

Capstone Project Classification

(Abhishek Mishra, Kurva Mallesh, Arunesh Mishra) Data science trainees,
Alma Better, Bangalore

Abstract:

Netflix is a subscription-based streaming service that allows our members to watch TV shows and movies on an internet-connected device.

This dataset consists of tv shows and movies available on Netflix as of 2019. The dataset is collected from Flixable which is a third-party Netflix search engine.

In 2018, they released an interesting report which shows that the number of TV shows on Netflix has nearly tripled since 2010. The streaming service's number of movies has decreased by more than 2,000 titles since 2010, while its number of TV shows has nearly tripled. It will be interesting to explore what all other insights can be obtained from the same dataset.

Integrating this dataset with other external datasets such as IMDB ratings, rotten tomatoes can also provide many interesting findings.

Our EDA can make us understand data which variable is very important and check how every variable connected with dependent variable.

We make some models to predict the label column based on features.

Data Description: -

Attribute Information:

The description of the features provided in the dataset

- **Show_id:** Unique ID for every Movie / Tv Show
- **Type:** Identifier - A Movie or TV Show
- **Title:** Title of the Movie / Tv Show
- **Director:** Director of the Movie
- **Cast:** Actors involved in the movie / show
- **Country:** Country where the movie / show was produced
- **Date_added:** Date it was added on Netflix
- **Release_year:** Actual Release year of the movie / show
- **Rating:** TV Rating of the movie / show
- **Duration:** Total Duration - in minutes or number of seasons
- **Listed_in:** Genre
- **Description:** The Summary description

1. Data wrangling step: -

- We have 7787 rows and 12 columns provided in the data.
- In the dataset we have 11 object columns and 1 integer column as release year.
- First we have 2389 null values in director column. We have almost 30% null values in this column so we cannot use this column in model training but we can use it in EDA.
- We have 718 null values in cast column. and it can be replaced with 'unknown'.
- we have 507 null values in country column. Replacing nulls with 'mode'.
- Also, we have 10 null values in Date_added column.
- We have few rows of Date_added so we can 'drop' these rows.

2. Null value treatment: -

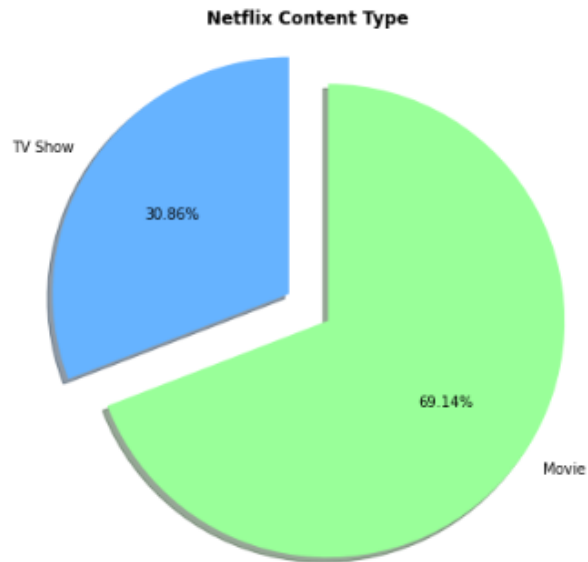
- ✓ First, we have 2389 null values in director column.
- ✓ We have almost 30% null values in this column so we can not use this column in model training but we can use it in EDA.
- ✓ We have 718 null values in cast column. and it can be replaced with 'unknown'.
- ✓ We have 507 null values in country column. Replacing nulls with 'mode'.

3. EDA

Exploratory Data Analysis (EDA):

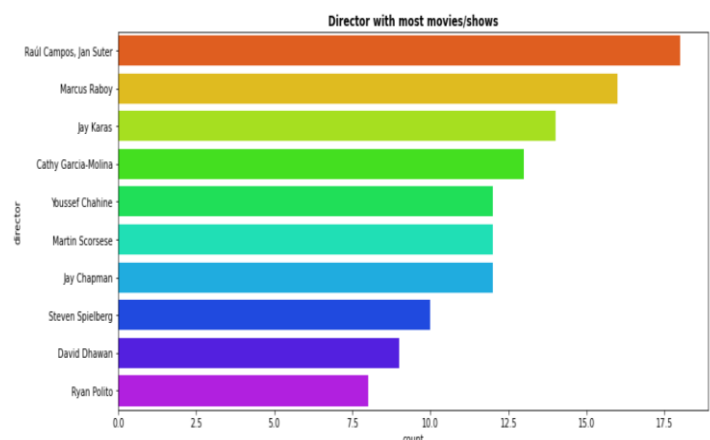
After the data wrangling step, we performed EDA by comparing different parameters which are involved in the dataset. EDA helps us to find the different relations among the parameters. It involves the visualization of the data by comparing the different parameters to find out the best among all.

Learn about "Type" Column



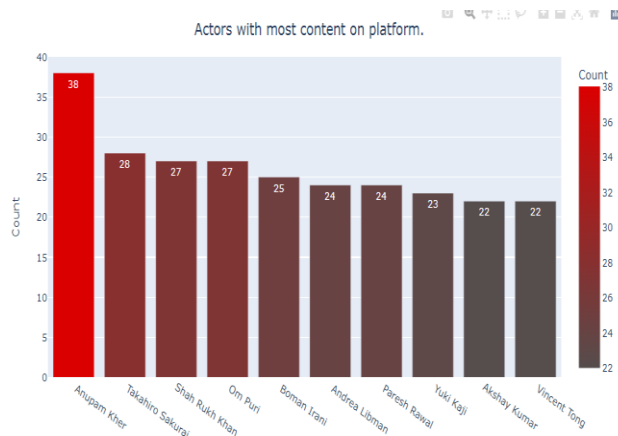
- ✓ According to the graph we have 5377 (69.14%) movies.
- ✓ And 2400 (30.86%) as TV Show in this dataset.

Learn about 'director' column



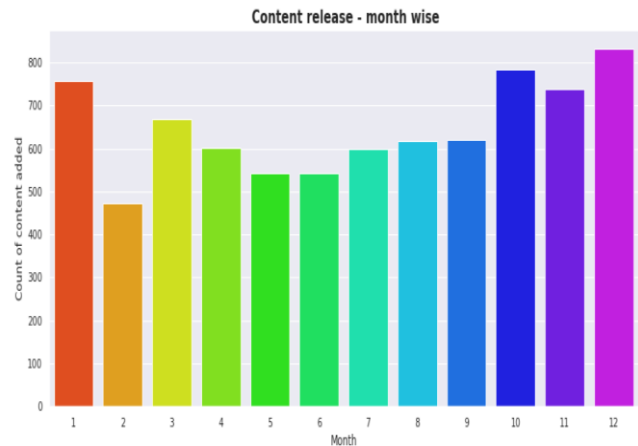
- ✓ According to plot we can say Raul Campos and Jan Suter collectively have the most content on Netflix.
- ✓ Marcus Raboy has the second most content on Netflix.

Learn about 'cast' column



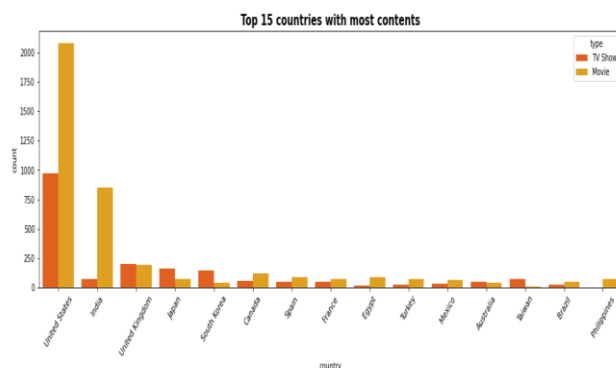
- ✓ Now we can say in this data Anupam Kher having 38 number of listings.
- ✓ Takahiro Sakurai is the second most listed actor on netflix.
- ✓ Shah Rukh Khan is the 3rd most listed actor on netflix.

Month wise Content release analysis



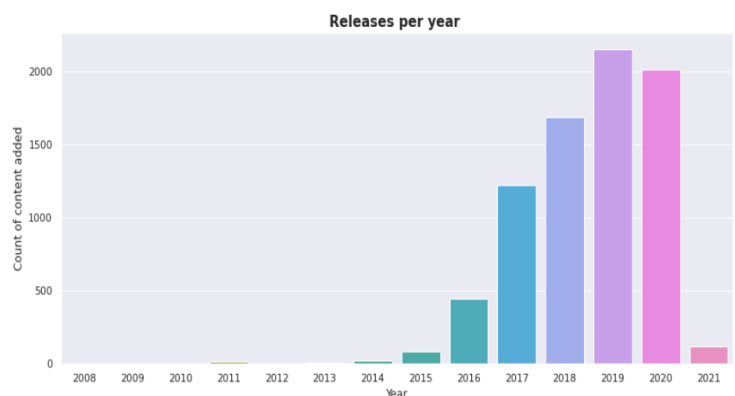
- ✓ We have so many contents release in October (785), November (738), December (833) and January (757) maybe it is because of Holiday season.

Learn about 'country' column



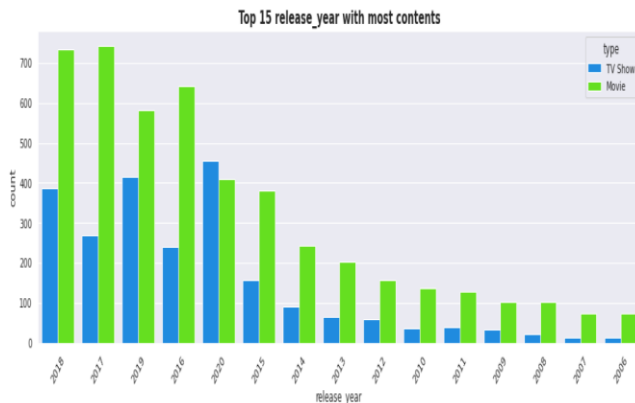
- ✓ According to the plot we can understanding United States have 2080 Movies and 975 TV Show.
- ✓ INDIA have second most listed country with 852 movies and 71 TV Show on Netflix.

Year wise Content release analysis



- ✓ The number of releases has significantly increased after 2015 to 2020.
- ✓ But sudden drop in 2021 maybe it is because of covid 19.

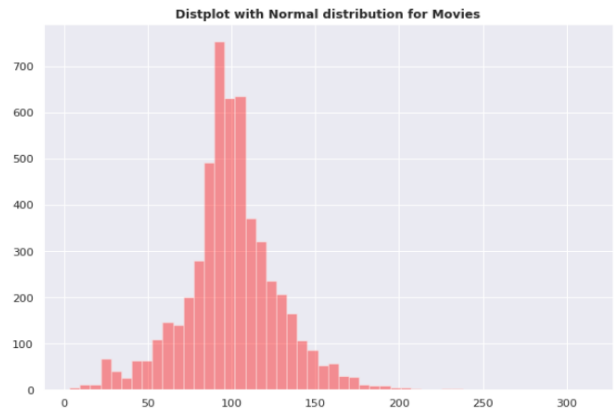
Learn about 'release_year' column



- ✓ We have 744 movies and 268 TV Show release in 2017.
- ✓ Also 734 movies and 386 TV Show release in 2018.
- ✓ 82% (6431) of the content was released between 2010 and 2021.
- ✓ 17.28% (1346) of the content was released before 2010.

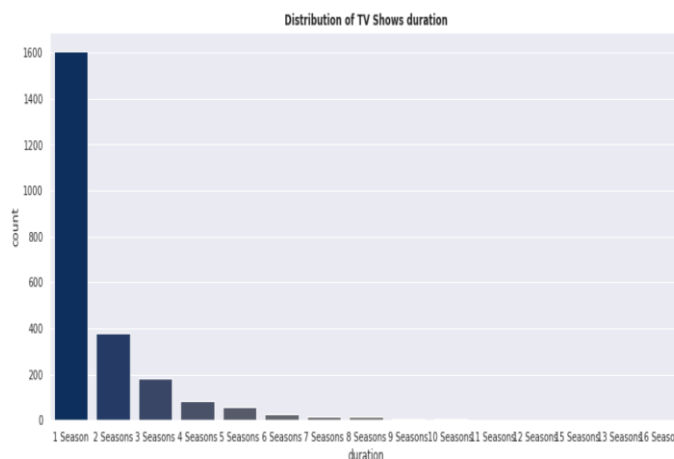
- ✓ We have second most listed duration as season 2 with 378 listing.

Learn about 'duration' column for movies



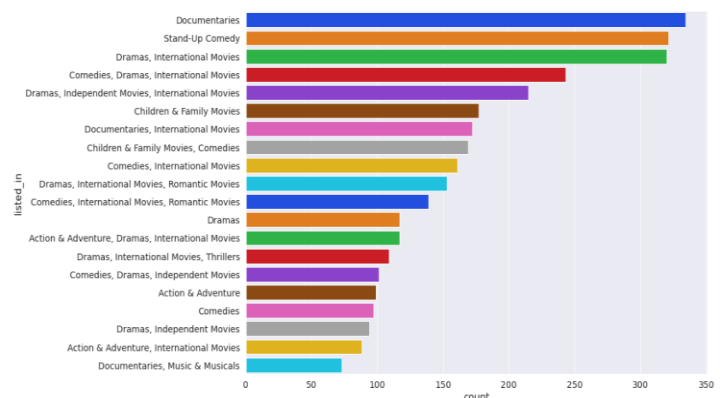
- ✓ Mainly the movie duration is in b/w 55 to 150 minutes.
- ✓ Most of the movies list for 90 to 120 minutes.

Learn about 'duration' column for TV Show



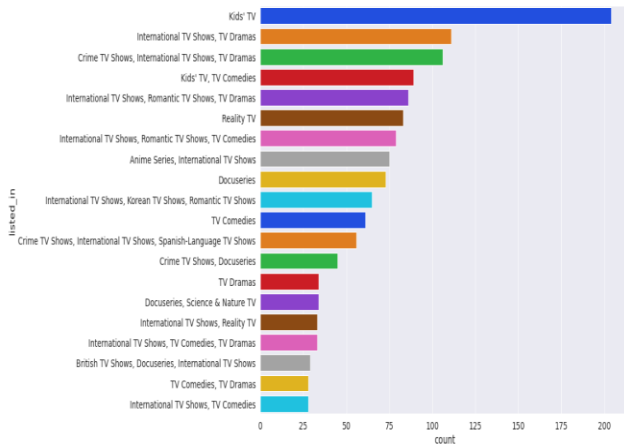
- ✓ We have most listed duration as season 1 with 1608 listing.

Learn about 'genera' for movies column



- ✓ In Movies Documentaries is the most popular genera on Netflix.
- ✓ Comedy is the second most popular genera on Netflix.

Learn about 'genera for TV-Show' column

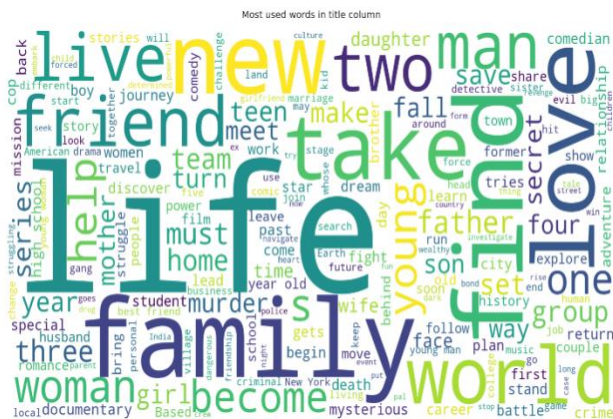


- ✓ In TV Shows Drama is the most popular genera.
- ✓ International TV shows is the second most popular genera.



- ✓ Most repeated words in the description of the TV shows and movies are Family, new, Love, Life, mother, find.

Learn about 'title' column



- ✓ Most repeated words in title column are love, Christmas, World, Man, and life.

EDA Conclusion: -

1. The number of releases has significantly increased after 2015 to 2020.
2. But sudden drop in 2021 maybe it is because of covid 19.
3. In TV Shows Drama is the most popular genera.
4. Most repeated words in title column are love, Christmas, World, Man and life.
5. We have 744 movies and 268 TV Show release in 2017.
6. Also 734 movies and 386 TV Show release in 2018
7. 82% (6431) of the content was released between 2010 and 2021
8. 17.28% (1346) of the content was released before 2010.
9. Most number of movies rated TV-MA i.e., Adult Rating
10. Most number of TV Shows rated TV-MA i.e., Adult Rating
11. We have most listed duration as season 1 with 1608 listing.
12. We have second most listed duration as season 2 with 378 listing.
13. Mainly the movie duration is in b/w 55 to 150 minutes.
14. Most of the movies list for 90 to 120 minutes.
15. In Movies Documentaries is the most popular genera on Netflix.
16. Comedy is the second most popular genera on Netflix.

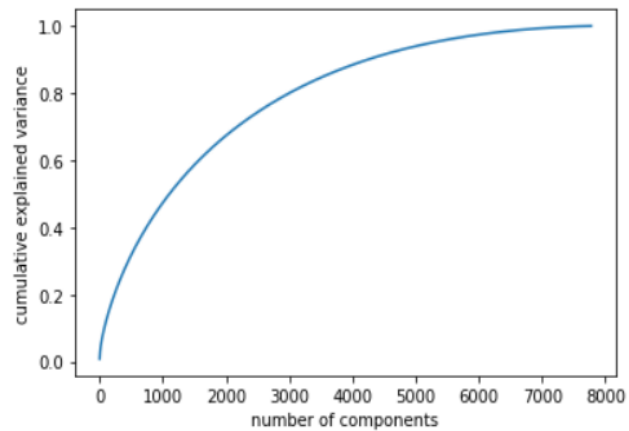
Data Pre-Processing

Feature Engineering:

- For train the model we use description column, listed_in column, rating column, country column, title column, director column, cast column.
- convert all words in lowercase
- We remove all stop words.
- Also use stemming function.

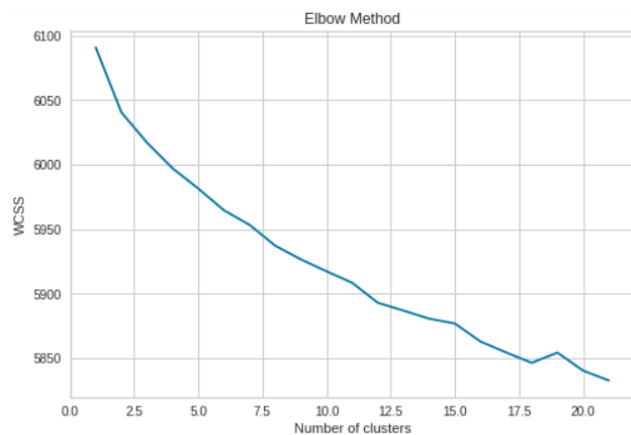
Cumulative Explained Variance

```
Text(0, 0.5, 'cumulative explained variance')
```



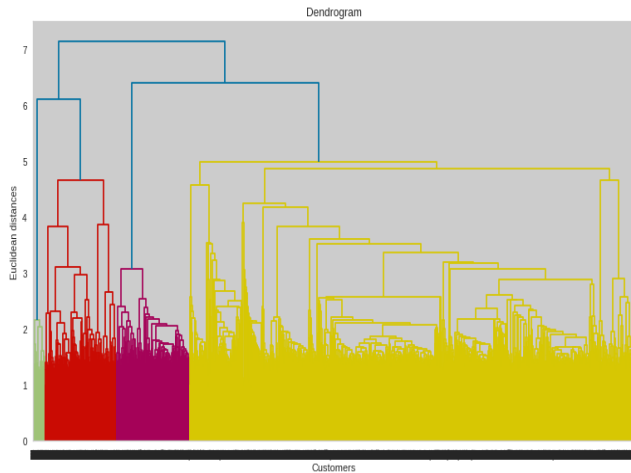
✓ We will use 3000 components

Elbow Method for KMeans Clustering



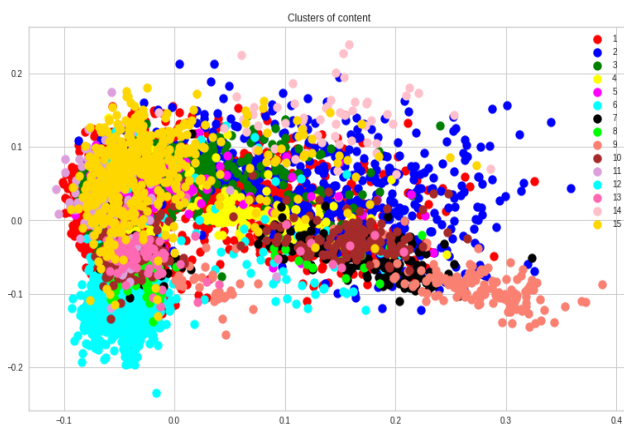
✓ We will take no. of clusters as 15

Dendrogram



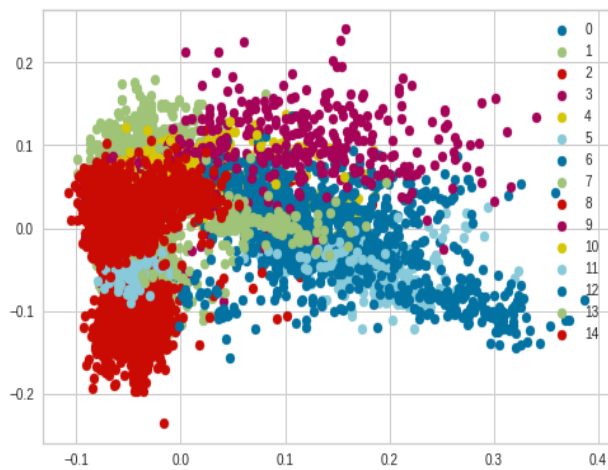
✓ We will take no. of clusters as 15

Agglomerative Clustering



- ✓ For $n_clusters = 2$, silhouette score 0.001154
- ✓ For $n_clusters = 3$, silhouette score is 0.001837
- ✓ For $n_clusters = 4$, silhouette score is -0.004009
- ✓ For $n_clusters = 5$, silhouette score is -0.003056
- ✓ For $n_clusters = 6$, silhouette score is -0.002319
- ✓ For $n_clusters = 7$, silhouette score is -0.001574
- ✓ For $n_clusters = 8$, silhouette score is -0.001121
- ✓ For $n_clusters = 9$, silhouette score is -0.0004279
- ✓ For $n_clusters = 10$, silhouette score is 0.000220
- ✓ For $n_clusters = 11$, silhouette score is -0.000294
- ✓ For $n_clusters = 12$, silhouette score is 0.000230
- ✓ For $n_clusters = 13$, silhouette score is 0.000521
- ✓ For $n_clusters = 14$, silhouette score is 0.000385
- ✓ For $n_clusters = 15$, silhouette score is 0.000817

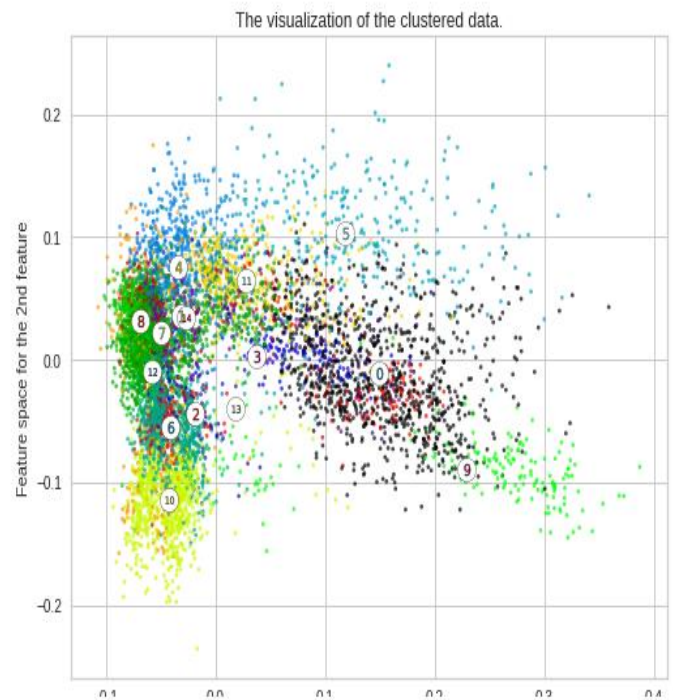
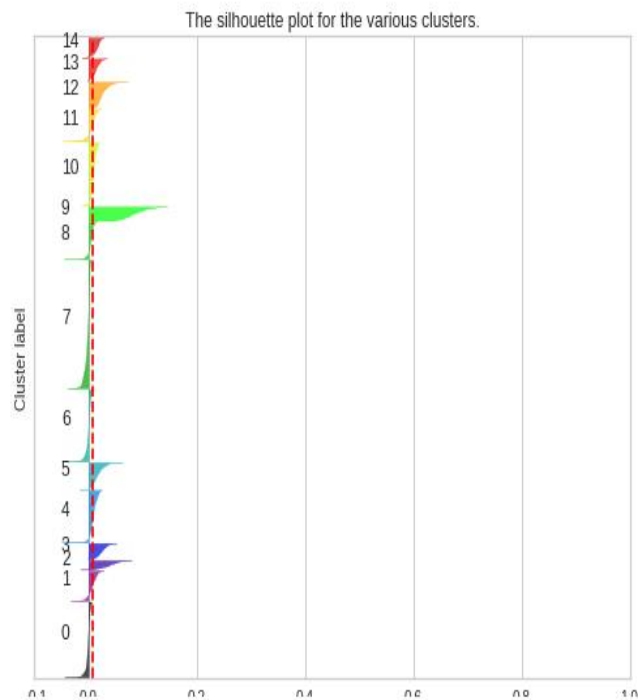
K Means Clustering



✓ Silhouette Coefficient: 0.004

Silhouette Score for K Means Clustering

Silhouette analysis for KMeans clustering on sample data with n_clusters = 15



Enter your text here:ghost
the movies suggest for you:

- 1 - Eugenie Nights
- 2 - Al Hayba
- 3 - Because We're Heading Out
- 4 - 122
- 5 - El-Khawaga's Dilemma
- 6 - الب مبروك
- 7 - Son Of Adam
- 8 - The Land of Hypocrisy
- 9 - Juman
- 10 - The Dealer
- 11 - The Platform
- 12 - Secret of the Nile
- 13 - More to Say
- 14 - Game Over
- 15 - The Thief and the Imbecile
- 16 - An Hour and a Half
- 17 - The Land
- 18 - Cairo Station
- 19 - Convict
- 20 - Warda
- 21 - Border Security: America's Front Line
- 22 - My Pride
- 23 - Paranormal
- 24 - The Road to El Camino: Behind the Scenes of El Camino: A Breaking Bad Movie
- 25 - Return of the Prodigal Son
- 26 - El desconocido
- 27 - Disappearance
- 28 - Valentino
- 29 - Scarecrow
- 30 - Find Yourself

Try to create a recommendation system if I search ghost in this recommendation system so it suggest these 30 titles from the dataset of Netflix.

Conclusion from Model

Training: -

WE used Elbow method for finding k values.
Also used Silhouette Score for best score.
Also used Dendrogram for finding the value of clusters.

Here are few clusters with there word cloud graph

Analysis of cluster 0

Type - Movie, TV Show
Title- Naruto, high, girl, low, movie, dragon, bleach, fate, battle
Countries- Japan, US, India
Ratings- TV-MA, PG, Y7
Genres- International TV series- Anime
Description- family, world, human, friend

Analysis of cluster 1

Type - Movies, TV Show
Title- master, love, Dorgan, aur, Mumbai, Singh
Countries- India, China and Hong Kong
Ratings- TV-MA, pg
Genres- International movies, Dramas, Action
Description- family, man, love, India, woman, find

Analysis of cluster 2

Type - Movies, TV Show
Title- club, Spain, live, holy
Countries- Spain, Mexico, France
Ratings- TV-MA, NR, PG
Genres- Dramas International, show
International
Description- family, young, secret, story.

Analysis of cluster 3

Type - Movies, TV Show
Title- Girl, man, love, monster, holiday etc.
Countries- United states, United Kingdom, Japan etc.
Ratings- TV-MA, PG etc.
Genres- family movies, movie comedies etc.
Description- find, save, find, new, school etc.

Analysis of cluster 4

Type - TV Shows, Movies etc.
Title- Power rangers, adventure, stories, rescue, bheem, little, monster etc.
Countries- US, France, UK, Japan etc.
Ratings- TV-Y7 etc.
Genres- Kids shows-comedy, Korean etc.
Description-adventure, friend, world, anime etc.

References-

1. scikit-learn
2. Matplotlib
3. Seaborn
4. MachineLearningMastery
5. GeeksforGeeks
6. Analytics Vidhya
7. Wikipedia

