data-exploration-and-visualisation

July 6, 2023

1 Netflix : Data Exploration and Visualisation by Kunal Gandhi

1.1 Importing the Important Libraries

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

1.2 Downloading the Dataset

[ ]:
```
!wget https://d2beiqkhq929f0.cloudfront.net/public_assets/assets/000/000/940/
↪original/netflix.csv
```

```
--2023-07-06 13:56:23--  https://d2beiqkhq929f0.cloudfront.net/public_assets/ass
ets/000/000/940/original/netflix.csv
Resolving d2beiqkhq929f0.cloudfront.net (d2beiqkhq929f0.cloudfront.net)…
13.35.37.102, 13.35.37.31, 13.35.37.159, …
Connecting to d2beiqkhq929f0.cloudfront.net
(d2beiqkhq929f0.cloudfront.net)|13.35.37.102|:443… connected.
HTTP request sent, awaiting response… 200 OK
Length: 3399671 (3.2M) [text/plain]
Saving to: ‘netflix.csv.8’

netflix.csv.8       100%[===================>]   3.24M  --.-KB/s    in 0.03s

2023-07-06 13:56:23 (118 MB/s) - ‘netflix.csv.8’ saved [3399671/3399671]
```

1.3 Reading the Dataset

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

[ ]:

	show_id	type	title	director	\
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	
1	s2	TV Show	Blood & Water	NaN	

```
2         s3  TV Show              Ganglands  Julien Leclercq
3         s4  TV Show  Jailbirds New Orleans             NaN
4         s5  TV Show           Kota Factory             NaN
…       …       …                      …              …
8802   s8803    Movie                 Zodiac    David Fincher
8803   s8804  TV Show            Zombie Dumb             NaN
8804   s8805    Movie             Zombieland  Ruben Fleischer
8805   s8806    Movie                   Zoom     Peter Hewitt
8806   s8807    Movie                 Zubaan      Mozez Singh

                                                    cast        country  \
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
…                                                    …              …
8802  Mark Ruffalo, Jake Gyllenhaal, Robert Downey J…  United States
8803                                                 NaN            NaN
8804  Jesse Eisenberg, Woody Harrelson, Emma Stone, …  United States
8805  Tim Allen, Courteney Cox, Chevy Chase, Kate Ma…  United States
8806  Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan…          India

             date_added  release_year rating   duration  \
0     September 25, 2021          2020  PG-13     90 min
1     September 24, 2021          2021  TV-MA  2 Seasons
2     September 24, 2021          2021  TV-MA   1 Season
3     September 24, 2021          2021  TV-MA   1 Season
4     September 24, 2021          2021  TV-MA  2 Seasons
…                    …           …    …         …
8802   November 20, 2019          2007      R    158 min
8803        July 1, 2019          2018  TV-Y7  2 Seasons
8804    November 1, 2019          2009      R     88 min
8805    January 11, 2020          2006     PG     88 min
8806       March 2, 2019          2015  TV-14    111 min

                                              listed_in  \
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 …
…                                                   …
8802                  Cult Movies, Dramas, Thrillers
8803            Kids' TV, Korean TV Shows, TV Comedies
8804                           Comedies, Horror Movies
8805               Children & Family Movies, Comedies
```

```
8806     Dramas, International Movies, Music & Musicals

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

[8807 rows x 12 columns]
```

1.4 Observing the dataset different datatypes available and a glimpse over the count of NaN values present in a particular column.

[ ]:
```
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
```

1.4.1 We observe that in the rating category at the last some values mentioned are 74 min, 84 min and 66 mi, they can't be a category, they are missing values in duration column.

[ ]:
```
df["rating"].value_counts()
```

[ ]:
```
TV-MA       3207
TV-14       2160
TV-PG        863
R            799
PG-13        490
TV-Y7        334
TV-Y         307
PG           287
TV-G         220
NR            80
G             41
TV-Y7-FV       6
NC-17          3
UR             3
74 min         1
84 min         1
66 min         1
Name: rating, dtype: int64
```

1.4.2 We get the shape and statistical summary of the dataset to get the understanding of the data

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

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

[ ]:
```
df.describe(include="object").T
```

[ ]:
```
             count unique                                                top  \
show_id       8807   8807                                                 s1
type          8807      2                                              Movie
title         8807   8807                                Dick Johnson Is Dead
director      6173   4528                                       Rajiv Chilaka
cast          7982   7692                                    David Attenborough
country       7976    748                                         United States
date_added    8797   1767                                      January 1, 2020
rating        8803     17                                               TV-MA
duration      8804    220                                            1 Season
listed_in     8807    514                          Dramas, International Movies
description   8807   8775  Paranormal activity at a lush, abandoned prope…
```

```
              freq
show_id          1
type          6131
title            1
director        19
cast            19
country       2818
date_added     109
rating        3207
duration      1793
listed_in      362
description      4
```

1.4.3 We Check for duplicates values column-wise present

[ ]:
```
df.isna().sum() # Missing values in each coln
```

[ ]:
```
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
```

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

[ ]:
```
0
```

[ ]:
```
df["type"].value_counts()
```

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

1.4.4 Here, we explode our data because there are a lot of columns in our data where the information is coupled in a single cell. We use the functions called stacking and unstacking for creation of a new dataframe.For the 'cast,' 'country,' 'listed_in,' and 'director' columns, we split the values based on the comma separator and created separate rows for each value. This transformation enables us to analyze the data at a more granular level.

[ ]:
```
unstacked1=df["cast"].apply(lambda x:str(x).split(",")).tolist()
unstacked2=df["country"].apply(lambda x:str(x).split(",")).tolist()
unstacked3=df["listed_in"].apply(lambda x:str(x).split(",")).tolist()
unstacked4=df["director"].apply(lambda x:str(x).split(",")).tolist()
```

[ ]:
```
df_cast=pd.DataFrame(unstacked1,index=df["title"])
df_cast
```

[ ]:

title	0	1	2	\
Dick Johnson Is Dead	nan	None	None	
Blood & Water	Ama Qamata	Khosi Ngema	Gail Mabalane	
Ganglands	Sami Bouajila	Tracy Gotoas	Samuel Jouy	
Jailbirds New Orleans	nan	None	None	
Kota Factory	Mayur More	Jitendra Kumar	Ranjan Raj	
…	…	…	…	
Zodiac	Mark Ruffalo	Jake Gyllenhaal	Robert Downey Jr.	
Zombie Dumb	nan	None	None	
Zombieland	Jesse Eisenberg	Woody Harrelson	Emma Stone	
Zoom	Tim Allen	Courteney Cox	Chevy Chase	
Zubaan	Vicky Kaushal	Sarah-Jane Dias	Raaghav Chanana	

title	3	4	\
Dick Johnson Is Dead	None	None	
Blood & Water	Thabang Molaba	Dillon Windvogel	
Ganglands	Nabiha Akkari	Sofia Lesaffre	
Jailbirds New Orleans	None	None	
Kota Factory	Alam Khan	Ahsaas Channa	
…	…	…	
Zodiac	Anthony Edwards	Brian Cox	
Zombie Dumb	None	None	
Zombieland	Abigail Breslin	Amber Heard	
Zoom	Kate Mara	Ryan Newman	
Zubaan	Manish Chaudhary	Meghna Malik	

title	5	6	\
Dick Johnson Is Dead	None	None	
Blood & Water	Natasha Thahane	Arno Greeff	

```
Ganglands                Salim Kechiouche   Noureddine Farihi
Jailbirds New Orleans                None                None
Kota Factory              Revathi Pillai          Urvi Singh
…                                    …                   …
Zodiac                      Elias Koteas         Donal Logue
Zombie Dumb                          None                None
Zombieland                   Bill Murray          Derek Graf
Zoom                       Michael Cassidy     Spencer Breslin
Zubaan                       Malkeet Rauni      Anita Shabdish

                                        7                 8   \
title
Dick Johnson Is Dead                 None              None
Blood & Water              Xolile Tshabalala   Getmore Sithole
Ganglands                Geert Van Rampelberg   Bakary Diombera
Jailbirds New Orleans                None              None
Kota Factory                   Arun Kumar              None
…                                     …                 …
Zodiac                   John Carroll Lynch   Dermot Mulroney
Zombie Dumb                          None              None
Zombieland                           None              None
Zoom                            Rip Torn      Kevin Zegers
Zubaan                 Chittaranjan Tripathy              None

                                     9   …    40    41    42    43    44  \
title                                    …
Dick Johnson Is Dead              None  …  None  None  None  None  None
Blood & Water           Cindy Mahlangu  …  None  None  None  None  None
Ganglands                         None  …  None  None  None  None  None
Jailbirds New Orleans             None  …  None  None  None  None  None
Kota Factory                      None  …  None  None  None  None  None
…                                    …  …   …   …   …   …   …
Zodiac                  Chloë Sevigny  …  None  None  None  None  None
Zombie Dumb                       None  …  None  None  None  None  None
Zombieland                        None  …  None  None  None  None  None
Zoom                              None  …  None  None  None  None  None
Zubaan                            None  …  None  None  None  None  None

                         45    46    47    48    49
title
Dick Johnson Is Dead   None  None  None  None  None
Blood & Water          None  None  None  None  None
Ganglands              None  None  None  None  None
Jailbirds New Orleans  None  None  None  None  None
Kota Factory           None  None  None  None  None
…                     …   …   …   …   …
Zodiac                 None  None  None  None  None
```

```
Zombie Dumb             None  None  None  None  None
Zombieland              None  None  None  None  None
Zoom                    None  None  None  None  None
Zubaan                  None  None  None  None  None

[8807 rows x 50 columns]
```

[ ]:
```
df_cast=df_cast.stack()
df_cast
```

[ ]:
```
title
Dick Johnson Is Dead  0                       nan
Blood & Water         0                Ama Qamata
                      1               Khosi Ngema
                      2             Gail Mabalane
                      3            Thabang Molaba
                                          …
Zubaan                3           Manish Chaudhary
                      4               Meghna Malik
                      5             Malkeet Rauni
                      6            Anita Shabdish
                      7     Chittaranjan Tripathy
Length: 64951, dtype: object
```

[ ]:
```
df_cast=pd.DataFrame(df_cast)
df_cast
```

[ ]:
```
                                        0
title
Dick Johnson Is Dead 0                 nan
Blood & Water        0          Ama Qamata
                     1         Khosi Ngema
                     2       Gail Mabalane
                     3      Thabang Molaba
…                                       …
Zubaan               3     Manish Chaudhary
                     4         Meghna Malik
                     5       Malkeet Rauni
                     6      Anita Shabdish
                     7 Chittaranjan Tripathy

[64951 rows x 1 columns]
```

[ ]:
```
df_cast.reset_index(inplace=True)
```

[ ]:
```
df_cast=df_cast[['title',0]]
df_cast
```

[ ]:
```
                    title                      0
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
…                     …                      …
64946               Zubaan        Manish Chaudhary
64947               Zubaan            Meghna Malik
64948               Zubaan           Malkeet Rauni
64949               Zubaan          Anita Shabdish
64950               Zubaan   Chittaranjan Tripathy

[64951 rows x 2 columns]
```

[ ]:
```
df_cast.columns=['title','cast']
```

[ ]:
```
df_cast
```

[ ]:
```
                    title                     cast
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
…                     …                      …
64946               Zubaan        Manish Chaudhary
64947               Zubaan            Meghna Malik
64948               Zubaan           Malkeet Rauni
64949               Zubaan          Anita Shabdish
64950               Zubaan   Chittaranjan Tripathy

[64951 rows x 2 columns]
```

[ ]:
```
df_country=pd.DataFrame(unstacked2,index=df["title"])
df_country=df_country.stack()
df_country=pd.DataFrame(df_country)
df_country.reset_index(inplace=True)
df_country=df_country[['title',0]]
df_country.columns=['title','country']
df_country
```

[ ]:
```
                     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
…                      …            …
10845                Zodiac  United States
10846          Zombie Dumb            nan
10847           Zombieland  United States
10848                 Zoom  United States
10849               Zubaan          India

[10850 rows x 2 columns]
```

[ ]:
```
df_listed_in=pd.DataFrame(unstacked3,index=df["title"])
df_listed_in=df_listed_in.stack()
df_listed_in=pd.DataFrame(df_listed_in)
df_listed_in.reset_index(inplace=True)
df_listed_in=df_listed_in[['title',0]]
df_listed_in.columns=['title','listed_in']
df_listed_in
```

[ ]:
```
                     title                 listed_in
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
…                       …                        …
19318                  Zoom  Children & Family Movies
19319                  Zoom                Comedies
19320                Zubaan                  Dramas
19321                Zubaan      International Movies
19322                Zubaan          Music & Musicals

[19323 rows x 2 columns]
```

[ ]:
```
df_director=pd.DataFrame(unstacked4,index=df["title"])
df_director=df_director.stack()
df_director=pd.DataFrame(df_director)
df_director.reset_index(inplace=True)
df_director=df_director[['title',0]]
df_director.columns=['title','director']
df_director
```

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

```
…                    …              …
9607                Zodiac    David Fincher
9608           Zombie Dumb            nan
9609            Zombieland  Ruben Fleischer
9610                  Zoom     Peter Hewitt
9611                Zubaan      Mozez Singh

[9612 rows x 2 columns]
```

[ ]:
```
Merge1=df_cast.merge(df_director, on="title", how="inner")

Merge1
```

[ ]:
```
                     title                   cast         director
0      Dick Johnson Is Dead                    nan  Kirsten Johnson
1             Blood & Water            Ama Qamata              nan
2             Blood & Water           Khosi Ngema              nan
3             Blood & Water         Gail Mabalane              nan
4             Blood & Water        Thabang Molaba              nan
…                     …                  …              …
70807               Zubaan      Manish Chaudhary      Mozez Singh
70808               Zubaan          Meghna Malik      Mozez Singh
70809               Zubaan         Malkeet Rauni      Mozez Singh
70810               Zubaan        Anita Shabdish      Mozez Singh
70811               Zubaan  Chittaranjan Tripathy      Mozez Singh

[70812 rows x 3 columns]
```

[ ]:
```
Merge2=Merge1.merge(df_listed_in, on="title", how="inner")
Merge2
```

[ ]:
```
                     title                   cast         director  \
0      Dick Johnson Is Dead                    nan  Kirsten Johnson
1             Blood & Water            Ama Qamata              nan
2             Blood & Water            Ama Qamata              nan
3             Blood & Water            Ama Qamata              nan
4             Blood & Water           Khosi Ngema              nan
…                     …                  …              …
161211              Zubaan        Anita Shabdish      Mozez Singh
161212              Zubaan        Anita Shabdish      Mozez Singh
161213              Zubaan  Chittaranjan Tripathy      Mozez Singh
161214              Zubaan  Chittaranjan Tripathy      Mozez Singh
161215              Zubaan  Chittaranjan Tripathy      Mozez Singh

                   listed_in
0              Documentaries
1      International TV Shows
```

```
2                    TV Dramas
3                  TV Mysteries
4        International TV Shows
…                            …
161211     International Movies
161212         Music & Musicals
161213                  Dramas
161214     International Movies
161215         Music & Musicals

[161216 rows x 4 columns]
```

[ ]:
```
Merge3=Merge2.merge(df_country, on="title", how="inner")
Merge3
```

[ ]:
```
                        title                    cast          director  \
0        Dick Johnson Is Dead                     nan   Kirsten Johnson
1                Blood & Water             Ama Qamata               nan
2                Blood & Water             Ama Qamata               nan
3                Blood & Water             Ama Qamata               nan
4                Blood & Water            Khosi Ngema               nan
…                          …                      …               …
202060                Zubaan          Anita Shabdish      Mozez Singh
202061                Zubaan          Anita Shabdish      Mozez Singh
202062                Zubaan   Chittaranjan Tripathy      Mozez Singh
202063                Zubaan   Chittaranjan Tripathy      Mozez Singh
202064                Zubaan   Chittaranjan Tripathy      Mozez Singh

                     listed_in        country
0                Documentaries  United States
1        International TV Shows   South Africa
2                    TV Dramas   South Africa
3                  TV Mysteries   South Africa
4        International TV Shows   South Africa
…                            …              …
202060     International Movies          India
202061         Music & Musicals          India
202062                  Dramas          India
202063     International Movies          India
202064         Music & Musicals          India

[202065 rows x 5 columns]
```

[ ]:
```
final_merge=Merge3.merge(df,on="title",how="inner")
final_merge.
  ↪drop(columns=["cast_y","director_y","country_y","listed_in_y"],axis=1,inplace=True)
final_merge
```

[ ]:

	title	cast_x	director_x	\
0	Dick Johnson Is Dead	nan	Kirsten Johnson	
1	Blood & Water	Ama Qamata	nan	
2	Blood & Water	Ama Qamata	nan	
3	Blood & Water	Ama Qamata	nan	
4	Blood & Water	Khosi Ngema	nan	
…	…	…	…	
202060	Zubaan	Anita Shabdish	Mozez Singh	
202061	Zubaan	Anita Shabdish	Mozez Singh	
202062	Zubaan	Chittaranjan Tripathy	Mozez Singh	
202063	Zubaan	Chittaranjan Tripathy	Mozez Singh	
202064	Zubaan	Chittaranjan Tripathy	Mozez Singh	

	listed_in_x	country_x	show_id	type	\
0	Documentaries	United States	s1	Movie	
1	International TV Shows	South Africa	s2	TV Show	
2	TV Dramas	South Africa	s2	TV Show	
3	TV Mysteries	South Africa	s2	TV Show	
4	International TV Shows	South Africa	s2	TV Show	
…	…	…	…	…	
202060	International Movies	India	s8807	Movie	
202061	Music & Musicals	India	s8807	Movie	
202062	Dramas	India	s8807	Movie	
202063	International Movies	India	s8807	Movie	
202064	Music & Musicals	India	s8807	Movie	

	date_added	release_year	rating	duration	\
0	September 25, 2021	2020	PG-13	90 min	
1	September 24, 2021	2021	TV-MA	2 Seasons	
2	September 24, 2021	2021	TV-MA	2 Seasons	
3	September 24, 2021	2021	TV-MA	2 Seasons	
4	September 24, 2021	2021	TV-MA	2 Seasons	
…	…	…	…	…	
202060	March 2, 2019	2015	TV-14	111 min	
202061	March 2, 2019	2015	TV-14	111 min	
202062	March 2, 2019	2015	TV-14	111 min	
202063	March 2, 2019	2015	TV-14	111 min	
202064	March 2, 2019	2015	TV-14	111 min	

	description
0	As her father nears the end of his life, filmm…
1	After crossing paths at a party, a Cape Town t…
2	After crossing paths at a party, a Cape Town t…
3	After crossing paths at a party, a Cape Town t…
4	After crossing paths at a party, a Cape Town t…
…	…
202060	A scrappy but poor boy worms his way into a ty…

```
202061  A scrappy but poor boy worms his way into a ty…
202062  A scrappy but poor boy worms his way into a ty…
202063  A scrappy but poor boy worms his way into a ty…
202064  A scrappy but poor boy worms his way into a ty…

[202065 rows x 12 columns]
```

1.4.5 As we have exploded the data and used a function called merge to collate all the data with the original dataframe which created a dataframe with unique values but still we need to take care of the NaN values available.

2 Now comes the step of handling missing values

2.0.1 We have columns with name "cast" and "director" where we can't perform any imputations. For those we need to replace them with "no cast" and "No director" in the dataframe. For column country we have replace the same mode of the country popular

[ ]:
```
(final_merge["cast_x"]=="nan").value_counts()
```

[ ]:
```
False    199916
True       2149
Name: cast_x, dtype: int64
```

[ ]:
```
final_merge['cast_x'].replace( "nan", 'No cast', inplace=True)
```

[ ]:
```
(final_merge["listed_in_x"]=="nan").value_counts() # as they were unique and␣
↪present
```

[ ]:
```
False    202065
Name: listed_in_x, dtype: int64
```

[ ]:
```
(final_merge["director_x"]=="nan").value_counts()
```

[ ]:
```
False    151422
True      50643
Name: director_x, dtype: int64
```

[ ]:
```
final_merge['director_x'].replace( "nan", 'No director', inplace=True)
```

[ ]:
```
(final_merge["country_x"]=="nan").value_counts()
```

[ ]:
```
False    190168
True      11897
Name: country_x, dtype: int64
```

[ ]:
```
country_mode=final_merge["country_x"].mode()
country_mode
```

[ ]:
```
0    United States
Name: country_x, dtype: object
```

[ ]:
```
final_merge["country_x"].replace("nan",country_mode[0],inplace=True)
```

[ ]:
```
final_merge
```

[ ]:
```
                      title                cast_x       director_x  \
0       Dick Johnson Is Dead              No cast  Kirsten Johnson
1              Blood & Water           Ama Qamata      No director
2              Blood & Water           Ama Qamata      No director
3              Blood & Water           Ama Qamata      No director
4              Blood & Water          Khosi Ngema      No director
…                        …                    …                …
202060               Zubaan       Anita Shabdish      Mozez Singh
202061               Zubaan       Anita Shabdish      Mozez Singh
202062               Zubaan   Chittaranjan Tripathy      Mozez Singh
202063               Zubaan   Chittaranjan Tripathy      Mozez Singh
202064               Zubaan   Chittaranjan Tripathy      Mozez Singh

                  listed_in_x      country_x show_id     type  \
0               Documentaries  United States      s1    Movie
1       International TV Shows   South Africa      s2  TV Show
2                   TV Dramas   South Africa      s2  TV Show
3                TV Mysteries   South Africa      s2  TV Show
4       International TV Shows   South Africa      s2  TV Show
…                          …            …     …       …
202060    International Movies          India   s8807    Movie
202061        Music & Musicals          India   s8807    Movie
202062                 Dramas          India   s8807    Movie
202063    International Movies          India   s8807    Movie
202064        Music & Musicals          India   s8807    Movie

                date_added  release_year rating   duration  \
0       September 25, 2021          2020  PG-13     90 min
1       September 24, 2021          2021  TV-MA  2 Seasons
2       September 24, 2021          2021  TV-MA  2 Seasons
3       September 24, 2021          2021  TV-MA  2 Seasons
4       September 24, 2021          2021  TV-MA  2 Seasons
…                      …           …    …         …
202060       March 2, 2019          2015  TV-14    111 min
202061       March 2, 2019          2015  TV-14    111 min
202062       March 2, 2019          2015  TV-14    111 min
202063       March 2, 2019          2015  TV-14    111 min
```

```
202064       March 2, 2019          2015  TV-14    111 min

                                                 description
0       As her father nears the end of his life, filmm…
1       After crossing paths at a party, a Cape Town t…
2       After crossing paths at a party, a Cape Town t…
3       After crossing paths at a party, a Cape Town t…
4       After crossing paths at a party, a Cape Town t…
…                                                     …
202060  A scrappy but poor boy worms his way into a ty…
202061  A scrappy but poor boy worms his way into a ty…
202062  A scrappy but poor boy worms his way into a ty…
202063  A scrappy but poor boy worms his way into a ty…
202064  A scrappy but poor boy worms his way into a ty…

[202065 rows x 12 columns]
```

[ ]:
```
final_merge["rating"].value_counts()
```

[ ]:
```
TV-MA       73915
TV-14       43957
R           25860
PG-13       16246
TV-PG       14926
PG          10919
TV-Y7        6304
TV-Y         3665
TV-G         2779
NR           1573
G            1530
NC-17         149
TV-Y7-FV       86
UR             86
74 min          1
84 min          1
66 min          1
Name: rating, dtype: int64
```

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

[ ]:
```
title            0
cast_x           0
director_x       0
listed_in_x      0
country_x        0
show_id          0
type             0
```

```
date_added      158
release_year      0
rating           67
duration          3
description       0
dtype: int64
```

[ ]:
```
final_merge.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 202065 entries, 0 to 202064
Data columns (total 12 columns):
 #   Column        Non-Null Count   Dtype
---  ------        --------------   -----
 0   title         202065 non-null  object
 1   cast_x        202065 non-null  object
 2   director_x    202065 non-null  object
 3   listed_in_x   202065 non-null  object
 4   country_x     202065 non-null  object
 5   show_id       202065 non-null  object
 6   type          202065 non-null  object
 7   date_added    201907 non-null  object
 8   release_year  202065 non-null  int64
 9   rating        201998 non-null  object
 10  duration      202062 non-null  object
 11  description   202065 non-null  object
dtypes: int64(1), object(11)
memory usage: 20.0+ MB
```

[ ]:
```
final_merge
```

[ ]:
```
                      title                cast_x       director_x  \
0       Dick Johnson Is Dead              No cast  Kirsten Johnson
1              Blood & Water           Ama Qamata      No director
2              Blood & Water           Ama Qamata      No director
3              Blood & Water           Ama Qamata      No director
4              Blood & Water          Khosi Ngema      No director
…                        …                    …               …
202060               Zubaan        Anita Shabdish      Mozez Singh
202061               Zubaan        Anita Shabdish      Mozez Singh
202062               Zubaan  Chittaranjan Tripathy      Mozez Singh
202063               Zubaan  Chittaranjan Tripathy      Mozez Singh
202064               Zubaan  Chittaranjan Tripathy      Mozez Singh

                  listed_in_x      country_x show_id     type  \
0               Documentaries  United States      s1    Movie
1       International TV Shows   South Africa      s2  TV Show
```

```
2                    TV Dramas   South Africa      s2  TV Show
3                  TV Mysteries   South Africa      s2  TV Show
4         International TV Shows   South Africa      s2  TV Show
…                           …            …     …      …
202060     International Movies          India   s8807    Movie
202061         Music & Musicals          India   s8807    Movie
202062                  Dramas          India   s8807    Movie
202063     International Movies          India   s8807    Movie
202064         Music & Musicals          India   s8807    Movie

                date_added  release_year rating   duration  \
0        September 25, 2021          2020  PG-13     90 min
1        September 24, 2021          2021  TV-MA  2 Seasons
2        September 24, 2021          2021  TV-MA  2 Seasons
3        September 24, 2021          2021  TV-MA  2 Seasons
4        September 24, 2021          2021  TV-MA  2 Seasons
…                       …           …    …        …
202060       March 2, 2019          2015  TV-14    111 min
202061       March 2, 2019          2015  TV-14    111 min
202062       March 2, 2019          2015  TV-14    111 min
202063       March 2, 2019          2015  TV-14    111 min
202064       March 2, 2019          2015  TV-14    111 min

                                                 description
0        As her father nears the end of his life, filmm…
1        After crossing paths at a party, a Cape Town t…
2        After crossing paths at a party, a Cape Town t…
3        After crossing paths at a party, a Cape Town t…
4        After crossing paths at a party, a Cape Town t…
…                                                      …
202060   A scrappy but poor boy worms his way into a ty…
202061   A scrappy but poor boy worms his way into a ty…
202062   A scrappy but poor boy worms his way into a ty…
202063   A scrappy but poor boy worms his way into a ty…
202064   A scrappy but poor boy worms his way into a ty…

[202065 rows x 12 columns]
```

2.0.2 Replacing the missing values in duration with unrecognized values in rating column and subsequently converting those to NaN values.

[ ]:
```
final_merge.loc[126582,"duration"]=final_merge.loc[126582,"rating"]
final_merge.loc[131648,"duration"]=final_merge.loc[131648,"rating"]
final_merge.loc[131782,"duration"]=final_merge.loc[131782,"rating"]
```

[ ]:
```
final_merge.loc[126582,"rating"]=np.nan
final_merge.loc[131648,"rating"]=np.nan
final_merge.loc[131782,"rating"]=np.nan
```

[ ]:
```
final_merge.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 202065 entries, 0 to 202064
Data columns (total 12 columns):
 #   Column        Non-Null Count   Dtype 
---  ------        --------------   ----- 
 0   title         202065 non-null  object
 1   cast_x        202065 non-null  object
 2   director_x    202065 non-null  object
 3   listed_in_x   202065 non-null  object
 4   country_x     202065 non-null  object
 5   show_id       202065 non-null  object
 6   type          202065 non-null  object
 7   date_added    201907 non-null  object
 8   release_year  202065 non-null  int64 
 9   rating        201995 non-null  object
 10  duration      202065 non-null  object
 11  description   202065 non-null  object
dtypes: int64(1), object(11)
memory usage: 28.1+ MB
```

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

[ ]:
```
title            0
cast_x           0
director_x       0
listed_in_x      0
country_x        0
show_id          0
type             0
date_added     158
release_year     0
rating          70
duration         0
description      0
dtype: int64
```

2.0.3 Dealing with missing values in rating column categorizing on movies and Tv show basis and calculate the mode for replacement of the same accordingly.

[ ]:
```
movie_rating=final_merge.loc[final_merge['type'] == 'Movie', 'rating'].mode()[0]
movie_rating
```

[ ]:
```
'TV-MA'
```

[ ]:
```
Tv_rating=final_merge.loc[final_merge['type'] == 'TV Show', 'rating'].mode()[0]
Tv_rating
```

[ ]:
```
'TV-MA'
```

[ ]:
```
final_merge['rating'] = final_merge.apply(lambda x: movie_rating if x['type']␣
↪== 'Movie' and pd.isna(x['rating'])
                        else Tv_rating if x['type'] == 'TV Show' and pd.
↪isna(x['rating'])
                        else x['rating'], axis=1)
```

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

[ ]:
```
title            0
cast_x           0
director_x       0
listed_in_x      0
country_x        0
show_id          0
type             0
date_added     158
release_year     0
rating           0
duration         0
description      0
dtype: int64
```

2.0.4 Dates have been filled with 0 as no information is provided in other columns for imputation and to maintain the data integrity and accuracy.

[ ]:
```
final_merge["date_added"].fillna(0,inplace=True)
```

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

[ ]:
```
title          0
cast_x         0
director_x     0
listed_in_x    0
country_x      0
```

```
show_id         0
type            0
date_added      0
release_year    0
rating          0
duration        0
description     0
dtype: int64
```

2.0.5 Dealing with duplicate rows, keeping the first row and dropping the other

[ ]:
```
final_merge.loc[final_merge.duplicated()]
```

[ ]:
```
                     title                cast_x      director_x  \
39354            Rust Creek         Micah Hauptman     Jen McGowan
135656  300 Miles to Heaven   Adrianna Biedrzyńska  Maciej Dejczer
135657  300 Miles to Heaven   Adrianna Biedrzyńska  Maciej Dejczer
135658  300 Miles to Heaven   Adrianna Biedrzyńska  Maciej Dejczer
135659  300 Miles to Heaven   Adrianna Biedrzyńska  Maciej Dejczer
135660  300 Miles to Heaven   Adrianna Biedrzyńska  Maciej Dejczer
135661  300 Miles to Heaven   Adrianna Biedrzyńska  Maciej Dejczer

                  listed_in_x      country_x show_id   type  \
39354               Thrillers  United States   s1632  Movie
135656                 Dramas        Denmark   s6014  Movie
135657                 Dramas         France   s6014  Movie
135658                 Dramas         Poland   s6014  Movie
135659   International Movies        Denmark   s6014  Movie
135660   International Movies         France   s6014  Movie
135661   International Movies         Poland   s6014  Movie

              date_added  release_year rating duration  \
39354   November 30, 2020          2018      R  108 min
135656    October 1, 2019          1989  TV-14   93 min
135657    October 1, 2019          1989  TV-14   93 min
135658    October 1, 2019          1989  TV-14   93 min
135659    October 1, 2019          1989  TV-14   93 min
135660    October 1, 2019          1989  TV-14   93 min
135661    October 1, 2019          1989  TV-14   93 min

                                              description
39354   A wrong turn in the woods becomes a fight for …
135656  Hoping to help their dissident parents, two br…
135657  Hoping to help their dissident parents, two br…
135658  Hoping to help their dissident parents, two br…
135659  Hoping to help their dissident parents, two br…
135660  Hoping to help their dissident parents, two br…
```

```
135661  Hoping to help their dissident parents, two br…
```

[ ]:
```
final_merge.drop_duplicates(keep="first")
```

[ ]:
```
                        title                 cast_x       director_x  \
0       Dick Johnson Is Dead                No cast  Kirsten Johnson
1              Blood & Water             Ama Qamata      No director
2              Blood & Water             Ama Qamata      No director
3              Blood & Water             Ama Qamata      No director
4              Blood & Water            Khosi Ngema      No director
…                        …                      …              …
202060                Zubaan          Anita Shabdish      Mozez Singh
202061                Zubaan          Anita Shabdish      Mozez Singh
202062                Zubaan   Chittaranjan Tripathy      Mozez Singh
202063                Zubaan   Chittaranjan Tripathy      Mozez Singh
202064                Zubaan   Chittaranjan Tripathy      Mozez Singh

                   listed_in_x      country_x show_id     type  \
0                Documentaries  United States      s1    Movie
1       International TV Shows   South Africa      s2  TV Show
2                   TV Dramas   South Africa      s2  TV Show
3                TV Mysteries   South Africa      s2  TV Show
4       International TV Shows   South Africa      s2  TV Show
…                          …              …     …      …
202060    International Movies          India   s8807    Movie
202061        Music & Musicals          India   s8807    Movie
202062                 Dramas          India   s8807    Movie
202063    International Movies          India   s8807    Movie
202064        Music & Musicals          India   s8807    Movie

                date_added  release_year rating   duration  \
0       September 25, 2021          2020  PG-13     90 min
1       September 24, 2021          2021  TV-MA  2 Seasons
2       September 24, 2021          2021  TV-MA  2 Seasons
3       September 24, 2021          2021  TV-MA  2 Seasons
4       September 24, 2021          2021  TV-MA  2 Seasons
…                      …           …     …        …
202060      March 2, 2019          2015  TV-14    111 min
202061      March 2, 2019          2015  TV-14    111 min
202062      March 2, 2019          2015  TV-14    111 min
202063      March 2, 2019          2015  TV-14    111 min
202064      March 2, 2019          2015  TV-14    111 min

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

```
3       After crossing paths at a party, a Cape Town t…
4       After crossing paths at a party, a Cape Town t…
…                                                     …
202060  A scrappy but poor boy worms his way into a ty…
202061  A scrappy but poor boy worms his way into a ty…
202062  A scrappy but poor boy worms his way into a ty…
202063  A scrappy but poor boy worms his way into a ty…
202064  A scrappy but poor boy worms his way into a ty…

[202058 rows x 12 columns]
```

2.0.6 Converting date_added column in datetime format and extracting month_name, year, day from the same for analysis. With this we also rename some columns and eliminating any white space present in the cell for avoiding duplicacy and accurate results.

[ ]:
```
final_merge["date_added"]=pd.to_datetime(final_merge["date_added"])
final_merge['month_added'] = final_merge['date_added'].dt.month
final_merge['month_name_added'] = final_merge['date_added'].dt.month_name()
final_merge['year_added'] = final_merge['date_added'].dt.year
final_merge['week_added'] = final_merge['date_added'].dt.isocalendar().week
```

[ ]:
```
final_merge.rename(columns={"cast_x": "cast", "director_x":␣
 ↪"director","listed_in_x":"genre","country_x":"country"},inplace=True)
```

[ ]:
```
final_merge['rating'] = final_merge['rating'].str.strip()
final_merge['country'] = final_merge['country'].str.strip()
final_merge['director'] = final_merge['director'].str.strip()
final_merge['cast'] = final_merge['cast'].str.strip()
final_merge['genre'] = final_merge['genre'].str.strip()
```

[ ]:
```
final_merge
```

[ ]:
```
                     title                  cast         director  \
0       Dick Johnson Is Dead               No cast  Kirsten Johnson
1              Blood & Water            Ama Qamata      No director
2              Blood & Water            Ama Qamata      No director
3              Blood & Water            Ama Qamata      No director
4              Blood & Water           Khosi Ngema      No director
…                        …                     …               …
202060                Zubaan         Anita Shabdish      Mozez Singh
202061                Zubaan         Anita Shabdish      Mozez Singh
202062                Zubaan  Chittaranjan Tripathy      Mozez Singh
202063                Zubaan  Chittaranjan Tripathy      Mozez Singh
202064                Zubaan  Chittaranjan Tripathy      Mozez Singh

                       genre        country show_id     type date_added  \
```

```
0                Documentaries  United States      s1    Movie 2021-09-25
1       International TV Shows   South Africa      s2  TV Show 2021-09-24
2                   TV Dramas   South Africa      s2  TV Show 2021-09-24
3                 TV Mysteries   South Africa      s2  TV Show 2021-09-24
4       International TV Shows   South Africa      s2  TV Show 2021-09-24
…                         …            …     …      …       …
202060    International Movies          India   s8807    Movie 2019-03-02
202061        Music & Musicals          India   s8807    Movie 2019-03-02
202062                  Dramas          India   s8807    Movie 2019-03-02
202063    International Movies          India   s8807    Movie 2019-03-02
202064        Music & Musicals          India   s8807    Movie 2019-03-02

        release_year rating   duration  \
0               2020  PG-13     90 min
1               2021  TV-MA  2 Seasons
2               2021  TV-MA  2 Seasons
3               2021  TV-MA  2 Seasons
4               2021  TV-MA  2 Seasons
…              …    …         …
202060          2015  TV-14    111 min
202061          2015  TV-14    111 min
202062          2015  TV-14    111 min
202063          2015  TV-14    111 min
202064          2015  TV-14    111 min

                                                 description  month_added  \
0       As her father nears the end of his life, filmm…            9
1       After crossing paths at a party, a Cape Town t…            9
2       After crossing paths at a party, a Cape Town t…            9
3       After crossing paths at a party, a Cape Town t…            9
4       After crossing paths at a party, a Cape Town t…            9
…                                                     …          …
202060  A scrappy but poor boy worms his way into a ty…            3
202061  A scrappy but poor boy worms his way into a ty…            3
202062  A scrappy but poor boy worms his way into a ty…            3
202063  A scrappy but poor boy worms his way into a ty…            3
202064  A scrappy but poor boy worms his way into a ty…            3

       month_name_added  year_added  week_added
0             September        2021          38
1             September        2021          38
2             September        2021          38
3             September        2021          38
4             September        2021          38
…                   …          …         …
202060            March        2019           9
202061            March        2019           9
```

```
202062            March       2019          9
202063            March       2019          9
202064            March       2019          9

[202065 rows x 16 columns]
```

2.1 Finally after data sanitization and preprocessing our dataframe : final_merge is ready for analysis !!!!

3 Exploratary Data Analysis

3.1 Analysis 1 : Distribution of Movie/ Tv show In Netflix Library

3.1.1 First Calculation of the distribution in percentage terms of Movie/ Tvshow

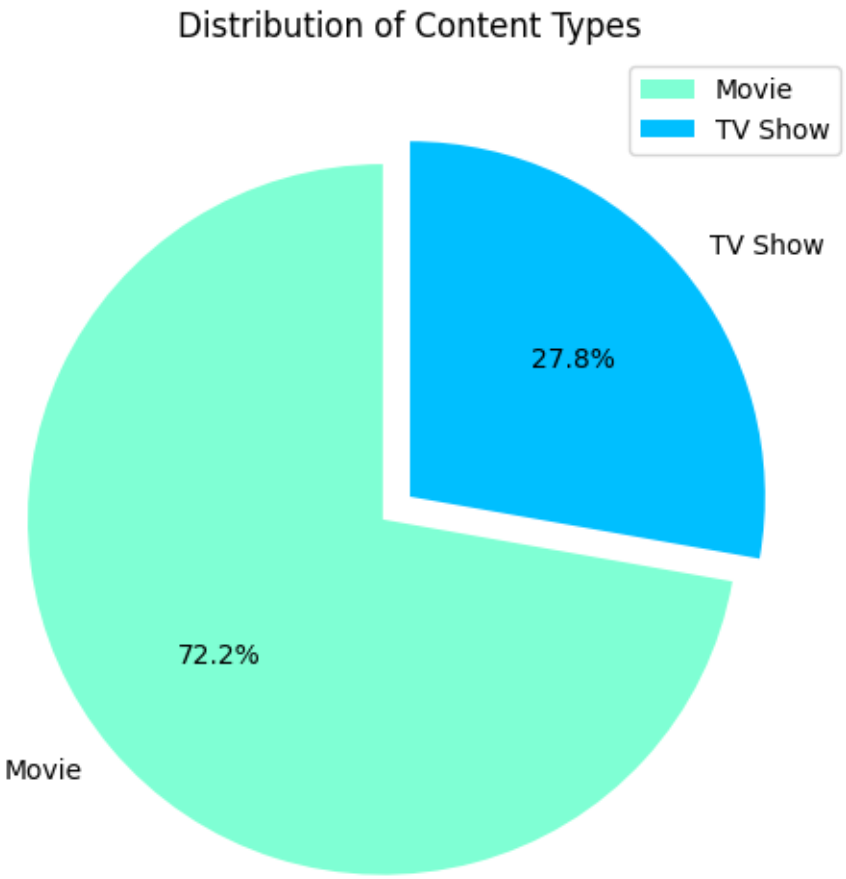
[ ]:
```
x=final_merge.groupby(["type"])["type"].count()
y = len(final_merge)
r = ((x/y) * 100).round(2)
df_type=pd.DataFrame(r)
df_type.rename({'type': '%'}, axis=1, inplace=True)
df_type
```

[ ]:
```
              %
type
Movie     72.21
TV Show   27.79
```

3.1.2 Visualizing the distribution in a 3D Pie Plot

[ ]:
```
plt.figure(figsize=(10,6))
plt.pie(df_type["%"],labels=df_type.
 ↪index,colors=("aquamarine","deepskyblue"),explode=(0.1,0),autopct='%1.
 ↪1f%%',startangle=90)

plt.legend(loc='upper right')
plt.title('Distribution of Content Types')
plt.show()
```



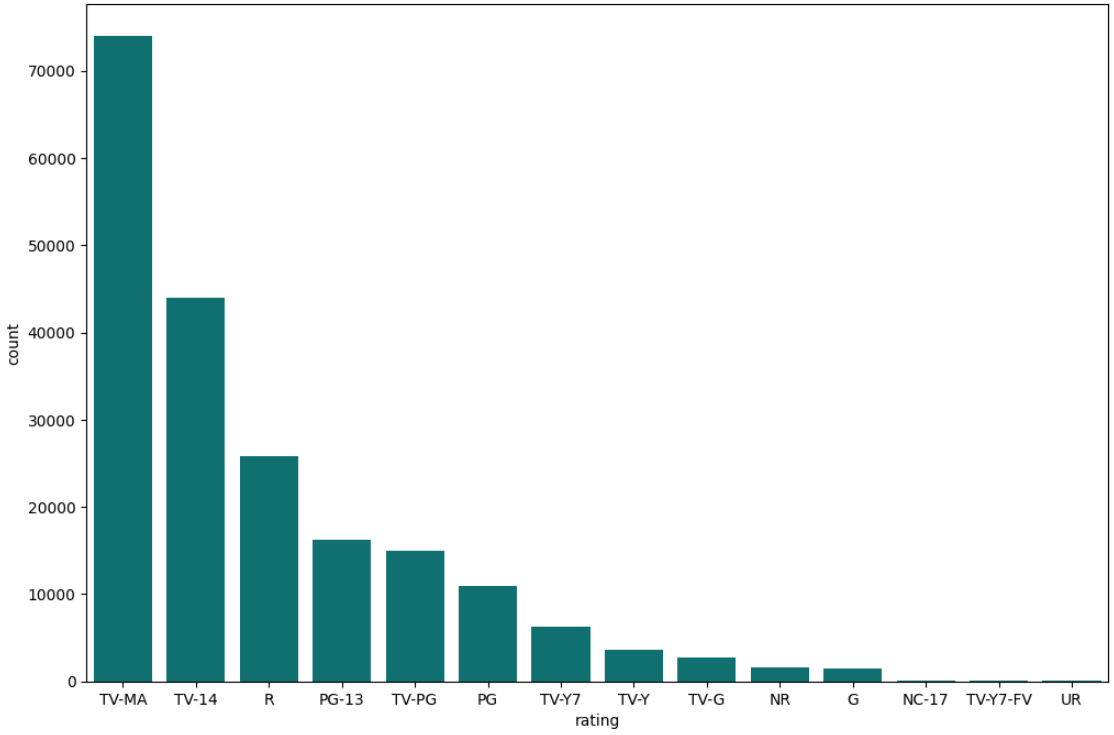
3.1.3 Count and Visualization of Categorical variable : "Rating"

[ ]:
```
final_merge["rating"].value_counts()
```

[ ]:
```
TV-MA       73985
TV-14       43957
R           25860
PG-13       16246
TV-PG       14926
PG          10919
TV-Y7        6304
TV-Y         3665
TV-G         2779
NR           1573
G            1530
NC-17         149
TV-Y7-FV       86
```

```
UR              86
Name: rating, dtype: int64
```

[ ]:
```
plt.figure(figsize=(12,8))
sns.countplot(x="rating",data=final_merge,order=final_merge['rating'].
 ↪value_counts().index, color='teal')
plt.show()
```



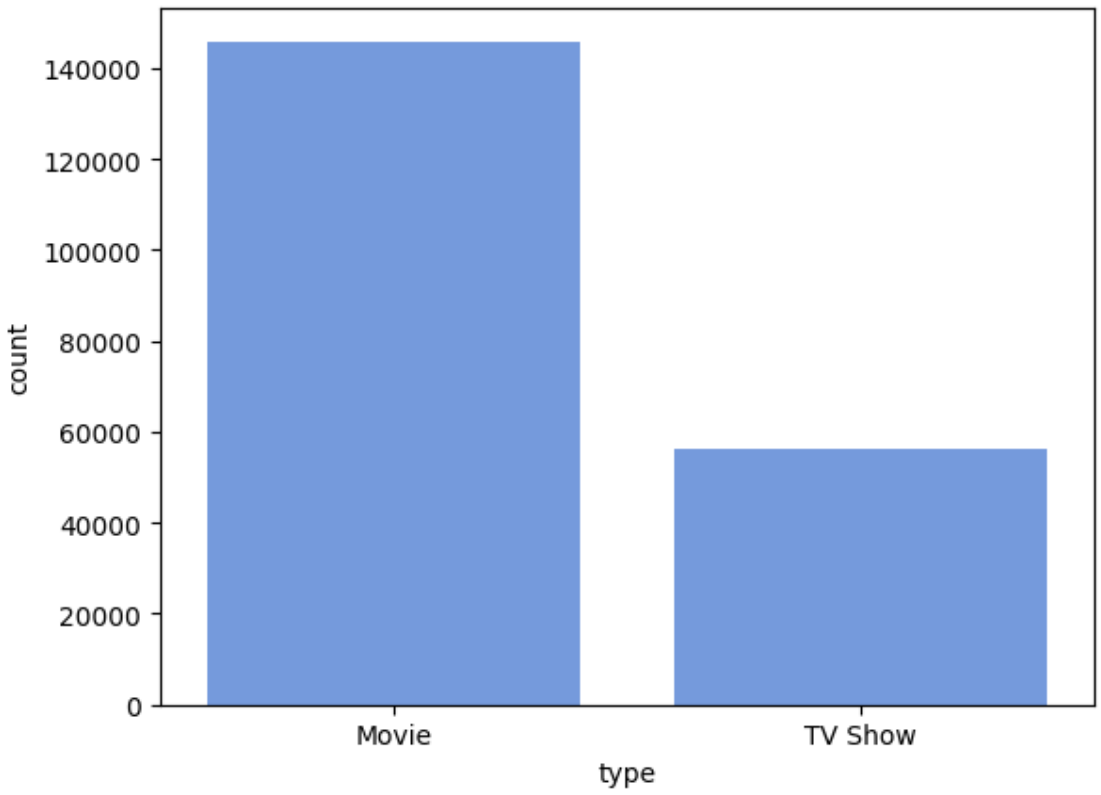
3.1.4 Count and visualization of Categorical variable : "type"

[ ]:
```
x
```

[ ]:
```
type
Movie      145917
TV Show     56148
Name: type, dtype: int64
```

[ ]:
```
sns.countplot(x="type",data=final_merge,order=final_merge['type'].
 ↪value_counts().index, color='cornflowerblue')
```

[ ]:
```
<Axes: xlabel='type', ylabel='count'>
```



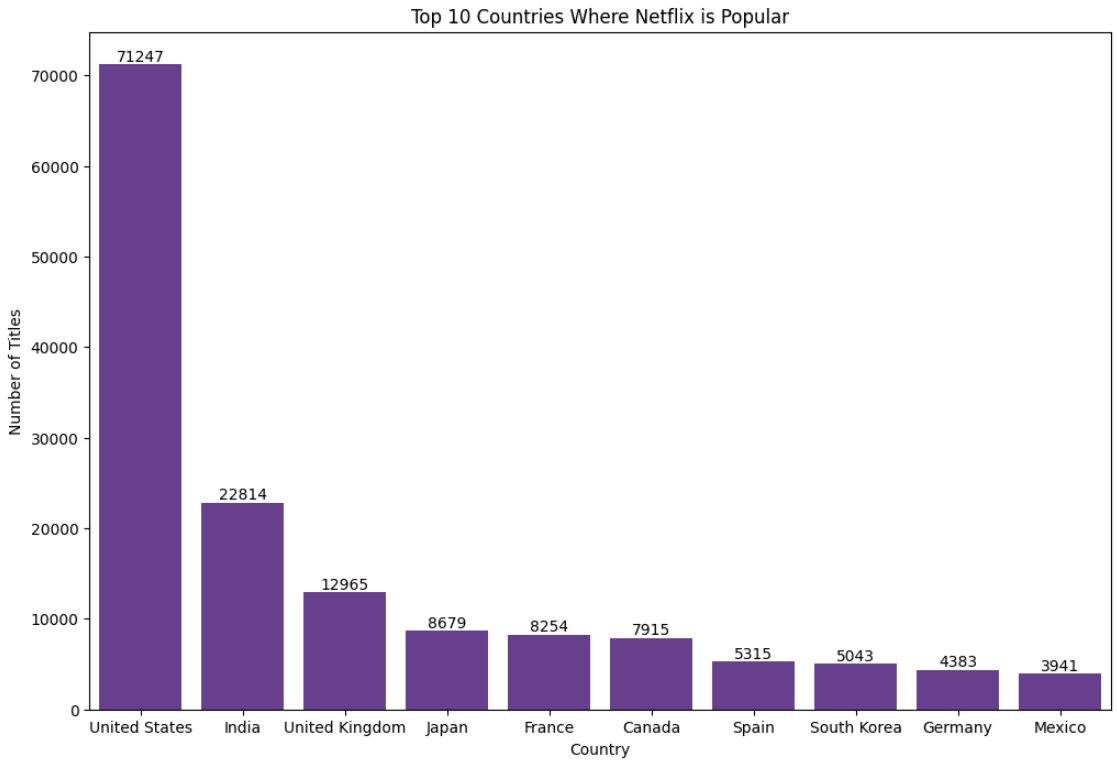
3.1.5 Count and visualization of Categorical variable : "country"

[ ]:
```
country_counts=final_merge["country"].value_counts()
top_10_countries = country_counts.head(10)
country_counts
```

[ ]:
```
United States     71247
India             22814
United Kingdom    12965
Japan              8679
France             8254
                  …
Panama                2
Mongolia              2
Kazakhstan            1
Nicaragua             1
Uganda                1
Name: country, Length: 123, dtype: int64
```

[ ]:
```
plt.figure(figsize=(12, 8))
```

```
bar_plot=sns.barplot(x=top_10_countries.index, y=top_10_countries.
  ↪values,color="rebeccapurple")
plt.xlabel('Country')
plt.ylabel('Number of Titles')
plt.title('Top 10 Countries Where Netflix is Popular')
for index, value in enumerate(top_10_countries.values):
    bar_plot.text(index, value, str(value), ha='center', va='bottom')
plt.show()
```



3.1.6 Count of Categorical variable : Director

[ ]:
```
final_merge["director"].value_counts()[1:]
```

[ ]:
```
Martin Scorsese          419
Youssef Chahine          409
Cathy Garcia-Molina      356
Steven Spielberg         355
Lars von Trier           336
                        ...
Brendon Marotta            1
Charlie Siskel             1
Adam Bolt                  1
```

```
Anthony Palmer           1
Kirsten Johnson          1
Name: director, Length: 4993, dtype: int64
```

[ ]:
```
final_merge["genre"].value_counts()
```

[ ]:
```
Dramas                          29806
International Movies            28243
Comedies                        20829
International TV Shows          12845
Action & Adventure              12216
Independent Movies               9834
Children & Family Movies         9771
TV Dramas                        8942
Thrillers                        7107
Romantic Movies                  6412
TV Comedies                      4963
Crime TV Shows                   4733
Horror Movies                    4571
Kids' TV                         4568
Sci-Fi & Fantasy                 4037
Music & Musicals                 3077
Romantic TV Shows                3049
Documentaries                    2409
Anime Series                     2313
TV Action & Adventure            2288
Spanish-Language TV Shows        2126
British TV Shows                 1808
Sports Movies                    1531
Classic Movies                   1443
TV Mysteries                     1281
Korean TV Shows                  1122
Cult Movies                      1077
TV Sci-Fi & Fantasy              1045
Anime Features                   1045
TV Horror                         941
Docuseries                        845
LGBTQ Movies                      838
TV Thrillers                      768
Teen TV Shows                     742
Reality TV                        735
Faith & Spirituality              719
Stand-Up Comedy                   540
Movies                            412
TV Shows                          337
Classic & Cult TV                 272
Stand-Up Comedy & Talk Shows      268
```

```
Science & Nature TV               157
Name: genre, dtype: int64
```

3.1.7 Count of Categorical Variable: Cast/ Actors

[ ]:
```
final_merge["cast"].value_counts()[1:11]
```

[ ]:
```
Liam Neeson          161
Alfred Molina        160
John Krasinski       139
Salma Hayek          130
Frank Langella       128
Anupam Kher          127
John Rhys-Davies     125
Shah Rukh Khan       108
Naseeruddin Shah     106
Radhika Apte         104
Name: cast, dtype: int64
```

[ ]:
```
final_merge["country"].nunique()
```

[ ]:
```
123
```

[ ]:
```
final_merge["cast"].nunique()
```

[ ]:
```
36440
```

[ ]:
```
final_merge["rating"].nunique()
```

[ ]:
```
14
```

[ ]:
```
final_merge["director"].nunique()
```

[ ]:
```
4994
```

[ ]:
```
final_merge["genre"].nunique()
```

[ ]:
```
42
```

[ ]:
```
final_merge["title"].nunique()
```

[ ]:
```
8807
```

##**Insights from analysis 1** : We have calculated the frequency, their respective unique values for all the categorical variables present in the dataframe. Our Analysis has revealed that Netflix has added more movies than TV shows and they dominate the netflix library. The country where Netflix is popular which is “United States”. It summarizes our data to a level where we have unique 8807

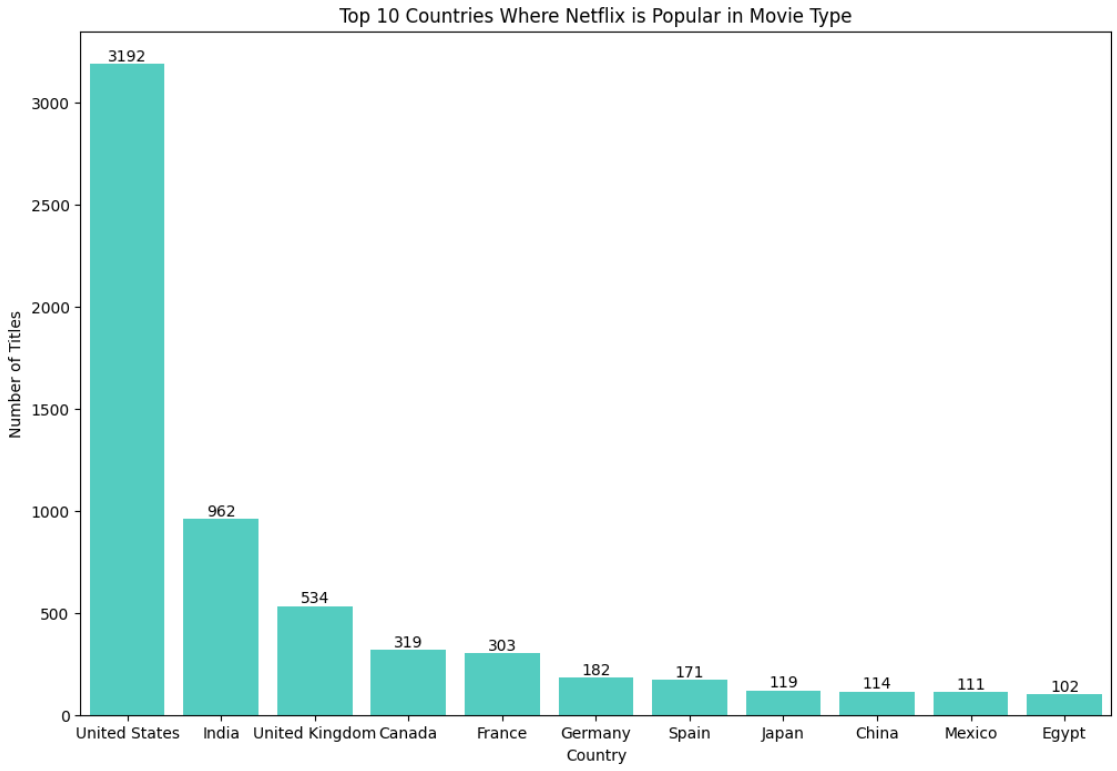
titles, 36439 cast/ Actors (eliminating “No cast”), 4993 directors (eliminating “No director”), 14 ratings, 123 countries and 42 genres present in the data. We can observe the distribution of ratings on Netflix. It helps us identify the most common rating categories and their relative frequency. It offers insights into the evolving content landscape and audience reception.

4 Analysis 2 : Comparison of Tv shows vs Movies

4.1 Number of movies produced in each country and plotting the top 10 countries

[ ]:
```
final_merge.rename(columns={"listed_in":"genre"},inplace=True)
Movie=final_merge.loc[final_merge["type"]=="Movie"]
Popular_Country=Movie.groupby(["country"])["title"].nunique().
 ↪sort_values(ascending=False)[:11]
```

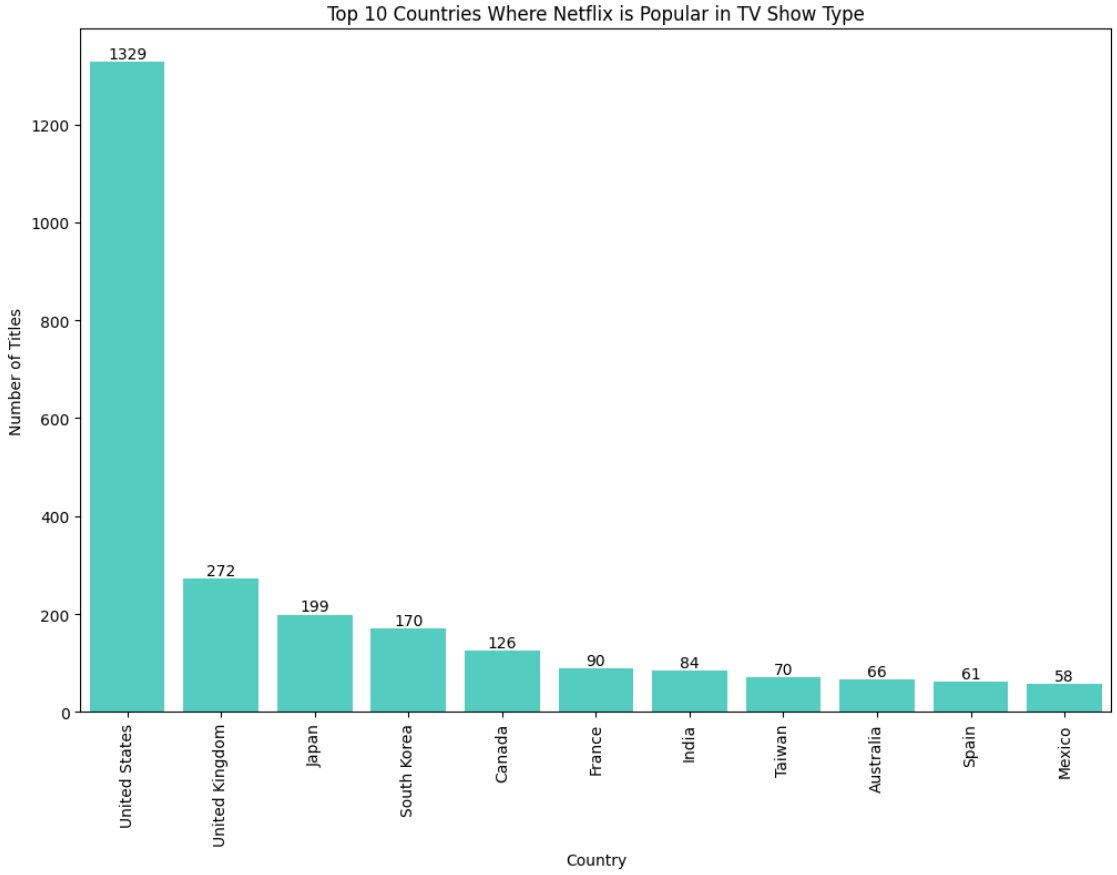
[ ]:
```
plt.figure(figsize=(12, 8))
bar_plot_y=sns.barplot(x=Popular_Country.index, y=Popular_Country.
 ↪values,color="turquoise")
plt.xlabel('Country')
plt.ylabel('Number of Titles')
plt.title('Top 10 Countries Where Netflix is Popular in Movie Type')
for index, value in enumerate(Popular_Country.values):
    bar_plot_y.text(index, value, str(value), ha='center', va='bottom')
plt.show()
```



4.2 Number of Tv shows produced in each country and plotting the top 10 countries

[ ]:
```
TV_show=final_merge.loc[final_merge["type"]=="TV Show"]
popular_countries=TV_show.groupby(["country"])["title"].nunique().
 ↪sort_values(ascending=False)[:11]
```

[ ]:
```
plt.figure(figsize=(12, 8))
bar_plot_h=sns.barplot(x=popular_countries.index, y=popular_countries.
 ↪values,color="turquoise")
plt.xlabel('Country')
plt.ylabel('Number of Titles')
plt.xticks(rotation=90)
plt.title('Top 10 Countries Where Netflix is Popular in TV Show Type')
for index, value in enumerate(popular_countries.values):
    bar_plot_h.text(index, value, str(value), ha='center', va='bottom')
plt.show()
```



4.3 Insights from analysis 2 : Our analysis reveals the top 10 countries by categorising movies and Tv Shows separately. Again "United states" as attained the first position in both the categories.

5 Analysis 3 : Best time to launch a TV show/Movie ?

5.1 Best week to release the Tv-show or the Movie

```
[ ]: Best_week_Movie=Movie.groupby(["week_added"])["title"].nunique().
      ↪sort_values(ascending=False)[:1]
     Best_week_Movie
```

```
[ ]: week_added
     1    316
     Name: title, dtype: int64
```

```
[ ]: Best_week_Tvshow=TV_show.groupby(["week_added"])["title"].nunique().
      ↪sort_values(ascending=False)[:1]
     Best_week_Tvshow
```

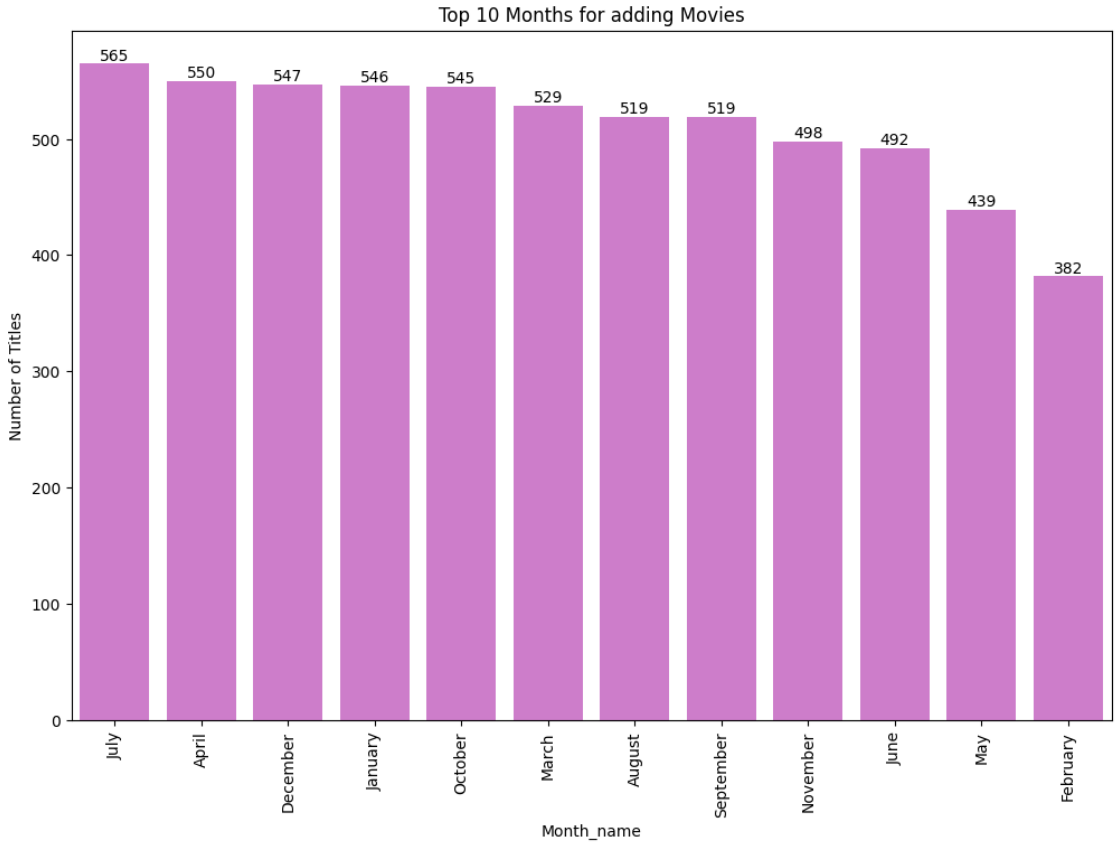
```
[ ]: week_added
     27    86
     Name: title, dtype: int64
```

5.2 Best month to release the Tv-show or the Movie

```
[ ]: Best_month_Movie=Movie.groupby(["month_name_added"])["title"].nunique().
      ↪sort_values(ascending=False)
     Best_month_Movie
```

```
[ ]: month_name_added
     July          565
     April         550
     December      547
     January       546
     October       545
     March         529
     August        519
     September     519
     November      498
     June          492
     May           439
     February      382
     Name: title, dtype: int64
```

[ ]:
```
plt.figure(figsize=(12, 8))
bar_plot_h=sns.barplot(x=Best_month_Movie.index, y=Best_month_Movie.
 ↪values,color="orchid")
plt.xlabel('Month_name')
plt.ylabel('Number of Titles')
plt.xticks(rotation=90)
plt.title('Top 10 Months for adding Movies')
for index, value in enumerate(Best_month_Movie.values):
    bar_plot_h.text(index, value, str(value), ha='center', va='bottom')
plt.show()
```

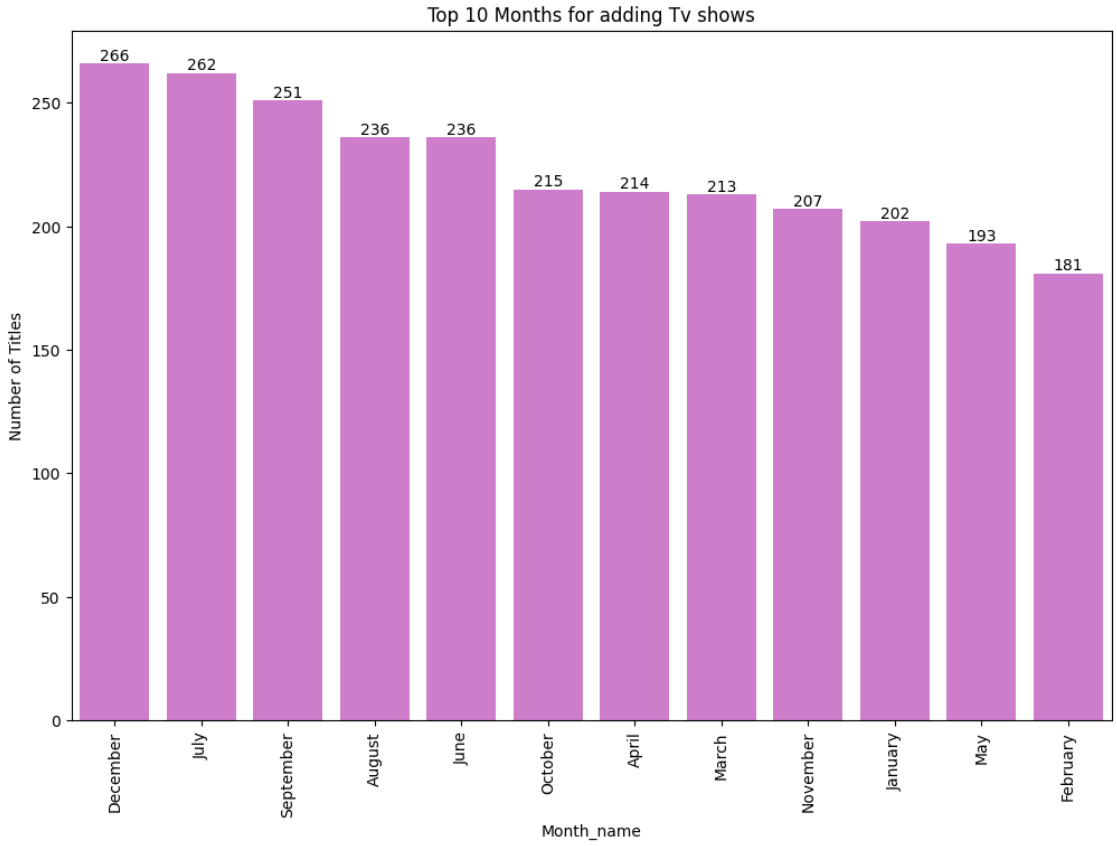


[ ]:
```
Best_month_Tvshow=TV_show.groupby(["month_name_added"])["title"].nunique().
 ↪sort_values(ascending=False)
Best_month_Tvshow
```

[ ]:
```
month_name_added
December     266
July         262
September    251
August       236
```

```
June          236
October       215
April         214
March         213
November      207
January       202
May           193
February      181
Name: title, dtype: int64
```

[ ]:
```
plt.figure(figsize=(12, 8))
bar_plot_h=sns.barplot(x=Best_month_Tvshow.index, y=Best_month_Tvshow.
 ↪values,color="orchid")
plt.xlabel('Month_name')
plt.ylabel('Number of Titles')
plt.xticks(rotation=90)
plt.title('Top 10 Months for adding Tv shows')
for index, value in enumerate(Best_month_Tvshow.values):
    bar_plot_h.text(index, value, str(value), ha='center', va='bottom')
plt.show()
```



5.3 Insights from Analysis 3: The above analysis shows us the best time for movie/Tv show addition in netflix library indicating a strategic approach to content release. If we categorize the same into week or month basis, we obtain result as :-

5.3.1 Week-Wise

1. Movie Week –> 1st Week
2. Tv_show_Week –>27th Week

5.3.2 Month-Wise

1. Movie Month –> July
2. Movie Month –> December

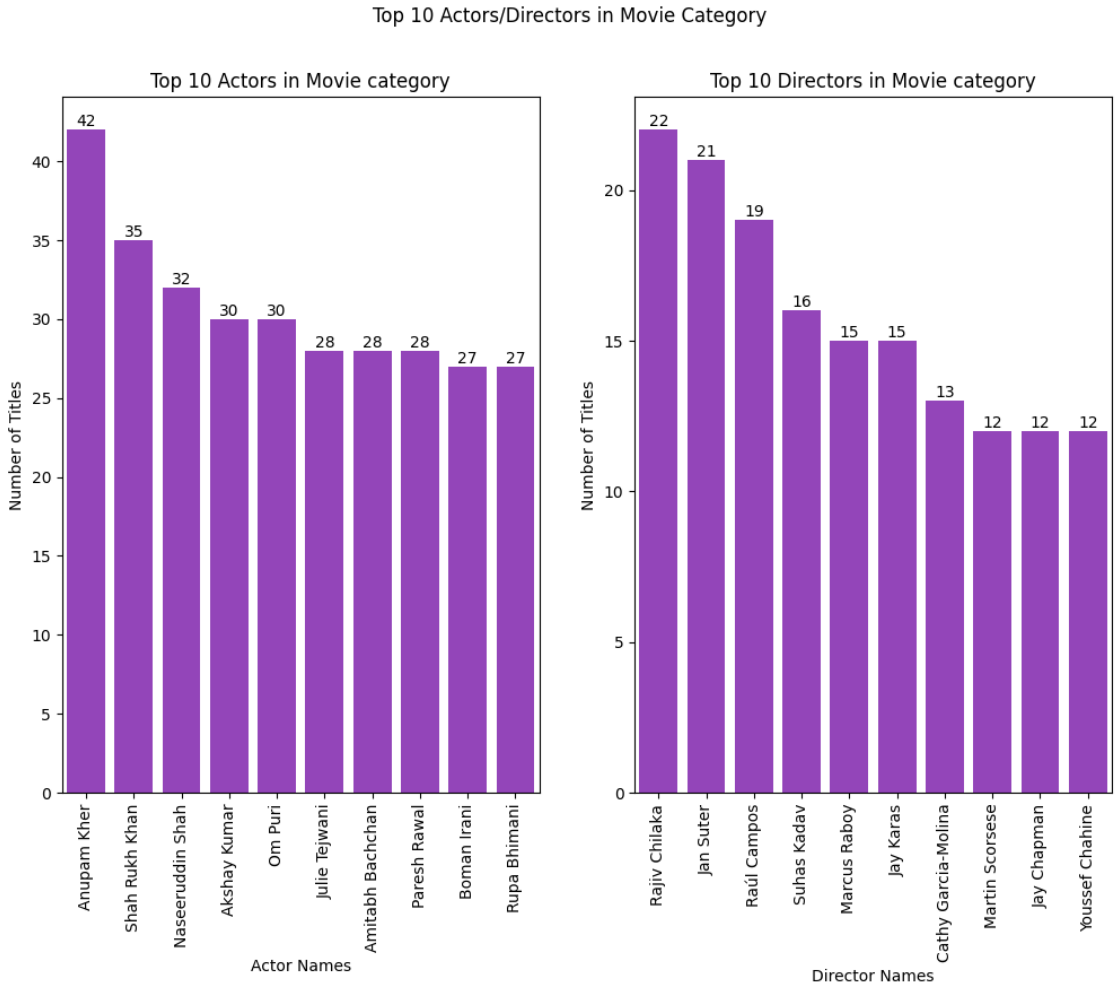
6 Analysis 4 : Analysis of Actors/Directors of different types of TVshows/Movies.

6.0.1 Top 10 Actors/ Directors in Movie Category

[ ]:
```
top_10_actors_movie=Movie.groupby(["cast"])["title"].nunique().
 ↪sort_values(ascending=False)[1:11]
top_10_directors_movie=Movie.groupby(["director"])["title"].nunique().
 ↪sort_values(ascending=False)[1:11]

plt.figure(figsize=(12, 8)).suptitle("Top 10 Actors/Directors in Movie␣
 ↪Category")
plt.subplot(1,2,1)
bar_plot_h=sns.barplot(x=top_10_actors_movie.index, y=top_10_actors_movie.
 ↪values,color="darkorchid")
plt.xlabel('Actor Names')
plt.ylabel('Number of Titles')
plt.xticks(rotation=90)
plt.title('Top 10 Actors in Movie category')
for index, value in enumerate(top_10_actors_movie.values):
    bar_plot_h.text(index, value, str(value), ha='center', va='bottom')

plt.subplot(1,2,2)
bar_plot_h=sns.barplot(x=top_10_directors_movie.index, y=top_10_directors_movie.
 ↪values,color="darkorchid")
plt.xlabel('Director Names')
plt.ylabel('Number of Titles')
plt.xticks(rotation=90)
plt.title('Top 10 Directors in Movie category')
for index, value in enumerate(top_10_directors_movie.values):
    bar_plot_h.text(index, value, str(value), ha='center', va='bottom')
plt.show()
```



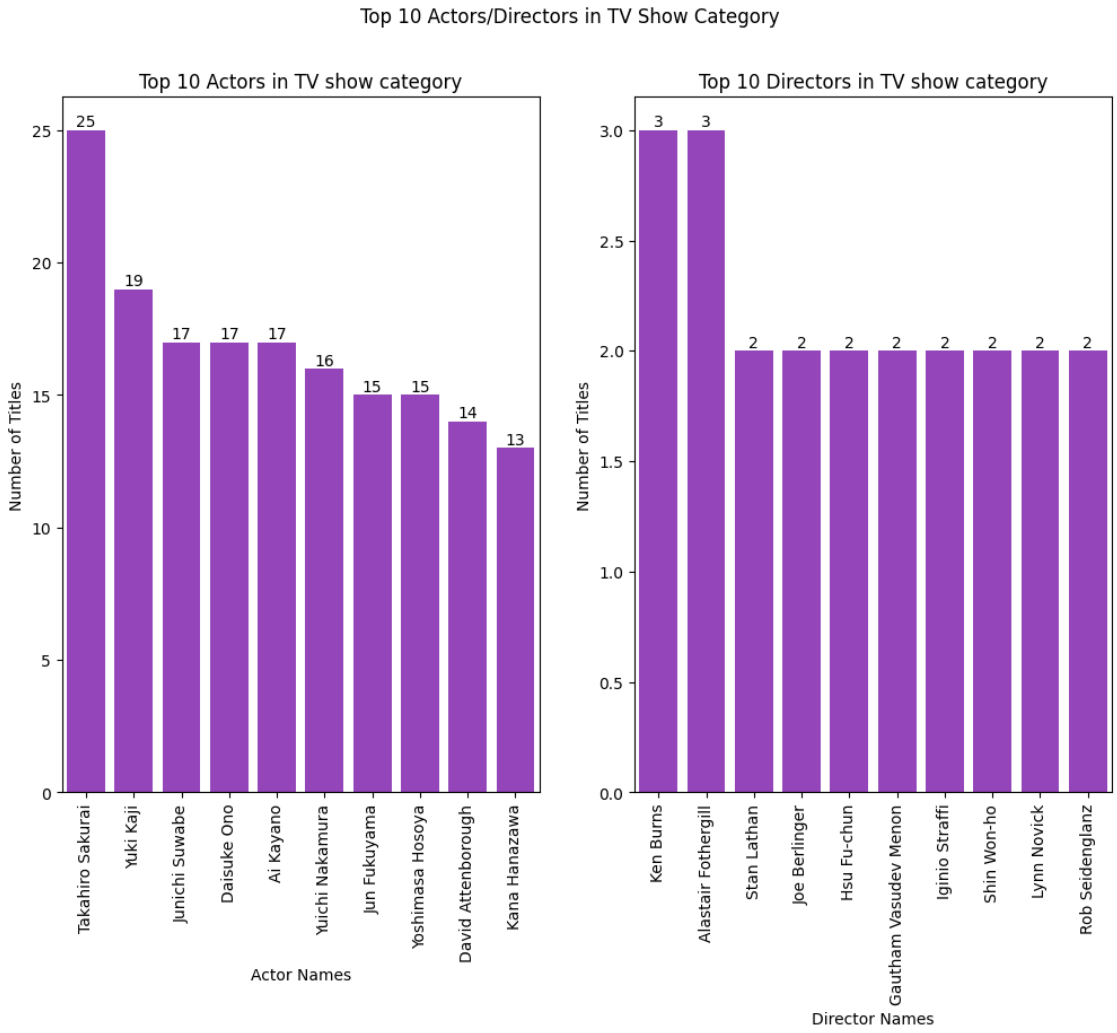
6.0.2 Top 10 Actors/ Directors in TV Show Category

[ ]:
```
top_10_actors_Tvshow=TV_show.groupby(["cast"])["title"].nunique().
 ↪sort_values(ascending=False)[1:11]
top_10_directors_Tvshow=TV_show.groupby(["director"])["title"].nunique().
 ↪sort_values(ascending=False)[1:11]

plt.figure(figsize=(12, 8)).suptitle("Top 10 Actors/Directors in TV Show␣
 ↪Category")
plt.subplot(1,2,1)
bar_plot_h=sns.barplot(x=top_10_actors_Tvshow.index, y=top_10_actors_Tvshow.
 ↪values,color="darkorchid")
plt.xlabel('Actor Names')
plt.ylabel('Number of Titles')
plt.xticks(rotation=90)
plt.title('Top 10 Actors in TV show category')
```

```
for index, value in enumerate(top_10_actors_Tvshow.values):
    bar_plot_h.text(index, value, str(value), ha='center', va='bottom')

plt.subplot(1,2,2)
bar_plot_h=sns.barplot(x=top_10_directors_Tvshow.index,␣
 ↪y=top_10_directors_Tvshow.values,color="darkorchid")
plt.xlabel('Director Names')
plt.ylabel('Number of Titles')
plt.xticks(rotation=90)
plt.title('Top 10 Directors in TV show category')
for index, value in enumerate(top_10_directors_Tvshow.values):
    bar_plot_h.text(index, value, str(value), ha='center', va='bottom')
plt.show()
```



6.1 Insights from analysis 4: This analysis showcases the top 10 Actors/ directors streamed in movie/Tv show category.

6.1.1 The top actor in movie category is “Anupam Kher” and director “Rajiv Chilaka” .

6.1.2 The top actor in Tv show category is “Takahiro Sakurai” and director “Ken Burns” .

7 Analysis 5 : Which genre movies are more popular or produced more?

7.0.1 Visualizing via Word map the genre in Movie category

[ ]:
```
from wordcloud import WordCloud

Text_movie_genre=" ".join(Movie["genre"])
wordcloud_movie =␣
 ↪WordCloud(width=800,height=800,min_font_size=10,background_color="black").
 ↪generate(Text_movie_genre)

plt.figure(figsize=(8,6))
plt.imshow(wordcloud_movie)
plt.axis("off")
plt.tight_layout(pad=0)
plt.show()
```

7.0.2 Visualizing via Word map the genre in TV Show category

```
[ ]: Text_TV_show_genre=" ".join(TV_show["genre"])
wordcloud_Tvshow =␣
  ↪WordCloud(width=800,height=800,min_font_size=10,background_color="black").
  ↪generate(Text_TV_show_genre)

plt.figure(figsize=(8,6))
plt.imshow(wordcloud_Tvshow)
plt.axis("off")
plt.tight_layout(pad=0)
plt.show()
```

##**Insights from analysis 5**: Words like Dramas, international movies pops out in movie category and Tv shows, international Tv in Tv show category capturing recurring themes in Netflix contents.

8 Analysis 6 : Top 10 Genres by Movie/TV Show Count

[ ]:
```
top_10_movie_genre=final_merge.loc[final_merge["type"]=="Movie"]["genre"].
↪value_counts()[:11]
top_10_movie_genre
```

[ ]:
```
Dramas                      29806
International Movies        28243
```

```
Comedies                    20829
Action & Adventure          12216
Independent Movies           9834
Children & Family Movies     9771
Thrillers                    7107
Romantic Movies              6412
Horror Movies                4571
Sci-Fi & Fantasy             4037
Music & Musicals             3077
Name: genre, dtype: int64
```

[ ]:
```
top_10_TVshow_genre=final_merge.loc[final_merge["type"]=="TV Show"]["genre"].
 ↪value_counts()[:11]
top_10_TVshow_genre
```

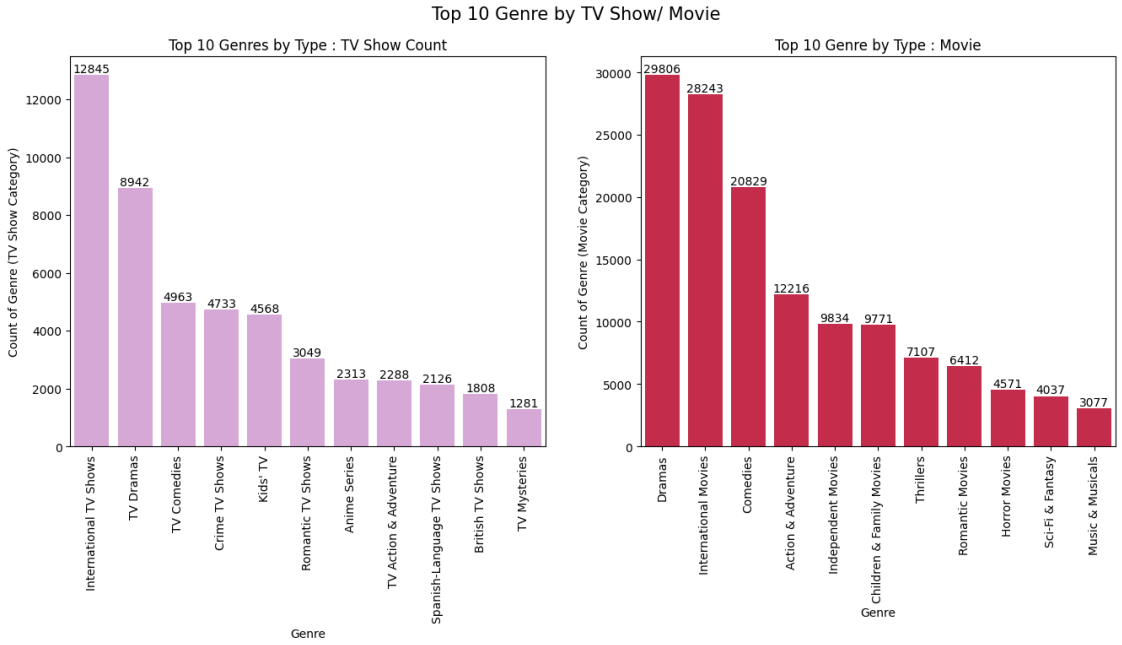
[ ]:
```
International TV Shows       12845
TV Dramas                     8942
TV Comedies                   4963
Crime TV Shows                4733
Kids' TV                      4568
Romantic TV Shows             3049
Anime Series                  2313
TV Action & Adventure         2288
Spanish-Language TV Shows     2126
British TV Shows              1808
TV Mysteries                  1281
Name: genre, dtype: int64
```

[ ]:
```
plt.figure(figsize=(16, 6)).suptitle("Top 10 Genre by TV Show/ Movie",␣
 ↪fontsize=15)
plt.subplot(1,2,1)
bar_plot = sns.barplot(x=top_10_TVshow_genre.index, y=top_10_TVshow_genre.
 ↪values,color="plum")
plt.xticks(rotation=90)
plt.xlabel('Genre')
plt.ylabel('Count of Genre (TV Show Category)')
plt.title('Top 10 Genres by Type : TV Show Count')
for index, value in enumerate(top_10_TVshow_genre.values):
    bar_plot.text(index, value,str(value), ha='center', va='bottom')

plt.subplot(1,2,2)
bar_plot = sns.barplot(x=top_10_movie_genre.index, y=top_10_movie_genre.
 ↪values,color="crimson")
plt.xticks(rotation=90)
plt.xlabel('Genre')
plt.ylabel('Count of Genre (Movie Category)')
plt.title('Top 10 Genre by Type : Movie')
```

```
for index, value in enumerate(top_10_movie_genre.values):
    bar_plot.text(index, value,str(value), ha='center', va='bottom')

plt.show()
```



8.1 Insights from Analysis 6: This analysis provides insights into viewer preferences which is International Tv shows in Tv show category and Dramas in movie category.

9 Analysis 7 : How has the number of movies released per year changed over the last 20-30 years?

[ ]:
```
final_merge["release_year"].dtype
```

[ ]: dtype('int64')

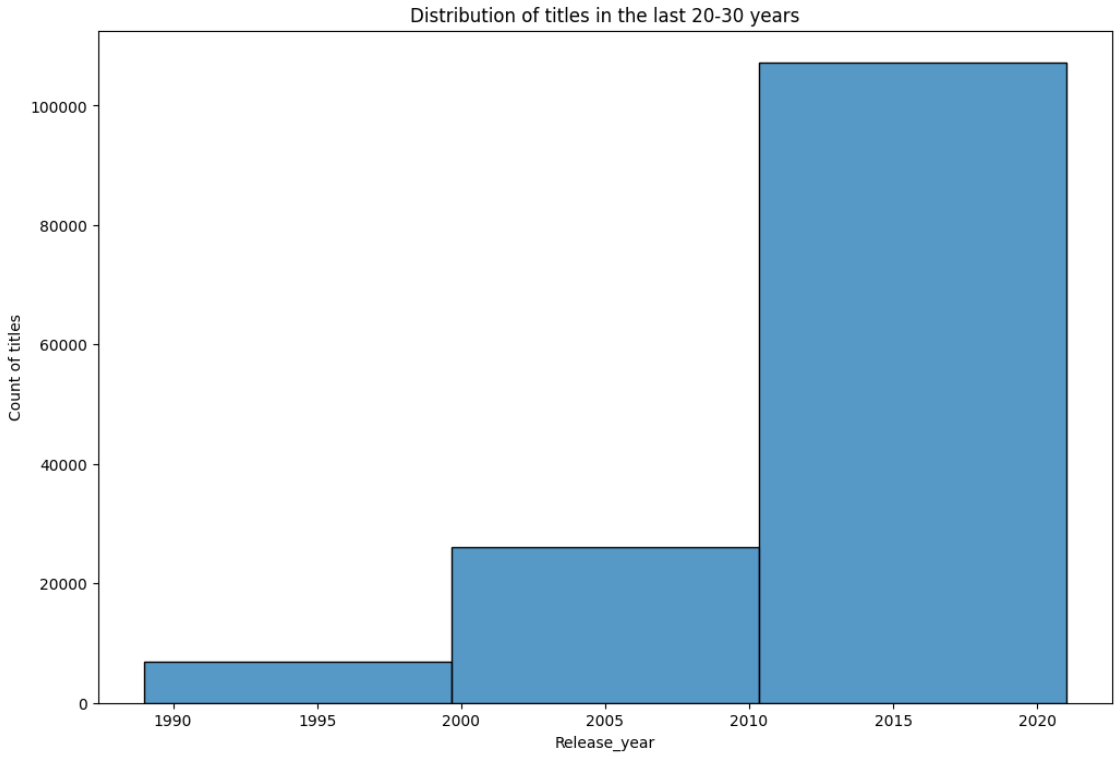
[ ]:
```
Movie["release_year"].max()
```

[ ]: 2021

[ ]:
```
Movie["release_year"].min()
```

[ ]: 1942

```
[ ]: plt.figure(figsize=(12,8))
     sns.histplot(Movie['release_year'],binrange=([1989,2021]),bins=3)
     plt.xlabel('Release_year')
     plt.ylabel('Count of titles')
     plt.title('Distribution of titles in the last 20-30 years')
     plt.show()
```

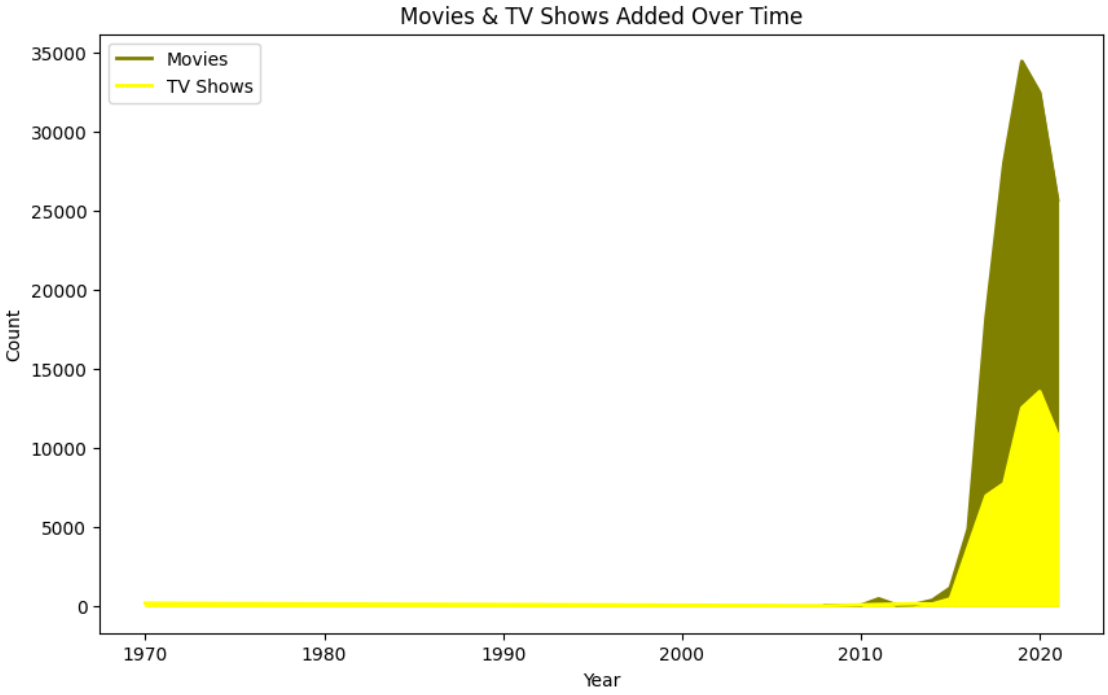


9.1 Insights from analysis 7: This analysis shows the quantum of movies added in the last 20-30 years has increased to a great extent. It also sums up that the viewers preferences to the movies more in comparison to TV shows.

10 Analysis 8 : Does Netflix has more focus on TV Shows than movies in recent years

```
[ ]: movies_count = Movie['year_added'].value_counts().sort_index()
     tv_shows_count = TV_show['year_added'].value_counts().sort_index()
     plt.figure(figsize=(10, 6))
     plt.plot(movies_count.index, movies_count.values, color='olive',
     label='Movies', linewidth=2)
     plt.plot(tv_shows_count.index, tv_shows_count.values, color='yellow',
     label='TV Shows', linewidth=2)
     plt.fill_between(movies_count.index, movies_count.values, color='olive')
```

```
plt.fill_between(tv_shows_count.index, tv_shows_count.values, color='yellow')
plt.xlabel('Year')
plt.ylabel('Count')
plt.title('Movies & TV Shows Added Over Time')
plt.legend()
plt.show()
```



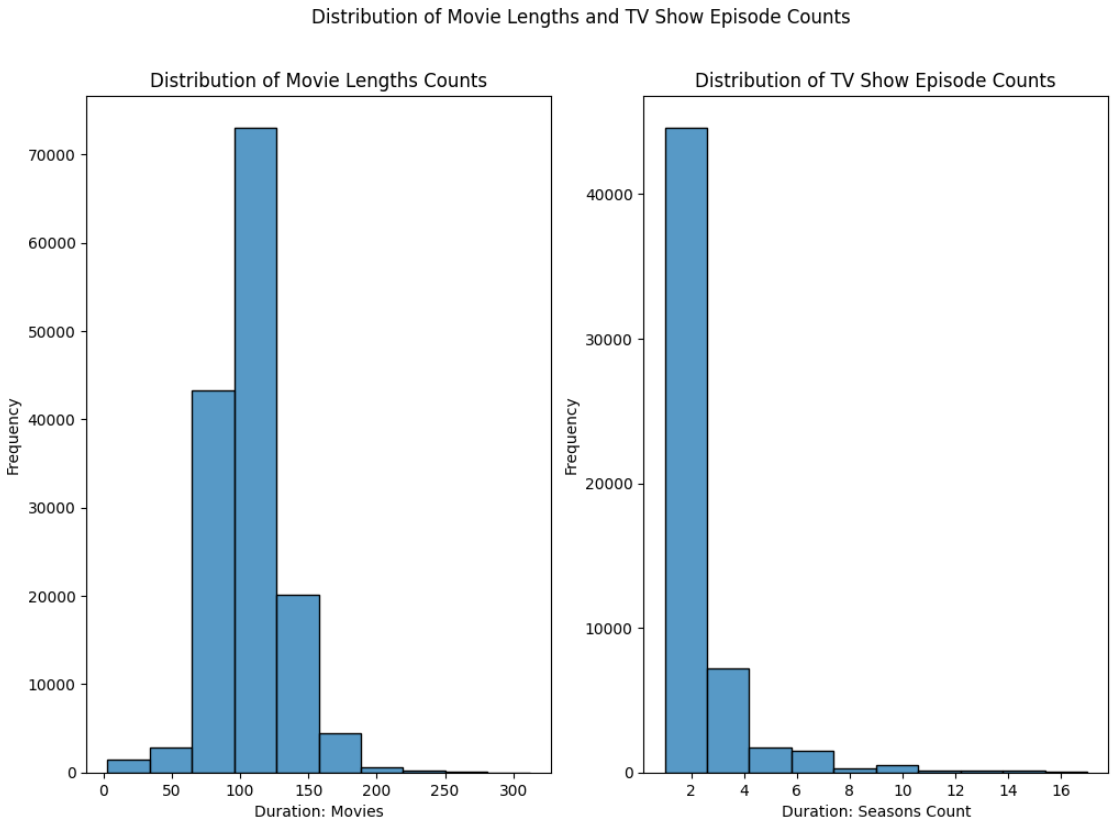
10.1 Insights from Analysis 8: This analysis clearly proves the fact that netflix has added more movies than Tv shows. The jump seen in the visualization is more for movies in comparison to TV shows and it also tells us about the viewers preferences.

11 Analysis 9 : Distribution of Movie Lengths and TV Show Episode Counts?

[ ]:
```
movie_lengths=Movie["duration"].str.extract("(\d+)",expand=False).astype(int)
Tv_show_episodes = TV_show['duration'].str.extract("(\d+)", expand=False).
  ↪astype(int)
plt.figure(figsize=(12,8)).suptitle("Distribution of Movie Lengths and TV Show␣
  ↪Episode Counts")
plt.subplot(1,2,1)
sns.histplot(movie_lengths,bins=10)
plt.xlabel('Duration: Movies')
```

```
plt.ylabel('Frequency')
plt.title('Distribution of Movie Lengths Counts')
plt.subplot(1,2,2)
sns.histplot(Tv_show_episodes,bins=10)
plt.xlabel('Duration: Seasons Count')
plt.ylabel('Frequency')
plt.title('Distribution of TV Show Episode Counts')

plt.show()
```



12 Analysis 9 : Duration Distribution for Movies and TV Shows

[ ]:
```
TV_show['duration'] = TV_show['duration'].str.extract('(\d+)', expand=False).
  ↪astype(int)
Movie['duration'] = Movie['duration'].str.extract('(\d+)', expand=False).
  ↪astype(int)
```

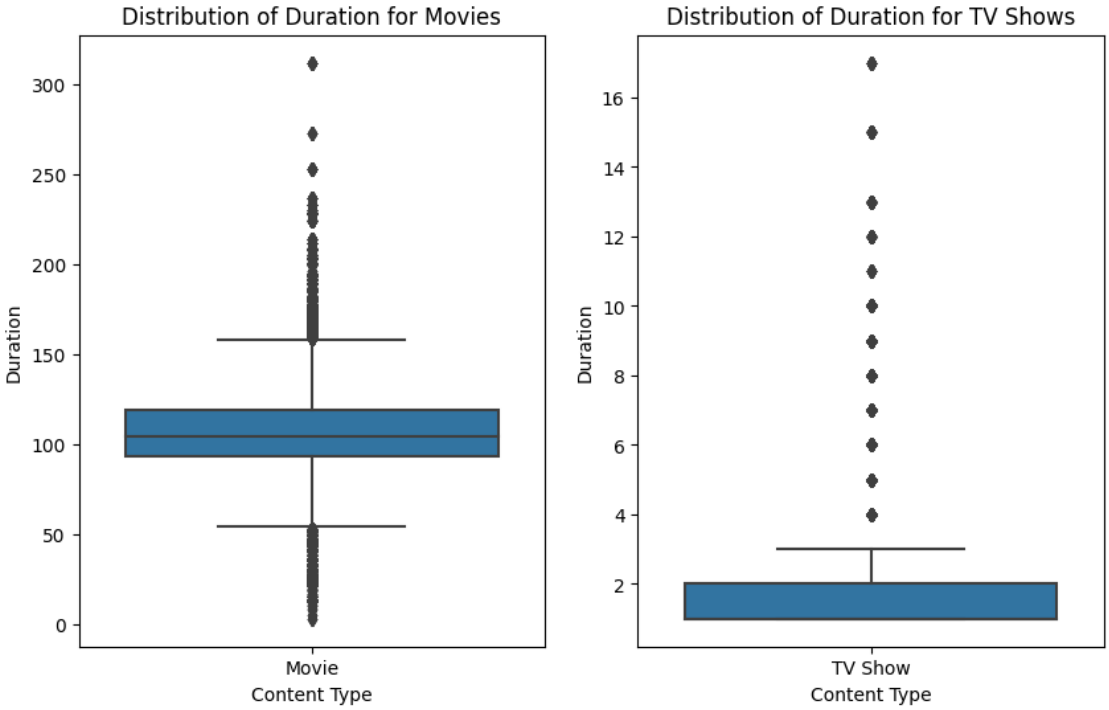
```
<ipython-input-912-8c4d08ac7307>:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead
```

```
See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  TV_show['duration'] = TV_show['duration'].str.extract('(\d+)',
expand=False).astype(int)
<ipython-input-912-8c4d08ac7307>:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  Movie['duration'] = Movie['duration'].str.extract('(\d+)',
expand=False).astype(int)
```

[ ]:
```
plt.figure(figsize=(10, 6))
plt.subplot(1,2,1)
sns.boxplot(data=Movie, x='type', y='duration')
plt.xlabel('Content Type')
plt.ylabel('Duration')
plt.title('Distribution of Duration for Movies')

plt.subplot(1,2,2)
sns.boxplot(data=TV_show, x='type', y='duration')
plt.xlabel('Content Type')
plt.ylabel('Duration')
plt.title('Distribution of Duration for TV Shows')
plt.show()
```



12.1 Insights from analysis 8 & 9: From the above mentioned histogram and box plot analysis it provides insights regarding the duration of movies/Tv shows which are added in the Netflix library, provides a median value of duration which is 100 minutes approax, hardly 2 seasons in movie and TV show category respectively. There are also some movies and Tv shows durations which are acting as an outliers in the box plot.

13 Analysis 10 : Understanding what content is available in different countries?

[ ]:
```
Country_content_wise=Movie.groupby(["country"])["genre"].value_counts().
↪sort_values(ascending=False)
Country_content_wise=pd.DataFrame(Country_content_wise)
Country_content_wise
```

[ ]:

		genre
country	genre	
United States	Comedies	9171
	Dramas	9131
India	International Movies	7059
United States	Children & Family Movies	5665
India	Dramas	5569
…		…
Georgia	Documentaries	1
Switzerland	Faith & Spirituality	1
Iceland	Stand-Up Comedy	1
Germany	Faith & Spirituality	1
Slovenia	Comedies	1

[896 rows x 1 columns]

[ ]:
```
Country_content_wise_TV=TV_show.groupby(["country"])["genre"].value_counts().
↪sort_values(ascending=False)
Country_content_wise_TV=pd.DataFrame(Country_content_wise_TV)
Country_content_wise_TV
```

[ ]:

		genre
country	genre	
United States	TV Dramas	3429
	TV Comedies	2711
	International TV Shows	2268
	Kids' TV	2258
Japan	International TV Shows	1809
…		…

```
Czech Republic British TV Shows            1
Norway         Docuseries                  1
               Science & Nature TV         1
Greece         Science & Nature TV         1
Thailand       Docuseries                  1

[519 rows x 1 columns]
```

13.1 Insights from analysis 10: Above analysis provides the number of contents available in Movie and Tv show category separately. It aslo provides the insight regarding the favourability of contents among viewers in different categories.

14 Analysis 11 : Find After how many days the movie will be added to Netflix after the release of the movie (you can consider the recent past data)

[ ]:
```
Movie["days_diff"]=abs(Movie["year_added"]-Movie["release_year"])
Movie["days_diff"]=Movie["days_diff"]*365
Movie["days_diff"].mode()
```

```
<ipython-input-953-f045e1826cbd>:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  Movie["days_diff"]=abs(Movie["year_added"]-Movie["release_year"])
<ipython-input-953-f045e1826cbd>:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  Movie["days_diff"]=Movie["days_diff"]*365
```

[ ]:
```
0    0
Name: days_diff, dtype: int64
```

[ ]:
```
TV_show["days_diff"]=abs(TV_show["year_added"]-TV_show["release_year"])
TV_show["days_diff"]=TV_show["days_diff"]*365
TV_show["days_diff"].mode()
```

```
<ipython-input-952-9f63e86ae243>:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead
```

```
See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  TV_show["days_diff"]=abs(TV_show["year_added"]-TV_show["release_year"])
<ipython-input-952-9f63e86ae243>:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  TV_show["days_diff"]=TV_show["days_diff"]*365
```

[ ]:
```
0    0
Name: days_diff, dtype: int64
```

14.1 Insights from analysis 11:In the above analysis we capture the mode of difference between the release and the date the movie or a TV show is added which comes out to be 0 in both categories implying that most movies Tv shows get added in the year frame.

15 RECOMMENDATIONS:

15.1 As the streaming industry evolves, understanding these patterns and trends becomes increasingly essential for navigating the dynamic landscape of Netflix and its vast library.

15.2 It should build relationships with other providers preferably the multinational television providers such as "HBO" and "Starz" in order to increase the selection streaming titles.

15.3 This will ultimately lead to attracting more customers and therfore increase in market share.

15.4 It would help in lowering the churn rate and help expand their customer base.

15.5 Some genre movies are still missing in the Netflix Library. Though, its a very last library. I would recommend them to build relationship with other providers to complete the library as much as possible.

16 CONCLUSION: This case study has been an enlightening and entertaining journey into the world of Netflix, and we encourage you to explore the captivating stories within its ever-changing content offerings. Let the data guide your streaming adventures!

[7]:
```
pip install notebook-as-pdf
```

```
Requirement already satisfied: notebook-as-pdf in
/usr/local/lib/python3.10/dist-packages (0.5.0)
Requirement already satisfied: nbconvert in /usr/local/lib/python3.10/dist-
packages (from notebook-as-pdf) (6.5.4)
Requirement already satisfied: pyppeteer in /usr/local/lib/python3.10/dist-
packages (from notebook-as-pdf) (1.0.2)
Requirement already satisfied: PyPDF2 in /usr/local/lib/python3.10/dist-packages
(from notebook-as-pdf) (3.0.1)
Requirement already satisfied: lxml in /usr/local/lib/python3.10/dist-packages
(from nbconvert->notebook-as-pdf) (4.9.2)
Requirement already satisfied: beautifulsoup4 in /usr/local/lib/python3.10/dist-
packages (from nbconvert->notebook-as-pdf) (4.11.2)
Requirement already satisfied: bleach in /usr/local/lib/python3.10/dist-packages
(from nbconvert->notebook-as-pdf) (6.0.0)
Requirement already satisfied: defusedxml in /usr/local/lib/python3.10/dist-
```

```
packages (from nbconvert->notebook-as-pdf) (0.7.1)
Requirement already satisfied: entrypoints>=0.2.2 in
/usr/local/lib/python3.10/dist-packages (from nbconvert->notebook-as-pdf) (0.4)
Requirement already satisfied: jinja2>=3.0 in /usr/local/lib/python3.10/dist-
packages (from nbconvert->notebook-as-pdf) (3.1.2)
Requirement already satisfied: jupyter-core>=4.7 in
/usr/local/lib/python3.10/dist-packages (from nbconvert->notebook-as-pdf)
(5.3.1)
Requirement already satisfied: jupyterlab-pygments in
/usr/local/lib/python3.10/dist-packages (from nbconvert->notebook-as-pdf)
(0.2.2)
Requirement already satisfied: MarkupSafe>=2.0 in
/usr/local/lib/python3.10/dist-packages (from nbconvert->notebook-as-pdf)
(2.1.3)
Requirement already satisfied: mistune<2,>=0.8.1 in
/usr/local/lib/python3.10/dist-packages (from nbconvert->notebook-as-pdf)
(0.8.4)
Requirement already satisfied: nbclient>=0.5.0 in
/usr/local/lib/python3.10/dist-packages (from nbconvert->notebook-as-pdf)
(0.8.0)
Requirement already satisfied: nbformat>=5.1 in /usr/local/lib/python3.10/dist-
packages (from nbconvert->notebook-as-pdf) (5.9.0)
Requirement already satisfied: packaging in /usr/local/lib/python3.10/dist-
packages (from nbconvert->notebook-as-pdf) (23.1)
Requirement already satisfied: pandocfilters>=1.4.1 in
/usr/local/lib/python3.10/dist-packages (from nbconvert->notebook-as-pdf)
(1.5.0)
Requirement already satisfied: pygments>=2.4.1 in
/usr/local/lib/python3.10/dist-packages (from nbconvert->notebook-as-pdf)
(2.14.0)
Requirement already satisfied: tinycss2 in /usr/local/lib/python3.10/dist-
packages (from nbconvert->notebook-as-pdf) (1.2.1)
Requirement already satisfied: traitlets>=5.0 in /usr/local/lib/python3.10/dist-
packages (from nbconvert->notebook-as-pdf) (5.7.1)
Requirement already satisfied: appdirs<2.0.0,>=1.4.3 in
/usr/local/lib/python3.10/dist-packages (from pyppeteer->notebook-as-pdf)
(1.4.4)
Requirement already satisfied: certifi>=2021 in /usr/local/lib/python3.10/dist-
packages (from pyppeteer->notebook-as-pdf) (2023.5.7)
Requirement already satisfied: importlib-metadata>=1.4 in
/usr/local/lib/python3.10/dist-packages (from pyppeteer->notebook-as-pdf)
(6.7.0)
Requirement already satisfied: pyee<9.0.0,>=8.1.0 in
/usr/local/lib/python3.10/dist-packages (from pyppeteer->notebook-as-pdf)
(8.2.2)
Requirement already satisfied: tqdm<5.0.0,>=4.42.1 in
/usr/local/lib/python3.10/dist-packages (from pyppeteer->notebook-as-pdf)
(4.65.0)
```

```
Requirement already satisfied: urllib3<2.0.0,>=1.25.8 in
/usr/local/lib/python3.10/dist-packages (from pyppeteer->notebook-as-pdf)
(1.26.16)
Requirement already satisfied: websockets<11.0,>=10.0 in
/usr/local/lib/python3.10/dist-packages (from pyppeteer->notebook-as-pdf) (10.4)
Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.10/dist-
packages (from importlib-metadata>=1.4->pyppeteer->notebook-as-pdf) (3.15.0)
Requirement already satisfied: platformdirs>=2.5 in
/usr/local/lib/python3.10/dist-packages (from jupyter-
core>=4.7->nbconvert->notebook-as-pdf) (3.7.0)
Requirement already satisfied: jupyter-client>=6.1.12 in
/usr/local/lib/python3.10/dist-packages (from
nbclient>=0.5.0->nbconvert->notebook-as-pdf) (6.1.12)
Requirement already satisfied: fastjsonschema in /usr/local/lib/python3.10/dist-
packages (from nbformat>=5.1->nbconvert->notebook-as-pdf) (2.17.1)
Requirement already satisfied: jsonschema>=2.6 in
/usr/local/lib/python3.10/dist-packages (from
nbformat>=5.1->nbconvert->notebook-as-pdf) (4.3.3)
Requirement already satisfied: soupsieve>1.2 in /usr/local/lib/python3.10/dist-
packages (from beautifulsoup4->nbconvert->notebook-as-pdf) (2.4.1)
Requirement already satisfied: six>=1.9.0 in /usr/local/lib/python3.10/dist-
packages (from bleach->nbconvert->notebook-as-pdf) (1.16.0)
Requirement already satisfied: webencodings in /usr/local/lib/python3.10/dist-
packages (from bleach->nbconvert->notebook-as-pdf) (0.5.1)
Requirement already satisfied: attrs>=17.4.0 in /usr/local/lib/python3.10/dist-
packages (from jsonschema>=2.6->nbformat>=5.1->nbconvert->notebook-as-pdf)
(23.1.0)
Requirement already satisfied: pyrsistent!=0.17.0,!=0.17.1,!=0.17.2,>=0.14.0 in
/usr/local/lib/python3.10/dist-packages (from
jsonschema>=2.6->nbformat>=5.1->nbconvert->notebook-as-pdf) (0.19.3)
Requirement already satisfied: pyzmq>=13 in /usr/local/lib/python3.10/dist-
packages (from jupyter-client>=6.1.12->nbclient>=0.5.0->nbconvert->notebook-as-
pdf) (23.2.1)
Requirement already satisfied: python-dateutil>=2.1 in
/usr/local/lib/python3.10/dist-packages (from jupyter-
client>=6.1.12->nbclient>=0.5.0->nbconvert->notebook-as-pdf) (2.8.2)
Requirement already satisfied: tornado>=4.1 in /usr/local/lib/python3.10/dist-
packages (from jupyter-client>=6.1.12->nbclient>=0.5.0->nbconvert->notebook-as-
pdf) (6.3.1)
```