In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from wordcloud import WordCloud
```

In [2]:
```
df = pd.read_csv(r"D:\DSML class\Real world data assignments\Python\d2beiqkhq929f0.cloud
```

Basic Analysis

Observation of Data

In [3]:
```
df.shape
```

Out[3]:
```
(8807, 12)
```

In [4]:
```
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
```

a. Unnesting

In [5]:
```
df['cast'] = df['cast'].str.split(',')
df['listed_in'] = df['listed_in'].str.split(',')
df['director'] = df['director'].str.split(',')
```

In [6]:
```
df = df.explode('cast', ignore_index = True)
df = df.explode('listed_in', ignore_index = True)
df = df.explode('director', ignore_index = True)
```

In [7]:
```
df.head(10)
```

Out[7]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	September 25, 2021	2020	PG-13	90 min	Documentar

1	s2	TV Show	Blood & Water	NaN	Ama Qamata	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	Internatio TV Sho
2	s2	TV Show	Blood & Water	NaN	Ama Qamata	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	TV Dram
3	s2	TV Show	Blood & Water	NaN	Ama Qamata	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	TV Myster
4	s2	TV Show	Blood & Water	NaN	Khosi Ngema	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	Internatio TV Sho
5	s2	TV Show	Blood & Water	NaN	Khosi Ngema	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	TV Dram
6	s2	TV Show	Blood & Water	NaN	Khosi Ngema	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	TV Myster
7	s2	TV Show	Blood & Water	NaN	Gail Mabalane	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	Internatio TV Sho
8	s2	TV Show	Blood & Water	NaN	Gail Mabalane	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	TV Dram
9	s2	TV Show	Blood & Water	NaN	Gail Mabalane	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	TV Myster

b. Handling Null Values

In [8]:
```
values = {'director': 'unknown_director', 'cast': 'unknown_cast', 'country': 'unknown_co
df.fillna(value = values, inplace = True)
df.head(10)
```

Out[8]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	unknown_cast	United States	September 25, 2021	2020	PG-13	90 min
1	s2	TV Show	Blood & Water	unknown_director	Ama Qamata	South Africa	September 24, 2021	2021	TV-MA	2 Seasons
2	s2	TV Show	Blood & Water	unknown_director	Ama Qamata	South Africa	September 24, 2021	2021	TV-MA	2 Seasons
3	s2	TV Show	Blood & Water	unknown_director	Ama Qamata	South Africa	September 24, 2021	2021	TV-MA	2 Seasons
4	s2	TV Show	Blood & Water	unknown_director	Khosi Ngema	South Africa	September 24, 2021	2021	TV-MA	2 Seasons
5	s2	TV Show	Blood & Water	unknown_director	Khosi Ngema	South Africa	September 24, 2021	2021	TV-MA	2 Seasons
6	s2	TV Show	Blood & Water	unknown_director	Khosi Ngema	South Africa	September 24, 2021	2021	TV-MA	2 Seasons
7	s2	TV Show	Blood & Water	unknown_director	Gail Mabalane	South Africa	September 24, 2021	2021	TV-MA	2 Seasons
8	s2	TV Show	Blood & Water	unknown_director	Gail Mabalane	South Africa	September 24, 2021	2021	TV-MA	2 Seasons

9	s2	TV Show	Blood & Water	unknown_director	Gail Mabalane	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	

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

a. Non-ghraphical Analysis

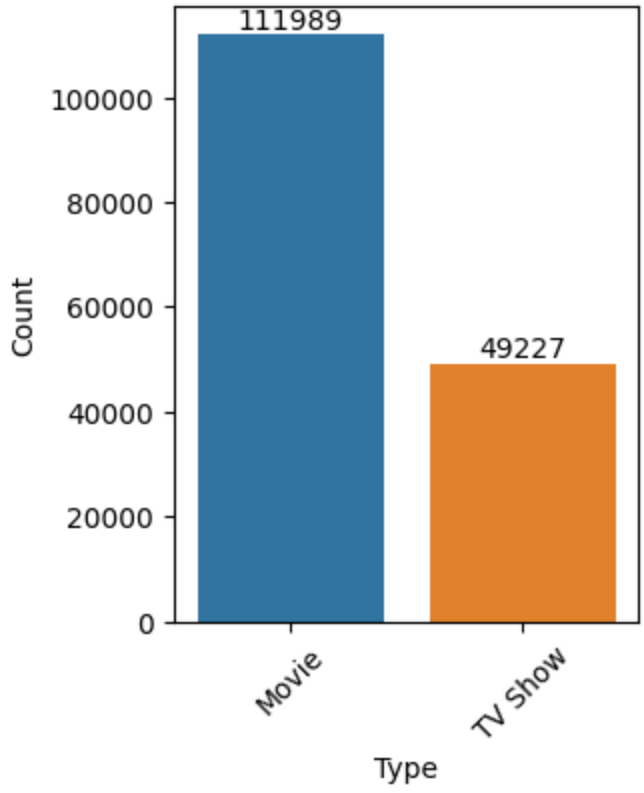
In [9]:
```
type_count = df['type'].value_counts()
```

In [10]:
```
type_count
```

Out[10]:
```
Movie      111989
TV Show     49227
Name: type, dtype: int64
```

b. Ghraphical Analysis

In [25]:
```
plt.figure(figsize=(3,4))
sns.countplot(x=df['type'])
plt.xticks(rotation=45)
ax=sns.countplot(data=df, x="type")
ax.bar_label(ax.containers[0])
ax.set(xlabel = 'Type', ylabel = 'Count')
plt.show()
```



Insights

- The number of movies are higher than the number of TV Shows.
- Movies dominate the Netflix platform 100% more than the TV Shows.

Question 2: Comparison of tv shows vs. movies.

a. Top 10 countries with most movies produced

In [12]:
```
movies = df[(df['type'] == 'Movie') & (df['country'] != 'unknown_country')]
movies.groupby('country')['title'].nunique().sort_values(ascending = False).head(10)
```

Out[12]:
```
country
United States     2058
India              893
United Kingdom     206
Canada             122
Spain               97
Egypt               92
Nigeria             86
Indonesia           77
Turkey              76
Japan               76
Name: title, dtype: int64
```

b. Top 10 countries with most TV Shows produced

In [13]:
```
tvShows = df.loc[(df['type'] == 'TV Show') & (df['country'] != 'unknown_country')]
tvShows.groupby('country')['title'].nunique().sort_values(ascending = False).head(10)
```

Out[13]:
```
country
United States     760
United Kingdom    213
Japan             169
South Korea       158
India              79
Taiwan             68
Canada             59
France             49
Australia          48
Spain              48
Name: title, dtype: int64
```

Insights

- United States rank number one in the number of Movies and TV Shows produced around the world.
- India produces the second highest number of movies whereas United Kingdom in the TV Shows category.
- Japan produces more TV Shows compared to Movies.

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

Add release week column

In [14]:
```
date_data = df[df['date_added'] != 'unknown_date_added']
```

In [15]:
```
date_data['release_week'] = pd.to_datetime(date_data['date_added']).apply(lambda x: x.we
```

```
C:\Users\shaje\AppData\Local\Temp\ipykernel_9652\167593795.py: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
  date_data['release_week'] = pd.to_datetime(date_data['date_added']).apply(lambda x: x.
week)
```

a. Best week to release Movies

In [16]:
```
dd_movies = date_data.loc[date_data['type'] == 'Movie']
dd_movies.groupby('release_week')['title'].nunique().sort_values(ascending = False).head
```

Out[16]:
```
release_week
1     316
44    243
40    215
9     207
26    195
Name: title, dtype: int64
```

b. Best week to release TV Shows

In [17]:
```
dd_tv_show = date_data.loc[date_data['type'] == 'TV Show']
dd_tv_show.groupby('release_week')['title'].nunique().sort_values(ascending = False).hea
```

Out[17]:
```
release_week
27    86
31    83
13    76
44    75
24    75
Name: title, dtype: int64
```

Add release month column

In [18]:
```
date_data['release_month'] = pd.to_datetime(date_data['date_added']).apply(lambda x: x.m
```

```
C:\Users\shaje\AppData\Local\Temp\ipykernel_9652\2004766752.py:1: SettingWithCopyWarnin
g:
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
  date_data['release_month'] = pd.to_datetime(date_data['date_added']).apply(lambda x:
x.month)
```

c. Best month to release Movies

In [19]:
```
dd_movies = date_data.loc[date_data['type'] == 'Movie']
dd_movies.groupby('release_month')['title'].nunique().sort_values(ascending = False)
```

Out[19]:
```
release_month
7     565
4     550
12    547
1     546
10    545
```

```
3      529
8      519
9      519
11     498
6      492
5      439
2      382
Name: title, dtype: int64
```

d. Best month to release TV Shows

In [20]:
```
dd_movies = date_data.loc[date_data['type'] == 'TV Show']
dd_movies.groupby('release_month')['title'].nunique().sort_values(ascending = False)
```

Out[20]:
```
release_month
12     266
7      262
9      251
6      236
8      236
10     215
4      214
3      213
11     207
5      193
1      192
2      181
Name: title, dtype: int64
```

Insights

- The best week to release Movies is week number 1 whereas best week for TV Show release is week number 27.
- The best month to release Movies is in July and for the TV Show release is December.

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

a. Top ten Actors in Movies or TV Shows

In [21]:
```
actor = df.loc[df['cast'] != 'unknown_cast']
actor.groupby(by = ['cast'])['title'].nunique().sort_values(ascending = False).head(10)
```

Out[21]:
```
cast
 Anupam Kher          39
 Rupa Bhimani         31
 Takahiro Sakurai     30
 Julie Tejwani        28
 Om Puri              27
Shah Rukh Khan        26
 Rajesh Kava          26
 Boman Irani          25
 Andrea Libman        25
 Yuki Kaji            25
Name: title, dtype: int64
```

b. Top ten Directors in Movies or TV Shows

In [22]:
```
director = df.loc[df['director'] != 'unknown_director'][['director', 'title']]
director.groupby('director')['title'].nunique().sort_values(ascending = False).head(10)
```

Out[22]:
```
director
Rajiv Chilaka          22
Raúl Campos            18
 Jan Suter             18
Suhas Kadav            16
Marcus Raboy           16
Jay Karas              15
Cathy Garcia-Molina    13
Jay Chapman            12
Martin Scorsese        12
Youssef Chahine        12
Name: title, dtype: int64
```

Insights

- Anupam Kher is the most appeared actor in the Movies/TV Shows.
- Rajiv Chilaka is the person who has directed the most number of Movies/TV Shows.

Question 5: Which genre movies are more popular or produced more?

In [23]:
```
text = df.loc[df['type'] == 'Movie']['listed_in']
w = WordCloud()
stop_words = list(w.stopwords)
custom_stop_words = ['Movies', 'International']
stop_words = set(stop_words + custom_stop_words)
wordcloud = WordCloud(collocations = False, background_color = 'white', stopwords = stop

plt.imshow(wordcloud)
plt.axis("off")
plt.show()
```

Insights

- The Drama genre movies are most popular
- The genres Comedies, Action and Adventure are also popular as well.

Question 6: 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)

In [24]:
```
date_data['date_added_ts'] = pd.to_datetime(date_data['date_added'])
date_data['rel_add_diff'] = date_data['date_added_ts'] - pd.to_datetime(date_data['relea
date_data['rel_add_diff'].mode()
```

```
C:\Users\shaje\AppData\Local\Temp\ipykernel_9652\986191081.py: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
  date_data['date_added_ts'] = pd.to_datetime(date_data['date_added'])
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-2020' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-2021' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1993' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-2018' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1996' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1998' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1997' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-2010' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-2013' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-2017' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1975' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1978' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
```

```
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1962' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1969' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1977' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1967' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1968' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1965' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1946' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1942' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1955' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1944' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1947' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\anaconda3\lib\site-packages\pandas\core\tools\datetimes.py:1047: UserWarn
ing: Parsing '31-12-1943' in DD/MM/YYYY format. Provide format or specify infer_datetime
_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
C:\Users\shaje\AppData\Local\Temp\ipykernel_9652\986191081.py:2: SettingWithCopyWarning:

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

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_
guide/indexing.html#returning-a-view-versus-a-copy
  date_data['rel_add_diff'] = date_data['date_added_ts'] - pd.to_datetime(date_data['rel
ease_year'].apply(lambda x: '31-12-'+str(x)))
```

Out[24]:
```
0   182 days
Name: rel_add_diff, dtype: timedelta64[ns]
```

Insight

- A movie is added to the Netflix platform, 182 days after it has been reeased.

Overall Insights

1. Movies dominate the Netflix platform 100% more than TV Shows.
2. The United States ranks number one in the number of Movies and TV Shows produced around the world.
3. India produces the second highest number of movies whereas the United Kingdom in the TV Shows category.
4. Japan produces more TV Shows compared to Movies, hence TV Shows are more popular than movies in Japan.
5. The best week to release Movies and TV Shows is week number 1 and week number 27 respectively.
6. The best month to release Movies and TV Shows is in July and December respectively.
7. Anupam Kher is the most appeared actor in the Movies/TV Shows.
8. Rajiv Chilaka is the person who has directed the most Movies/TV Shows.
9. The Drama genre movies are most popular and Netflix should look forward to finding more movies in the genre Drama.
10. Next to Drama genres like Comedies, Action, and Adventure are also popular.
11. A movie is added to the Netflix platform, 182 days after it has been released.