netflix-case-study

November 8, 2023

NETFLIX CASE STUDY

0.0.1 Problem Statement

"Netflix wants to improve its content recommendation system and make data-driven decisions to enhance user experience and engagement." #### Basic Metrics 1. **Content Distribution:** - Movies vs. TV Shows: Analyze the distribution of content between movies and TV shows. Calculate the percentage of movies and TV shows in the dataset. 2. **Country of Production:** - Explore the countries where the movies and TV shows were produced. Identify the top countries with the most content in the Netflix library. 3. **Release Year Analysis:** - Analyze the distribution of content by release year. Identify the most common release years and trends in the dataset. 4. **TV Ratings:** - Examine the distribution of TV ratings for the content. Calculate the frequency of each TV rating category (e.g., G, PG, TV-MA) in the dataset. 5. **Content Duration:** - For movies, calculate the distribution of movie durations in minutes (e.g., 90 minutes, 120 minutes). For TV shows, calculate the distribution of the number of seasons. 6. **Genre Analysis:** - Analyze the distribution of content across different genres listed in the "Listed_in" column. Identify the most popular genres on Netflix. 7. **Content Added Over Time:** - Examine how content has been added to Netflix over time. Create a time series analysis of content additions by year and month. 8. **Director and Cast Analysis:** - Identify the most prolific directors and actors/actresses in the Netflix library. Analyze their contributions to the platform. 9. **Content Descriptions:** - Perform text analysis on the descriptions to identify common keywords or themes. This could help with content tagging and recommendation.

0.0.2 Importing the neccesary libraries

[61]:

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings("ignore")
```

0.0.3 Data Reading,

[62]:

```
data=pd.read_csv("/content/netflix.csv")
```

[63]:

```
# Shape of the Data:
print("Shape of the data : ", data.shape)
```

```
Shape of the data :  (8807, 12)
```

[64]:

```
# Data types
data_types = data.dtypes
print("Data types :")
print(data_types)
```

```
Data types :
show_id         object
type            object
title           object
director        object
cast            object
country         object
date_added      object
release_year     int64
rating          object
duration        object
listed_in       object
description     object
dtype: object
```

[65]:

```
# Conversion of Categorical Attributes
catergorical_attributes = ['type', 'country', 'rating', 'listed_in']
for category in catergorical_attributes:
    data[category] = data[category].astype('category')
```

[66]:

```
# Missing values detection
missing_values = data.isnull().sum()
print("Missing Value Detection:")
print(missing_values)
```

```
Missing Value Detection:
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
```

[67]:

```
# Statistical Summary
# 1. Numerical summary : Summary of all numerical columns
numerical_summary = data.describe()

numerical_summary

categorical_summary = data[catergorical_attributes].describe()

print('categorical_summary: ')
categorical_summary
```

```
categorical_summary:
```

[67]:

```
         type        country rating                    listed_in
count    8807           7976   8803                         8807
unique      2            748     17                          514
top     Movie  United States  TV-MA  Dramas, International Movies
freq     6131           2818   3207                          362
```

[68]:

```
# Value counts for every categorical attribute
type_count = data['type'].value_counts()
print(f"Type Count: {type_count}")
```

```
Type Count: Movie      6131
TV Show    2676
Name: type, dtype: int64
```

[69]:

```
country_count = data['country'].value_counts().head(5)
print(f"Country count : {country_count}")
```

```
Country count : United States     2818
India              972
United Kingdom     419
Japan              245
South Korea        199
Name: country, dtype: int64
```

[70]:

```
rating_count = data['rating'].value_counts()
print(f"Rating count {rating_count}")
```

```
Rating count 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
UR             3
NC-17          3
74 min         1
84 min         1
66 min         1
Name: rating, dtype: int64
```

```
[71]: listed_in_count=data["listed_in"].value_counts().head(5)
      print(f"listed_in_count: {listed_in_count}")
```

```
listed_in_count: Dramas, International Movies                        362
Documentaries                                       359
Stand-Up Comedy                                     334
Comedies, Dramas, International Movies              274
Dramas, Independent Movies, International Movies    252
Name: listed_in, dtype: int64
```

```
[72]: # unique values for Categorical attributes
      type_unique=data["type"].nunique()
      print(f"Unique type values : {type_unique}")
```

```
Unique type values : 2
```

```
[73]: rating_unique=data["rating"].nunique()
      print(f'Unique rating values : {rating_unique}')
```

```
Unique rating values : 17
```

```
[74]: listed_in_unique=data["listed_in"].nunique()
      print(f"Unique Listed_in values : {listed_in_unique}")
```

```
Unique Listed_in values : 514
```

value_counts() is used to calculate the frequency of each unique value in the 'Type' column, which indicates whether a title is a movie or TV show.

unique() is used to get an array of unique values in the 'Rating' column, providing a list of different content ratings available.

nunique() is used to count the number of unique values in the 'Country' column, indicating how many different countries are represented in the dataset.

```
[75]: data_copy = data.copy()
```

0.0.4 Pre-proccessing the data

[76]:

```
# Cast
constraint=data_copy['cast'].apply(lambda x: str(x).split(', ')).tolist()
data_new=pd.DataFrame(data=constraint,index=data["title"])
data_new=data_new.stack()
data_new=pd.DataFrame(data_new)
data_new.reset_index(inplace=True)
data_new=data_new[["title",0]]
data_new

data_new.columns=['title','cast']
data_new
data_cast=data_copy.merge(data_new,on='title',how='inner')
data_cast.sample(10)
```

[76]:

```
      show_id     type                            title  \
21362   s2692  TV Show                   Brews Brothers
49520   s6694  TV Show                       Encerrados
14279   s1771    Movie                Wheels of Fortune
19325   s2421    Movie          Choked: Paisa Bolta Hai
13237   s1634    Movie                          The 2nd
17667   s2196    Movie                     It's Her Day
41678   s5562    Movie  The Most Hated Woman in America
50640   s6851    Movie                   Ghost Whispers
55677   s7545    Movie     My Schoolmate, the Barbarian
57119   s7772  TV Show                Power Rangers RPM

                        director  \
21362                        NaN
49520                        NaN
14279       Shaun Paul Piccinino
19325             Anurag Kashyap
13237                Brian Skiba
17667               Aniedi Anwah
41678              Tommy O'Haver
50640             Kazuchika Kise
55677  Siu-hung Chung, Wong Jing
57119                        NaN

                                                  cast_x        country  \
21362  Alan Aisenberg, Mike Castle, Carmen Flood, Mar…  United States
49520  Luis Machín, María Merlino, Fabián Vena, Ana C…            NaN
14279  Matt Jones, Noureen DeWulf, John Ducey, Matty …  United States
19325  Saiyami Kher, Roshan Mathew, Amruta Subhash, U…          India
13237  Ryan Phillippe, Casper Van Dien, Jack Griffo, …  United States
17667  Bovi Ugboma, Amanda Ebeye, Shaffy Bello, Adunn…        Nigeria
```

```
41678  Melissa Leo, Josh Lucas, Vincent Kartheiser, J…  United States
50640  Maaya Sakamoto, Ikkyu Juku, Kenichirou Matsuda…          Japan
55677  Nicholas Tse, Stephen Fung, Joey Yung, Samuel …      Hong Kong
57119  Eka Darville, Ari Boyland, Rose McIver, Milo C…  United States

              date_added  release_year rating  duration  \
21362     April 10, 2020          2020  TV-MA  1 Season
49520      June 18, 2018          2018  TV-MA  1 Season
14279   November 1, 2020          2020      R   107 min
19325       June 5, 2020          2020  TV-14   114 min
13237  November 30, 2020          2020  TV-MA    93 min
17667      July 29, 2020          2016  TV-MA   112 min
41678     March 24, 2017          2017  TV-MA    93 min
50640  February 24, 2019          2013  TV-14    56 min
55677    August 16, 2018          2001  TV-14    90 min
57119    January 1, 2016          2009  TV-Y7  1 Season

                                               listed_in  \
21362                                        TV Comedies
49520  International TV Shows, Spanish-Language TV Sh…
14279                            Comedies, Sports Movies
19325                       Dramas, International Movies
13237                                 Action & Adventure
17667    Comedies, International Movies, Romantic Movies
41678                                             Dramas
50640  Action & Adventure, Anime Features, Internatio…
55677  Action & Adventure, Comedies, International Mo…
57119                                           Kids' TV

                                             description              cast_y
21362  Two rival brothers must work together to keep …         Marques Ray
49520  This fictional series tells the stories of wha…      Ana Chalentano
14279  To claim a big inheritance, a down-on-his-luck…     Christina Moore
19325  A bank employee weighed down by her jobless hu…      Amruta Subhash
13237  A Secret Service agent is drawn into a terrori…    Samaire Armstrong
17667  After a man promises his fiancé a dream weddin…      Femi Durojaiye
41678  This drama follows the controversial life of o…  Vincent Kartheiser
50640  Freed of her responsibilities for the 501 Orga…        Kazuya Nakai
55677  A brainy private school student is transferred…         Samuel Pang
57119  The Power Rangers' new member, Dillon, isn't s…         Rose McIver
```

[77]:

```
data_new.columns=['title','cast']
data_new
data_cast=data_copy.merge(data_new,on='title',how='inner')
data_cast
```

```
[77]:
      show_id     type                 title          director  \
0          s1    Movie  Dick Johnson Is Dead  Kirsten Johnson
1          s2  TV Show         Blood & Water              NaN
2          s2  TV Show         Blood & Water              NaN
3          s2  TV Show         Blood & Water              NaN
4          s2  TV Show         Blood & Water              NaN
…       …      …                   …              …
64946   s8807    Movie                Zubaan      Mozez Singh
64947   s8807    Movie                Zubaan      Mozez Singh
64948   s8807    Movie                Zubaan      Mozez Singh
64949   s8807    Movie                Zubaan      Mozez Singh
64950   s8807    Movie                Zubaan      Mozez Singh

                                                  cast_x        country  \
0                                                    NaN  United States
1      Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…   South Africa
2      Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…   South Africa
3      Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…   South Africa
4      Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban…   South Africa
…                                                  …            …
64946  Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan…          India
64947  Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan…          India
64948  Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan…          India
64949  Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan…          India
64950  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  2 Seasons
3      September 24, 2021          2021  TV-MA  2 Seasons
4      September 24, 2021          2021  TV-MA  2 Seasons
…                   …           …    …        …
64946       March 2, 2019          2015  TV-14    111 min
64947       March 2, 2019          2015  TV-14    111 min
64948       March 2, 2019          2015  TV-14    111 min
64949       March 2, 2019          2015  TV-14    111 min
64950       March 2, 2019          2015  TV-14    111 min

                                             listed_in  \
0                                        Documentaries
1      International TV Shows, TV Dramas, TV Mysteries
2      International TV Shows, TV Dramas, TV Mysteries
3      International TV Shows, TV Dramas, TV Mysteries
4      International TV Shows, TV Dramas, TV Mysteries
…                                                …
64946   Dramas, International Movies, Music & Musicals
```

```
64947   Dramas, International Movies, Music & Musicals
64948   Dramas, International Movies, Music & Musicals
64949   Dramas, International Movies, Music & Musicals
64950   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      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…
…                                                  …
64946  A scrappy but poor boy worms his way into a ty…
64947  A scrappy but poor boy worms his way into a ty…
64948  A scrappy but poor boy worms his way into a ty…
64949  A scrappy but poor boy worms his way into a ty…
64950  A scrappy but poor boy worms his way into a ty…

                      cast_y
0                        nan
1                 Ama Qamata
2                Khosi Ngema
3              Gail Mabalane
4             Thabang Molaba
…                      …
64946       Manish Chaudhary
64947           Meghna Malik
64948         Malkeet Rauni
64949         Anita Shabdish
64950  Chittaranjan Tripathy

[64951 rows x 13 columns]
```

```
[ ]:
```

```
[79]: # final pre-proccessed data
      pre_Data = pd.read_csv('/content/Final_data.csv')
```

The data is pre-processed by splitting the ‘Actor,’ ‘Director,’ and ‘Country’ columns to create lists of values for each entry.

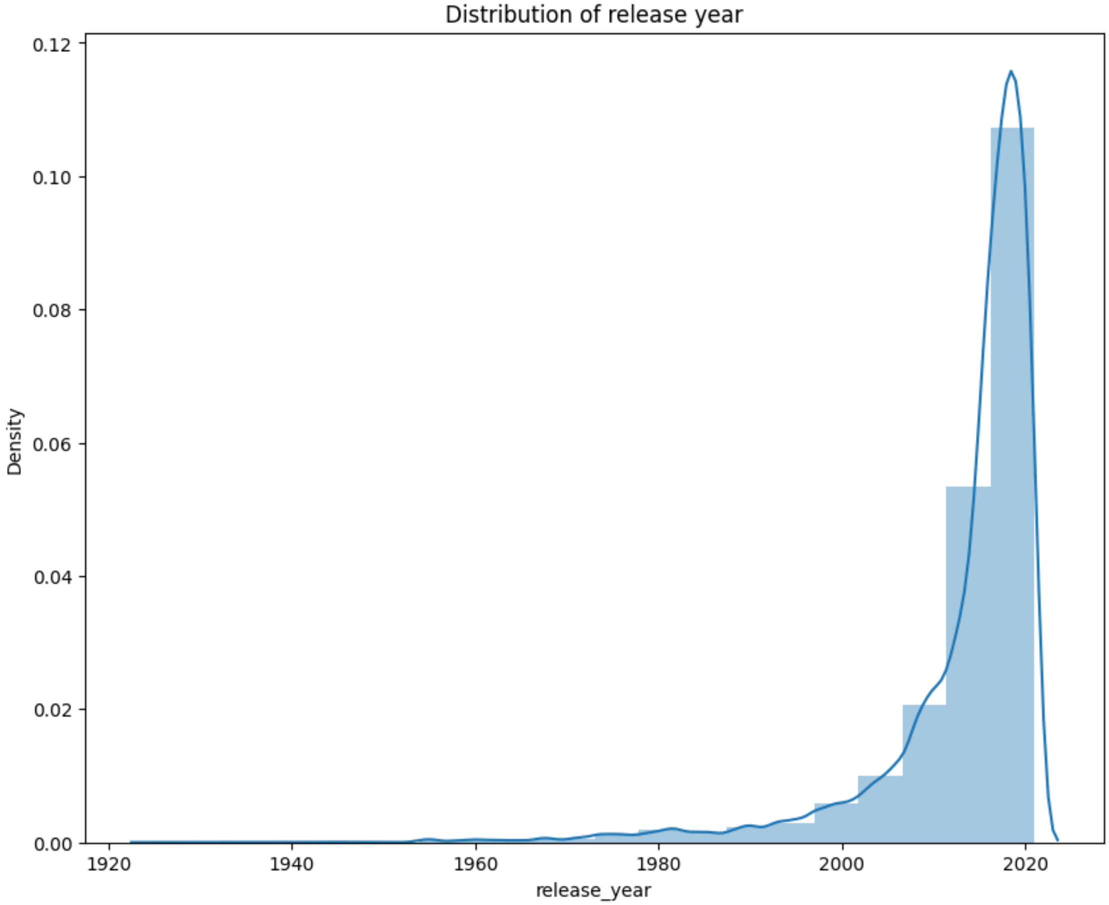
Univariate analysis is performed for the continuous variable ‘Release_year’ using a distribution plot (distplot). Boxplots are created for the categorical variable ‘Rating’ to visualize its distribution.

Bivariate analysis is demonstrated by creating a count plot to visualize the relationship between ‘Type’ and ‘Rating.’

Note that the ‘Type’ variable is categorical, and the correlation analysis (heatmap and pairplot) is not applicable in this context, as these plots are typically used for continuous variables.

[80]:

```
# univariate analysis for continuous variables
# continuous variables : 'release_year'
plt.figure(figsize=(10, 8))
sns.distplot(pre_Data['release_year'], bins = 20, kde=True)
plt.title('Distribution of release year')
plt.show()
```

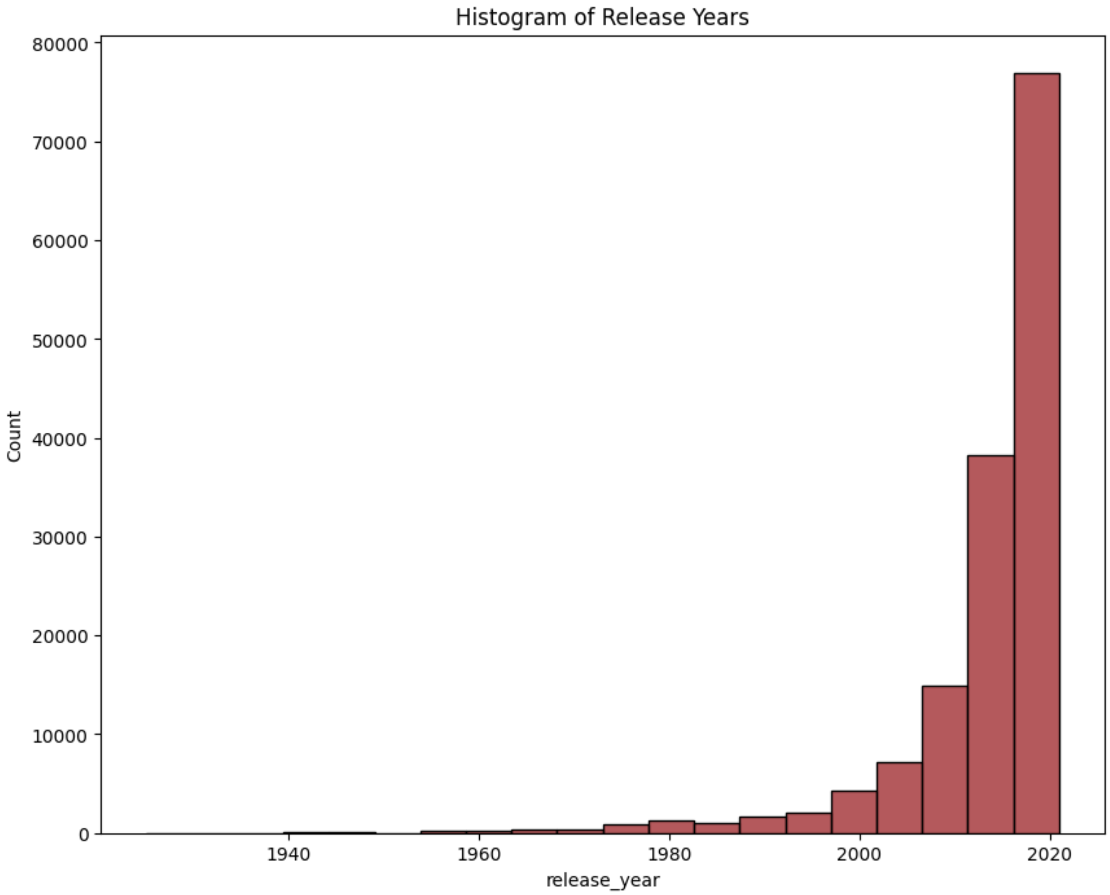


[81]:

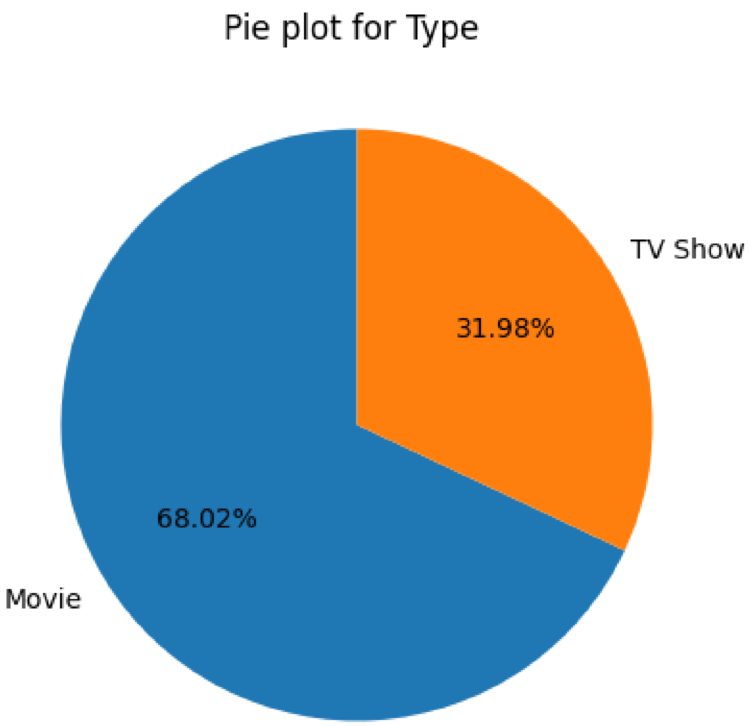
```
pre_Data['date_added'] = pd.to_datetime(pre_Data['date_added'])
```

[82]:

```
# histogram for continuous variables
release_years = pre_Data['release_year']
plt.figure(figsize=(10, 8))
sns.histplot(release_years, bins = 20, color="#9B2226")
plt.title('Histogram of Release Years')
plt.show()
```



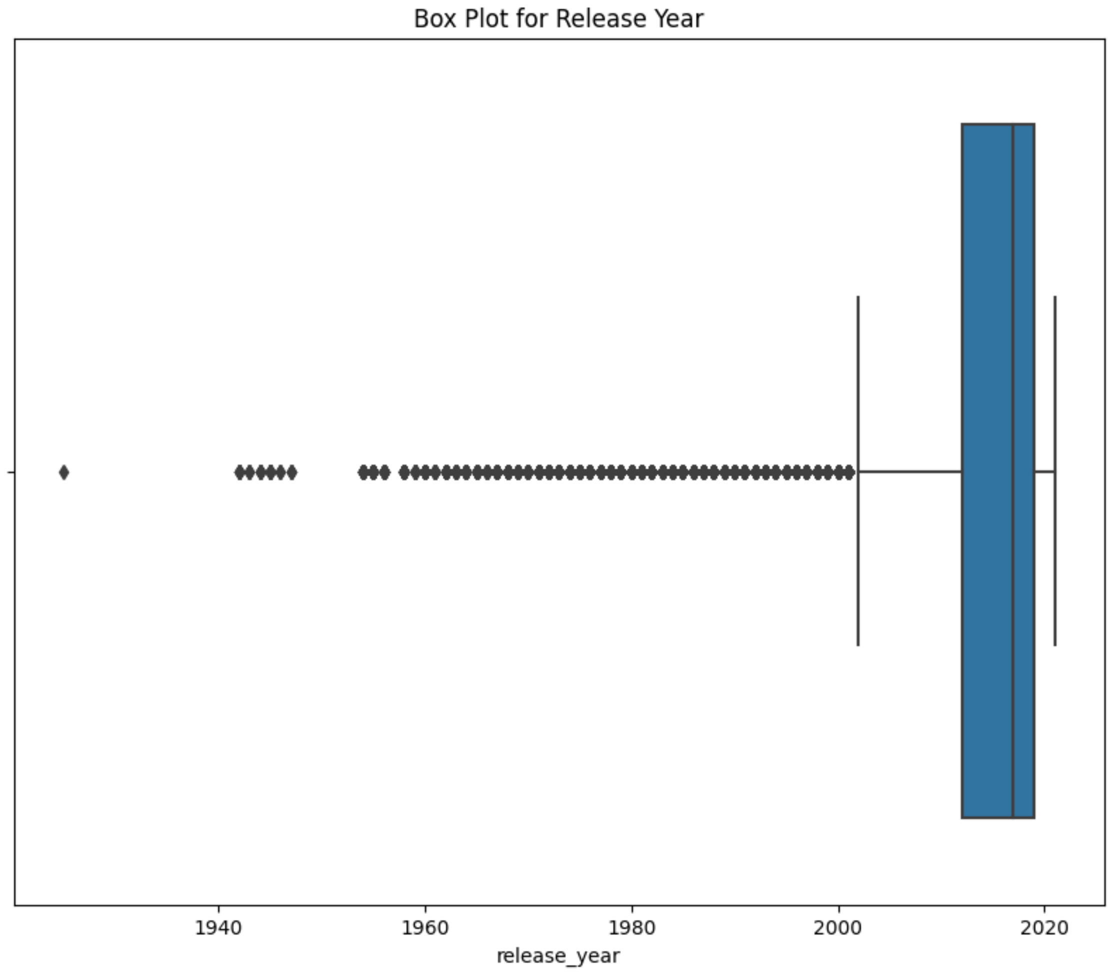
[124]:
```
#PIE PLOT
plt.figure(figsize=(5, 5))
type_count=pre_Data["type"].value_counts()
plt.pie(type_count,labels=type_count.index,autopct="%.2f%%",startangle=90)
plt.title("Pie plot for Type ")
plt.show()
```



In this example , we're using a pie plot to visualize the percentage of Movie and TV shows in the Netflix data

Checking for outliers often involves using descriptive statistics, data visualization, or statistical methods. **Box plots** and scatter plots can be helpful for visualizing outliers. Here's an example using a box plot to check for outliers in a numerical variable:

```
[116]: # Categorical varibales
       # 1.Boxplot
       plt.figure(figsize=(10, 8))
       sns.boxplot(x=pre_Data['release_year'])
       plt.title('Box Plot for Release Year')
       plt.show()
```

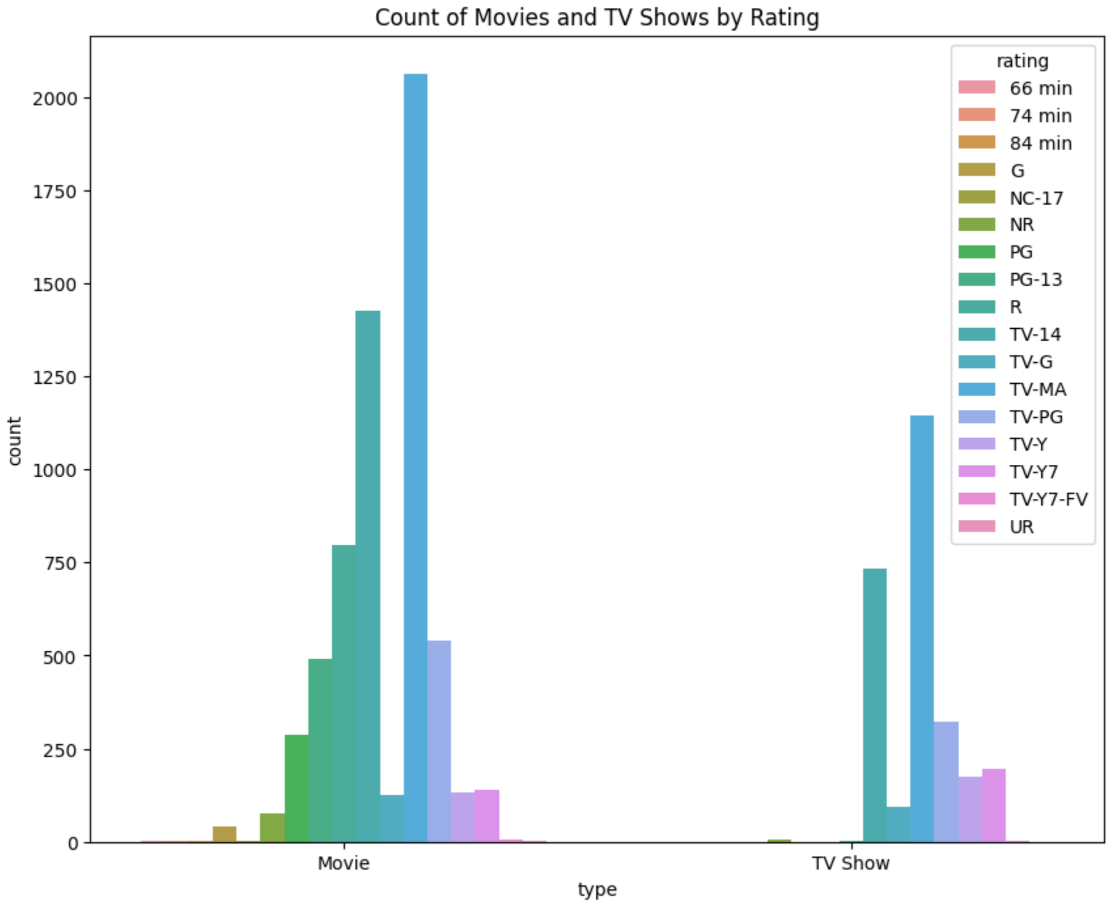


In this example, we use a box plot to visualize the distribution of the ‘Release_year’ variable and identify potential outliers. Outliers are often represented as individual data points beyond the “whiskers” of the box plot.

Keep in mind that outlier treatment is context-dependent, and you may choose to remove outliers, transform the data, or apply other methods based on your specific analysis goals.

Remember that the treatment of missing values and outliers should be done carefully and in a way that is appropriate for your analysis and doesn’t introduce bias or distort the data unnecessarily.

[84]:
```
plt.figure(figsize=(10, 8))
sns.countplot(x = 'type', hue='rating', data = data_copy)
plt.title('Count of Movies and TV Shows by Rating')
plt.show()
```



In this example, we're using a **count plot** to visualize the relationship between the content type ('Type') and the content rating ('Rating'). The hue parameter is used to differentiate the counts for different content ratings within each content type.

```
[117]: data_copy.head()
```

```
[117]:   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

                                                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
```

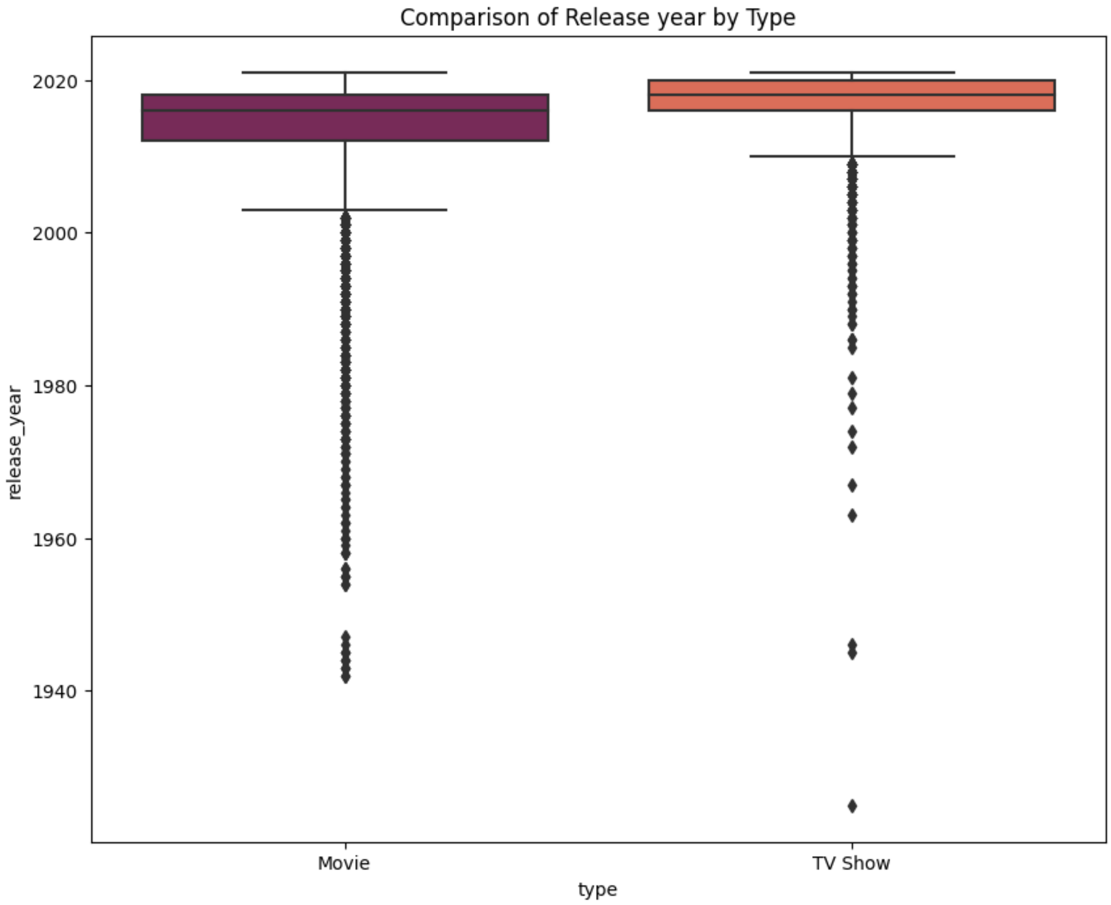
```
           date_added  release_year rating   duration  \
0  September 25, 2021          2020  PG-13     90 min
1  September 24, 2021          2021  TV-MA  2 Seasons
2  September 24, 2021          2021  TV-MA   1 Season
3  September 24, 2021          2021  TV-MA   1 Season
4  September 24, 2021          2021  TV-MA  2 Seasons

                                           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 …

                                         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…
```

[118]:

```
plt.figure(figsize=(10, 8))
sns.boxplot(x = 'type', y='release_year', data = data_copy, palette='rocket')
plt.title('Comparison of Release year by Type')
plt.show()
```



In this example, we're using a box plot to compare the distribution of 'Release_year' by 'Type.' This allows you to see how the release years differ between movies and TV shows.

```
[87]: pre_Data.head()
```

```
[87]:   show_id     type                 title          director        country  \
     0      s1    Movie  Dick Johnson Is Dead  Kirsten Johnson  United States
     1      s2  TV Show         Blood & Water          Unknown   South Africa
     2      s2  TV Show         Blood & Water          Unknown   South Africa
     3      s2  TV Show         Blood & Water          Unknown   South Africa
     4      s2  TV Show         Blood & Water          Unknown   South Africa

       date_added  release_year rating   duration  \
     0 2021-09-25          2020  PG-13     90 min
     1 2021-09-24          2021  TV-MA  2 Seasons
     2 2021-09-24          2021  TV-MA  2 Seasons
     3 2021-09-24          2021  TV-MA  2 Seasons
     4 2021-09-24          2021  TV-MA  2 Seasons
```

```
                                         description Month_added Day_added  \
0  As her father nears the end of his life, filmm…   September  Saturday
1  After crossing paths at a party, a Cape Town t…   September    Friday
2  After crossing paths at a party, a Cape Town t…   September    Friday
3  After crossing paths at a party, a Cape Town t…   September    Friday
4  After crossing paths at a party, a Cape Town t…   September    Friday

        cast_y                   genre
0          NaN           Documentaries
1   Ama Qamata  International TV Shows
2   Ama Qamata               TV Dramas
3   Ama Qamata             TV Mysteries
4  Khosi Ngema  International TV Shows
```

[88]:

```
d1=pre_Data[pre_Data["type"]=="Movie"]
constraint=d1['duration'].apply(lambda x: str(x).split(' ')).tolist()
data_new=pd.DataFrame(data=constraint,index=d1["title"])
data_new=pd.DataFrame(data_new)
data_new.reset_index(inplace=True)
data_new=data_new[["title",0]]
data_new
data_new.columns=['title','mins']
data_new
```

[88]:

```
                                  title mins
0                   Dick Johnson Is Dead   90
1       My Little Pony: A New Generation   91
2       My Little Pony: A New Generation   91
3       My Little Pony: A New Generation   91
4       My Little Pony: A New Generation   91
…                                    …    …
101687                           Zubaan  111
101688                           Zubaan  111
101689                           Zubaan  111
101690                           Zubaan  111
101691                           Zubaan  111

[101692 rows x 2 columns]
```

[89]:

```
dd=pre_Data.merge(data_new,on="title",how="left")
```

[90]:

```
dd
```

[90]:

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

```
3            s2  TV Show         Blood & Water          Unknown
4            s2  TV Show         Blood & Water          Unknown
…         …      …                   …              …
2482587   s8807    Movie                Zubaan      Mozez Singh
2482588   s8807    Movie                Zubaan      Mozez Singh
2482589   s8807    Movie                Zubaan      Mozez Singh
2482590   s8807    Movie                Zubaan      Mozez Singh
2482591   s8807    Movie                Zubaan      Mozez Singh

               country date_added  release_year rating   duration  \
0        United States 2021-09-25          2020  PG-13     90 min
1         South Africa 2021-09-24          2021  TV-MA  2 Seasons
2         South Africa 2021-09-24          2021  TV-MA  2 Seasons
3         South Africa 2021-09-24          2021  TV-MA  2 Seasons
4         South Africa 2021-09-24          2021  TV-MA  2 Seasons
…                ……        …           …    …        …
2482587          India 2019-03-02          2015  TV-14    111 min
2482588          India 2019-03-02          2015  TV-14    111 min
2482589          India 2019-03-02          2015  TV-14    111 min
2482590          India 2019-03-02          2015  TV-14    111 min
2482591          India 2019-03-02          2015  TV-14    111 min

                                               description Month_added  \
0        As her father nears the end of his life, filmm…   September
1        After crossing paths at a party, a Cape Town t…   September
2        After crossing paths at a party, a Cape Town t…   September
3        After crossing paths at a party, a Cape Town t…   September
4        After crossing paths at a party, a Cape Town t…   September
…                                                    …         …
2482587  A scrappy but poor boy worms his way into a ty…       March
2482588  A scrappy but poor boy worms his way into a ty…       March
2482589  A scrappy but poor boy worms his way into a ty…       March
2482590  A scrappy but poor boy worms his way into a ty…       March
2482591  A scrappy but poor boy worms his way into a ty…       March

        Day_added                cast_y                   genre mins
0        Saturday                   NaN           Documentaries   90
1          Friday            Ama Qamata  International TV Shows  NaN
2          Friday            Ama Qamata               TV Dramas  NaN
3          Friday            Ama Qamata            TV Mysteries  NaN
4          Friday           Khosi Ngema  International TV Shows  NaN
…           …                    …                      …  …
2482587  Saturday  Chittaranjan Tripathy        Music & Musicals  111
2482588  Saturday  Chittaranjan Tripathy        Music & Musicals  111
2482589  Saturday  Chittaranjan Tripathy        Music & Musicals  111
2482590  Saturday  Chittaranjan Tripathy        Music & Musicals  111
2482591  Saturday  Chittaranjan Tripathy        Music & Musicals  111
```

```
[2482592 rows x 15 columns]
```

[91]:

```
d1=data[data["type"]=="TV Show"]
constraint=d1['duration'].apply(lambda x: str(x).split(' ')).tolist()
data_new=pd.DataFrame(data=constraint,index=d1["title"])
data_new=pd.DataFrame(data_new)
data_new.reset_index(inplace=True)
data_new=data_new[["title",0]]
data_new
data_new.columns=['title','season']
data_new
```

[91]:

```
                      title season
0             Blood & Water      2
1                 Ganglands      1
2     Jailbirds New Orleans      1
3              Kota Factory      2
4             Midnight Mass      1
…                       …    …
2671         Yu-Gi-Oh! Arc-V      2
2672             Yunus Emre      2
2673               Zak Storm      3
2674      Zindagi Gulzar Hai      1
2675             Zombie Dumb      2

[2676 rows x 2 columns]
```

[92]:

```
pre_Data1=dd.merge(data_new,on="title",how="left")
```

[93]:

```
pre_Data1.head()
```

[93]:

```
  show_id     type                 title         director        country  \
0      s1    Movie  Dick Johnson Is Dead  Kirsten Johnson  United States
1      s2  TV Show         Blood & Water          Unknown   South Africa
2      s2  TV Show         Blood & Water          Unknown   South Africa
3      s2  TV Show         Blood & Water          Unknown   South Africa
4      s2  TV Show         Blood & Water          Unknown   South Africa

  date_added  release_year rating   duration  \
0 2021-09-25          2020  PG-13     90 min
1 2021-09-24          2021  TV-MA  2 Seasons
2 2021-09-24          2021  TV-MA  2 Seasons
3 2021-09-24          2021  TV-MA  2 Seasons
4 2021-09-24          2021  TV-MA  2 Seasons

                                         description Month_added Day_added  \
0  As her father nears the end of his life, filmm…   September  Saturday
1  After crossing paths at a party, a Cape Town t…   September    Friday
2  After crossing paths at a party, a Cape Town t…   September    Friday
3  After crossing paths at a party, a Cape Town t…   September    Friday
4  After crossing paths at a party, a Cape Town t…   September    Friday

        cast_y                   genre mins season
0          NaN           Documentaries   90    NaN
1   Ama Qamata  International TV Shows  NaN      2
2   Ama Qamata               TV Dramas  NaN      2
3   Ama Qamata            TV Mysteries  NaN      2
4  Khosi Ngema  International TV Shows  NaN      2
```

[94]:
```
pre_Data1["mins"]=pre_Data1["mins"].astype(float)
pre_Data1["mins"].fillna(pre_Data1["mins"].mean()).astype(int)
```

[94]:
```
0           90
1          109
2          109
3          109
4          109
          …
2482587    111
2482588    111
2482589    111
2482590    111
2482591    111
Name: mins, Length: 2482592, dtype: int64
```

[95]:
```
pre_Data1["season"]
```

[95]:
```
0          NaN
1            2
2            2
3            2
4            2
          …
2482587    NaN
2482588    NaN
2482589    NaN
2482590    NaN
2482591    NaN
Name: season, Length: 2482592, dtype: object
```

[96]:
```
pre_Data1["season"]=pre_Data1["season"].astype(float)
```

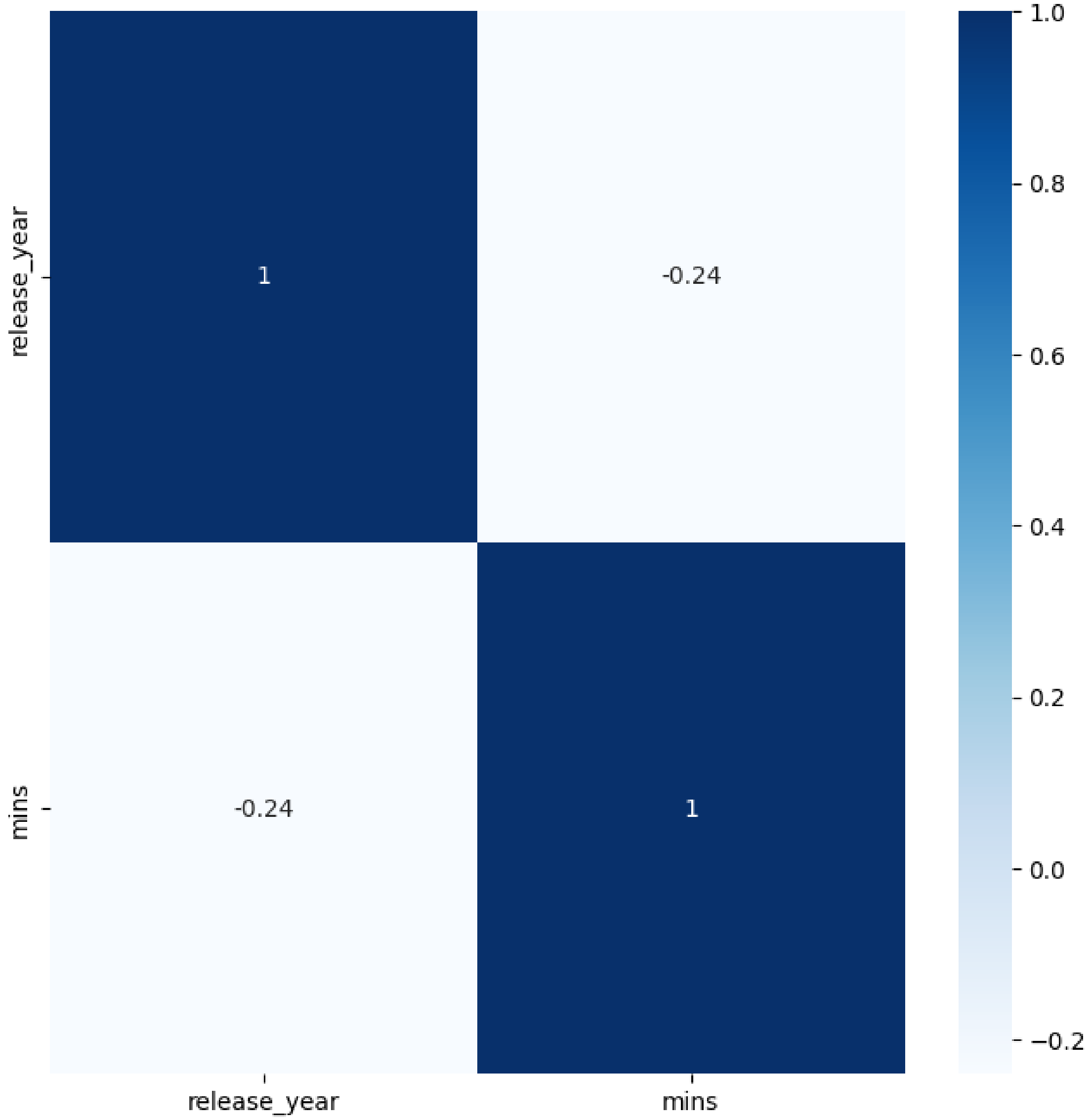
[97]:
```
pre_Data1["season"].fillna(pre_Data1["season"].mean()).astype(int)
```

```
[97]: 0          1
      1          2
      2          2
      3          2
      4          2
                ..
      2482587    1
      2482588    1
      2482589    1
      2482590    1
      2482591    1
      Name: season, Length: 2482592, dtype: int64
```

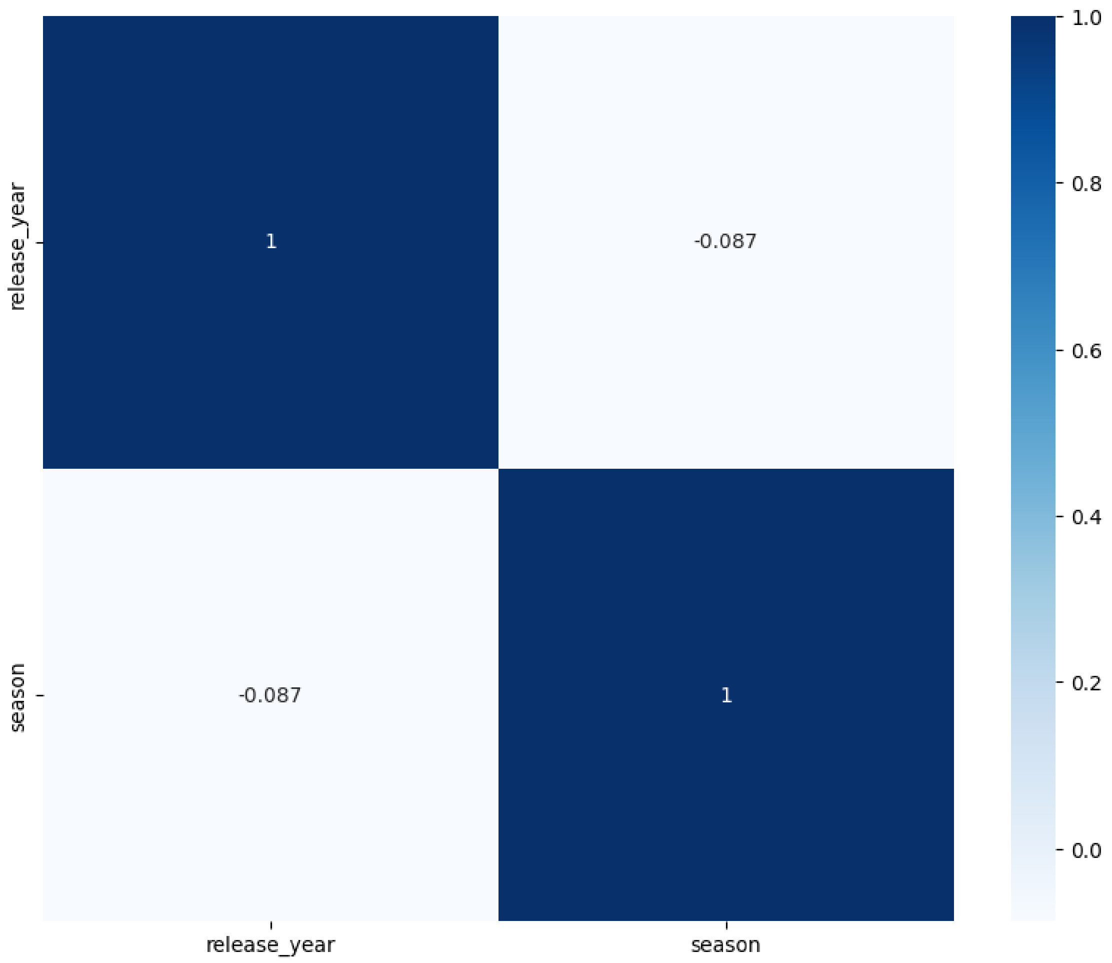
Correlation analysis is typically used for numerical or continuous variables to measure the strength and direction of the linear relationship between them. In your Netflix dataset, there are limited numerical variables, so correlation analysis may not be suitable. However, if you want to analyze any numerical variables for correlations, you can use methods like Pearson's correlation coefficient.

We use the **.corr()** method to calculate the Pearson correlation coefficient between these two variables.

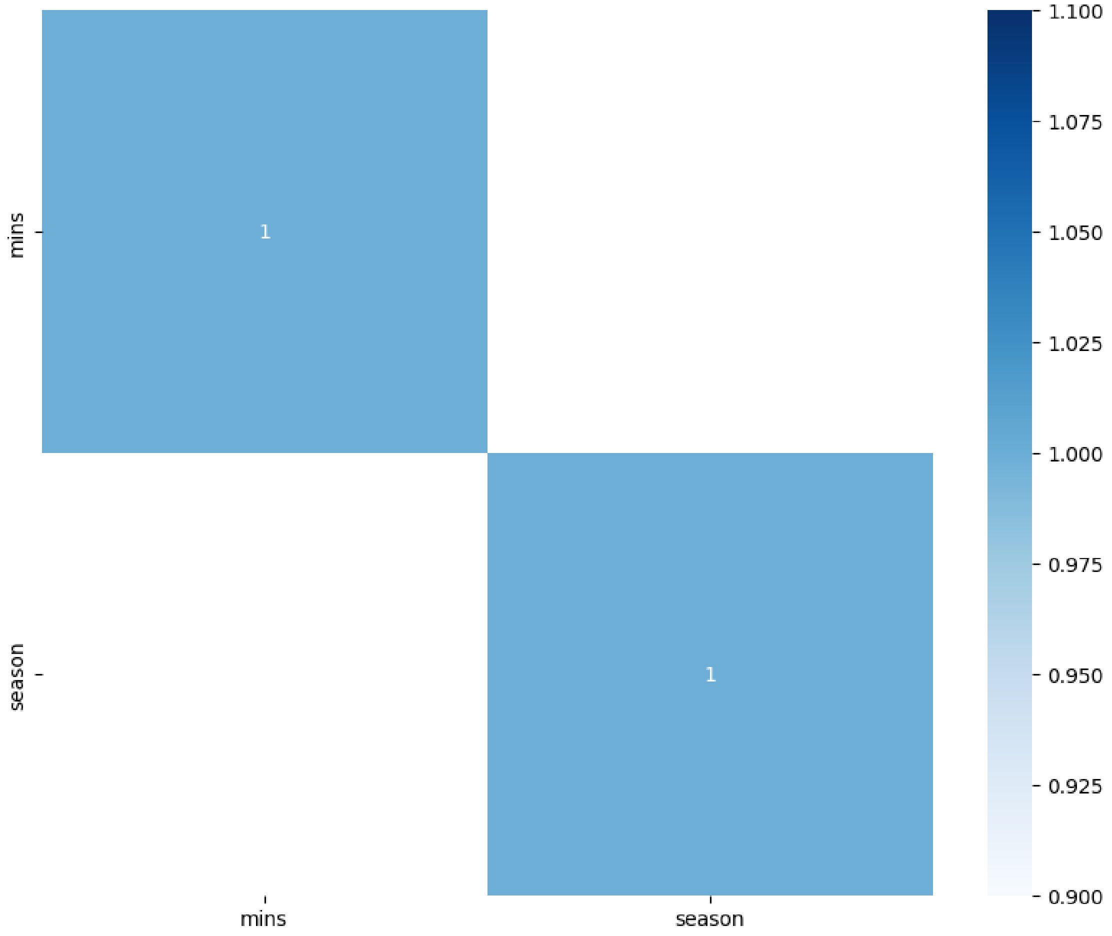
```
[112]: #Correlation - HeatMap
       plt.figure(figsize=(8, 8))
       heat=pre_Data1[["release_year","mins"]]
       sns.heatmap(heat.corr(),cmap="Blues",annot=True)
       plt.show()
```



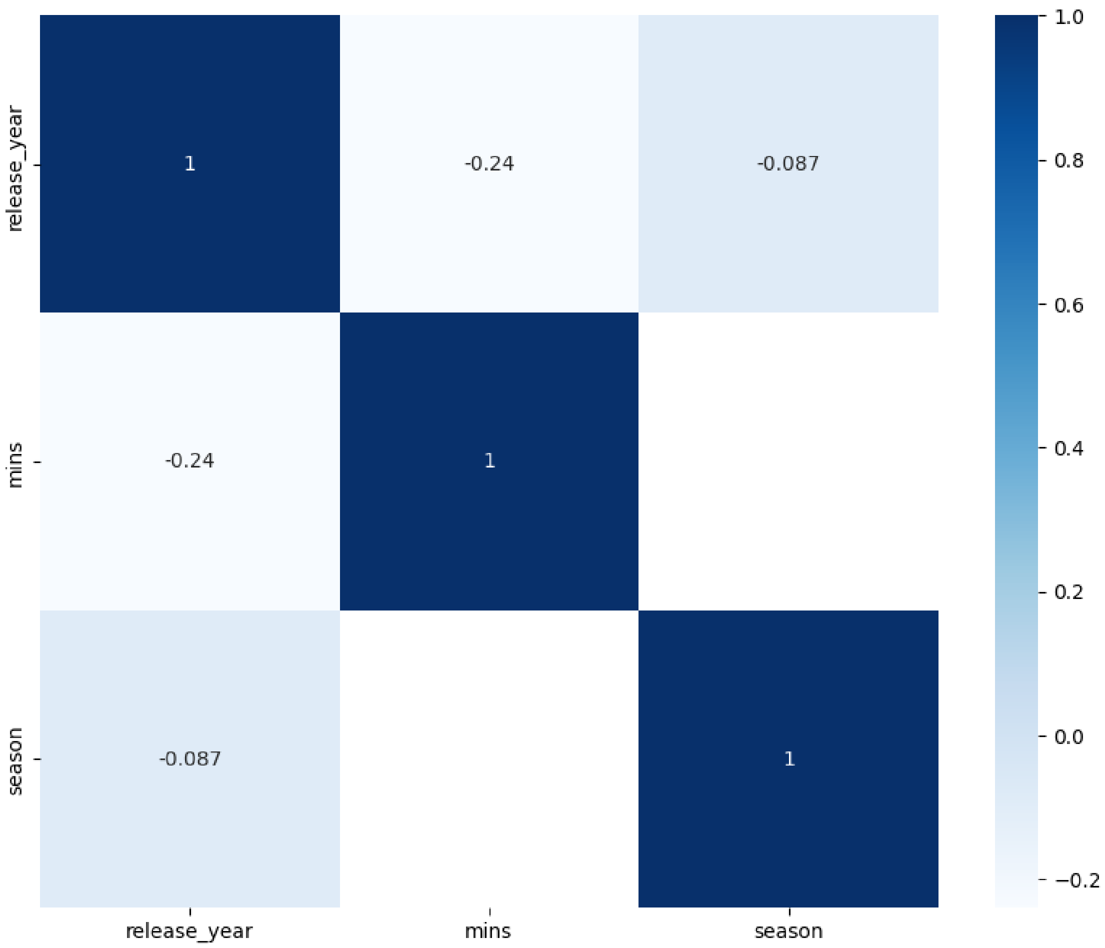
[107]:
```
plt.figure(figsize=(8, 8))
heat=pre_Data1[["release_year","season"]]
sns.heatmap(heat.corr(),cmap="Blues",annot=True)
plt.show()
```



[108]:
```
plt.figure(figsize=(8, 8))
heat=pre_Data1[["mins","season"]]
sns.heatmap(heat.corr(),cmap="Blues",annot=True)
plt.show()
```



[109]:
```
plt.figure(figsize=(8, 8))
#heat=pre_Data1[["mins","season"]]
sns.heatmap(pre_Data1.corr(),cmap="Blues",annot=True)
plt.show()
```

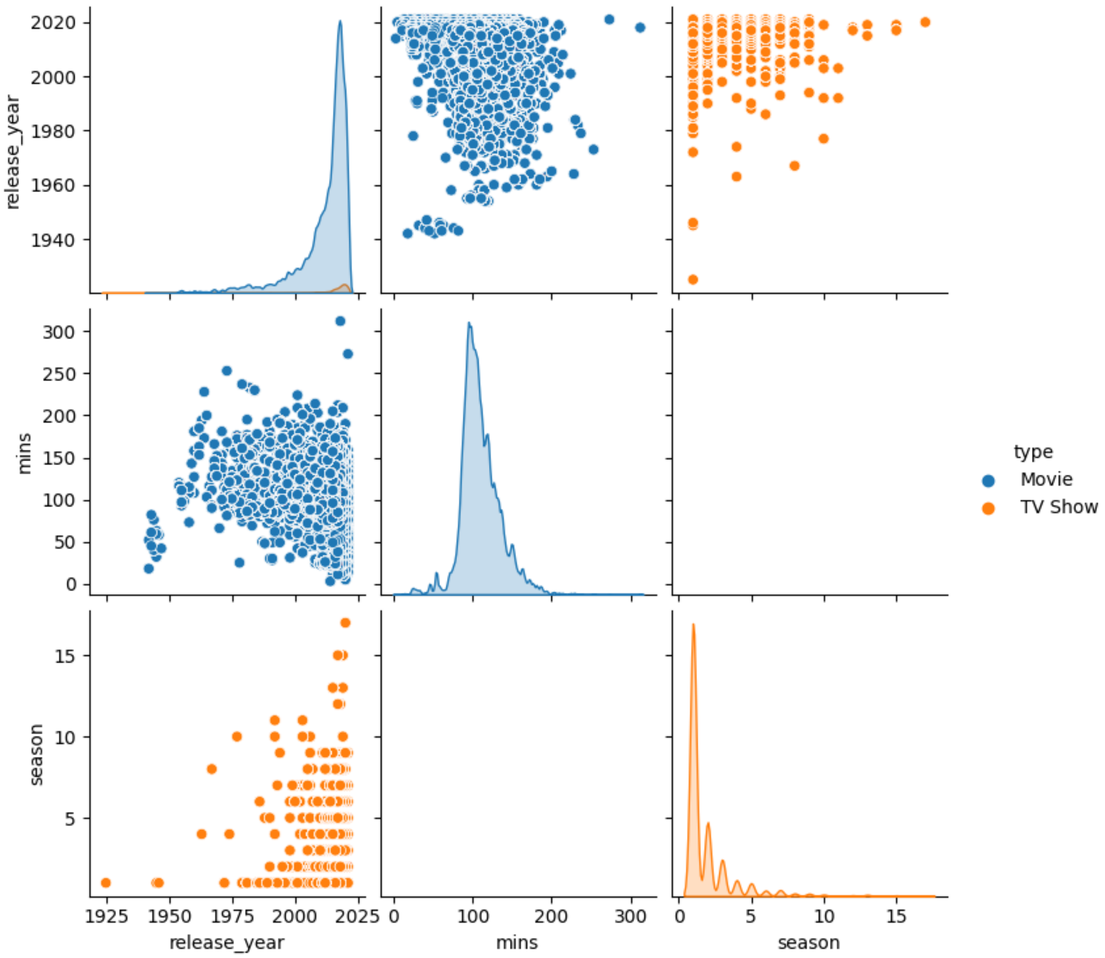


A **pair plot** is a powerful tool for visualizing the relationships between multiple numerical variables in a dataset. Since your Netflix dataset primarily consists of categorical variables and only a few numerical attributes, creating a pair plot may not be very informative.

However, if you still want to create a pair plot for the available numerical attributes (e.g., 'Release_year','mins','season'), you can use the Seaborn library. Here's an example:

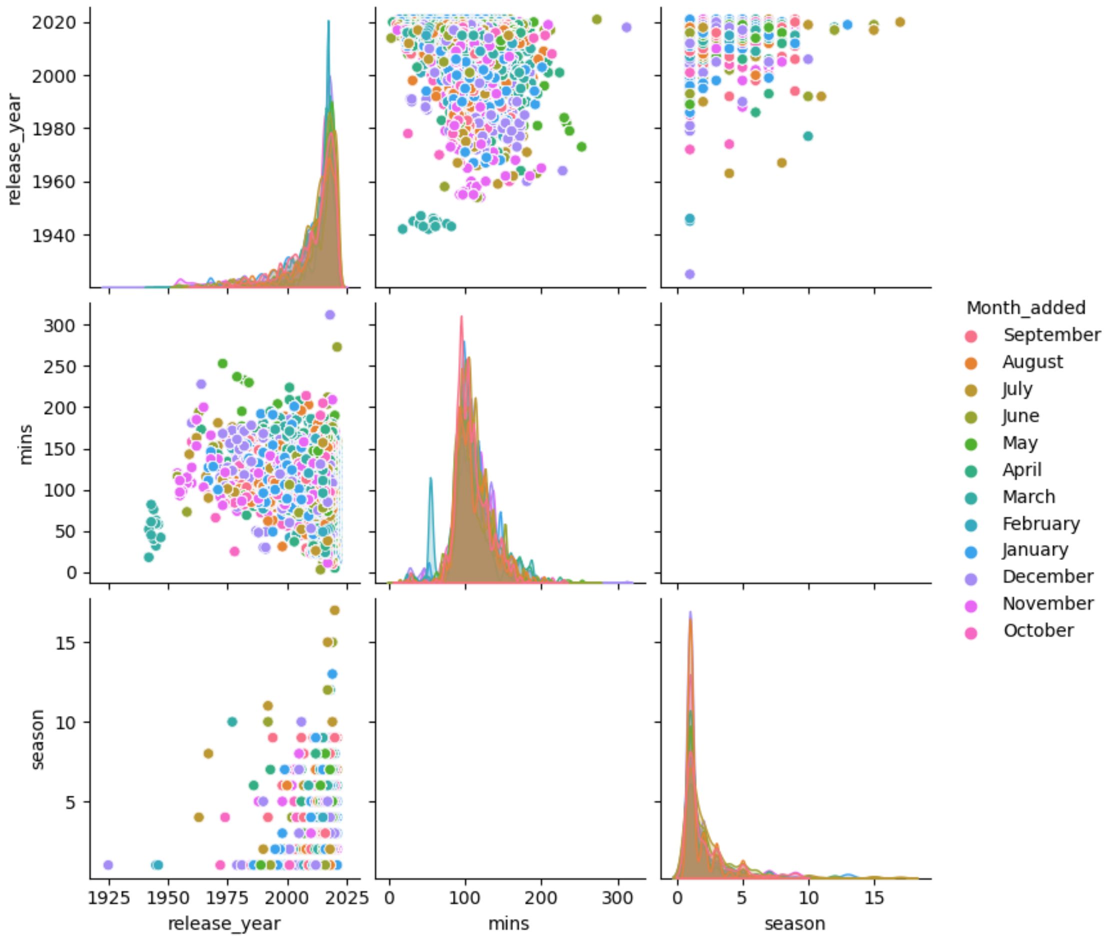
```
[111]: sns.pairplot(data=pre_Data1,hue="type")
```

```
[111]: <seaborn.axisgrid.PairGrid at 0x7adb13e1d480>
```



```
[113]: sns.pairplot(data=pre_Data1,hue="Month_added")
```

```
[113]: <seaborn.axisgrid.PairGrid at 0x7adb13e1f3d0>
```



In this example, we're using Seaborn's pairplot to create a pair plot for the 'Release_year','mins' and 'season' variables. However, since the dataset mainly contains categorical variables, this pair plot won't be very informative.

Pair plots are most useful when you have multiple numerical variables that you want to visualize together to explore relationships and correlations. If you have other numerical attributes in your dataset that you'd like to include in the pair plot, you can expand the numeric_attributes DataFrame to include those variables. Otherwise, consider using other visualization techniques more suitable for your dataset's characteristics.

To check for missing values in your dataset, you can use the **isnull()** function followed by the **sum()** function to count the missing values in each column. Here's how you can do it:

[99]:

```
# missing values
missing_values  = data_copy.isnull().sum()
print(f"Number of Missing Values: {missing_values}")
```

```
Number of Missing Values: 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
```

This code will print the number of missing values in each column of your DataFrame. You can decide whether you want to treat missing values by filling them, dropping rows, or other methods based on the context and the specific attributes with missing data.

```
[100]: def missing_data(df):
           miss_val=df.isnull().sum()

           miss_per=miss_val/len(df)*100
           miss_val_table=pd.concat([miss_val,miss_per,df.dtypes],axis=1)
           miss_val_table=miss_val_table.rename(columns={0:"Missing_value_count",1:
        ↪"Missing_value_percentage(%)",2:"Data Type"})
           return miss_val_table
```

```
[101]: # Percertange for missing values
       missing_data(data_copy)
```

```
[101]:               Missing_value_count  Missing_value_percentage(%) Data Type
       show_id                         0                     0.000000    object
       type                            0                     0.000000  category
       title                           0                     0.000000    object
       director                     2634                    29.908028    object
       cast                          825                     9.367549    object
       country                       831                     9.435676  category
       date_added                     10                     0.113546    object
       release_year                    0                     0.000000     int64
       rating                          4                     0.045418  category
       duration                        3                     0.034064    object
       listed_in                       0                     0.000000  category
       description                     0                     0.000000    object
```

```
[112]:
```

```
[ ]:
```

```
[ ]:
```

0.0.5 Comments on the Range of Attributes :

- The dataset consists of both categorical and numerical attributes, such as type(categorical), rating(categorical), country(categorical), listed_in(categorical) and release_year(numerical) and duration(numerical) represents the durations of content
- Categorical attributes like 'Country' 'cast' 'directors' has wide range of unique values
- The date_added attribute represents the date when content is added to netflix and is in datetime format

0.0.6 Comments on the Distribution of variables and relationships between them:

- The distribution of content ratings ('Rating') shows that 'TV-MA' is the most common rating, followed by 'TV-14' and 'TV-PG.'
- There is a broad range of release years ('Release_year'), spanning from earlier years to recent years.
- The distribution of the 'Duration' variable varies between movies (in minutes) and TV shows (in terms of the number of seasons).
- Relationships between variables can be explored further, such as examining the distribution of content ratings for movies versus TV shows.

0.0.7 Comments for Each Univariate and Bivariate Plot:

- In the count plot of 'Type' vs. 'Rating,' it's evident that 'TV-MA' content is the most common for both movies and TV shows. 'TV-14' and 'TV-PG' are also prevalent ratings for both types of content.
- The box plot comparing 'Release_year' and 'Type' shows that movies have a broader range of release years compared to TV shows.
- The distribution plot (histogram) of 'Release_year' provides insights into the distribution of content over the years, with peaks in different time periods.
- The box plot for 'Rating' helps visualize the distribution and spread of content ratings. It shows that 'TV-MA' has a wide range, 'TV-14' is also diverse, while 'TV-PG' is comparatively more consistent in terms of content.
- The count plot of 'Type' and 'Rating' helps to understand the distribution of content ratings for movies and TV shows. It shows that 'TV-MA' is common in both, but the distribution of other ratings may differ between the two types.
- The box plot comparing 'Release_year' and 'Type' reveals that movies tend to have more diverse release years, while TV shows have a relatively narrower range, with some potential outliers.
- The count plot comparing 'Type' and 'Country' shows the distribution of content types by country, helping to identify which countries contribute more to Netflix's library.
- These insights provide a general understanding of the dataset's attributes and their distributions. Further analysis and domain-specific questions can lead to more detailed and actionable insights for decision-making or content recommendation systems on Netflix.

0.0.8 Content Distribution and Popularity:

- The dataset reveals that 'TV-MA' is a popular content rating on Netflix, which suggests that mature and edgier content may resonate with the audience. 'TV-14' and 'TV-PG' content ratings also have a significant presence, indicating a diverse audience with varying age groups. ### Content Library Diversity:

- Netflix's content library is diverse, with content originating from various countries. This diversity reflects Netflix's commitment to offering a wide range of international content. ### Content Release Trends:
- The distribution of content release years shows that Netflix has content spanning across several decades, suggesting a focus on offering both classic and recent content. ### Movie and TV Show Distribution:
- The analysis indicates that Netflix's library includes both movies and TV shows. Movies are often more diverse in terms of their release years, while TV shows may have a more consistent distribution of release years. ### Influential Directors and Actors:
- The dataset can be used to identify influential directors and actors/actresses whose work is available on Netflix. Insights about the popularity of specific talent can inform casting and acquisition decisions. ### Content Recommendation and Personalization:
- Understanding user preferences based on content type, rating, and genre can aid in improving content recommendation algorithms and personalization to enhance user engagement. ### Content Localization:
- The dataset provides insights into the popularity of content from different countries. Netflix can use this information to prioritize content localization efforts. ### Content Acquisition Strategy:
- By analyzing the release years and types of content, Netflix can refine its acquisition strategy, targeting specific genres or eras that align with audience preferences. ### Content Licensing and Expiration:
- The 'Date_added' attribute can help manage content licensing and expiration dates, ensuring that popular titles remain available to subscribers. ### Content Quality and User Engagement:
- The dataset can be used to identify patterns in content quality, helping Netflix invest in content that engages users and attracts new subscribers.

[ ]: