Importing Python Libraries

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pylab as plt
import seaborn as sns
```

Importing Database

In [2]:
```
df = pd.read_csv('netflix.csv')
```

In [3]:
```
df.head(2)
```

Out[3]:

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

Shape of Neflix Dataset

In [4]:
```
df.shape
```

Out[4]:
```
(8807, 12)
```

In [5]:
```
df.columns
```

Out[5]:
```
Index(['show_id', 'type', 'title', 'director', 'cast', 'country', 'date_added',
       'release_year', 'rating', 'duration', 'listed_in', 'description'],
      dtype='object')
```

Checking for Duplicates

In [6]:
```
df.duplicated().sum()
```

Out[6]:
```
0
```

Data Cleaning

Checking the Null values

In [7]:
```
df.isnull().sum()
```

```
Out[7]: show_id            0
        type               0
        title              0
        director        2634
        cast             825
        country          831
        date_added        10
        release_year       0
        rating             4
        duration           3
        listed_in          0
        description        0
        dtype: int64
```

```
In [8]: null_count = df.isnull().sum()
        total_rows = len(df)
        null_percentage = round(((null_count / total_rows) * 100),2)
        null_percentage_df = pd.DataFrame({"Column Name" : null_percentage.index, "Null_Percentage" : null_percentage.val
        null_percentage_df = null_percentage_df.sort_values(by = 'Null_Percentage', ascending = False)
        null_percentage_df
```

Out[8]:

	Column Name	Null_Percentage
3	director	29.91
5	country	9.44
4	cast	9.37
6	date_added	0.11
8	rating	0.05
9	duration	0.03
0	show_id	0.00
1	type	0.00
2	title	0.00
7	release_year	0.00
10	listed_in	0.00
11	description	0.00

Formatting Date

In [9]:
```
# Converting "date_added" to datetime format

df["date_added"] = pd.to_datetime(df['date_added'], format = 'mixed')

# Extracting "day_added", "year_added", "month_added"

df['day_added'] = df['date_added'].dt.day_name()
df['year_added'] = df['date_added'].dt.year
df['month_added'] = df['date_added'].dt.month
```

In [10]:
```
df.head(2)
```

Out[10]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description	day_ac
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13	90 min	Documentaries	As her father nears the end of his life, filmm...	Satu
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV-MA	2 Seasons	International TV Shows, TV Dramas, TV Mysteries	After crossing paths at a party, a Cape Town t...	Fr

In [11]:
```
# Replace non-finite values (NaN or inf) with a default value (0)

df[['year_added', 'month_added']] = df[['year_added', 'month_added']].fillna(0).astype(int)

# Converting the values in Year_added, and month_added column to int

df['year_added'] = df['year_added'].astype(int)
df['month_added'] = df['month_added'].astype(int)
```

Dropping the Unnecessary Columns

In [12]:
```
df.drop(columns = ['show_id', 'description'], inplace=True)
```

Filling Values in Country column

In [13]:
```
# Split the comma separated values in column "country"

df2 = df.copy()
df2['country'] = df2['country'].str.split(', ')
df3 = df2.explode('country')

# Calculating the count of movies directed by each director in each country

df4 = df3.groupby(['director', 'country']).size().to_frame(name='count')
max_indices = df4.groupby('director')['count'].idxmax()

# Find the country with the maximum count for each director, and creates a new DataFrame "max_rows"

max_rows = df4.loc[max_indices].reset_index()
```

In [14]:
```
# Merge df2 and the max_rows DataFrame based on the 'director' column.

merge_df = pd.merge(df2, max_rows, how = 'left', on = 'director')

# Fill missing values in the 'country_x' column of merge_df with values from the 'country_y' column.

merge_df = merge_df.fillna({'country_x' : merge_df['country_y']})

# Updates the 'country' column in the original DataFrame df

df['country'] = merge_df['country_x']
```

In [15]:
```
df.country.isnull().sum()
```

Out[15]:
```
683
```

Result: Managed to fill 148 (831 - 683) null values in Country column

Handling null values

In [16]:
```
# Replacing null values in Director, Cast, Country, Rating, Day_added

df.fillna({'director': "Unknown Director",
           'cast': "Unknown Cast",
           'country': "Unknown Country",
           'rating': "Unknown Rating",
           'day_added': "Unknown Day"}, inplace=True)
```

In [17]:
```
# Replacing null values in "Duration" column

df[df['duration'].isnull()]
```

Out[17]:

	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	day_added	year_added	month_ac
5541	Movie	Louis C.K. 2017	Louis C.K.	Louis C.K.	[United States]	2017-04-04	2017	74 min	NaN	Movies	Tuesday	2017	
5794	Movie	Louis C.K.: Hilarious	Louis C.K.	Louis C.K.	[United States]	2016-09-16	2010	84 min	NaN	Movies	Friday	2016	
5813	Movie	Louis C.K.: Live at the Comedy Store	Louis C.K.	Louis C.K.	[United States]	2016-08-15	2015	66 min	NaN	Movies	Monday	2016	

It seems the missing values for duration are incorrectly recorded in rating column

In [18]:
```
# Correcting the error

df['duration'] = df['duration'].fillna(df['rating'])
```

In [19]:
```
# Correcting the rating column

# Calculating the most common rating for Movies

df.groupby('type')['rating'].value_counts(ascending=False).head(1)

# Replacing the incorrect values with most common rating

df['rating'] = df['rating'].replace({'74 min': 'TV-MA', '84 min': 'TV-MA', '66 min': 'TV-MA'})
```

In [20]:
```
df.isnull().sum()
```

Out[20]:
```
type             0
title            0
director         0
cast             0
country          0
date_added      10
release_year     0
rating           0
duration         0
listed_in        0
day_added        0
year_added       0
month_added      0
dtype: int64
```

Create Final DataFrame for Analysis

In [21]:
```
# Split the comma separated values in column "director". Keeping "title" as key

df2 = df[['title', 'director']].copy()
df2['director'] = df2['director'].str.split(', ')
df2 = df2.explode('director')

# Split the comma separated values in column "country". Keeping "title" as key

df3 = df[['title', 'country']].copy()
df3 = df3.explode('country')

merge_df = pd.merge(df2, df3, on = 'title') # Merging 'director' & 'country'

# Split the comma separated values in column "cast". Keeping "title" as key

df4 = df[['title', 'cast']].copy()
df4['cast'] = df4['cast'].str.split(', ')
df4 = df4.explode('cast')

merge_df2 = pd.merge(merge_df, df4, on = 'title') # Merging 'director' & 'country' & 'cast'

# Split the comma separated values in column "listed_in". Keeping "title" as key

df5 = df[['title', 'listed_in']].copy()
df5['listed_in'] = df5['listed_in'].str.split(', ')
df5 = df5.explode('listed_in')

merge_df3 = pd.merge(merge_df2, df5, on = 'title') # Merging 'director' & 'country' & 'cast' & 'listed_in'

# Final DataFrame

df_final = pd.merge(merge_df3, df, on = 'title', how = 'left') # Merging to get rest of the columns
```

In [22]:
```
df_final.head(2)
```

Out[22]:

	title	director_x	country_x	cast_x	listed_in_x	type	director_y	cast_y	country_y	date_added	release_year	rating	d
0	Dick Johnson Is Dead	Kirsten Johnson	United States	Unknown Cast	Documentaries	Movie	Kirsten Johnson	Unknown Cast	[United States]	2021-09-25	2020	PG-13	
1	Blood & Water	Unknown Director	South Africa	Ama Qamata	International TV Shows	TV Show	Unknown Director	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	[South Africa]	2021-09-24	2021	TV-MA	S

In [23]:
```
# Dropping the columns

df_final.drop(columns = ['director_y', 'cast_y', 'country_y', 'listed_in_y'], inplace=True)

# Renaming the columns

df_final.rename(columns={'director_x': 'director',
                         'cast_x': 'cast',
                         'country_x': 'country',
                         'listed_in_x': 'genre'}, inplace=True)
```

In [24]:
```
df_final.head(2)
```

Out[24]:

	title	director	country	cast	genre	type	date_added	release_year	rating	duration	day_added	year_added	mor
0	Dick Johnson Is Dead	Kirsten Johnson	United States	Unknown Cast	Documentaries	Movie	2021-09-25	2020	PG-13	90 min	Saturday	2021	
1	Blood & Water	Unknown Director	South Africa	Ama Qamata	International TV Shows	TV Show	2021-09-24	2021	TV-MA	2 Seasons	Friday	2021	

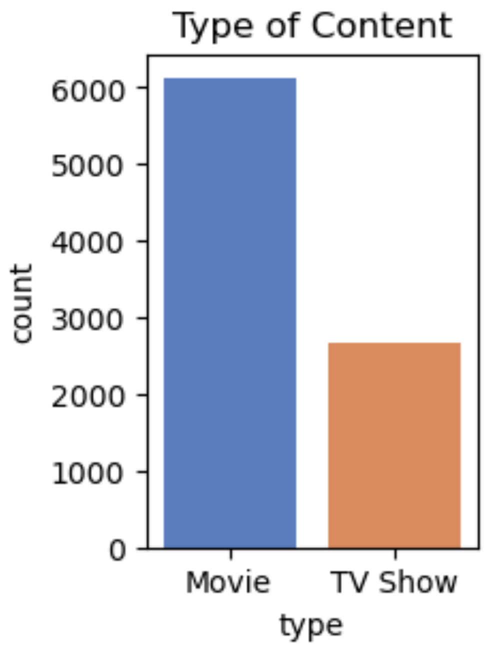
The Analysis

1) Analysing Type of Content on Netflix

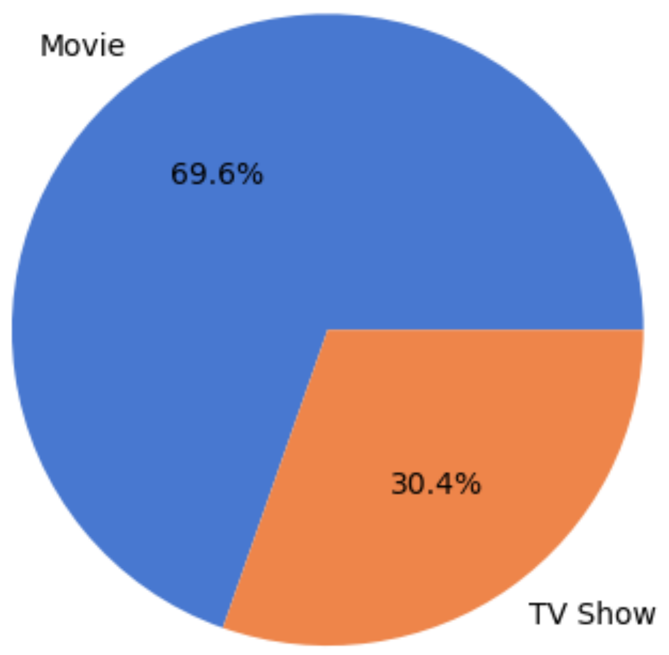
In [27]:
```
df.type.unique()
```

Out[27]:
```
array(['Movie', 'TV Show'], dtype=object)
```

In [28]:
```
sns.set_palette("muted")
plt.figure(figsize = (2, 3))
sns.countplot(x = df['type'], data = df)
plt.title('Type of Content')
plt.show()
```



In [31]:
```
plt.pie(x = df["type"].value_counts(), labels = df["type"].value_counts().index, autopct='%1.1f%%')
plt.show()
```

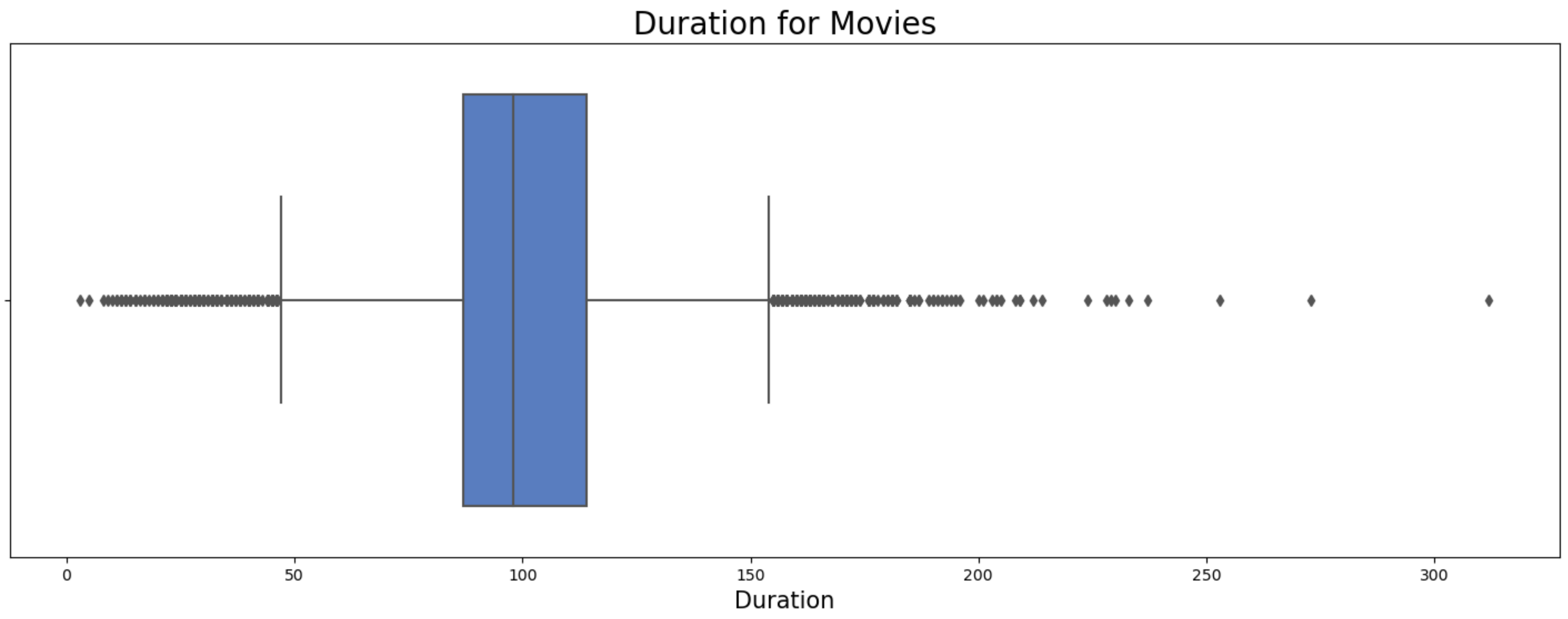


Almost 70% of Netflix's content is Movies

2) Analysing Duration of Movies/ TV shows

In [33]:
```
# Converting Duration Column to integer

df['duration'] = df['duration'].str.strip(' min')
df['duration'] = df['duration'].str.strip(' Seasons')
df['duration'] = df['duration'].astype(int)
```

In [35]:
```
# Boxplot will help determine most common range duration for Movies released on Netflix

movies_df = df[df['type'] == 'Movie']
sns.set_palette("muted")
plt.figure(figsize = (18, 6))
sns.boxplot(x=movies_df['duration'])
plt.xlabel('Duration', fontsize=15)
plt.ylabel('')
plt.title('Duration for Movies', fontsize=20)
plt.show()
```



In [37]:
```
movies_df['duration'].describe()
```

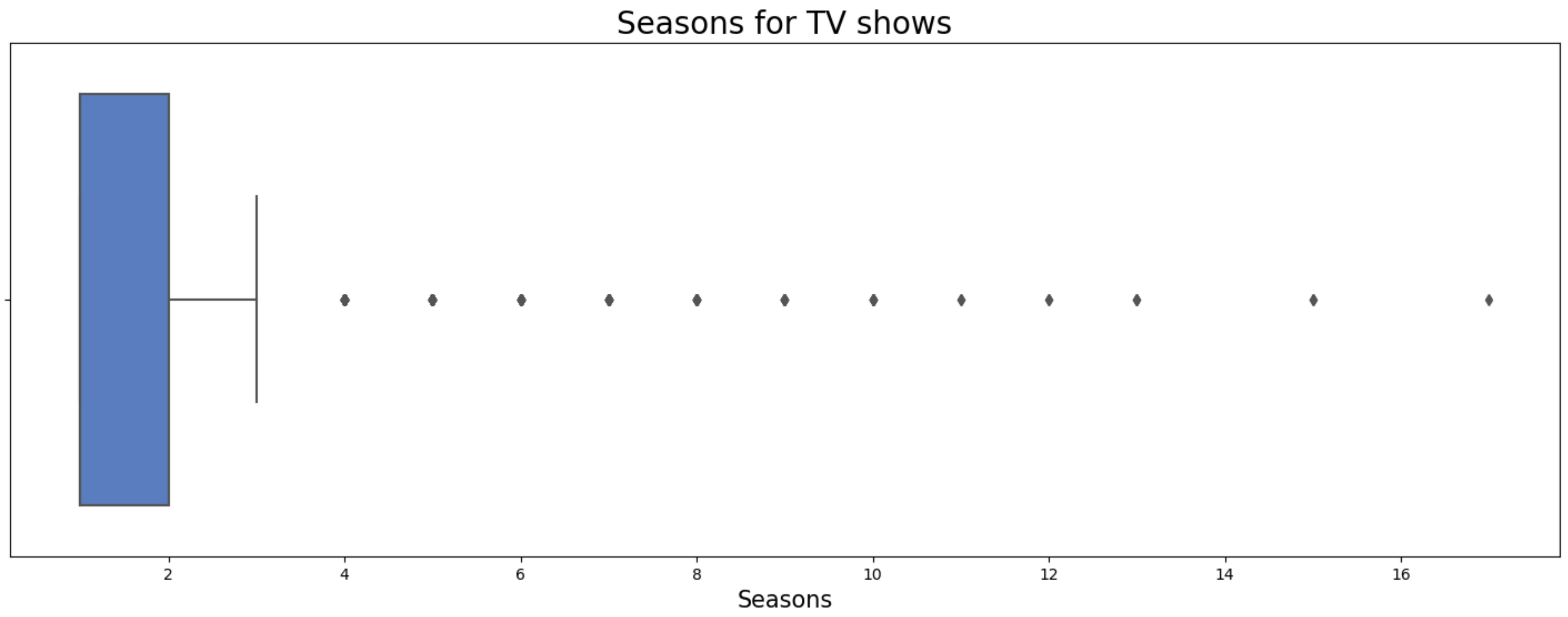
Out[37]:

```
count    6131.000000
mean       99.564998
std        28.289504
min         3.000000
25%        87.000000
50%        98.000000
75%       114.000000
max       312.000000
Name: duration, dtype: float64
```

Most common range of duration for Movies is from 90 mins to 120 mins

In [42]:

```python
# Boxplot will help determine most common range of seasons for TV shows released on Netflix

tv_df = df[df['type'] != 'Movie']
sns.set_palette("muted")
plt.figure(figsize = (18, 6))
sns.boxplot(x = tv_df['duration'])
plt.xlabel('Seasons', fontsize=15)
plt.ylabel('')
plt.title('Seasons for TV shows', fontsize=20)
plt.show()
```



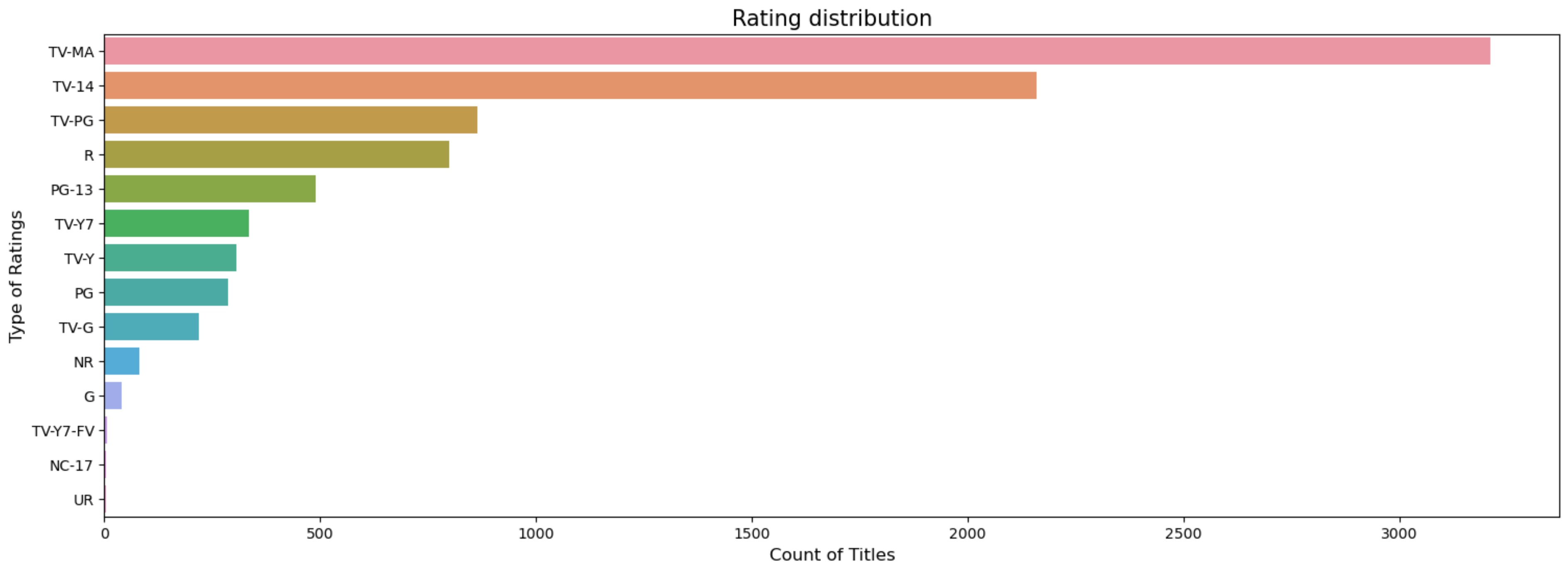
In [41]:
```
tv_df['duration'].describe()
```

Out[41]:
```
count    2676.000000
mean        1.764948
std         1.582752
min         1.000000
25%         1.000000
50%         1.000000
75%         2.000000
max        17.000000
Name: duration, dtype: float64
```

Most TV shows on Netflix run from 1 to 2 seasons

3) Analysing Rating of Content

In [46]:
```
df2 = df[df['rating'] != 'Unknown Rating'] # Excluding the Unknown rating for analysis

# Using Count plot to plot number of content for each type rating

plt.figure(figsize = (18, 6))
order = df2['rating'].value_counts().index
sns.countplot(data = df2, y = 'rating', order=order )
plt.title('Rating distribution', fontsize=15)
plt.xlabel('Count of Titles', fontsize=12)
plt.ylabel('Type of Ratings', fontsize=12)
plt.show()
```



In [47]:
```
df2['rating'].nunique()
```

Out[47]:
```
14
```

Out of 14 different types of ratings the most common maturity rating are TV-MA and TV-14.

Its can be concluded that Netflix focus on mature target audience.

Top 10 Actors for TV-MA rating

In [102…
```
df_final2 = df_final[df_final['cast'] != 'Unknown Cast']
df_final2 = df_final2[df_final2['rating'] == 'TV-MA']

df_final2 = df_final2.groupby(['cast'])['title'].nunique().sort_values(ascending=False)[:10:]
df_final2.reset_index()
```

Out[102]:

	cast	title
0	Takahiro Sakurai	17
1	Yuki Kaji	14
2	Robb Wells	13
3	John Paul Tremblay	12
4	Adil Hussain	11
5	Jun Fukuyama	11
6	Ramsey Nouah	11
7	Tiffany Haddish	10
8	Seema Biswas	10
9	Eric Idle	10

Top 10 Directors for TV-MA rating

In [100…

```
df_final3 = df_final[df_final['director'] != 'Unknown Director']
df_final3 = df_final3[df_final3['rating'] == 'TV-MA']
df_final3 = df_final3.groupby(['director'])['title'].nunique().sort_values(ascending=False)[:10:]
df_final3.reset_index()
```

Out[100]:

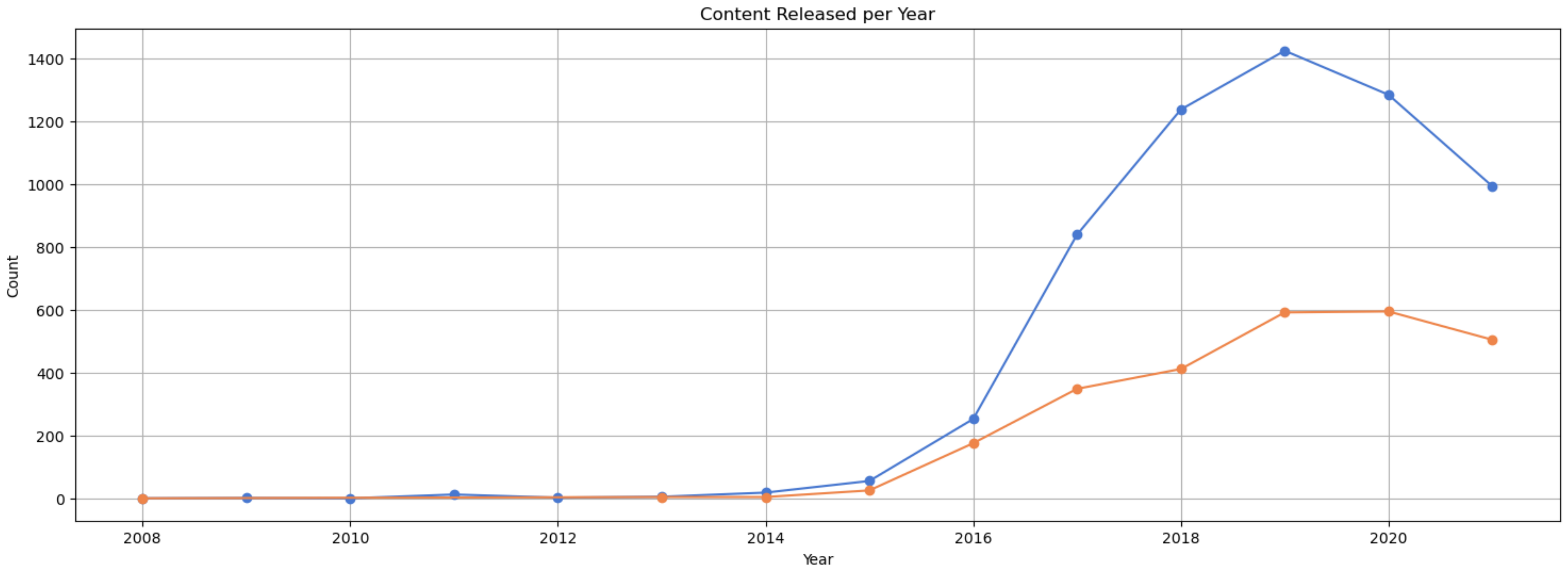
	director	title
0	Jan Suter	20
1	Raúl Campos	18
2	Marcus Raboy	13
3	Jay Karas	11
4	Jay Chapman	10
5	Shannon Hartman	8
6	Lance Bangs	7
7	Anurag Kashyap	7
8	Youssef Chahine	7
9	Ryan Polito	7

4) Changed in number of Movies/ TV shows over the year

In [49]:

```
df2 = df.copy()
df2 = df2[df2['year_added'] != 0] # Dropping the unknown rows

movies_year_df = df2[df2['type'] == 'Movie']
tv_year_df = df2[df2['type'] == 'TV Show']
```

In [52]:
```
movies_per_year = movies_year_df.groupby('year_added').size()
tv_per_year = tv_year_df.groupby('year_added').size()

plt.figure(figsize=(18, 6))
plt.plot(movies_per_year.index, movies_per_year.values, marker='o')
plt.plot(tv_per_year.index, tv_per_year.values, marker='o')
plt.xlabel('Year')
plt.xlabel('Year')
plt.ylabel('Count')
plt.title('Content Released per Year')
plt.grid(True)

plt.show()
```



5) Analysing content as per countries

In [53]:
```
# Top 10 Countries

country_df = df_final.groupby('country')['title'].nunique().sort_values(ascending=False).to_frame().reset_index()
country_df['title'] = country_df['title'].astype(int)
country_df['country'] = country_df['country'].astype(str)
country_df = country_df[country_df['country'] != 'Unknown Country']
country_df = country_df.head(10)
country_df
```

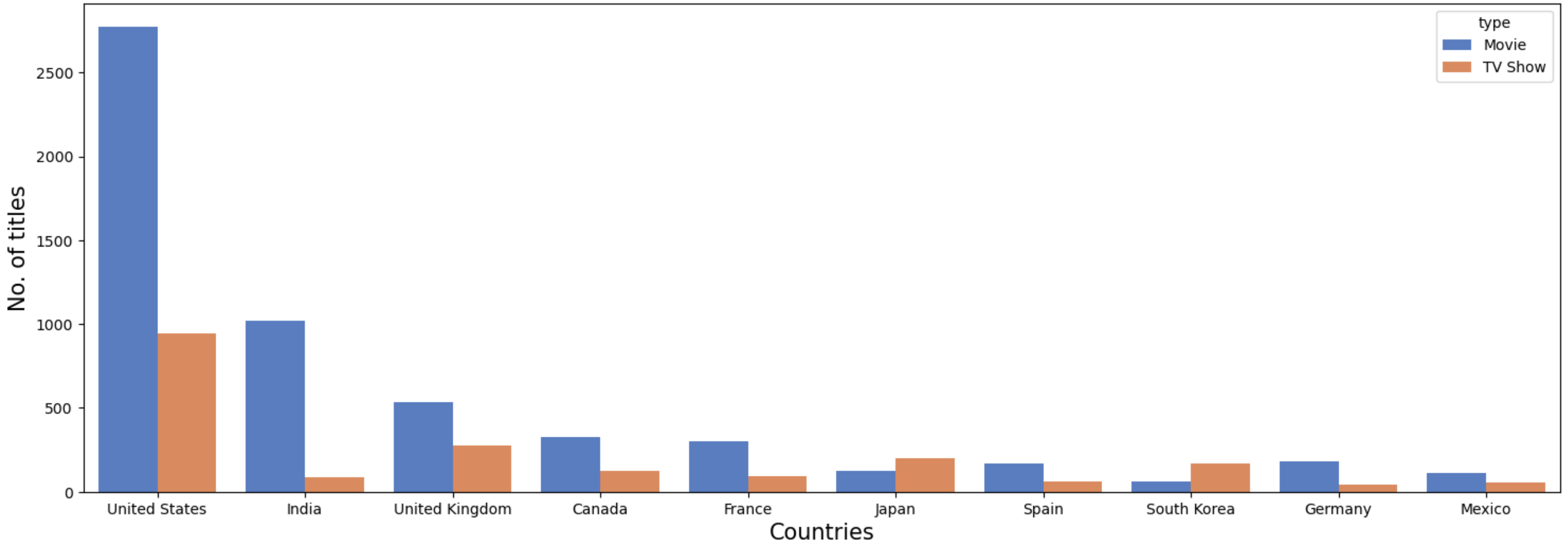
Out[53]:

	country	title
0	United States	3718
1	India	1102
2	United Kingdom	809
4	Canada	450
5	France	395
6	Japan	326
7	South Korea	233
8	Spain	233
9	Germany	227
10	Mexico	172

Distribution of movies and TV shows for top 10 countries

```
In [60]: country_df2 = df[['title', 'country', 'type']].copy()
         country_df2 = country_df2.explode('country')
         country_df2 = country_df2[country_df2['country'] != 'Unknown Country']
         top_country = country_df2['country'].value_counts().index[:10]
         top_country_df = country_df2.loc[country_df2['country'].isin(top_country)]
```

```
In [63]: order = top_country_df['country'].value_counts().index
         sns.set_palette("muted")
         plt.figure(figsize = (18, 6))
         sns.countplot(data = top_country_df, x = 'country', hue = 'type', order =order )
         plt.xlabel('Countries', fontsize=15)
         plt.ylabel('No. of titles', fontsize=15)
         plt.show()
```



Currently India ranks 2nd on total content released yet no. of TV show produced is significantly low

6) Analysing Genre Distribution

In [71]:
```
genres_df = df_final.groupby('genre')['title'].nunique().sort_values(ascending=False).to_frame().reset_index()
genres_df['title'] = genres_df['title'].astype(int)
genres_df['genre'] = genres_df['genre'].astype(str)
genres_df2 = genres_df.copy()
genres_df2['Contribution'] = round((genres_df['title']/len(df) * 100),2)
genres_df2[::]
```

Out[71]:

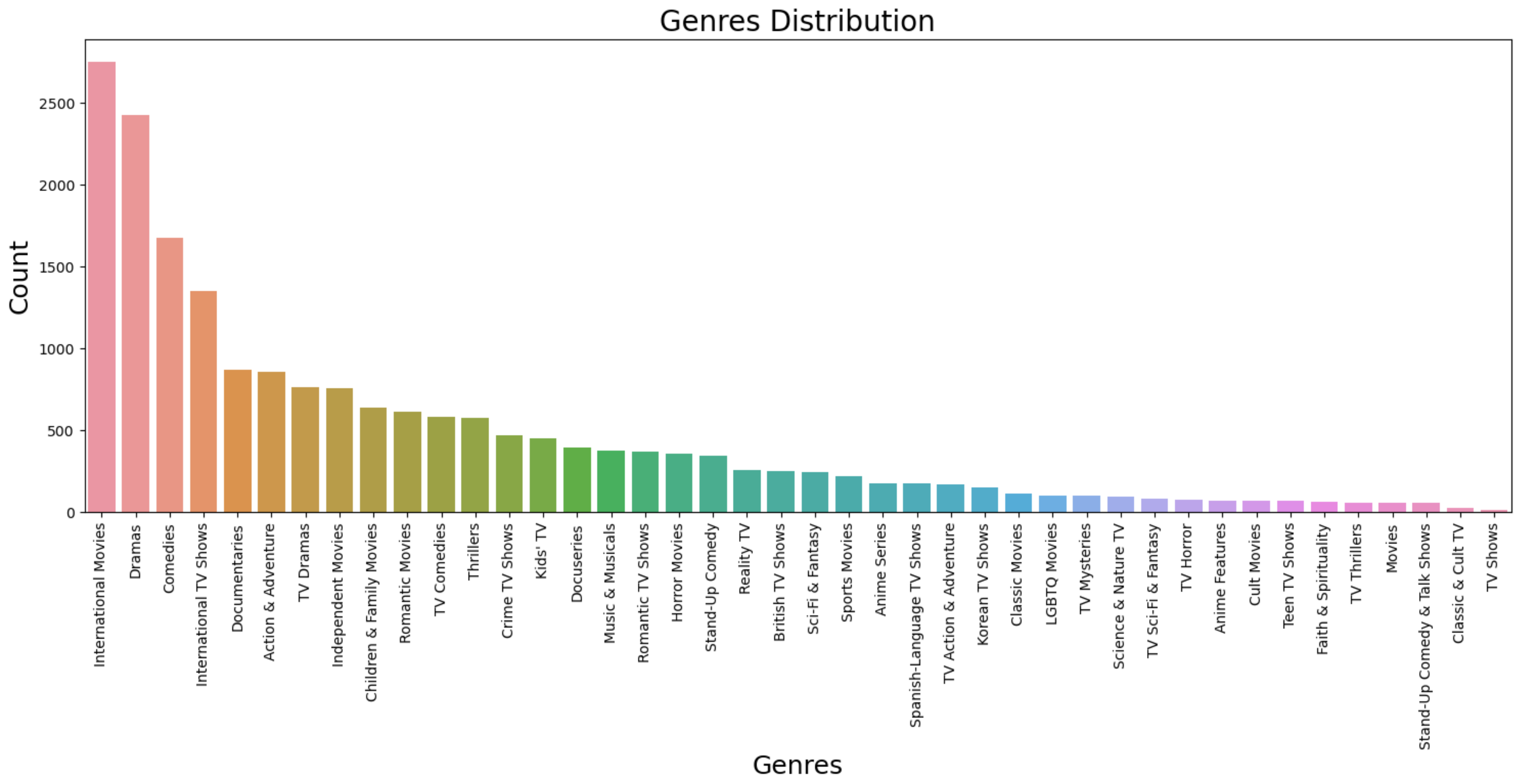
	genre	title	Contribution
0	International Movies	2752	31.25
1	Dramas	2427	27.56
2	Comedies	1674	19.01
3	International TV Shows	1351	15.34
4	Documentaries	869	9.87
5	Action & Adventure	859	9.75
6	TV Dramas	763	8.66
7	Independent Movies	756	8.58
8	Children & Family Movies	641	7.28
9	Romantic Movies	616	6.99
10	TV Comedies	581	6.60
11	Thrillers	577	6.55
12	Crime TV Shows	470	5.34
13	Kids' TV	451	5.12
14	Docuseries	395	4.49

15	Music & Musicals	375	4.26
16	Romantic TV Shows	370	4.20
17	Horror Movies	357	4.05
18	Stand-Up Comedy	343	3.89
19	Reality TV	255	2.90
20	British TV Shows	253	2.87
21	Sci-Fi & Fantasy	243	2.76
22	Sports Movies	219	2.49
23	Anime Series	176	2.00
24	Spanish-Language TV Shows	174	1.98
25	TV Action & Adventure	168	1.91
26	Korean TV Shows	151	1.71
27	Classic Movies	116	1.32
28	LGBTQ Movies	102	1.16
29	TV Mysteries	98	1.11
30	Science & Nature TV	92	1.04
31	TV Sci-Fi & Fantasy	84	0.95
32	TV Horror	75	0.85
33	Anime Features	71	0.81
34	Cult Movies	71	0.81
35	Teen TV Shows	69	0.78
36	Faith & Spirituality	65	0.74
37	TV Thrillers	57	0.65

38	Movies	57	0.65
39	Stand-Up Comedy & Talk Shows	56	0.64
40	Classic & Cult TV	28	0.32
41	TV Shows	16	0.18

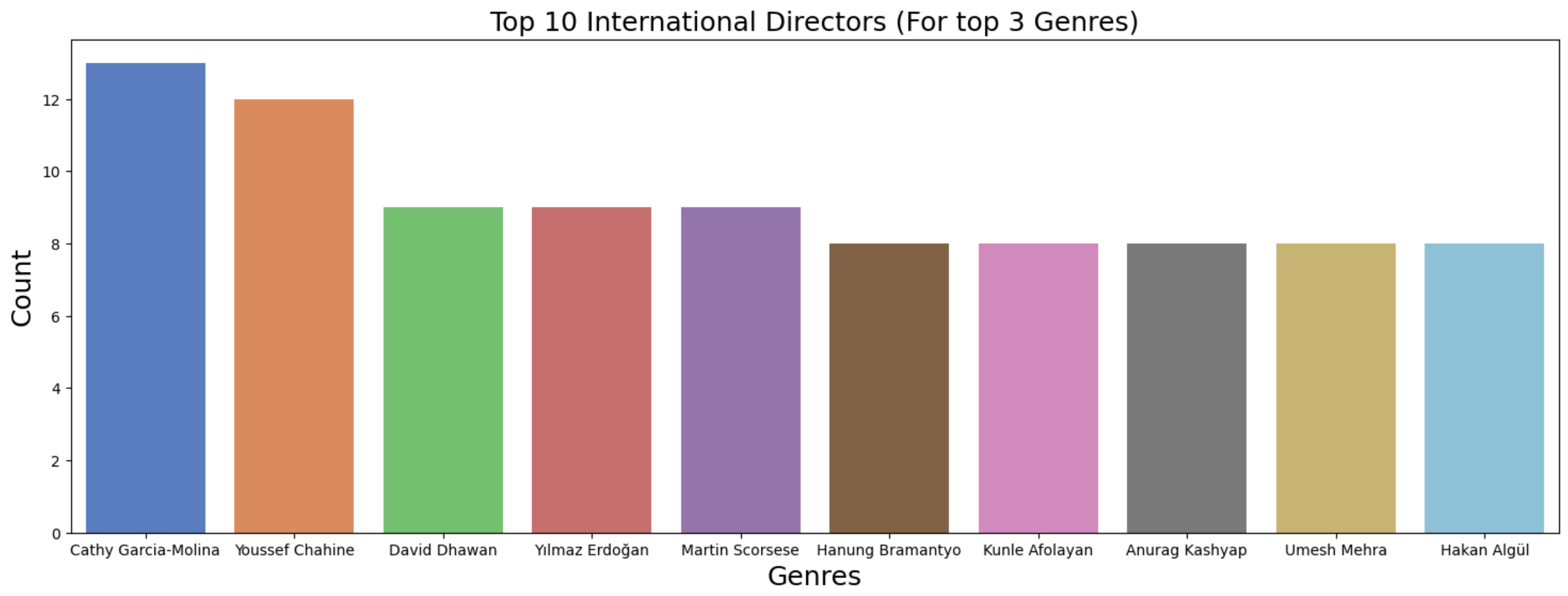
Out of 42 unique genres; International Movies, Dramas and Comedies are most popular on Neflix with a contribution of more than 77%

In [72]:
```
# Plotting different genres

sns.set_palette("muted")
plt.figure(figsize = (18, 6))
sns.barplot(x= genres_df['genre'], y=genres_df['title'], data = genres_df)
plt.title('Genres Distribution', fontsize=20)
plt.xticks(rotation=90, fontsize=10)
plt.xlabel('Genres', fontsize=18)
plt.ylabel('Count', fontsize=18)
plt.show()
```



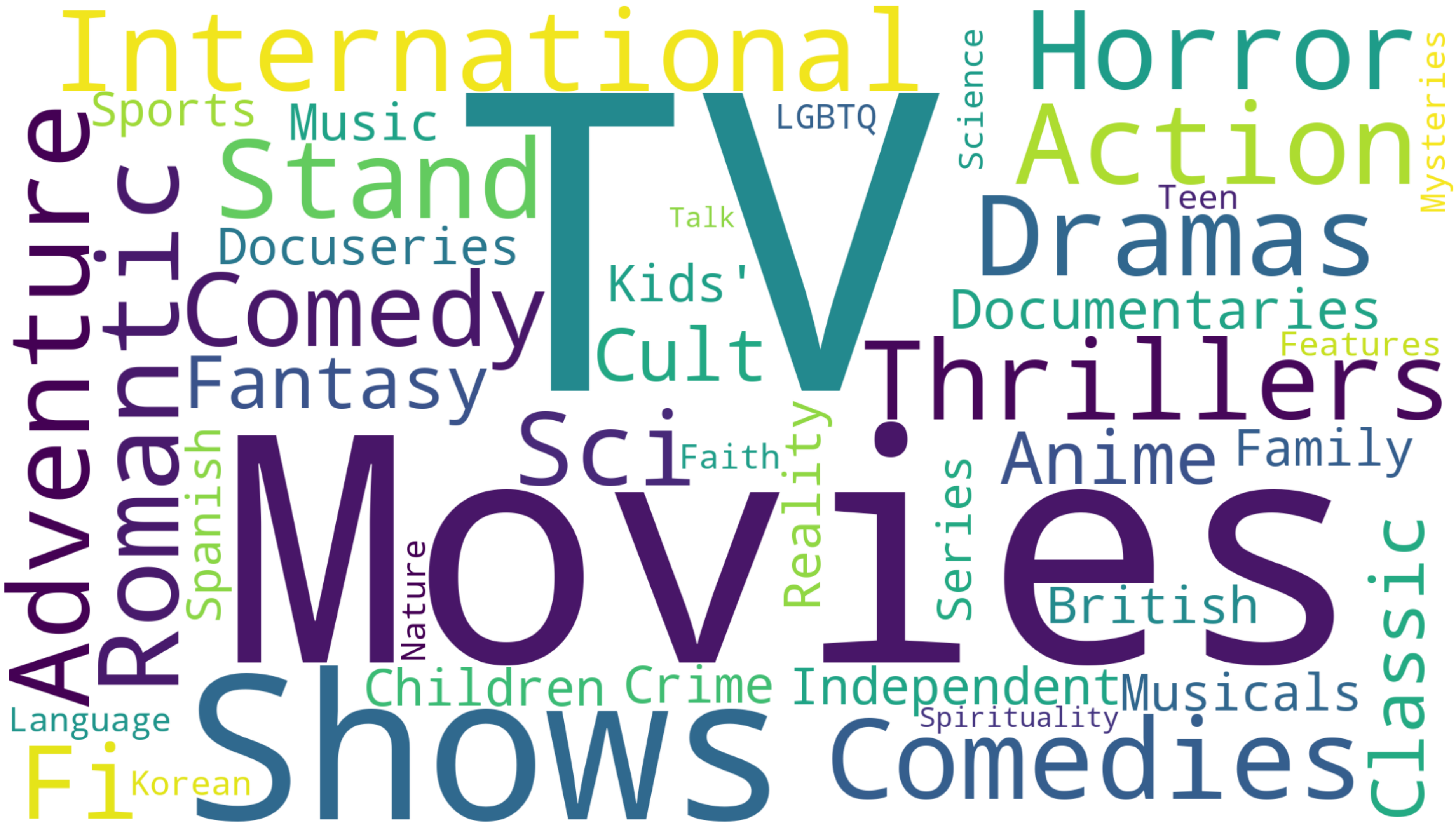
Top Director across popular genres

In [93]:
```
genre_director_df = df_final.copy()

top_genre = genre_director_df['genre'].value_counts().index[:3]
genre_director_df = genre_director_df.loc[genre_director_df['genre'].isin(top_genre)]

genre_director_df2 = genre_director_df.groupby('director')['title'].nunique().sort_values(ascending=False)[1:11:

genre_director_df2 = genre_director_df2.reset_index()

sns.set_palette("muted")
plt.figure(figsize = (18, 6))
sns.barplot(x= genre_director_df2['director'], y=genre_director_df2['title'], data = genre_director_df2)
plt.title('Top 10 International Directors (For top 3 Genres)', fontsize=18)
plt.xticks(fontsize=10)
plt.xlabel('Genres', fontsize=18)
plt.ylabel('Count', fontsize=18)
plt.show()
```



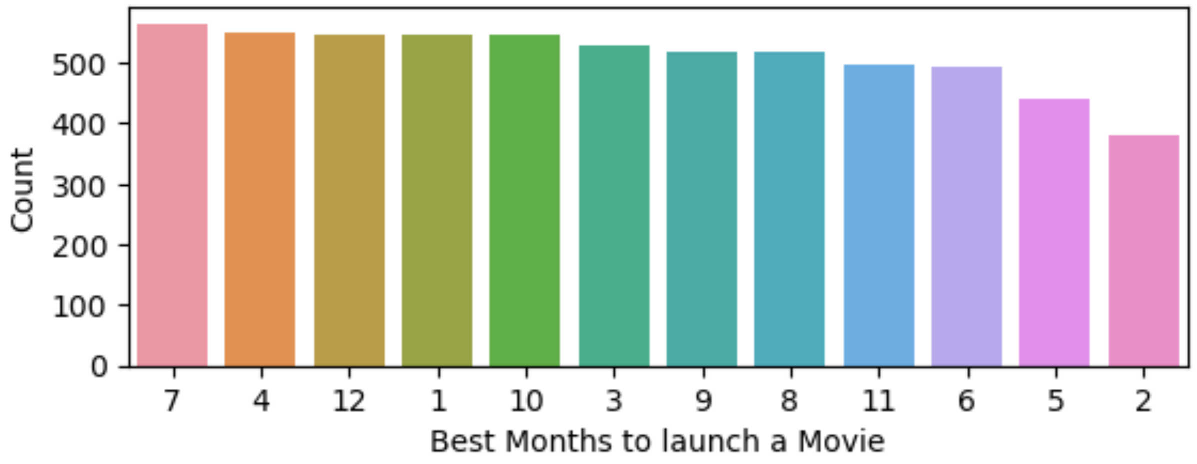
In [94]:
```
from wordcloud import WordCloud
```

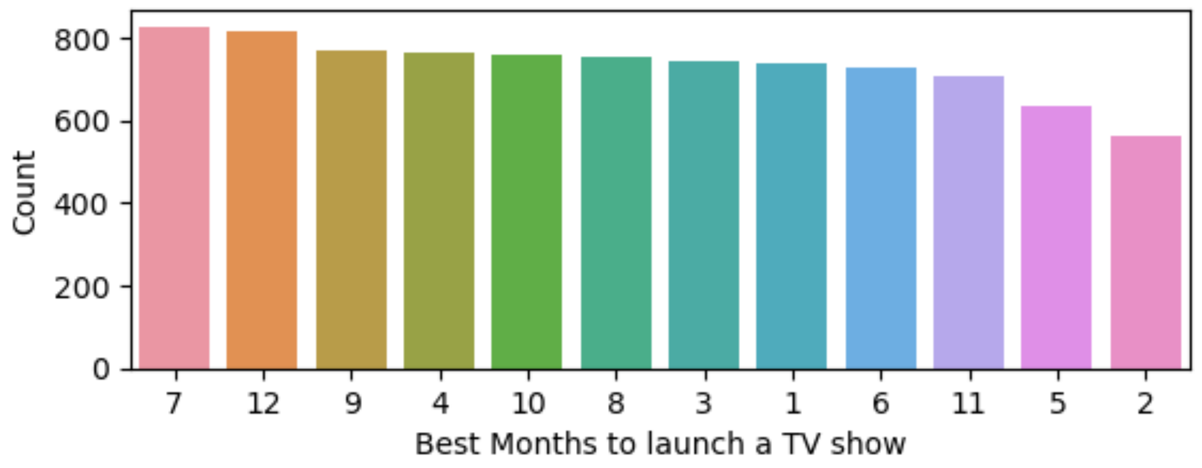
In [97]:
```
x = genres_df['genre'].astype(str).str.cat(sep=', ')

plt.subplots(figsize=(25,15))
wordcloud = WordCloud(background_color='white', width=1920, height=1080).generate(x)
plt.imshow(wordcloud)
plt.axis('off')
plt.show()
```



7) Analysing release of content on Netflix

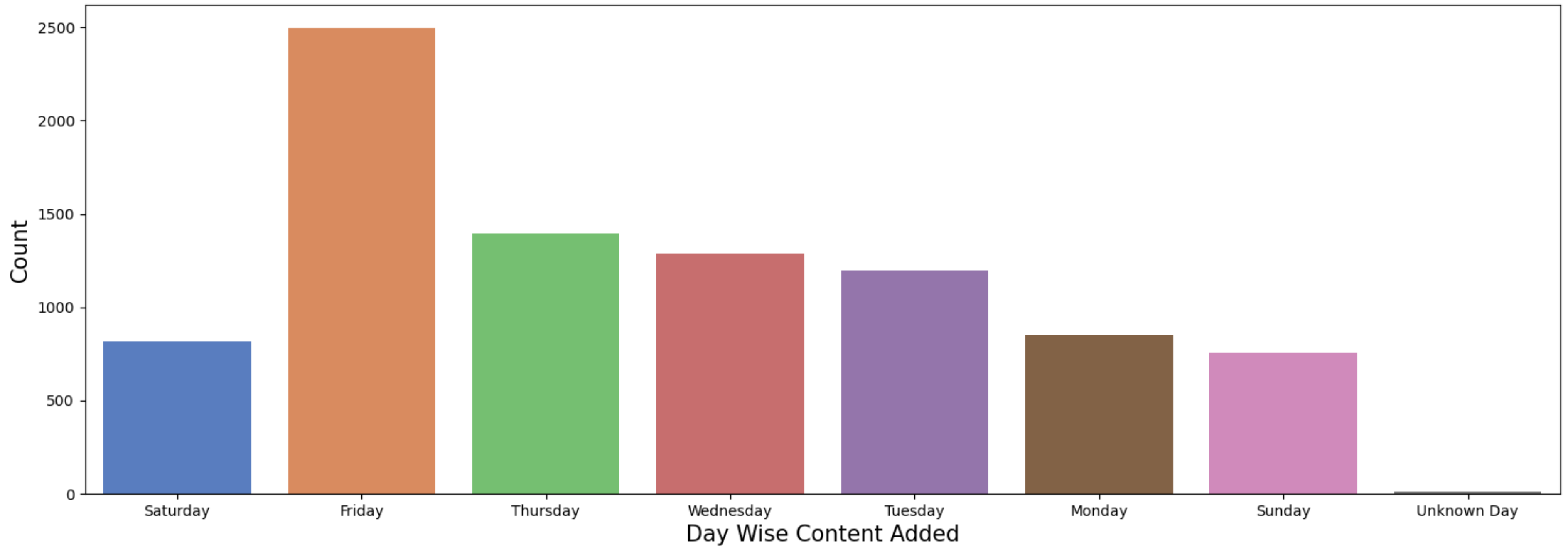
In [112…
```
# Best Months to release Movie/ TV show

movie_df2 = df[df['type'] == 'Movie']
tv_show_df2 = df[df['type'] == 'TV Show']
tv_show_df2 = df[df['month_added'] != 0]

plt.subplot(2,1,1)
sns.set_palette("muted")
order = movie_df2['month_added'].value_counts().index
sns.countplot(x = 'month_added', data = movie_df2, order=order)
plt.xlabel('Best Months to launch a Movie', fontsize=10)
plt.ylabel('Count', fontsize=10)
plt.show()

plt.subplot(2,1,1)
order = tv_show_df2['month_added'].value_counts().index
sns.countplot(x = 'month_added', data = tv_show_df2, order=order)
plt.xlabel('Best Months to launch a TV show', fontsize=10)
plt.ylabel('Count', fontsize=10)
plt.show()
```





In [113…

```
# Popular Day of the Week to release Content

sns.set_palette("muted")
plt.figure(figsize = (18, 6))
sns.countplot(x = 'day_added', data = df)
plt.xlabel('Day Wise Content Added', fontsize=15)
plt.ylabel('Count', fontsize=15)
plt.show()
```



After how many days the movie will be added to Netflix after the release of the movie

In [115…

```
release_df = df

release_df['date_added'] = pd.to_datetime(release_df['date_added'])
release_df['release_year'] = pd.to_datetime(release_df['release_year'], format='%Y')

release_df['days_to_add'] = (release_df['date_added'] - release_df['release_year']).dt.days
days_to_add = release_df['days_to_add'].mode()[0]

print(f"After {days_to_add} days from release the content will be added to Netflix.")
```

```
After 334.0 days from release the content will be added to Netflix.
```

In [ ]: