     0
dtype: int64
```

Duration seems not in proper format , need to work on this

```
final_df['duration'].value_counts()
```

```
1 Season      35035
2 Seasons      9559
3 Seasons      5084
94 min         4343
106 min        4040
97 min         3624
95 min         3560
96 min         3511
93 min         3480
90 min         3305
105 min        3209
107 min        3103
101 min        3048
102 min        3017
103 min        2985
98 min         2984
99 min         2956
91 min         2915
92 min         2863
104 min        2822
88 min         2781
110 min        2711
100 min        2699
108 min        2614
```

```
112 min       2594
85 min        2486
89 min        2420
86 min        2213
4 Seasons     2134
116 min       2122
118 min       2119
87 min        2089
119 min       2075
109 min       2020
113 min       1990
120 min       1845
117 min       1770
121 min       1728
5 Seasons     1698
111 min       1667
124 min       1590
114 min       1529
127 min       1505
115 min       1444
123 min       1398
125 min       1299
122 min       1298
84 min        1268
128 min       1241
130 min       1216
126 min       1205
81 min        1203
83 min        1192
133 min       1169
137 min       1122
82 min        1100
136 min       1092
132 min       1047
```

```
#replace min with empty string
final_df['duration'] = final_df['duration'].str.replace('min',"")
final_df.head()
```

	title	Directors	Actors	Genre	Country	show_id	type	date_added	release_year	rating	duration	description
0	Dick Johnson Is Dead	Kirsten Johnson	Unknown Actor	Documentaries	United States	s1	Movie	September 25, 2021	2020	PG-13	90	As her father nears the end of his life, filmm...
1	Blood & Water	Unkown Director	Ama Qamata	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
2	Blood & Water	Unkown Director	Ama Qamata	TV Dramas	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
3	Blood & Water	Unkown Director	Ama Qamata	TV Mysteries	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
4	Blood & Water	Unkown Director	Khosi Ngema	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...

```
final_df['duration'].unique()
```

```
array(['90 ', '2 Seasons', '1 Season', '91 ', '125 ', '9 Seasons', '104 ',
       '127 ', '4 Seasons', '67 ', '94 ', '5 Seasons', '161 ', '61 ',
       '166 ', '147 ', '103 ', '97 ', '106 ', '111 ', '3 Seasons', '110 ',
       '105 ', '96 ', '124 ', '116 ', '98 ', '23 ', '115 ', '122 ', '99 ',
       '88 ', '100 ', '6 Seasons', '102 ', '93 ', '95 ', '85 ', '83 ',
       '113 ', '13 ', '182 ', '48 ', '145 ', '87 ', '92 ', '80 ', '117 ',
       '128 ', '119 ', '143 ', '114 ', '118 ', '108 ', '63 ', '121 ',
       '142 ', '154 ', '120 ', '82 ', '109 ', '101 ', '86 ', '229 ',
       '76 ', '89 ', '156 ', '112 ', '107 ', '129 ', '135 ', '136 ',
       '165 ', '150 ', '133 ', '70 ', '84 ', '140 ', '78 ', '7 Seasons',
       '64 ', '59 ', '139 ', '69 ', '148 ', '189 ', '141 ', '130 ',
       '138 ', '81 ', '132 ', '10 Seasons', '123 ', '65 ', '68 ', '66 ',
       '62 ', '74 ', '131 ', '39 ', '46 ', '38 ', '8 Seasons',
       '17 Seasons', '126 ', '155 ', '159 ', '137 ', '12 ', '273 ', '36 ',
       '34 ', '77 ', '60 ', '49 ', '58 ', '72 ', '204 ', '212 ', '25 ',
       '73 ', '29 ', '47 ', '32 ', '35 ', '71 ', '149 ', '33 ', '15 ',
       '54 ', '224 ', '162 ', '37 ', '75 ', '79 ', '55 ', '158 ', '164 ',
       '173 ', '181 ', '185 ', '21 ', '24 ', '51 ', '151 ', '42 ', '22 ',
       '134 ', '177 ', '13 Seasons', '52 ', '14 ', '53 ', '8 ', '57 ',
       '28 ', '50 ', '9 ', '26 ', '45 ', '171 ', '27 ', '44 ', '146 ',
       '20 ', '157 ', '17 ', '203 ', '41 ', '30 ', '194 ', '15 Seasons',
       '233 ', '237 ', '230 ', '195 ', '253 ', '152 ', '190 ', '160 ',
       '208 ', '180 ', '144 ', '5 ', '174 ', '170 ', '192 ', '209 ',
       '187 ', '172 ', '16 ', '186 ', '11 ', '193 ', '176 ', '56 ',
       '169 ', '40 ', '10 ', '3 ', '168 ', '312 ', '153 ', '214 ', '31 ',
       '163 ', '19 ', '12 Seasons', '179 ', '11 Seasons', '43 ', '200 ',
       '196 ', '167 ', '178 ', '228 ', '18 ', '205 ', '201 ', '191 '],
      dtype=object)
```

```
final_df['duration_copy'] = final_df['duration'].copy() # creating copy handle 'season' value in duration column
final_df1 = final_df.copy()
```

Now we will do the opeation on copy of original data for analysis

```
final_df1.loc[final_df1['duration_copy'].str.contains('Season'),'duration_copy']=0
final_df1['duration_copy'] = final_df1['duration_copy'].astype('int')
final_df1.head()
```

	title	Directors	Actors	Genre	Country	show_id	type	date_added	release_year	rating	duration	description	duration_
0	Dick Johnson Is Dead	Kirsten Johnson	Unknown Actor	Documentaries	United States	s1	Movie	September 25, 2021	2020	PG-13	90	As her father nears the end of his life, filmm...	
1	Blood & Water	Unkown Director	Ama Qamata	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	
2	Blood & Water	Unkown Director	Ama Qamata	TV Dramas	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	
3	Blood & Water	Unkown Director	Ama Qamata	TV Mysteries	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape	
4	Blood &	Unkown	Khosi	International	South	s2	TV	September	2021	TV-MA	2	paths at a	

```
print('min : ',final_df1['duration_copy'].min(),', max : ',final_df1['duration_copy'].max())
```

```
min :  0 , max :  312
```

```
# since we found minimum and maximum value of duration we can divide this into groups using bins
bins_d = [-1,1,50,80,100,120,150,200,315]
labels_d = ['<1','1-50','50-80','80-100','100-120','120-150','150-200','200-315']
final_df1['duration_copy'] = pd.cut(final_df1['duration_copy'],bins=bins_d, labels= labels_d)
final_df1.head()
```

	title	Directors	Actors	Genre	Country	show_id	type	date_added	release_year	rating	duration	description	duration_
0	Dick Johnson Is Dead	Kirsten Johnson	Unknown Actor	Documentaries	United States	s1	Movie	September 25, 2021	2020	PG-13	90	As her father nears the end of his life, filmm...	8
1	Blood & Water	Unkown Director	Ama Qamata	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	
2	Blood & Water	Unkown Director	Ama Qamata	TV Dramas	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	
3	Blood & Water	Unkown Director	Ama Qamata	TV Mysteries	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	
4	Blood & Water	Unkown Director	Khosi Ngema	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	

```
# replace value of duration copy with original duration for season
final_df1.loc[~final_df1['duration'].str.contains('Seasons'),'duration'] = final_df1.loc[~final_df1['duration'].str.contains('Seasons'),'dur
final_df1.drop(['duration_copy'],axis=1,inplace=True)
final_df1.head()
```

	title	Directors	Actors	Genre	Country	show_id	type	date_added	release_year	rating	duration	description
0	Dick Johnson Is Dead	Kirsten Johnson	Unknown Actor	Documentaries	United States	s1	Movie	September 25, 2021	2020	PG-13	80-100	As her father nears the end of his life, filmm...
1	Blood & Water	Unkown Director	Ama Qamata	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
2	Blood & Water	Unkown Director	Ama Qamata	TV Dramas	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
3	Blood & Water	Unkown Director	Ama Qamata	TV Mysteries	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
4	Blood & Water	Unkown Director	Khosi Ngema	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...

```
# check again for duartion column values
final_df1['duration'].value_counts()
```

```
80-100        52992
100-120       48724
<1            35035
120-150       26691
2 Seasons      9559
50-80          7701
150-200        6737
3 Seasons      5084
1-50           2548
```

```
4 Seasons      2134
5 Seasons      1698
7 Seasons       843
6 Seasons       633
200-315         524
8 Seasons       286
9 Seasons       257
10 Seasons      220
13 Seasons      132
12 Seasons      111
15 Seasons       96
17 Seasons       30
11 Seasons       30
Name: duration, dtype: int64
```

➕ Adding new columns for better analysis

- We will add 3 columns - year_added,month_added,week_added to the df to facilitate further data analysis.

```
from datetime import datetime
from dateutil.parser import parse
# converting date_added to datetime format
arr=[]
for i in final_df1['date_added'].values:
  dt1 =parse(i)
  arr.append(dt1.strftime('%Y-%m-%d'))
final_df1['modified_date'] =arr

final_df1['modified_date'] = pd.to_datetime(final_df1['modified_date'])
final_df1['added_year'] = final_df1['modified_date'].dt.year
final_df1['added_month'] = final_df1['modified_date'].dt.month
final_df1['added_week'] = final_df1['modified_date'].dt.isocalendar().week
final_df1.head()
```

	title	Directors	Actors	Genre	Country	show_id	type	date_added	release_year	rating	duration	description	modified_
0	Dick Johnson Is Dead	Kirsten Johnson	Unknown Actor	Documentaries	United States	s1	Movie	September 25, 2021	2020	PG-13	80-100	As her father nears the end of his life, filmm...	2021-
1	Blood & Water	Unkown Director	Ama Qamata	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	2021-
2	Blood & Water	Unkown Director	Ama Qamata	TV Dramas	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	2021-
3	Blood & Water	Unkown Director	Ama Qamata	TV Mysteries	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	2021-
4	Blood & Water	Unkown Director	Khosi Ngema	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	2021-

```
#Titles such as Bahubali(Hindi Version),Bahubali(Tamil Version) were there. Since it's only one movie in different languages,
#presence of brackets and content between brackets is removed.

final_df1['title'] = final_df1['title'].str.replace(r"\(.*\)","",regex=True)
final_df1.head()
```

	title	Directors	Actors	Genre	Country	show_id	type	date_added	release_year	rating	duration	description	modified_
0	Dick Johnson Is Dead	Kirsten Johnson	Unknown Actor	Documentaries	United States	s1	Movie	September 25, 2021	2020	PG-13	80-100	As her father nears the end of his life, filmm...	2021-
1	Blood & Water	Unkown Director	Ama Qamata	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	2021-
2	Blood & Water	Unkown Director	Ama Qamata	TV Dramas	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	2021-
3	Blood & Water	Unkown Director	Ama Qamata	TV Mysteries	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	2021-
4	Blood & Water	Unkown Director	Khosi Ngema	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	2021-

Data Visualisation

Question 1. Find the counts of each categorical variable both using graphical and nongraphical analysis.

Ans. Actually i have 3 categories i.e : type,genre,ratings, will show 3 category wise distribution here.

- 🎬 Content Distribution : category 1 : type ->> movies and TV Show
- Genre distribution : category 2 : Genre & Count
- Rating wise distribution : Category 3: Rating & count

Double-click (or enter) to edit

🎬 Content Distribution :category 1 : type ->> movies and TV Show

- (a) . For Non-graphical Analysis:

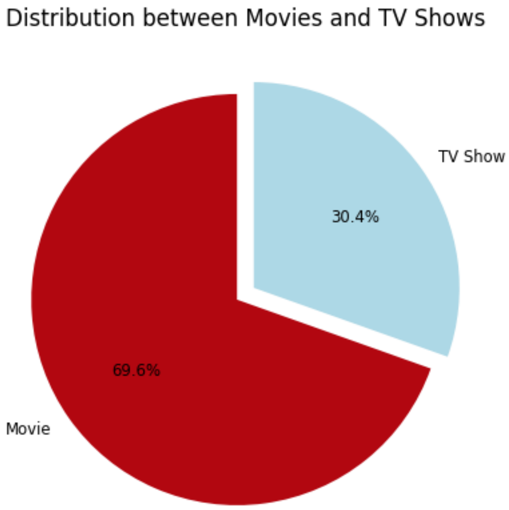
```
# non-graphical analysis for type
# number of distinct title per type
data_type = final_df1.groupby(['type']).agg({'title':'nunique'}).reset_index()
data_type
```

	type	title
0	Movie	6115
1	TV Show	2676

🎬 Content Distribution :category 1 : type ->> movies and TV Show

- (b). For graphical analysis:

```
# using piechart
plt.figure(figsize=(8,5))
plt.pie(data_type['title'],explode=(0.05,0.05), labels=data_type['type'],colors=['#b20710','#ADD8E6'],
        autopct='%.1f%%', startangle=90,textprops={'size': 'smaller'})
plt.title('Distribution between Movies and TV Shows')
plt.show()
```



Observation : We have almost 70:30 ratio of Movies and TV Shows in our data

🎥Genre distribution : category 2 :

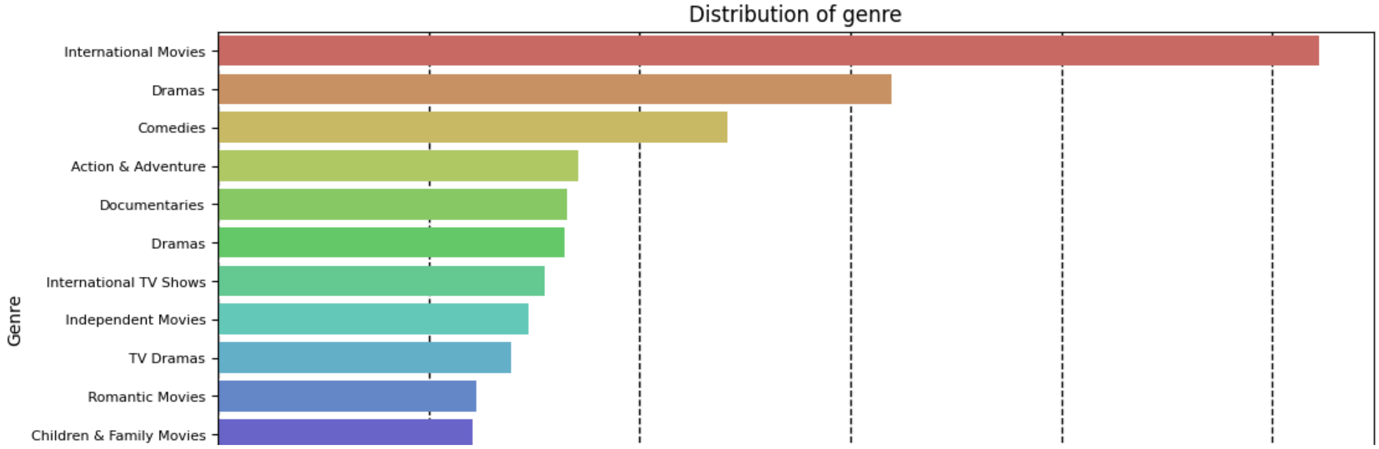
- (a) . For Non-graphical Analysis:

```
#number of distinct titles on the basis of genre
genre_data = final_df1.groupby(['Genre']).agg({"title":"nunique"}).reset_index().sort_values('title',ascending=False)
genre_data.head()
```

	Genre	title
13	International Movies	2624
49	Dramas	1600
44	Comedies	1210
37	Action & Adventure	859
47	Documentaries	829

(b). For graphical analysis: for genre based data

```
# for graphical represenation we are showing top 15 genre data
gen_15 = genre_data[:15]
plt.figure(figsize=(12,6))
plt.title('Distribution of genre')
plt.xlabel('Frequency of genre')
plt.ylabel('Genre')
plt.xticks(fontsize=10)
plt.yticks(fontsize=8)
plt.grid(True, color = "k", linewidth = "1.0", linestyle = "--")
sns.barplot(data=gen_15, y=gen_15['Genre'] , x=gen_15['title'], color='r',palette='hls',hue=gen_15['Genre'],zorder = 2)
plt.show()
```



🔍 **Insights** : International movies are leading in genre then dramas.

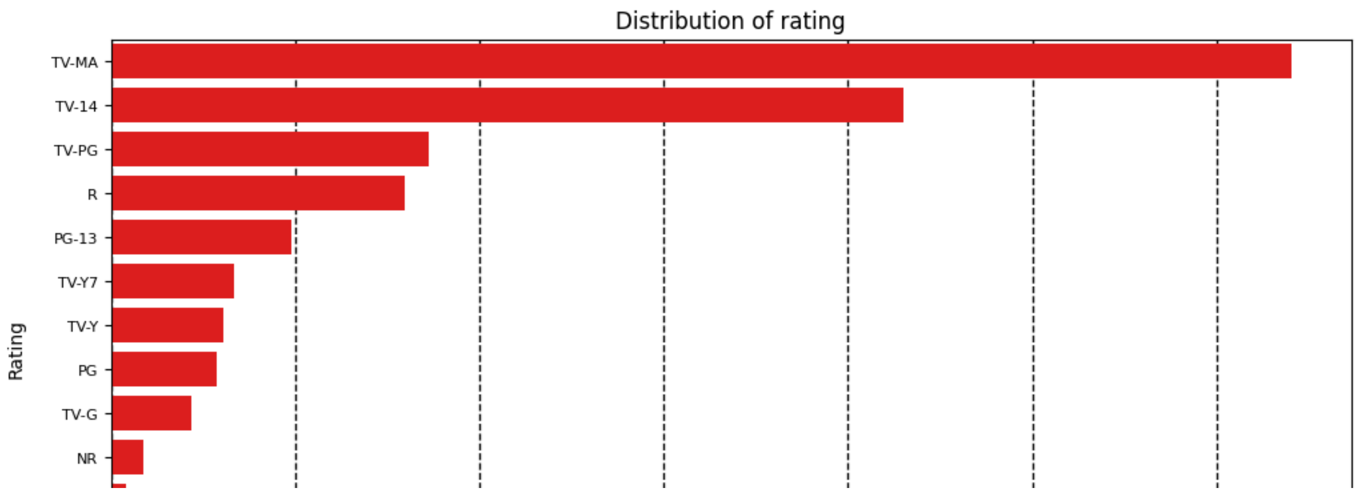
Category 3 : rating based

```
#number of distinct titles on the basis of rating
df_rating = final_df1.groupby(['rating']).agg({"title":"nunique"}).sort_values('title',ascending=False).reset_index()
df_rating.head()
```

	rating	title
0	TV-MA	3207
1	TV-14	2160
2	TV-PG	863
3	R	799
4	PG-13	490

Graphical representation

```
plt.figure(figsize=(12,6))
plt.title('Distribution of rating')
plt.xlabel('Frequency of rating')
plt.ylabel('Rating')
plt.xticks(fontsize=10)
plt.yticks(fontsize=8)
plt.grid(True, color = "k", linewidth = "1.0", linestyle = "--")
sns.barplot(data=df_rating, y=df_rating['rating'] , x=df_rating['title'], color='r',zorder = 2)
plt.show()
```



🔍 Insights : TV-MA, TV-14, TV-PG are on top by rating.

Question 2. Comparison of tv shows vs. movies.

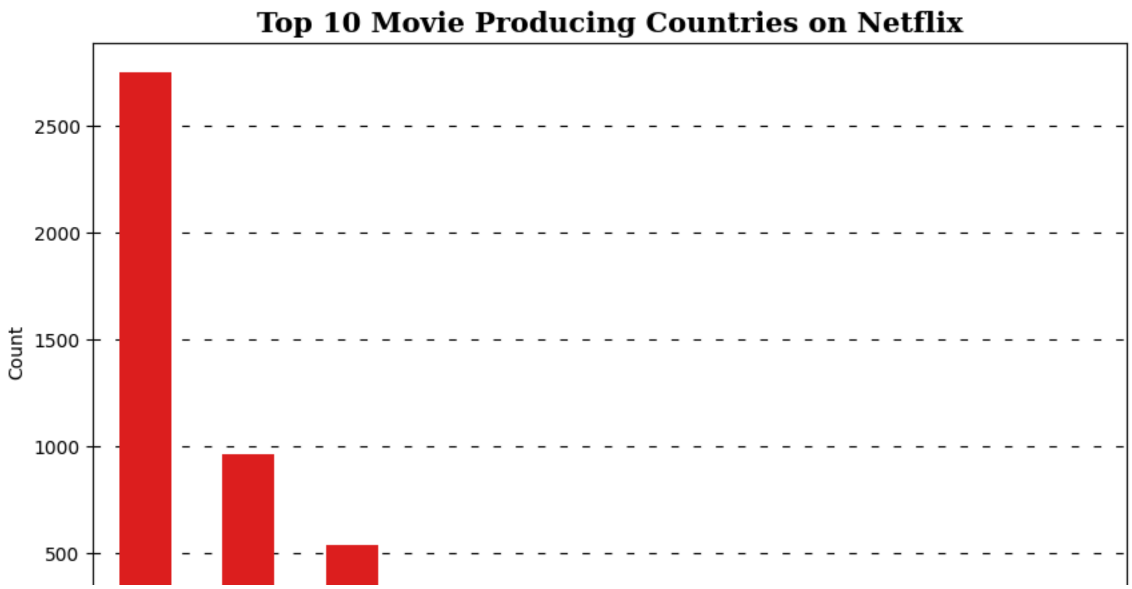
- a. Find the number of movies produced in each country and pick the top 10 countries.

```
final_df1['Country'] = final_df1['Country'].str.strip() # removing unnecesary spaces in country column
final_df1['Country'] = final_df1['Country'].str.replace('nan','Unkown Country') # replacing name with unkown country

df_movie = final_df1.loc[final_df1['type']=='Movie']   # filtered movie type from dataset
df_movie = df_movie.groupby('Country').agg({'title':'nunique'}).sort_values('title',ascending=False).reset_index() # counting and descending
df_movie = df_movie.drop(3) # removing unkown country for better understanding
df_movie = df_movie.loc[0:10]  # finally filter top 10 country with count value
df_movie
```

	Country	title
0	United States	2752
1	India	962
2	United Kingdom	534
4	Canada	319
5	France	303
6	Germany	182
7	Spain	171
8	Japan	119
9	China	114
10	Mexico	111

For graphical analysis:

```
# replacing country names in shortformat
ids={'United States':'USA','United Kingdom':'UK'}
for old,new in ids.items():
  df_movie['Country']= df_movie['Country'].str.replace(old,new,regex=False)

plt.figure(figsize=(10,6))

plt.grid(color = 'black',linestyle = '--',axis = 'y',zorder = 0,dashes = (5,10))  #setting grid style
plt.ylabel('Count')
plt.xlabel('Countries',{'weight':'bold','fontfamily':'serif'})
plt.title('Top 10 Movie Producing Countries on Netflix',{'font':'serif', 'size':15,'weight':'bold'})
sns.barplot(data=df_movie, x=df_movie['Country'], y=df_movie['title'], color ='r', width=0.5,zorder = 2)
plt.show()
```



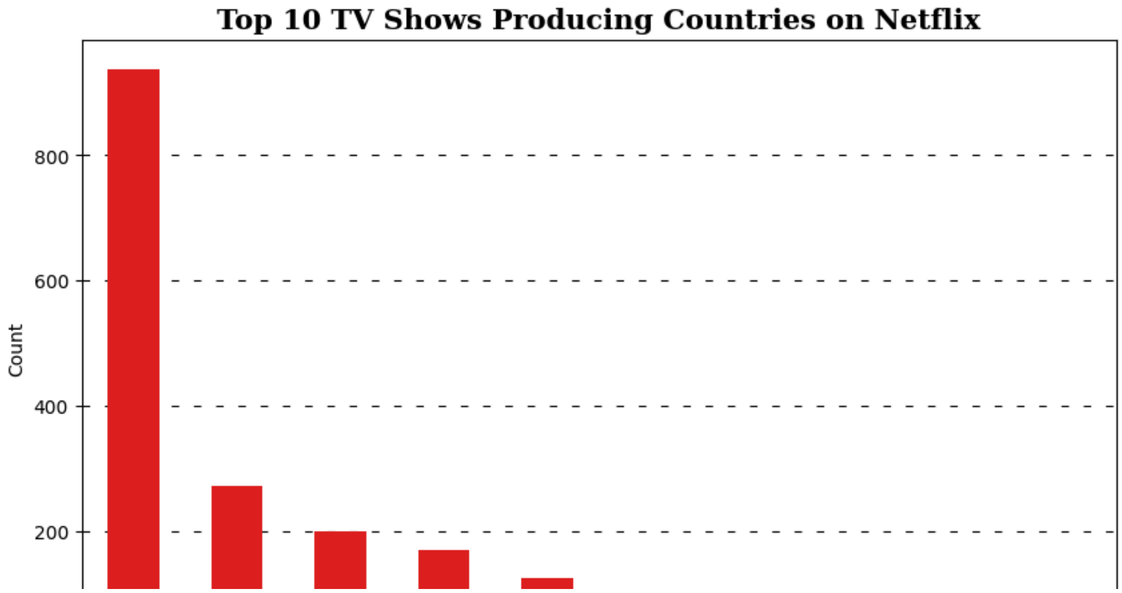
b. Find the number of Tv-Shows produced in each country and pick the top 10 countries.

```
df_tv = final_df1.loc[final_df1['type']=='TV Show']   # filtered TV Shows type from dataset
df_tv = df_tv.groupby('Country').agg({'title':'nunique'}).sort_values('title',ascending=False).reset_index() # counting and descending by cc

df_tv = df_tv.drop(1) # removing unkown country for better understanding
df_tv = df_tv.loc[0:10]  # finally filter top 10 country with count value
df_tv
```

	Country	title
0	United States	938
2	United Kingdom	272
3	Japan	199
4	South Korea	170
5	Canada	126
6	France	90
7	India	84
8	Taiwan	70
9	Australia	66
10	Spain	61

For graphical analysis

```
# replacing country names in shortformat
ids={'United States':'USA','United Kingdom':'UK','South Korea':'S Korea'}
for old,new in ids.items():
  df_tv['Country']= df_tv['Country'].str.replace(old,new,regex=False)


plt.figure(figsize=(10,6))

plt.grid(color = 'black',linestyle = '--',axis = 'y',zorder = 0,dashes = (5,10))  #setting grid style
plt.ylabel('Count')
plt.xlabel('Countries',{'weight':'bold','fontfamily':'serif'})
plt.title('Top 10 TV Shows Producing Countries on Netflix',{'font':'serif', 'size':15,'weight':'bold'})
sns.barplot(data=df_tv, x=df_tv['Country'], y=df_tv['title'], color ='r', width=0.5, zorder = 2)
plt.show()
```



3. What is the best time to launch a TV show?

- a. Find which is the best week to release the Tv-show or the movie. Do the analysis separately for Tv-shows and Movies

```
week = final_df1.groupby('added_week')['type'].value_counts()
week.name='count' # to avoid error
week =week.reset_index()
week.head()
```

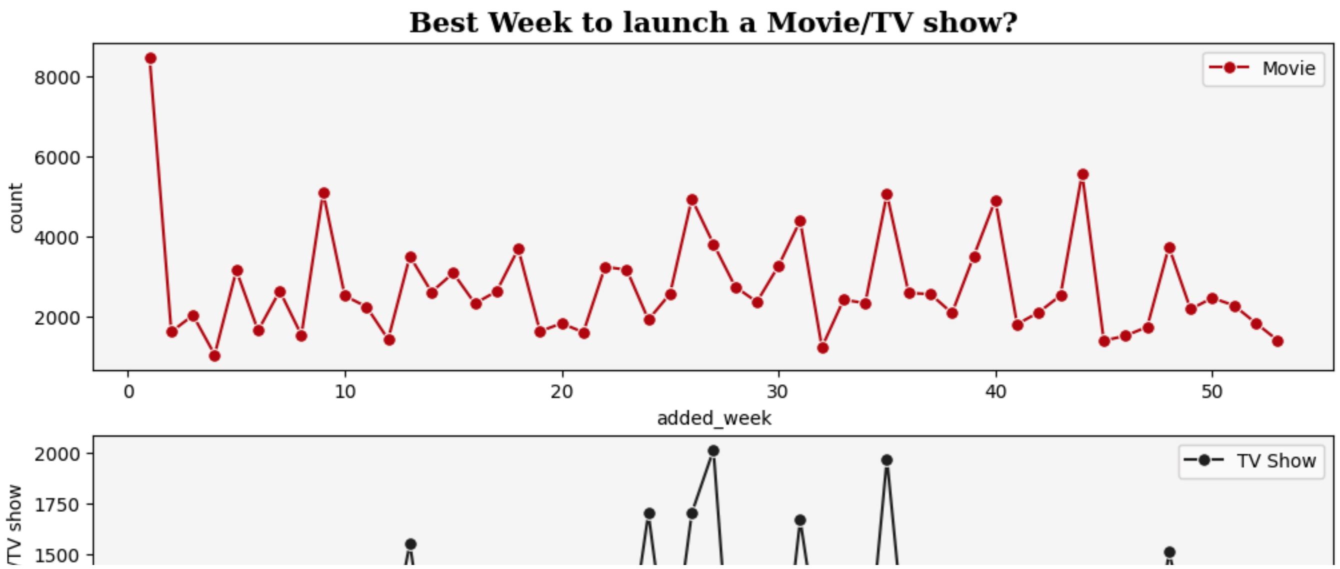
	added_week	type	count
0	1	Movie	8456
1	1	TV Show	1018
2	2	Movie	1618
3	2	TV Show	812
4	3	Movie	2031

```
week_movie = week.loc[week['type']=='Movie']
week_movie = week_movie.sort_values(by='count',ascending=False)

# fetch week wise data for TV Show
week_tv = week.loc[week['type']=='TV Show'].sort_values(by='count',ascending=False)

print("Movies with week")
print(week_movie.head())
print("      ")
print("TV Shows with week")
print(week_tv.head())
```

```
Movies with week
    added_week   type  count
0            1  Movie   8456
86          44  Movie   5563
16           9  Movie   5094
68          35  Movie   5048
50          26  Movie   4931

TV Shows with week
    added_week     type  count
53          27  TV Show   2013
69          35  TV Show   1969
51          26  TV Show   1703
47          24  TV Show   1702
61          31  TV Show   1670
```

Graphical represenation

```
#setting the plot style
fig = plt.figure(figsize = (12,7))
gs = fig.add_gridspec(2,1)

# creating graph for count of movies
ax0 = fig.add_subplot(gs[0,:])
ax0.set_facecolor('#f6f5f5')
sns.lineplot(data = week_movie, x = 'added_week', y = 'count',marker = 'o',markersize =7,color ='#b20710',
             label = 'Movie',ax = ax0)

# creating graph for count of tv shows
ax1 = fig.add_subplot(gs[1,:])
ax1.set_facecolor('#f6f5f5')
sns.lineplot(data = week_tv, x = 'added_week', y = 'count',marker = 'o',markersize = 7,color ='#221f1f',
             label = 'TV Show', ax = ax1)

#creating the title
ax0.set_title('Best Week to launch a Movie/TV show?',
            {'font':'serif', 'size':15,'weight':'bold'})
plt.xlabel('Week Number')
plt.ylabel('Count of Movies/TV show')
plt.show()
```



* 🔎*Insights:* * highest movies uploaded during 1st week of year . and highest TV Shows uploaded during 27th week of year. * 📢 *Recommendations :* * The weekly upload count of both Movies and TV shows exhibits a remarkably similar trend with respect to spikes and dips

- for Movies : we can observed that TV shows spike is down during 6-12 week ,19-23 week and continouse ups-down after 40th week . These week we can launch more movies for public.
- for TV Shows : we can see high spike during 1st week of movie ,rest of the weeks are ups-down . so we can launch similarly as per down of movie point week.

b. Find which is the best month to release the Tv-show or the movie.

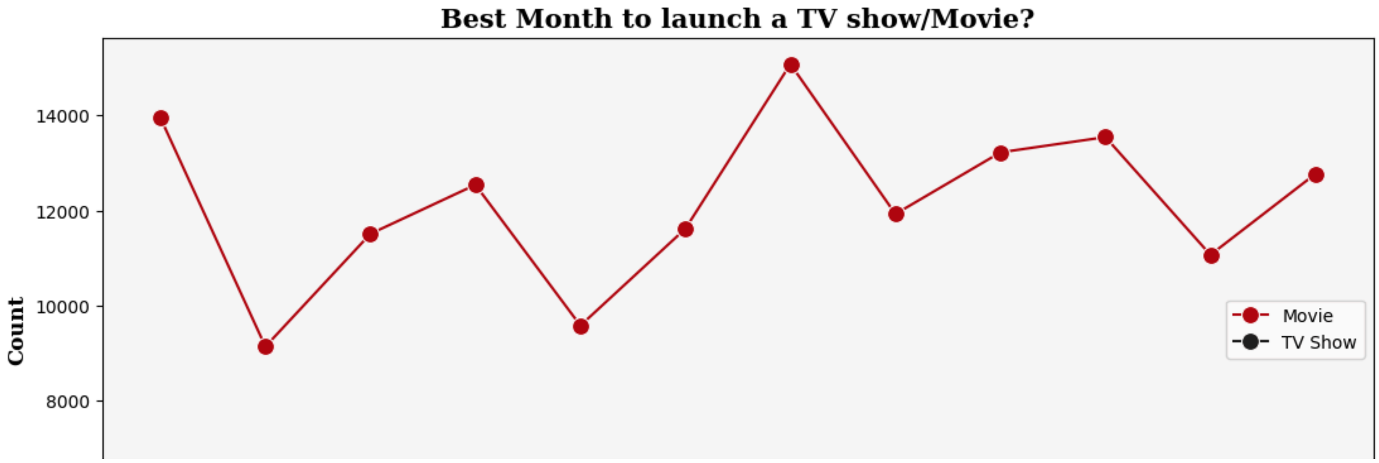
Do the analysis separately for Tv-shows and Movies

```
month = final_df1.groupby('added_month')['type'].value_counts()
month.name = 'count' # to avoid error while doing reset_index
month = month.reset_index()

# create 2 dataframe for movies and tv shows

month_movie = month.loc[month['type']=='Movie'].sort_values(by='count',ascending=False)
print("movie details by month")
print(month_movie.head())
print('===============')
month_tv = month.loc[month['type']=='TV Show'].sort_values(by='count',ascending=False)
print('==TV Show details by month==')
month_tv.head()
```

```
movie details by month
    added_month   type  count
12            7  Movie  15075
0             1  Movie  13947
18           10  Movie  13541
16            9  Movie  13220
22           12  Movie  12768
===============
==TV Show details by month==
```

	added_month	type	count
23	12	TV Show	5498
13	7	TV Show	5309
15	8	TV Show	5186
11	6	TV Show	5043
17	9	TV Show	4924

```
#setting the plot style
fig,ax = plt.subplots(figsize = (13,6))
ax.set_facecolor('#f6f5f5')

#creating the plot
sns.lineplot(data = month_movie, x = 'added_month', y = 'count',marker = 'o',markersize = 10,color ='#b20710',label = 'Movie',ax = ax)
sns.lineplot(data = month_tv, x = 'added_month', y = 'count',marker = 'o',markersize = 10,color ='#221f1f',label = 'TV Show', ax = ax)

#customizing the axis ticks
#ax.set_xticklabels(month_movie['added_month'],fontweight = 'bold',fontfamily='serif')

#customizing axis label
plt.xlabel('Month',fontweight = 'bold',fontfamily='serif',fontsize = 12)
plt.ylabel('Count',fontweight = 'bold',fontfamily='serif',fontsize = 12)

#customizing legend
plt.legend(loc = 'center right')

#creating the title
ax.set_title('Best Month to launch a TV show/Movie?',{'font':'serif', 'size':15,'weight':'bold'})

plt.show()
```



*🔎 *Insights :* * As per observation , less movie uploaded in February,May,August,November month so we can focus to release more TV shows on these months.

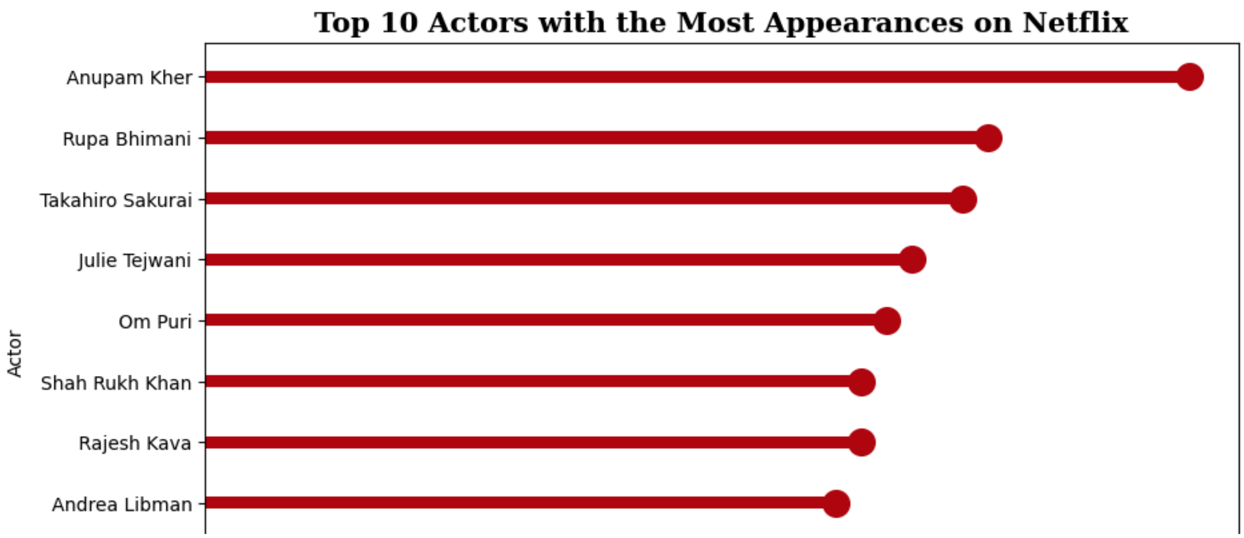
Question 4. Analysis of actors/directors of different types of shows/movies.

a. Identify the top 10 actors who have appeared in most movies or TV shows

```
act10 = final_df1.groupby('Actors')['title'].nunique().sort_values(ascending=False)
# removing unkown actor
a_10 = act10[1:11].reset_index()
a_10
```

	Actors	title
0	Anupam Kher	39
1	Rupa Bhimani	31
2	Takahiro Sakurai	30
3	Julie Tejwani	28
4	Om Puri	27
5	Shah Rukh Khan	26
6	Rajesh Kava	26
7	Andrea Libman	25
8	Paresh Rawal	25
9	Boman Irani	25

```
act_data = a_10[::-1] # sorting
#setting the plot style
fig,ax = plt.subplots(figsize = (10,6))
#creating the plot
ax.barh(y = act_data['Actors'],width =act_data['title'],height = 0.2,color = '#b20710')
ax.scatter(y = act_data['Actors'], x = act_data['title'] , s = 200 , color = '#b20710' )
plt.xlabel('Total number of movies/TV Shows')
plt.ylabel('Actor')
#creating the title
plt.title('Top 10 Actors with the Most Appearances on Netflix',{'font':'serif', 'size':15,'weight':'bold'})

plt.show()
```



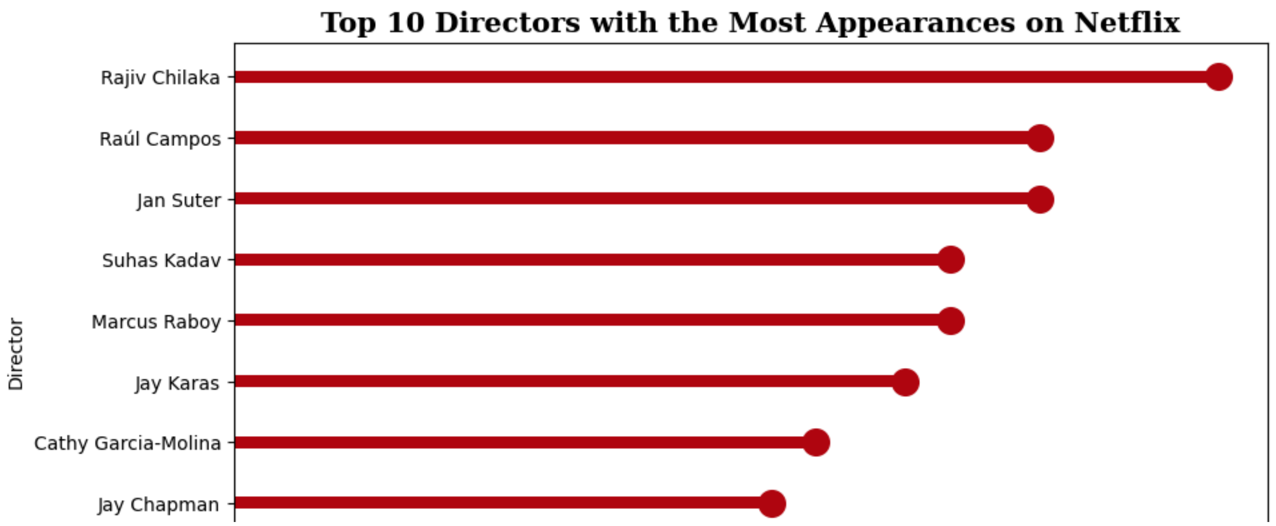
🔍 **Insights :** Significantly, 8 out of the top 10 Actors/Cast with the highest number of appearances on Netflix are of Indian origin.

b. Identify the top 10 directors who have appeared in most movies or TV shows.

```
dir10 = final_df1.groupby('Directors')['title'].nunique().sort_values(ascending=False)
# excluding unkown director from dataset
d_10 =dir10[1:11].reset_index()
d_10
```

	Directors	title
0	Rajiv Chilaka	22
1	Raúl Campos	18
2	Jan Suter	18
3	Suhas Kadav	16
4	Marcus Raboy	16
5	Jay Karas	15
6	Cathy Garcia-Molina	13
7	Jay Chapman	12
8	Martin Scorsese	12
9	Youssef Chahine	12

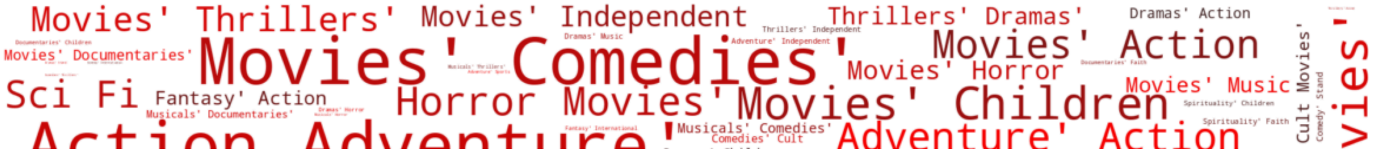
```
dir_data = d_10[::-1] # sorting
#setting the plot style
fig,ax = plt.subplots(figsize = (10,6))
#creating the plot
ax.barh(y = dir_data['Directors'],width =dir_data['title'],height = 0.2,color = '#b20710')
ax.scatter(y = dir_data['Directors'], x = dir_data['title'] , s = 200 , color = '#b20710' )
plt.xlabel('Total number of movies/TV Shows')
plt.ylabel('Director')
#creating the title
plt.title('Top 10 Directors with the Most Appearances on Netflix',{'font':'serif', 'size':15,'weight':'bold'})

plt.show()
```



🔍 Insights: we found that movies or TV shows of Rajiv chilaka appeared most of the time in netflix compare to other director.

Question 5. Which genre movies are more popular or produced more

```
from wordcloud import WordCloud
from wordcloud import ImageColorGenerator
from wordcloud import STOPWORDS

movie_genre = final_df1.loc[final_df1['type']=='Movie'] # filter movie data from orif=ginal dataset
text=str(movie_genre['Genre'].to_list())
color = sns.color_palette("dark:red", as_cmap=True)

stopwords = set(STOPWORDS)
wordcloud = WordCloud(stopwords=stopwords, background_color="white",width = 2000, height = 800,colormap=color).generate(text)
plt.figure( figsize=(15,10))
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis("off")
plt.show()
```


Movies' Thrillers'
Movies' Independent
Thrillers' Dramas'
Dramas' Action
Documentaries' Children
Movies' Documentaries'
Movies' Comedies'
Dramas' Music
Thrillers' Independent
Adventure' Independent
Movies' Action
Movies' Horror
Documentaries' Faith
Musicals' Thrillers'
Adventure' Sports
Movies' Music
Sci Fi
Fantasy' Action
Musicals' Documentaries'
Dramas' Horror
Horror Movies'
Movies' Children
Spirituality' Children
Spirituality' Faith
Cult Movies'
Comedy' Stand
vies'
Fantasy' International
Musicals' Comedies'
Comedies' Cult
Action Adventure'
Adventure' Action