Predicting İmdb Scores of Tv Shows and Movies in Netflix

Ahmet Göktuğ Özdemir

Capstone Project

December 2022

Table of Contents

Summary

This project aims to make a algorithm that can predict a tv show or movies imdb score and if entry will get higher score than median score.The Internet Movie Database (IMDb) is an online database containing information and statistics about movies, TV shows and video games as well as actors, directors and other film industry professionals. İn this project dataset(1) was used which has all movies and tv shows from Netflix up to year 2021. Netflix is one of the most popular media and video streaming platforms. They have over 8000 movies or tv shows available on their platform, currently they have over 200M Subscribers globally. Dataset consist of 8807 rows and 12 columns. Project consist of data exploration, dataset preparation, making the algorithm and discussing results. At the moment it uses k-nn algorithm.

Motivation

Currently Netflix is the biggest streaming service. I wanted to make something that could predict if something is worth my time. I used imdb rating as imdb scores are more reliable indicator of quality than Netflix's own scores. As for the reason I used only Netflix entrys I thought as Netflix is biggest streaming service their catalouge should be better than what is avaible in avarage and should be more known. With this I could know if something is good before it is released. I plan to use it for newly released titles rather than unreleased ones. This way before ratings are made I could decide if I should watch it or not.

Literature Review

One of the widely used classification algorithms is k-Nearest Neighbours (k-NN). Its popularity is mainly due to its simplicity, effectiveness, ease of implementation and ability to add new data in the training set at any time. However, one of its main drawbacks is the fact that its performance is highly dependent on the proper selection of parameter k, i.e. the number of nearest neighbours that the algorithm examines. The most frequently used technique for the “best” k determination is the cross validation as there is no general rule for choosing the k value due to its dependency on the training dataset. However, selecting a fixed k value throughout the dataset does not take into account its special features, like data distribution, class separation, imbalanced classes, sparse and dense neighborhoods and noisy subspaces(2)

As other researches indicates Netflix data set provides very little data for each movie -- only its title, the ratings from the users and the date of the ratings -- so we use the Internet Movie Database for richer metadata. We also experimented with clustering sparser metadata like actors and actresses. We then ran experiments on predicting ratings with and without the richer metadata. We found that enriching that enriching our baseline collaborative filtering approach with movie metadata only made a small improvement of 0.1% in the root mean squared error (RMSE) of our predictions(3)

Data Exploration & Codes

```
!pip install git+https://github.com/nielth/cinemagoer
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/
Collecting git+https://github.com/nielth/cinemagoer
  Cloning https://github.com/nielth/cinemagoer to /tmp/pip-req-build-g76nbxtu
  Running command git clone -q https://github.com/nielth/cinemagoer /tmp/pip-req-bui
Requirement already satisfied: SQLAlchemy in /usr/local/lib/python3.8/dist-packages (
Requirement already satisfied: lxml in /usr/local/lib/python3.8/dist-packages (from 
Requirement already satisfied: greenlet!=0.4.17 in /usr/local/lib/python3.8/dist-pack
```

We import our packages.

```
import http.client
import imdb
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from imdb import Cinemagoer
from sklearn.compose import make_column_transformer
from sklearn.preprocessing import OneHotEncoder
from sklearn.model_selection import train_test_split
from sklearn.feature_extraction.text import CountVectorizer
import seaborn as sb
import nltk as nl
from sklearn.neighbors import KNeighborsRegressor
from sklearn.model_selection import GridSearchCV
from sklearn.metrics import confusion_matrix
from sklearn.metrics import classification_report
from sklearn.model_selection import cross_val_score
from sklearn.preprocessing import MinMaxScaler
from sklearn.metrics import accuracy_score
from sklearn import preprocessing
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import accuracy_score, plot_confusion_matrix
```

```
def remove_suffix(input_string, suffix):
    if suffix and input_string.endswith(suffix):
        return input_string[:-len(suffix)]
    return input_string
```

Because getting data from imdb api takes too much time I worked with only 100 data for this time. For gettin all data from imdb takes up to 15 hours. By changing nrows we can use more of dataset.

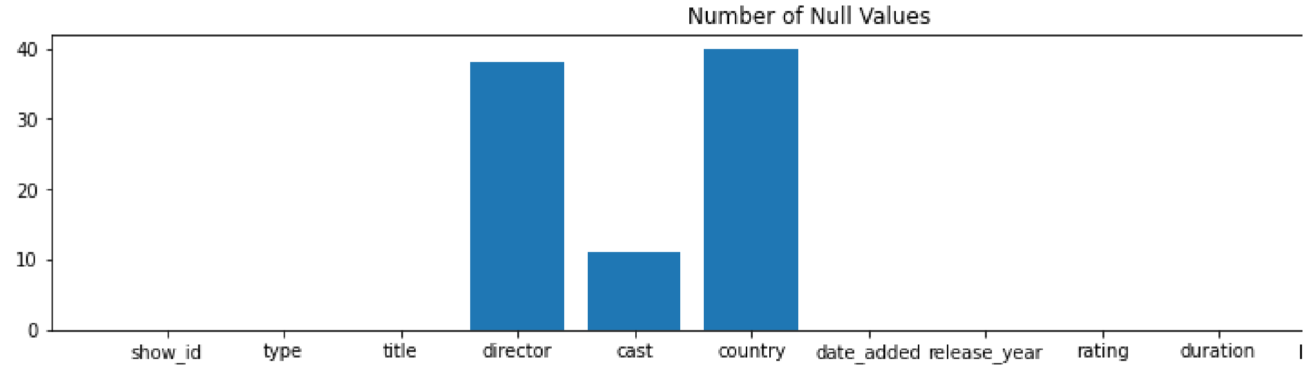
```
pd.options.mode.chained_assignment=None

ia = Cinemagoer()

pd.set_option('display.max_rows', 1000)
pd.set_option('display.max_columns', 1000)
pd.set_option('display.width', 1000)

df = pd.read_csv("netflix_titles.csv",nrows=100)
print(df.head())

nullcheck=df.isnull()
```

```
  show_id     type                 title         director
0      s1    Movie  Dick Johnson Is Dead  Kirsten Johnson
1      s2  TV Show         Blood & Water              NaN  Ama Qamata, Khosi Ngema,
2      s3  TV Show             Ganglands  Julien Leclercq  Sami Bouajila, Tracy Gotc
3      s4  TV Show  Jailbirds New Orleans              NaN
4      s5  TV Show          Kota Factory              NaN  Mayur More, Jitendra Kuma
```

Showing null entry numbers.

```
print(df.isna().sum())

y=df.isna().sum()
x =df.columns
f = plt.figure()
f.set_figwidth(15)
f.set_figheight(3)
print()
plt.bar(x,y)
plt.title('Number of Null Values')
plt.show()
```

```
show_id          0
type             0
title            0
director        38
cast            11
country         40
date_added       0
release_year     0
rating           0
duration         0
listed_in        0
description      0
dtype: int64
```



Getting missing values from imdb with cinemagoer api from imdb.

```
for i in range(len((nullcheck["director"]))):
    if (((nullcheck["director"][i])==True)):
        try:
            movies = ia.search_movie(df["title"][i])
            if (len(movies)>0):
                movieid = movies[0].movieID
                truemovie = ia.get_movie(movieid)
                director = []
                print(i)
                for j in range(len(truemovie["directors"])):
                    director.append(truemovie["directors"][j]["name"])
```

```
      else:
        print("Film does not exist in imdb")
    except KeyError:
          print("No director entry in imdb")
          if(df["type"][i]=="TV Show"):
            print("It is a Tv Show")
            director.append("Tv Show")
    except imdb._exceptions.IMDbParserError:
          print("Invalid title")
    except imdb._exceptions.IMDbDataAccessError:
          print("Timed out")
          i = i - 1
    except http.client.IncompleteRead:
          print("Incomplete Read")
          i = i - 1
    s = ','.join(director)
    df.iloc[:, 3][i] = s
```

```
1
No director entry in imdb
It is a Tv Show
3
No director entry in imdb
It is a Tv Show
4
No director entry in imdb
It is a Tv Show
10
No director entry in imdb
It is a Tv Show
14
No director entry in imdb
It is a Tv Show
15
No director entry in imdb
It is a Tv Show
17
No director entry in imdb
It is a Tv Show
19
No director entry in imdb
It is a Tv Show
21
No director entry in imdb
It is a Tv Show
25
No director entry in imdb
It is a Tv Show
31
No director entry in imdb
It is a Tv Show
32
No director entry in imdb
It is a Tv Show
33
No director entry in imdb
It is a Tv Show
Film does not exist in imdb
```

```
37
39
No director entry in imdb
It is a Tv Show
40
No director entry in imdb
It is a Tv Show
49
50
No director entry in imdb
It is a Tv Show
55
No director entry in imdb
It is a Tv Show
65
No director entry in imdb
It is a Tv Show
```

```
for i in range(len((nullcheck["country"]))):
    if (((nullcheck["country"][i])==True)):
        try:
            movies = ia.search_movie(df["title"][i])
            if (len(movies)>0):
                movieid = movies[0].movieID
                truemovie = ia.get_movie(movieid)
                country = []
                print(i)
                for j in range(len(truemovie["countries"])):
                    country.append(truemovie["countries"][j])
            else:
                print("Film does not exist in imdb")
            s = ','.join(country)
            df.iloc[:, 5][i] = s
        except KeyError:
                    print("No country entry in imdb")
        except imdb._exceptions.IMDbParserError:
                    print("Invalid title")
        except imdb._exceptions.IMDbDataAccessError:
                    print("Timed out")
                    i = i - 1
        except http.client.IncompleteRead:
                    print("Incomplete Read")
                    i = i - 1
```

```
2
3
5
6
10
11
13
14
16
18
19
20
22
```

```
23
26
30
31
33
Film does not exist in imdb
35
36
45
47
64
68
70
71
74
75
Film does not exist in imdb
78
79
80
83
85
86
87
88
89
No country entry in imdb
93
```

```
df.to_csv('complete_netflix_data.csv')
for i in range(len(df["cast"])):
    try:
        if (nullcheck["cast"][i])==True:
            movies = ia.search_movie(df["title"][i])
            if (len(movies)>0):
                movieid = movies[0].movieID
                truemovie = ia.get_movie(movieid)
                cast=[]
                print(i)
                for j in range(len(truemovie["cast"])):
                    cast.append(truemovie["cast"][j]["name"])
            else:
                print("Film does not exist in imdb")
            s = ','.join(cast)
            df.iloc[:, 4][i] = s
    except KeyError:
                print("No cast entry in imdb")
    except imdb._exceptions.IMDbParserError:
            print("Invalid title")
    except imdb._exceptions.IMDbDataAccessError:
            print("Timed out")
            i = i - 1
    except http.client.IncompleteRead:
            print("Incompleted Read")
            i = i - 1
df.to_csv('complete_netflix_data.csv')
```

```
0
3
No cast entry in imdb
10
14
16
20
45
66
69
74
91
```

```
score = []
for i in range(len((df["director"]))):
    try:
      movies = ia.search_movie(df["title"][i])
      if (len(movies)>0):
        movieid = movies[0].movieID
        truemovie = ia.get_movie(movieid)
        print(i)
        score.append(truemovie["rating"])
      else:
        print("Film does not exist in imdb")
        score.append(None)
    except KeyError:
          print("No rating entry in imdb")
          score.append(None)
    except imdb._exceptions.IMDbParserError:
          print("Invalid title")
    except imdb._exceptions.IMDbDataAccessError:
          print("Timed out")
          i = i - 1
    except http.client.IncompleteRead:
          print("Incomplete Read")
          i = i - 1
```

```
df["Score"] = score
```

```
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
```

```
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
Film does not exist in imdb
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
```

Showing remaining null values and dropping ones that could not be filled.

```
print("Null entry number:")
print(df.isna().sum())
print()
print("Drop null entrys")
df.dropna(inplace=True)
```

```
Null entry number:
show_id         0
type            0
title           0
director        0
cast            1
```

```
country         1
date_added      0
release_year    0
rating          0
duration        0
listed_in       0
description     0
Score           2
dtype: int64

Drop null entrys
```

```
df.to_csv('complete_netflix_data.csv')

print(df.head())
print()
print()
print("Null entry number:")
print(df.isna().sum())
print()
```

```
  show_id     type                 title         director                                     
0      s1    Movie  Dick Johnson Is Dead  Kirsten Johnson  Michael Hilow,Ana Hoffman,
1      s2  TV Show         Blood & Water          Tv Show  Ama Qamata, Khosi Ngema, (
2      s3  TV Show             Ganglands  Julien Leclercq  Sami Bouajila, Tracy Gotoa
4      s5  TV Show          Kota Factory          Tv Show  Mayur More, Jitendra Kumar
5      s6  TV Show         Midnight Mass    Mike Flanagan  Kate Siegel, Zach Gilford,


Null entry number:
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
Score           0
dtype: int64
```

Showing column types.

```
print(df.info())
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 96 entries, 0 to 99
Data columns (total 13 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   show_id       96 non-null     object 
 1   type          96 non-null     object 
 2   title         96 non-null     object 
 3   director      96 non-null     object 
 4   cast          96 non-null     object 
 5   country       96 non-null     object 
 6   date_added    96 non-null     object 
 7   release_year  96 non-null     int64  
 8   rating        96 non-null     object 
 9   duration      96 non-null     object 
 10  listed_in     96 non-null     object 
 11  description   96 non-null     object 
 12  Score         96 non-null     float64
dtypes: float64(1), int64(1), object(11)
memory usage: 10.5+ KB
None
```

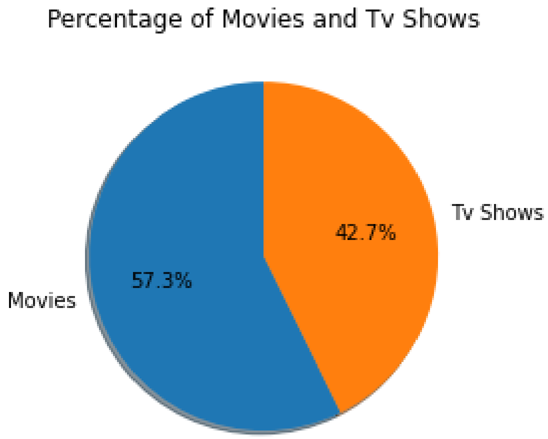
```
print(df.describe())
```

```
       release_year      Score
count     96.000000  96.000000
mean    2014.916667   6.644792
std       10.327956   1.153381
min     1975.000000   3.000000
25%     2012.750000   5.800000
50%     2021.000000   6.700000
75%     2021.000000   7.400000
max     2021.000000   9.100000
```

```
y=df.isna().sum()
print()
x =df.columns
f = plt.figure()
f.set_figwidth(15)
f.set_figheight(3)
plt.bar(x,y)
plt.title('Number of Nan Values')
plt.show()
print()
print()
```

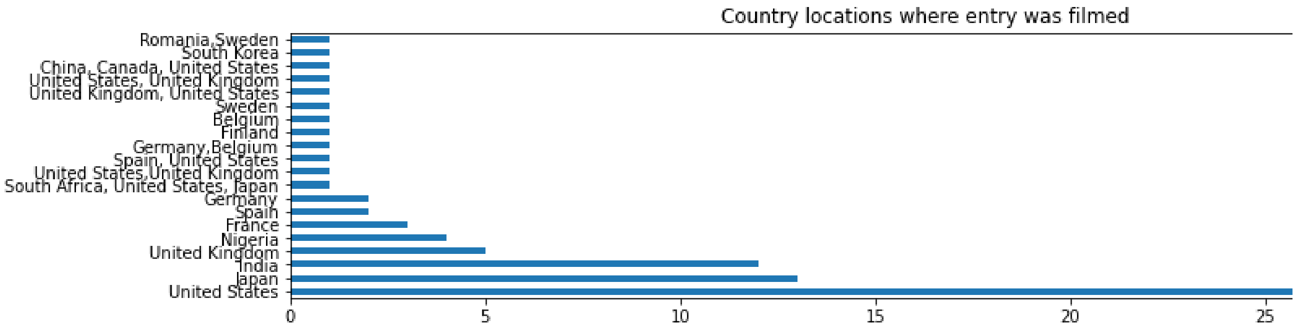
As we can see Netflix has more movies than Tv shows.

```
graph = [df['type'].value_counts()['Movie'], df['type'].value_counts()['TV Show']]
label = ["Movies", "Tv Shows"]
y = graph
plt.pie(y, labels=label,autopct='%1.1f%%',shadow=True, startangle=90)
plt.title('Percentage of Movies and Tv Shows')
plt.show()
print()
print()
```



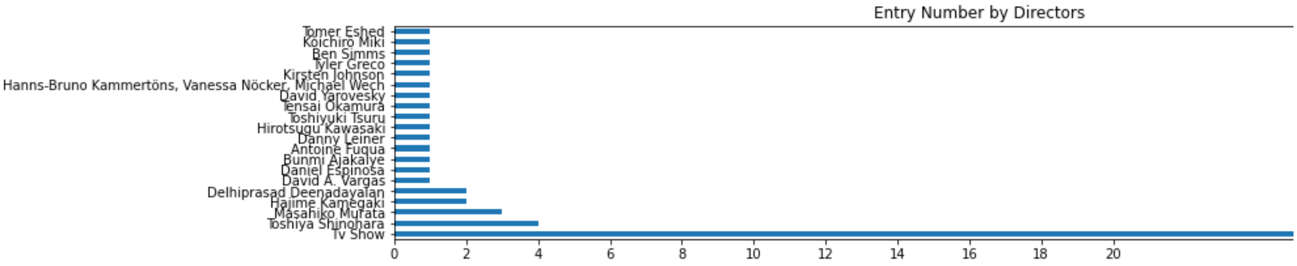
As seen in graphic united states has the most entrys.

```
f = plt.figure()
f.set_figwidth(14)
f.set_figheight(3)
df['country'].value_counts()[:20].plot(kind='barh')
plt.title('Country locations where entry was filmed')
plt.show()
```



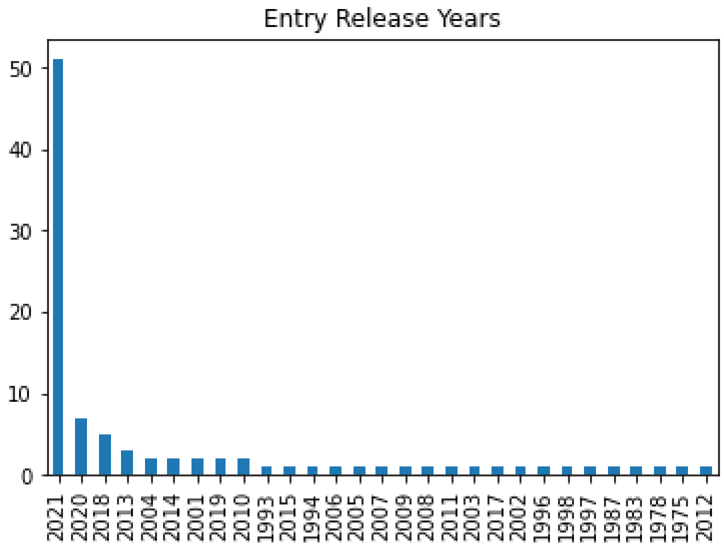
Because Tv shows have no director entry in imdb I gave Tv show directors 'Tv Show' label. Because of this there seems to be a lot of tv shows in directors. After that we can see directors with most number of films.

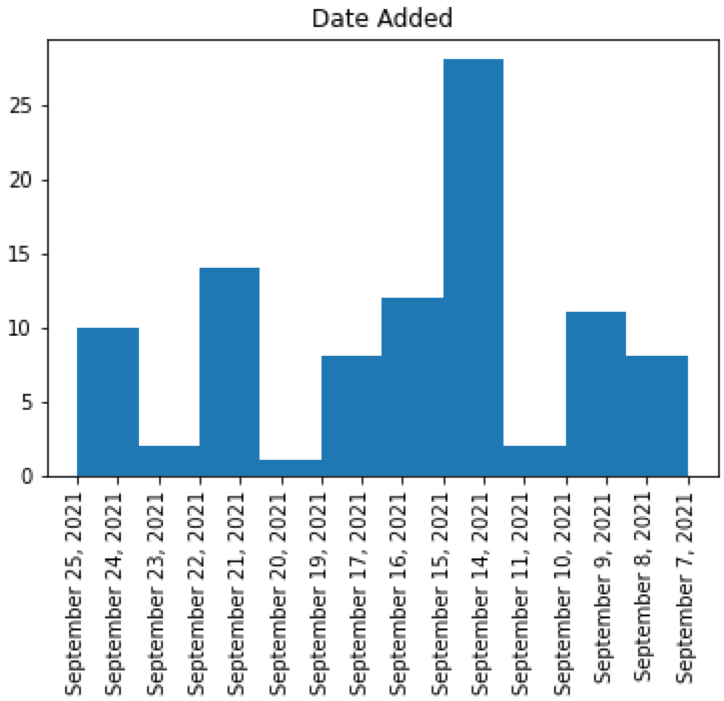
```
f = plt.figure()
df['director'].value_counts()[:20].plot(kind='barh')
f.set_figwidth(16)
f.set_figheight(3)
interval = range(0, 22, 2)
plt.xticks(interval)
plt.title('Entry Number by Directors')
plt.show()
```

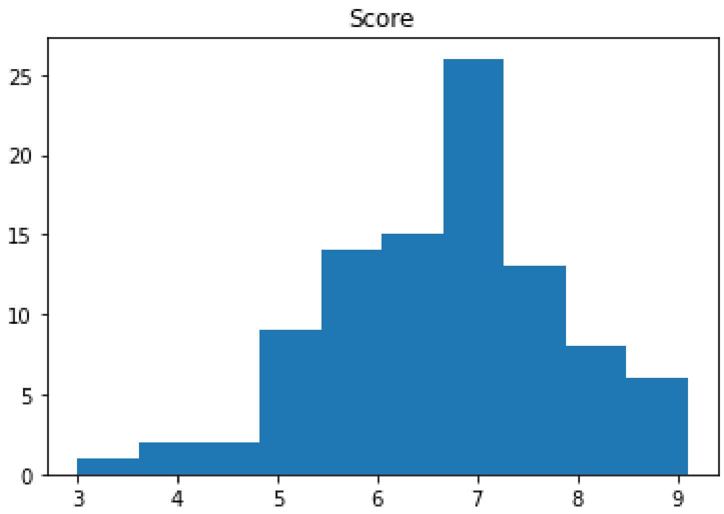


Below is some histograms of different values.

```
graph = df['release_year'].value_counts().plot.bar()
plt.title('Entry Release Years')
plt.show()


print()
print()

plt.hist(df["date_added"])
plt.xticks(rotation = 90)
plt.title('Date Added')
plt.show()

print()
print()

plt.hist(df["Score"])
plt.title('Score')
plt.show()

print()
print()
```







We can see the scores median and means.

```
print("Median Score")
print(df["Score"].median())
print("Mean Score")
print(df["Score"].agg('mean'))




df['director']=df['director'].astype('category')
df['country']=df['country'].astype('category')
df['cast']=df['cast'].astype('category')
df['listed_in']=df['listed_in'].astype('category')

df['type']=df['type'].astype('category')
df['rating']=df['rating'].astype('category')
df['release_year']=df['release_year'].astype('category')
```

```
Median Score
6.7
Mean Score
6.644791666666666
```

We use dummies to one hot encode our catagories. Reason we use dummies and not sklearn is we have multiple values in one cell.

```
df1 = df['listed_in'].str.get_dummies(',').add_prefix('listed_in_')
df2 = df['country'].str.get_dummies(',').add_prefix('country_')
df3 = df['cast'].str.get_dummies(',').add_prefix('cast_')
df4 = df['director'].str.get_dummies(',').add_prefix('director_')

df=df.drop(['cast','director','listed_in','country'], axis=1)
df = pd.concat([df, df1,df2,df3,df4], axis=1, join='inner')
df
```

	show_id	type	title	date_added	release_year	rating	duration	desc
0	s1	Movie	Dick Johnson Is Dead	September 25, 2021	2020	PG-13	90 min	As nears t his lif
1	s2	TV Show	Blood & Water	September 24, 2021	2021	TV-MA	2 Seasons	Afte paths a Cape
2	s3	TV Show	Ganglands	September 24, 2021	2021	TV-MA	1 Season	To p fam pow
4	s5	TV Show	Kota Factory	September 24, 2021	2021	TV-MA	2 Seasons	I coachir known t
5	s6	TV Show	Midnight Mass	September 24, 2021	2021	TV-MA	1 Season	The a ch you
6	s7	Movie	My Little Pony: A New Generation	September 24, 2021	2021	PG	91 min	E divic bright-
7	s8	Movie	Sankofa	September 24, 2021	1993	TV-MA	125 min	On a ph in C Americ
8	s9	TV Show	The Great British Baking Show	September 24, 2021	2021	TV-14	9 Seasons	A taler o baker
9	s10	Movie	The Starling	September 24, 2021	2021	PG-13	104 min	adjus a
10	s11	TV Show	Vendetta: Truth, Lies and The Mafia	September 24, 2021	2021	TV-MA	1 Season	Sicily bold "A coa
11	s12	TV Show	Bangkok Breaking	September 23, 2021	2021	TV-MA	1 Season	Str earn Bangk
12	s13	Movie	Je Suis Karl	September 23, 2021	2021	TV-MA	127 min	After m murc

When

Because we have Tv shows and movies in same dataset some values are seasons and some are minutes. We can not work with that so we make all of them categorical by making minutes categorical.

14 s15 TV India September 2021 TV-MA 1 Season

```
for i in range(len(df['duration'])):
 try:
  if ('Seasons' in df['duration'][i]):
   print('Passed because its a Tv Show')
  elif('Season' in df['duration'][i]):
   print('Passed because its a Tv Show')
  else:
    df['duration'][i]=remove_suffix(df['duration'][i],' min')
    print(df['duration'][i])
    number=int(df['duration'][i])
    if(number<70):
     df['duration'][i]='Shorter than a hour and ten minutes'
    elif(number<150):
     df['duration'][i]='Between one or two and half hour'
    elif(number>120):
     df['duration'][i]='Longer than two and half hour'
 except(KeyError):
  continue
df['duration']=df['duration'].astype('category')
```

```
90
Passed because its a Tv Show
Passed because its a Tv Show
Passed because its a Tv Show
Passed because its a Tv Show
91
125
Passed because its a Tv Show
104
Passed because its a Tv Show
Passed because its a Tv Show
127
91
Passed because its a Tv Show
Passed because its a Tv Show
67
Passed because its a Tv Show
94
Passed because its a Tv Show
Passed because its a Tv Show
Passed because its a Tv Show
161
61
166
Passed because its a Tv Show
147
103
97
106
```

```
111
Passed because its a Tv Show
Passed because its a Tv Show
Passed because its a Tv Show
110
105
Passed because its a Tv Show
96
Passed because its a Tv Show
Passed because its a Tv Show
124
116
98
91
23
115
Passed because its a Tv Show
122
Passed because its a Tv Show
Passed because its a Tv Show
99
99
88
100
Passed because its a Tv Show
102
93
96
95
```

33 s34 TV Squid Game September 2021 TV-MA 1 Season ca

We visualize the change.

```
plt.hist(df["duration"])
plt.title('Entry Durations')
plt.xticks(rotation = 90)
plt.show()
```

We use one hot encoding to make other values categorical.

1983 PG 98 min mari

```
transformer = make_column_transformer(
    (OneHotEncoder(), ['type','release_year','rating','duration']),remainder='passthrough'

transformed = transformer.fit_transform(df)
transformed_df = pd.DataFrame(
    transformed,
    columns=transformer.get_feature_names_out()
)

transformed_df.columns = transformed_df.columns.str.replace("onehotencoder__", " ")

transformed_df.columns = transformed_df.columns.str.replace("remainder__", " ")
```

Because we have too much columns we drop ones with less than 5 occurrence so we can work with our data better.

September

```
vec = CountVectorizer(stop_words='english')
X1 = vec.fit_transform(transformed_df[" title"])
count_array = X1.toarray()
X1 = pd.DataFrame(data=count_array,columns = vec.get_feature_names_out())
for (columnName, columnData) in X1.iteritems():
  if(X1[columnName].sum()<5):
    X1=X1.drop([columnName],axis=1)
transformed_df = pd.concat([transformed_df,X1], axis=1, join='inner')
transformed_df=transformed_df.drop([' title'],axis=1)
transformed_df=transformed_df.drop([' date_added'],axis=1)
transformed_df=transformed_df.drop([' show_id'],axis=1)
```

Castle Beyond 15, 2021

We tokenize the description and get values which has more than 5 occurrences.

```
X2 = vec.fit_transform(transformed_df[" description"])
count_array = X2.toarray()
X2 = pd.DataFrame(data=count_array,columns = vec.get_feature_names_out())
for (columnName, columnData) in X2.iteritems():
  if(X2[columnName].sum()<5):
    X2=X2.drop([columnName],axis=1)
transformed_df = pd.concat([transformed_df,X1], axis=1, join='inner')
transformed_df=transformed_df.drop([' description'],axis=1)
```

September demon

```
score=transformed_df[" Score"]
transformed_df=transformed_df.drop([' Score'],axis=1)
```

```
transformed_df["score"] = score
```

TV September 6 with

```
for (columnName, columnData) in transformed_df.iteritems():
  if(type(columnData.values[0])==int or type(columnData.values[0])==float):
    if(columnData.values[0]==1 or columnData.values[0]==0):
        if(transformed_df[columnName].value_counts()[1]<5):
          transformed_df=transformed_df.drop([columnName],axis=1)
```

Who

```
transformed_df.head()
```

	type_Movie	type_TV Show	release_year_2018	release_year_2020	release_year_2021	rati
0	1.0	0.0	0.0	1.0	0.0	
1	0.0	1.0	0.0	0.0	1.0	
2	0.0	1.0	0.0	0.0	1.0	
3	0.0	1.0	0.0	0.0	1.0	
4	0.0	1.0	0.0	0.0	1.0	

61 s62 Movie Movie 2: September 2005 TV-PG 97 min missior

```
transformed_df.describe()
```

	movie	naruto	movie	naruto
count	96.000000	96.000000	96.000000	96.000000
mean	0.125000	0.083333	0.125000	0.083333
std	0.332455	0.277836	0.332455	0.277836
min	0.000000	0.000000	0.000000	0.000000
25%	0.000000	0.000000	0.000000	0.000000
50%	0.000000	0.000000	0.000000	0.000000
75%	0.000000	0.000000	0.000000	0.000000
max	1.000000	1.000000	1.000000	1.000000

As we can see we don't have much correlation with anything.

66 s67 TV Anva September 2014 TV-G 1 Season

```
transformed_df.astype('float64').corr()
```

	type_Movie	type_TV Show	release_year_2018	release_year_2020	r
type_Movie	1.000000	-1.000000	0.012834	-0.000844	
type_TV Show	-1.000000	1.000000	-0.012834	0.000844	
release_year_2018	0.012834	-0.012834	1.000000	-0.065738	
release_year_2020	-0.000844	0.000844	-0.065738	1.000000	
release_year_2021	-0.346827	0.346827	-0.249542	-0.298561	
rating_PG	0.222928	-0.222928	0.133150	-0.072412	
rating_PG-13	0.260324	-0.260324	-0.070675	0.060399	
rating_TV-14	0.069530	-0.069530	0.014072	-0.025145	
rating_TV-MA	-0.327593	0.327593	0.033150	0.226637	
rating_TV-PG	0.124695	-0.124695	-0.108736	-0.130096	
rating_TV-Y	-0.081941	0.081941	-0.054945	-0.065738	
rating_TV-Y7	-0.212054	0.212054	0.133150	-0.072412	
duration_1 Season	-0.612870	0.612870	-0.010632	-0.051486	
duration_2 Seasons	-0.372521	0.372521	-0.075392	0.047249	
duration_Between one or two and half hour	0.845593	-0.845593	-0.135788	-0.034229	
listed_in_ Anime Features	0.326333	-0.326333	-0.088596	-0.106000	
listed_in_ Dramas	0.242139	-0.242139	-0.065738	0.229535	
listed_in_ International Movies	0.540092	-0.540092	-0.042360	0.002785	
listed_in_ International TV Shows	-0.372521	0.372521	-0.075392	0.047249	
listed_in_ TV Comedies	-0.324821	0.324821	0.114572	0.229535	
listed_in_ TV Dramas	-0.416655	0.416655	0.062860	0.024895	
listed_in_ Thrillers	0.242139	-0.242139	-0.065738	-0.078652	
listed_in_Action & Adventure	0.442913	-0.442913	-0.120247	-0.045215	
listed_in_British TV Shows	-0.271490	0.271490	-0.054945	0.114572	
listed_in_Children & Family Movies	0.260324	-0.260324	0.098945	-0.084559	

For us to make classification we need a new column. We make a column of if a entry has higher or lower than median score.

Shows

Shows

```
cl=[]
for i in range(len(transformed_df['score'])):
 try:
  if ( transformed_df['score'][i]>6.5 ):
   cl.append('Higher than median')
  elif(transformed_df['score'][i]<=6.5):
   cl.append('Lower than median')
 except(KeyError):
  continue
transformed_df['Class']=cl
transformed_df
```

	type_Movie	type_TV Show	release_year_2018	release_year_2020	release_year_2021	ra
0	1.0	0.0	0.0	1.0	0.0	
1	0.0	1.0	0.0	0.0	1.0	

We use label encoder and train test split to split and prepare our data.

```
le = preprocessing.LabelEncoder()
encoded=le.fit_transform(transformed_df['Class'])
transformed_df=transformed_df.drop(['Class'],axis=1)
X_train, X_test, y_train, y_test = train_test_split(transformed_df,encoded,test_size=0.3,r
```

```
knn = KNeighborsClassifier()
k_range = list(range(1, 31))
param_grid = dict(n_neighbors=k_range)
grid = GridSearchCV(knn, param_grid, cv=10, scoring='accuracy', return_train_score=False,v
grid_search=grid.fit(X_train, y_train)
```

```
     Fitting 10 folds for each of 30 candidates, totalling 300 fits
```

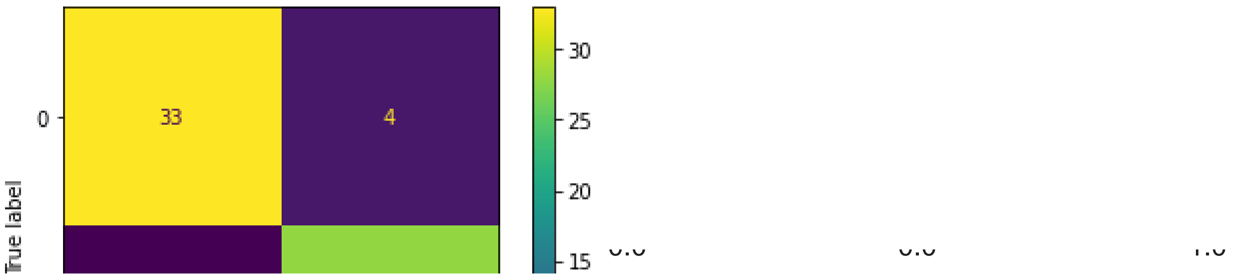
As seen our accuracy for classification is high.

```
y_test_hat=grid_search.predict(X_test)

test_accuracy=accuracy_score(y_test,y_test_hat)*100

print("Accuracy for our testing dataset with tuning is : {:.2f}%".format(test_accuracy) )
```

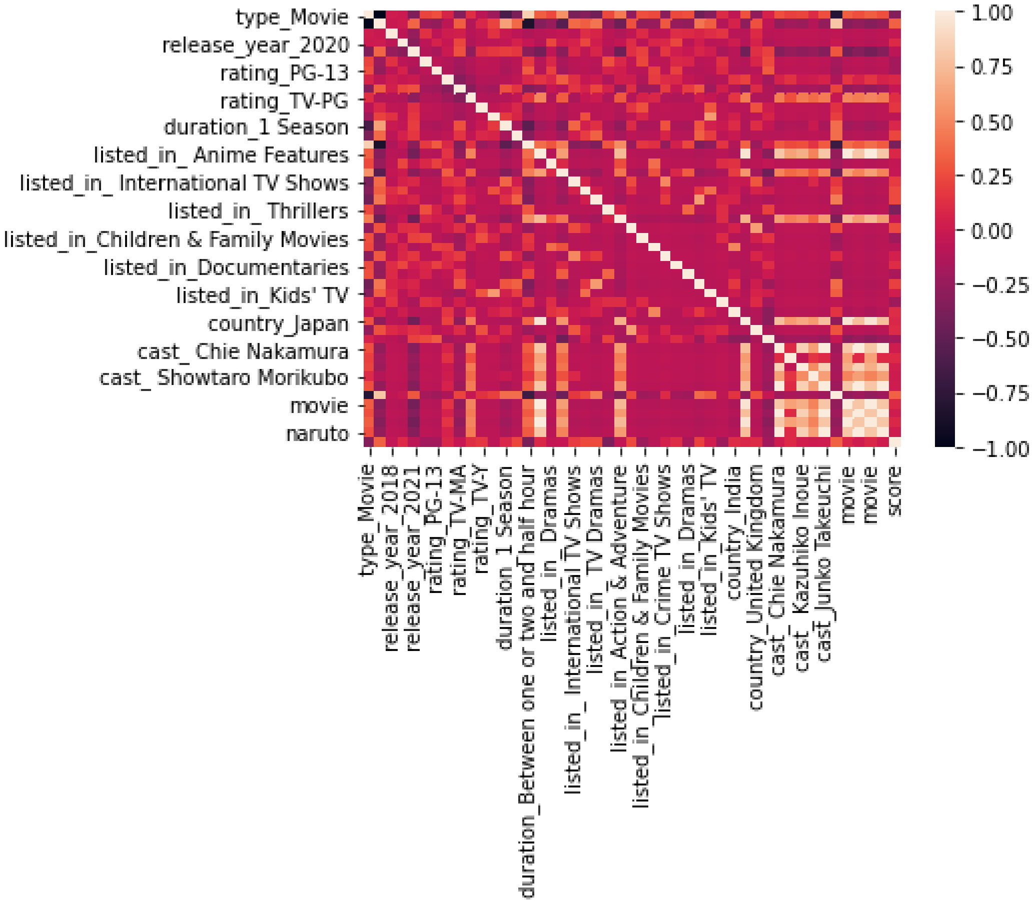
```
     Accuracy for our testing dataset with tuning is : 79.31%
```

```
plot_confusion_matrix(grid,X_train, y_train,values_format='d' )
```

```
/usr/local/lib/python3.8/dist-packages/sklearn/utils/deprecation.py:87: FutureWarning
  warnings.warn(msg, category=FutureWarning)
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x7f1b9d5bf4c0>
```



```
sb.heatmap(transformed_df.astype('float64').corr())
score = transformed_df['score']
transformed_df=transformed_df.drop(['score'],axis=1)
```



```
score=score.astype(int)
```

```
X_train, X_test, y_train, y_test = train_test_split(transformed_df, score, random_state =
X_train.head()
```

	type_Movie	type_TV Show	release_year_2018	release_year_2020	release_year_2021	ra
92	1.0	0.0	1.0	0.0	0.0	
41	1.0	0.0	0.0	0.0	0.0	
53	0.0	1.0	0.0	0.0	1.0	

```
print(X_test.head())
print()
print()
print(y_train.head())
```

```
    type_Movie  type_TV Show  release_year_2018  release_year_2020  release_year_202
52         1.0           0.0                0.0                0.0                0.
73         1.0           0.0                0.0                0.0                1.
91         0.0           1.0                0.0                0.0                1.
6          1.0           0.0                0.0                0.0                0.
54         1.0           0.0                0.0                0.0                0.


92    7
41    3
53    7
7     8
79    8
Name: score, dtype: int64
```

We try to make a regression prediction too.

```
scaler = MinMaxScaler(feature_range=(0, 1))
x_train_scaled = scaler.fit_transform(X_train)
x_train = pd.DataFrame(x_train_scaled)

x_test_scaled = scaler.fit_transform(X_test)
x_test = pd.DataFrame(x_test_scaled)
```

```
knn = KNeighborsRegressor()
grid_params = { 'n_neighbors' : [5,7,9,11,13,15],
               'weights' : ['uniform','distance'],
               'metric' : ['minkowski','euclidean','manhattan']}
gs = GridSearchCV(knn, grid_params, verbose = 1, cv=3, n_jobs = -1)
g_res = gs.fit(X_train, y_train)
```

```
Fitting 3 folds for each of 36 candidates, totalling 108 fits
```

```
g_res.best_score_
```

```
0.02823997430689018
```

```
g_res.best_params_
```

```
{'metric': 'minkowski', 'n_neighbors': 15, 'weights': 'distance'}
```

47	0.0	1.0	0.0	0.0	1.0

As seen our data in current state can not make accurate predictions.

48	0.0	1.0	0.0	0.0	0.0

```
print(g_res.score(X_test, y_test))
scores = cross_val_score(knn, transformed_df, score, cv =5)
print()
print()
print('Model accuracy: ',np.mean(scores))
```

```
0.11317334204763707


Model accuracy:  0.09678274964941644
```

51	1.0	0.0	0.0	0.0	0.0

Results

As seen from our results we can accurately predict if something is better than avarage but we can not predict precise scores. This means we need a different dataset or columns. We can use this as it is for some predictions and we can select what is worth our time.

54	1.0	0.0	0.0	0.0	0.0

References

1. https://www.kaggle.com/datasets/shivamb/netflix-shows?resource=download
2. Dynamic k determination in k-NN classifier: A literature review
3. Netflix Movie Rating Prediction using Enriched Movie Metadata

57	1.0	0.0	0.0	0.0	0.0
58	1.0	0.0	0.0	0.0	0.0
59	1.0	0.0	0.0	0.0	0.0
60	1.0	0.0	0.0	0.0	0.0
61	1.0	0.0	0.0	0.0	0.0