Type *Markdown* and LaTeX: α^2

Import Required Libary

In [396]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

In [397]:
```
df=pd.read_csv("C:/Users/User/ML Prac/netflix.csv")
```

In [398]:
```
df['date_added'] = pd.to_datetime(df['date_added'])
df.head()
```

Out[398]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	dura
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13	90
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV-MA	Sea
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	NaN	2021-09-24	2021	TV-MA	Sea
3	s4	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	2021-09-24	2021	TV-MA	Sea
4	s5	TV Show	Kota Factory	NaN	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	2021-09-24	2021	TV-MA	Sea

In [399]:
```
df.tail()
```

Out[399]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
8802	s8803	Movie	Zodiac	David Fincher	Mark Ruffalo, Jake Gyllenhaal, Robert Downey J...	United States	2019-11-20	2007	R
8803	s8804	TV Show	Zombie Dumb	NaN	NaN	NaN	2019-07-01	2018	TV-Y7
8804	s8805	Movie	Zombieland	Ruben Fleischer	Jesse Eisenberg, Woody Harrelson, Emma Stone, ...	United States	2019-11-01	2009	R
8805	s8806	Movie	Zoom	Peter Hewitt	Tim Allen, Courteney Cox, Chevy Chase, Kate Ma...	United States	2020-01-11	2006	PG
8806	s8807	Movie	Zubaan	Mozez Singh	Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan...	India	2019-03-02	2015	TV-14

In [400]:
```
df.shape
```

Out[400]:
```
(8807, 12)
```

In [401]:
```
df.duplicated().sum()
```

Out[401]:
```
0
```

In [402]:
```
df.columns
```

Out[402]:
```
Index(['show_id', 'type', 'title', 'director', 'cast', 'country', 'date_added',
       'release_year', 'rating', 'duration', 'listed_in', 'description'],
      dtype='object')
```

In [403]:
```
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   datetime64[ns]
 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: datetime64[ns](1), int64(1), object(10)
memory usage: 825.8+ KB
```

In [404]:
```
df['date_added']=pd.to_datetime(df['date_added'])
df = df.astype({'release_year':'int'})
```

In [405]:
```
df.dtypes
```

Out[405]:
```
show_id                 object
type                    object
title                   object
director                object
cast                    object
country                 object
date_added      datetime64[ns]
release_year             int32
rating                  object
duration                object
listed_in               object
description             object
dtype: object
```

3. Non-Graphical Analysis: Value counts and unique attributes (10 Points)

In [406]:
```
df.nunique()
```

Out[406]:
```
show_id         8807
type               2
title           8807
director        4528
cast            7692
country          748
date_added      1714
release_year      74
rating            17
duration         220
listed_in        514
description     8775
dtype: int64
```

In [407]:
```
mask1 = (df['type'] == 'Movie')

#mask1['rating'].value_counts()
movie_rating=df[mask1]
movie_rating['rating'].value_counts()
```

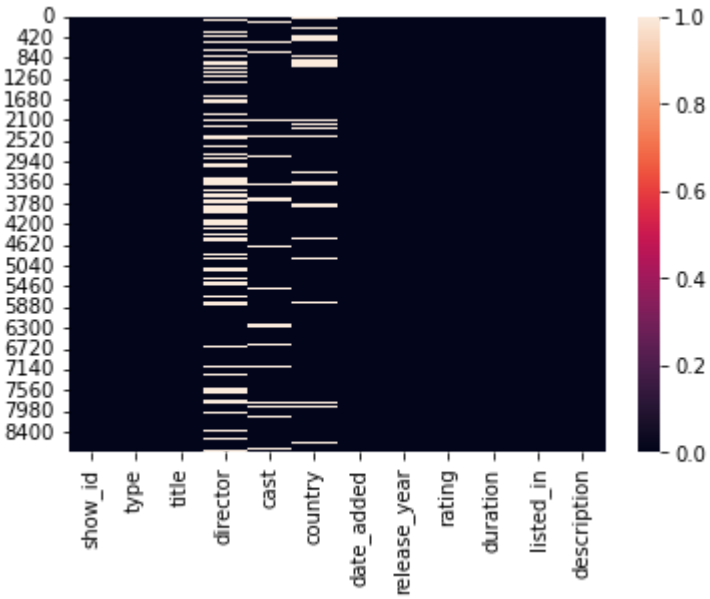
Out[407]:
```
TV-MA       2062
TV-14       1427
R            797
TV-PG        540
PG-13        490
PG           287
TV-Y7        139
TV-Y         131
TV-G         126
NR            75
G             41
TV-Y7-FV       5
NC-17          3
UR             3
74 min         1
84 min         1
66 min         1
Name: rating, dtype: int64
```

In [408]:
```
#Find the Missing Data Percentage
null_count=df.isnull().sum()
#print(null_count)
((null_count)/len(df)*100)
```

Out[408]:
```
show_id         0.000000
type            0.000000
title           0.000000
director       29.908028
cast            9.367549
country         9.435676
date_added      0.113546
release_year    0.000000
rating          0.045418
duration        0.034064
listed_in       0.000000
description     0.000000
dtype: float64
```

In [409]:
```
sns.heatmap(df.isnull())
```

Out[409]:
```
<AxesSubplot:>
```



Replace the Missing values for the columns => rating, Duration, date_added with the Highest Repeated Frequency in that Column

In [410]:
```
for ColName in df[['rating','duration','date_added']]:
    df[ColName].fillna(df[ColName].value_counts().index[0],inplace=True)
```

Fill All the missing values to => "Unknown" with fillna() Since it has High number of missing and can't replace with highest repeated value

In [411]:
```
for ColName in df[['cast','country','director']]:
    df[ColName].fillna("Unknown",inplace=True)
```

In [412]:
```
df.isnull().sum()
```

Out[412]:
```
show_id         0
type            0
title           0
director        0
cast            0
country         0
date_added      0
release_year    0
rating          0
duration        0
listed_in       0
description     0
dtype: int64
```

In [413]:
```
df['rating']= df['rating'].replace({
'TV-MA' :  'Adults',
'TV-14' :  'Teen- Age above 14',
'R'     :  'Adults',
'TV-PG' :  'Kids - with parental guidence',
'PG-13' :  'Teen- Age above 12',
'PG'    :  'Kids - with parental guidence',
'TV-Y7' :  'Kids- Age above 7',
'TV-Y'  :  'Kids',
'TV-G'  :  'Kids',
'NR'    :  'NR',
'G'     :  'Kids',
'TV-Y7-FV':   'Kids- Age above 7',
'NC-17' :  'Adults',
'UR'    :  'UR'})
```

In [414]:
```
df[df['rating'].str.contains("min")]
```

Out[414]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration
5541	s5542	Movie	Louis C.K. 2017	Louis C.K.	Louis C.K.	United States	2017-04-04	2017	74 min	1 Season
5794	s5795	Movie	Louis C.K.: Hilarious	Louis C.K.	Louis C.K.	United States	2016-09-16	2010	84 min	1 Season
5813	s5814	Movie	Louis C.K.: Live at the Comedy Store	Louis C.K.	Louis C.K.	United States	2016-08-15	2015	66 min	1 Season

In [415]:
```
df.at[5541,'rating']='TV-MA'
df.at[5794,'rating']='TV-MA'
df.at[5813,'rating']='TV-MA'
df.at[5541,'duration']='74 min'
df.at[5794,'duration']='84 min'
df.at[5813,'duration']='66 min'
df['rating'].value_counts()
```

Out[415]:
```
Adults                          4013
Teen- Age above 14              2160
Kids - with parental guidence   1150
Kids                             568
Teen- Age above 12               490
Kids- Age above 7                340
NR                                80
TV-MA                              3
UR                                 3
Name: rating, dtype: int64
```

4. Visual Analysis - Univariate, Bivariate after pre-processing of the data

Note: Pre-processing involves unnesting of the data in columns like Actor, Director, Country

4.1 For continuous variable(s): Distplot, countplot, histogram for univariate analysis (10 Points)

4.2 For categorical variable(s): Boxplot (10 Points)

4.3 For correlation: Heatmaps, Pairplots (10 Points)

In [416]:
```
def unnest_Col_Values(df, ColName):
    print(f"----Data_Frame----{ColName}-----Created-----")
    df[ColName].apply(lambda x: str(x).split(', ')).tolist()
    constraint=df[ColName].apply(lambda x: str(x).split(', ')).tolist()
    df_new=pd.DataFrame(constraint,index=df['title'])
    df_new=df_new.stack()
    df_new=pd.DataFrame(df_new)
    df_new.reset_index(inplace=True)
    df_new=df_new[['title',0]]
    df_new.columns=['title',ColName]

    return df_new

df_cast = unnest_Col_Values(df, 'cast')
df_country = unnest_Col_Values(df, 'country')
df_listed_in = unnest_Col_Values(df, 'listed_in')
df_director = unnest_Col_Values(df, 'director')
```

```
----Data_Frame----cast-----Created-----
----Data_Frame----country-----Created-----
----Data_Frame----listed_in-----Created-----
----Data_Frame----director-----Created-----
```

In [417]:
```
df_cast_director = pd.merge(df_cast, df_director, on='title', how='inner')
df_cast_director.head()
```

Out[417]:

	title	cast	director
0	Dick Johnson Is Dead	Unknown	Kirsten Johnson
1	Blood & Water	Ama Qamata	Unknown
2	Blood & Water	Khosi Ngema	Unknown
3	Blood & Water	Gail Mabalane	Unknown
4	Blood & Water	Thabang Molaba	Unknown

In [418]:
```
df_cast_director_genre = pd.merge(df_cast_director, df_listed_in, on='title', hov
df_cast_director_genre.head()
```

Out[418]:

	title	cast	director	listed_in
0	Dick Johnson Is Dead	Unknown	Kirsten Johnson	Documentaries
1	Blood & Water	Ama Qamata	Unknown	International TV Shows
2	Blood & Water	Ama Qamata	Unknown	TV Dramas
3	Blood & Water	Ama Qamata	Unknown	TV Mysteries
4	Blood & Water	Khosi Ngema	Unknown	International TV Shows

In [419]:
```
df_cast_director_genre_country = pd.merge(df_cast_director_genre, df_country, on=
df_cast_director_genre_country.head()
```

Out[419]:

	title	cast	director	listed_in	country
0	Dick Johnson Is Dead	Unknown	Kirsten Johnson	Documentaries	United States
1	Blood & Water	Ama Qamata	Unknown	International TV Shows	South Africa
2	Blood & Water	Ama Qamata	Unknown	TV Dramas	South Africa
3	Blood & Water	Ama Qamata	Unknown	TV Mysteries	South Africa
4	Blood & Water	Khosi Ngema	Unknown	International TV Shows	South Africa

In [420]:
```
df.drop(['director','cast','country','listed_in'],axis=1,inplace=True)
```

In [421]:
```
df_final = pd.merge(df, df_cast_director_genre_country, on='title', how='inner')
df_final.head()
```

Out[421]:

	show_id	type	title	date_added	release_year	rating	duration	description	cast	dir
0	s1	Movie	Dick Johnson Is Dead	2021-09-25	2020	Teen-Age above 12	90 min	As her father nears the end of his life, filmm...	Unknown	K Joh
1	s2	TV Show	Blood & Water	2021-09-24	2021	Adults	2 Seasons	After crossing paths at a party, a Cape Town t...	Ama Qamata	Unk
2	s2	TV Show	Blood & Water	2021-09-24	2021	Adults	2 Seasons	After crossing paths at a party, a Cape Town t...	Ama Qamata	Unk
3	s2	TV Show	Blood & Water	2021-09-24	2021	Adults	2 Seasons	After crossing paths at a party, a Cape Town t...	Ama Qamata	Unk
4	s2	TV Show	Blood & Water	2021-09-24	2021	Adults	2 Seasons	After crossing paths at a party, a Cape Town t...	Khosi Ngema	Unk

In [422]:
```
df_final1=df_final
df_final1.head()
```

Out[422]:

	show_id	type	title	date_added	release_year	rating	duration	description	cast	dir
0	s1	Movie	Dick Johnson Is Dead	2021-09-25	2020	Teen-Age above 12	90 min	As her father nears the end of his life, filmm...	Unknown	K Joh
1	s2	TV Show	Blood & Water	2021-09-24	2021	Adults	2 Seasons	After crossing paths at a party, a Cape Town t...	Ama Qamata	Unk
2	s2	TV Show	Blood & Water	2021-09-24	2021	Adults	2 Seasons	After crossing paths at a party, a Cape Town t...	Ama Qamata	Unk
3	s2	TV Show	Blood & Water	2021-09-24	2021	Adults	2 Seasons	After crossing paths at a party, a Cape Town t...	Ama Qamata	Unk
4	s2	TV Show	Blood & Water	2021-09-24	2021	Adults	2 Seasons	After crossing paths at a party, a Cape Town t...	Khosi Ngema	Unk

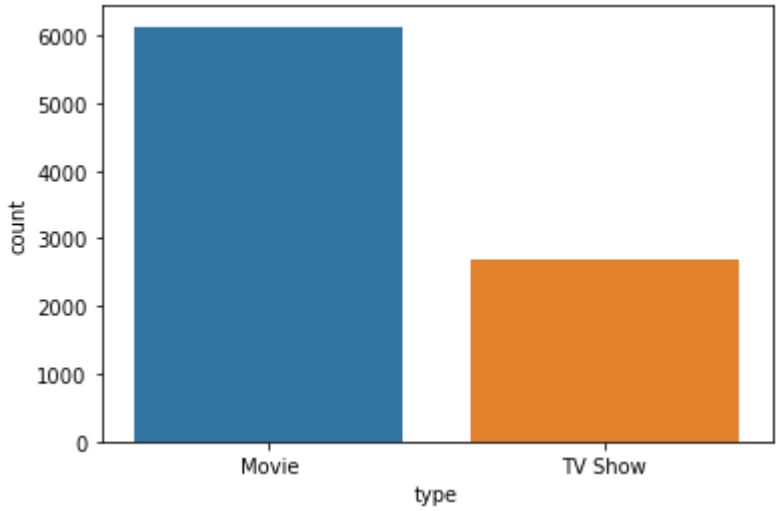
4.1 For continuous variable(s): Distplot, countplot, histogram for univariate analysis (10 Points)

4.2 For categorical variable(s): Boxplot (10 Points)

4.3 For correlation: Heatmaps, Pairplots (10 Points)

In [423]:
```
sns.countplot(data=df,x='type')
```

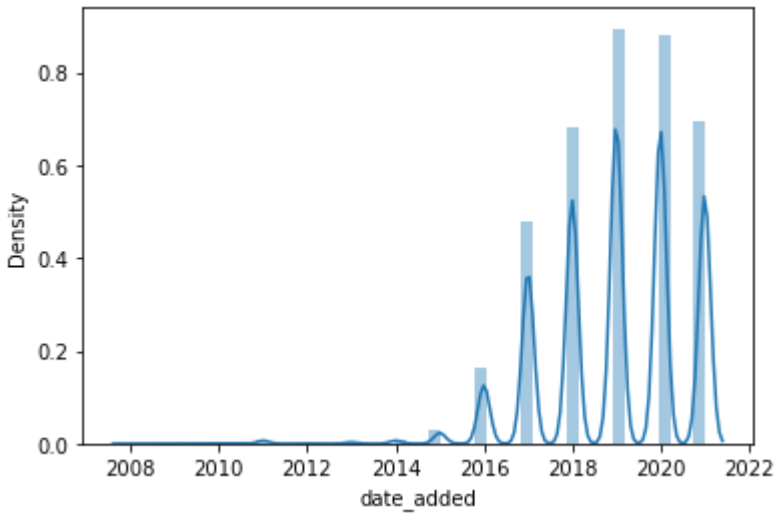
Out[423]: <AxesSubplot:xlabel='type', ylabel='count'>



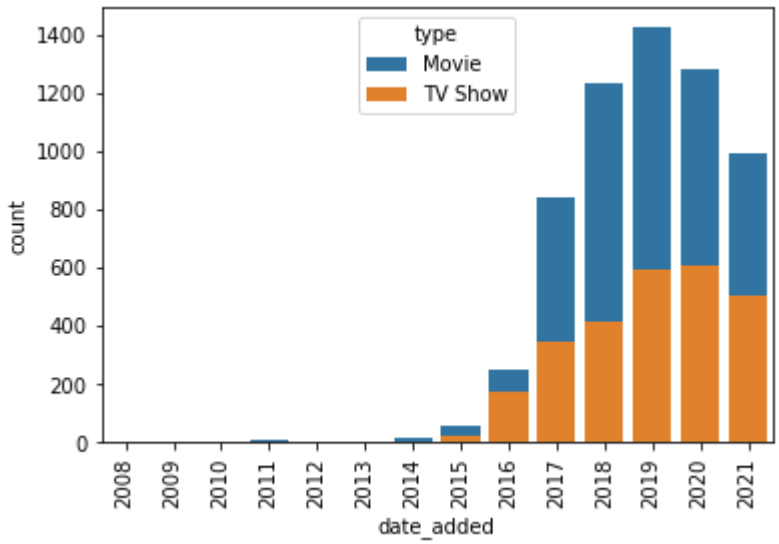
In [424]:
```
sns.distplot(df_final1['date_added'].dt.year)
```

```
C:\Users\User\anaconda3\lib\site-packages\seaborn\distributions.py:2619: Future
Warning: `distplot` is a deprecated function and will be removed in a future ve
rsion. Please adapt your code to use either `displot` (a figure-level function
with similar flexibility) or `histplot` (an axes-level function for histogram
s).
  warnings.warn(msg, FutureWarning)
```

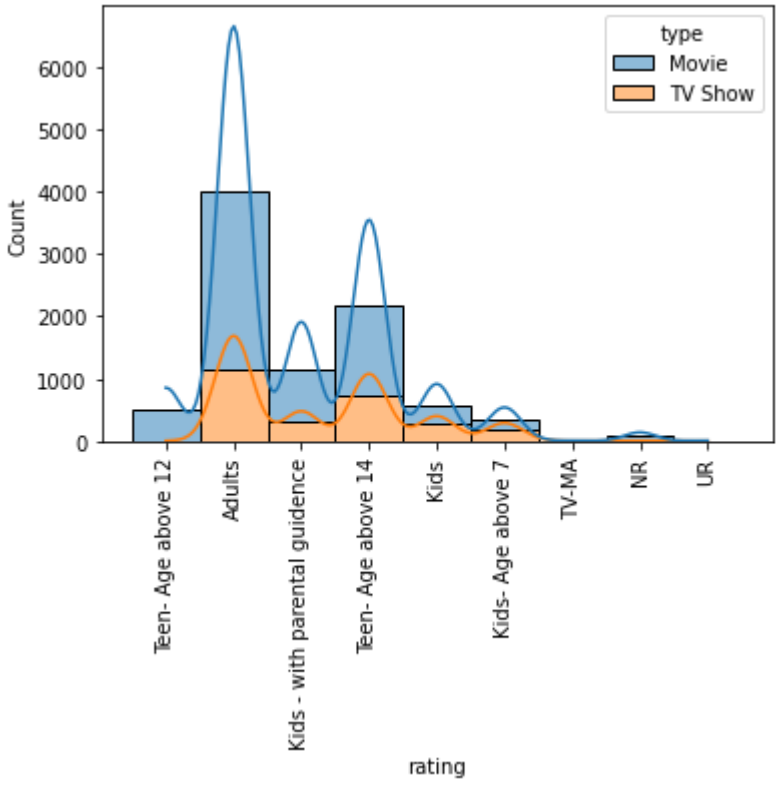
Out[424]: <AxesSubplot:xlabel='date_added', ylabel='Density'>



In [425]:
```
ax=sns.countplot(x=df['date_added'].dt.year,hue=df['type'],dodge = False)
ax.tick_params(axis='x', rotation=90)
```

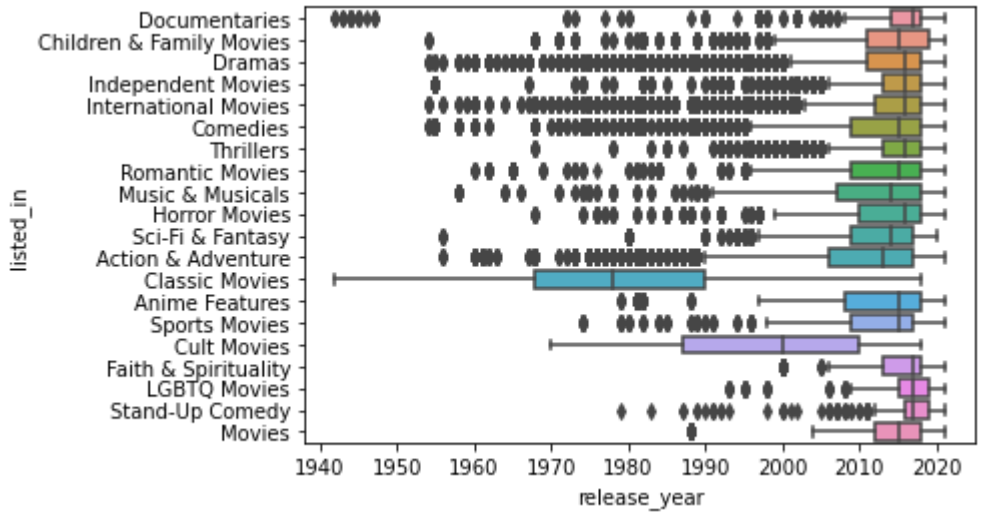


In [426]:
```
ax=sns.histplot(x=df['rating'],hue=df['type'],multiple="stack",kde=True)
ax.tick_params(axis='x', rotation=90)
```

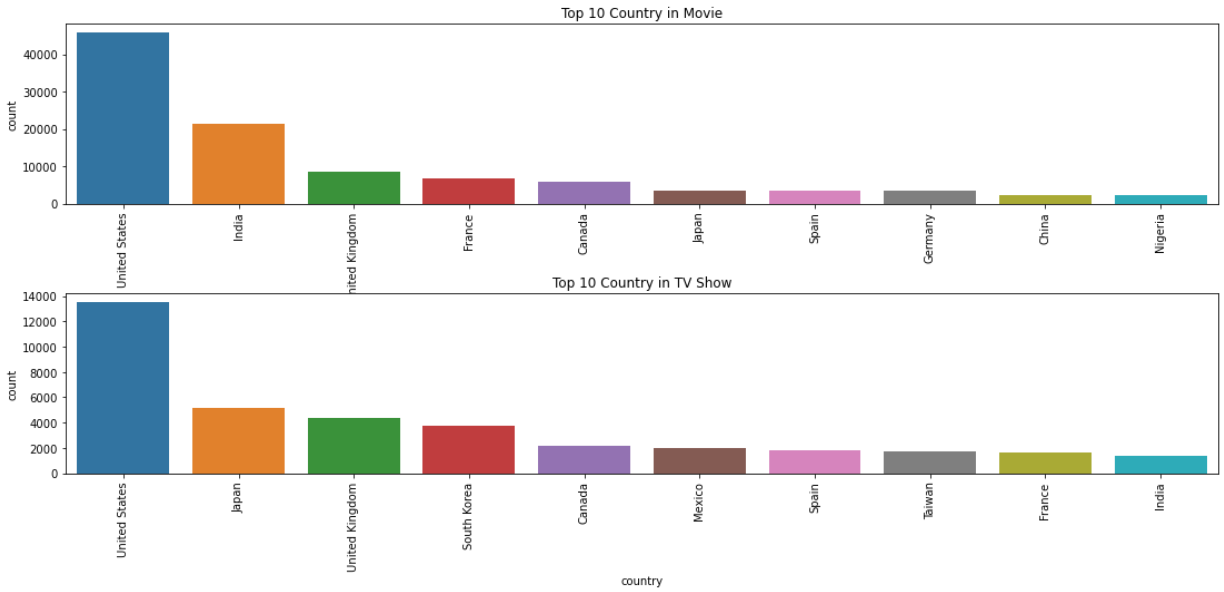


In [427]:
```
df_movie=df_final1[df_final1['type']=='Movie']
#df_movie['listed_in'].value_counts()
sns.boxplot(data=df_movie,y=df_movie['listed_in'],x=df_movie['release_year'])
```

Out[427]: <AxesSubplot:xlabel='release_year', ylabel='listed_in'>

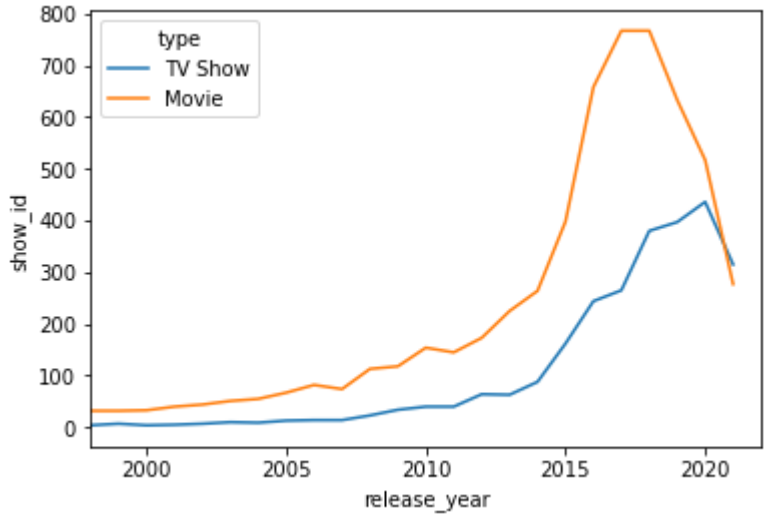


In [428]:
```
df_country_total=df_final1[['title','country','type']]
df_country_total=df_country_total[df_country_total['country']!='Unknown']
df_country_total=df_country_total.groupby(['type','country'])['title'].count().re
df_country_total.rename(columns = {'title':'count'},inplace=True)
df_movie_country=df_country_total[df_country_total['type']=='Movie'].head(10)

df_TvShow_country=df_country_total[df_country_total['type']=='TV Show'].head(10)

fig, axes = plt.subplots(2, 1)
#Movie
sns.barplot(data=df_movie_country,x='country',y='count',ax=axes[0]).set(title='To
axes[0].tick_params(axis='x', rotation=90)

sns.barplot(data=df_TvShow_country, x='country',y='count', ax=axes[1]).set(title=
axes[1].tick_params(axis='x', rotation=90)
plt.subplots_adjust(left=0.1,bottom=0.1,right=2.5,top=1.5,wspace=0.5, hspace=0.5)


plt.show()
```

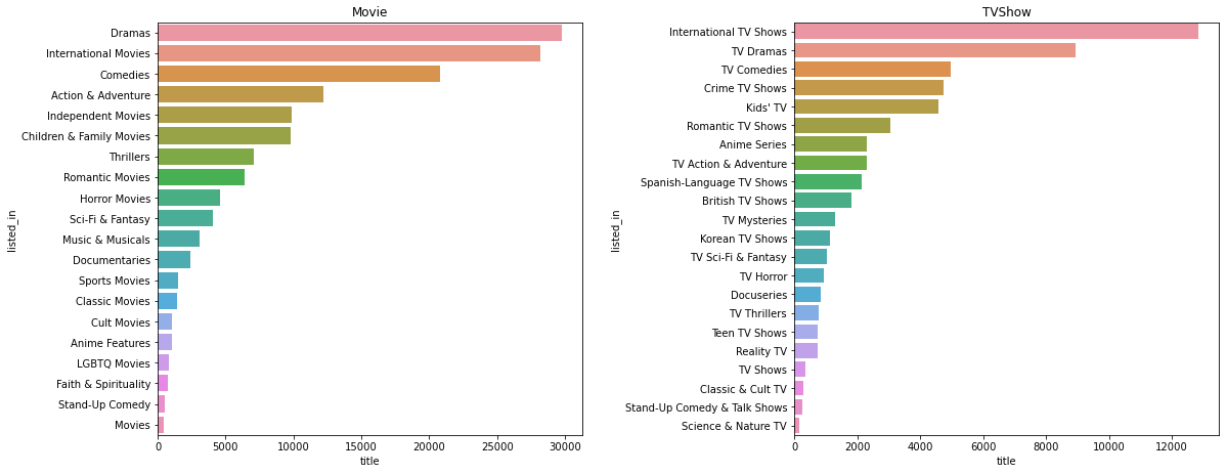


In [429]:
```
df_dist= df.groupby(["release_year","type"])["show_id"].count().reset_index()
ax=sns.lineplot(data=df_dist,x='release_year',y='show_id',hue='type')
ax.set_xlim(1998, 2022)
```

Out[429]: (1998.0, 2022.0)

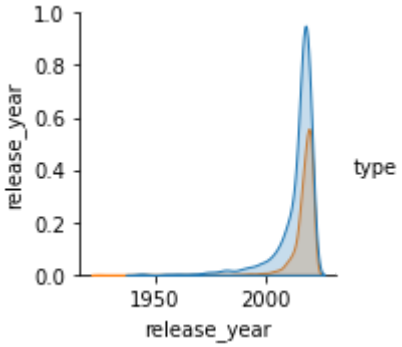


In [430]:
```
df_genre=df_final1[['title','type','listed_in']]
df_genre=df_genre.groupby(['listed_in','type'])['title'].count().reset_index().sc
df_Movie_genre = df_genre[df_genre['type']=='Movie']
df_TVShow_genre = df_genre[df_genre['type']=='TV Show']
#sns.barplot(data=df_Movie_genre,x='title',y='listed_in')

fig, axes = plt.subplots(1, 2)

# Movie
sns.barplot(ax=axes[0], x=df_Movie_genre.title, y=df_Movie_genre.listed_in)
axes[0].set_title('Movie')
# TV Show
sns.barplot(ax=axes[1], x=df_TVShow_genre.title, y=df_TVShow_genre.listed_in)
axes[1].set_title('TVShow')
plt.subplots_adjust(left=0.1,
                    bottom=0.1,
                    right=2.5,
                    top=1.5,
                    wspace=0.5,
                    hspace=0.5)
plt.show()
```



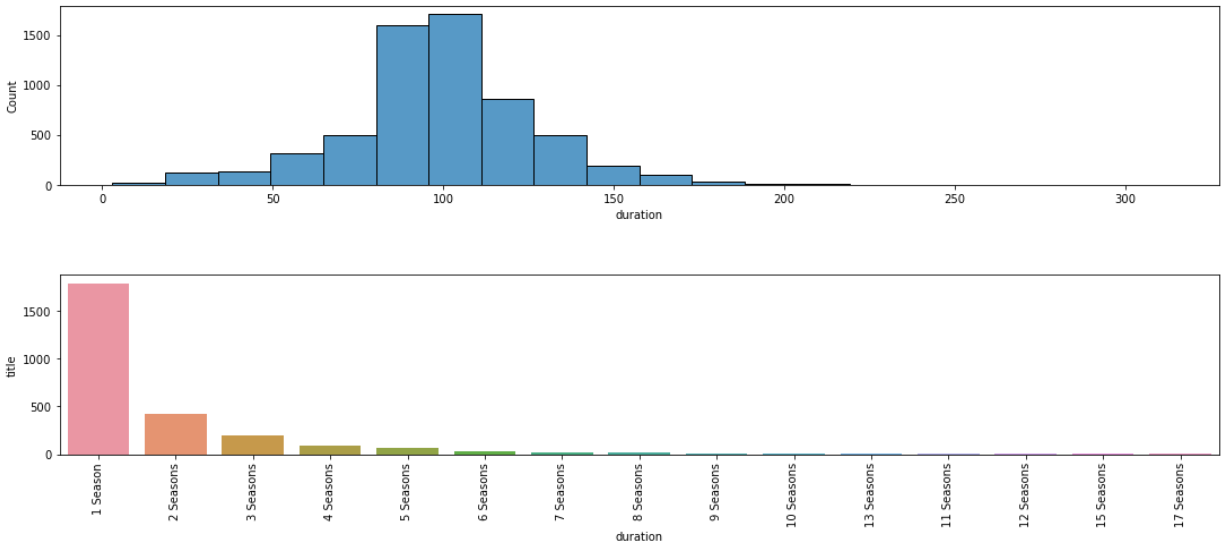
In [431]:
```
sns.pairplot(df, hue="type")
```

Out[431]:
```
<seaborn.axisgrid.PairGrid at 0x1e80dfe3f40>
```



In [432]:
```
df_movie_duration=df[df['type']=='Movie']

df_movie_duration['duration']=df_movie_duration['duration'].str.split(" ").str[0]

df_TVShow_duration=df[df['type']=='TV Show']
df_TVShow_duration=df_TVShow_duration[['title','duration']]
df_TVShow_duration=df_TVShow_duration.groupby(['duration'])['title'].count().rese

fig, axes = plt.subplots(2, 1)

#create chart in each subplot
sns.histplot(x=df_movie_duration['duration'],bins=20, ax=axes[0])

sns.barplot(data=df_TVShow_duration, x='duration',y='title', ax=axes[1])
axes[1].tick_params(axis='x', rotation=90)

plt.subplots_adjust(
                    right=2.5,
                    top=1.5,
                    hspace=0.5)

plt.show()
```

```
C:\Users\User\AppData\Local\Temp\ipykernel_5904\108242813.py:3: SettingWithCopy
Warning:
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/sta
ble/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pyd
ata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-c
opy)
  df_movie_duration['duration']=df_movie_duration['duration'].str.split(" ").st
r[0].astype(int)
```



In [ ]:

Insight's

=> **Adults** and **Teen above age 17** Both caombined has high viewing time. So they are the Target Audience.

=> For Movies it is Around between **90min - 120 min**. For TV Show mostly have **1 Season** beacuse every TV Show's Have one Season.

=> Movies which released between **1970-2000** are Classic Movies.Cult movie Are which released between **1990-2010**

=> There is a Sight Drop in overall Movie & Tv Show Due to **Covid Pandemic or Some other reasons**

Business Decision

=> **India has higher number of Movie than TV Shows**.So We Need to Focus on Launching More Movies in india than TV Shows. Like Wise **South Korea has Higher Number of TV shows than Movies**.

=> A Lot of Movies & TV Show with genre in **Drama, Comedy, Action, Adventure** are most Common and Have Higher Audience.Therfore we can concenrate on similar Genre.

=> Most of our Viewer are **Adults** and **Teen Above age 17**.we Have to focus on more contents to satisfy the need of this Age group.

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