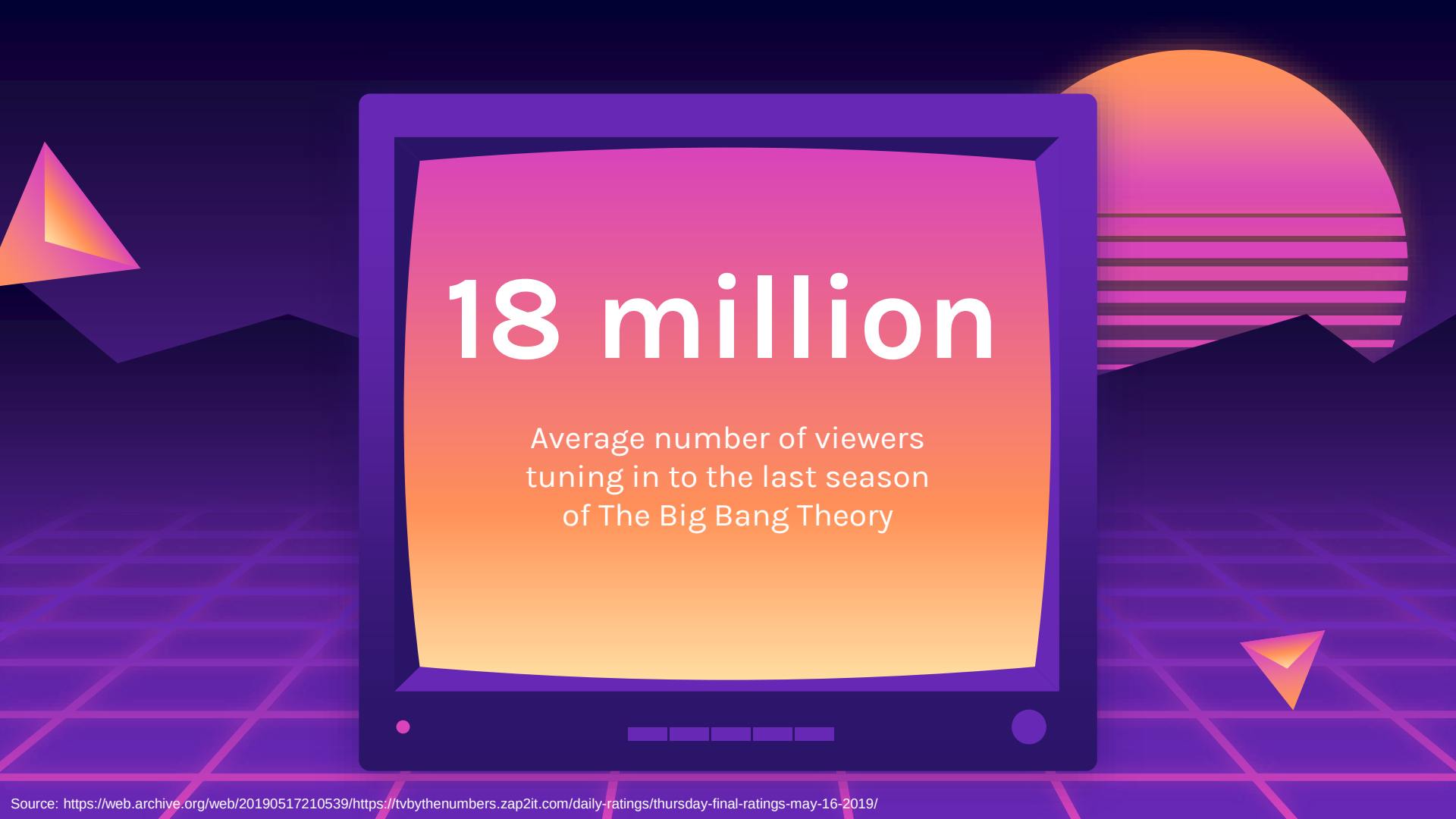
Project 3

Unveiling The Recipe For Comedy Success:

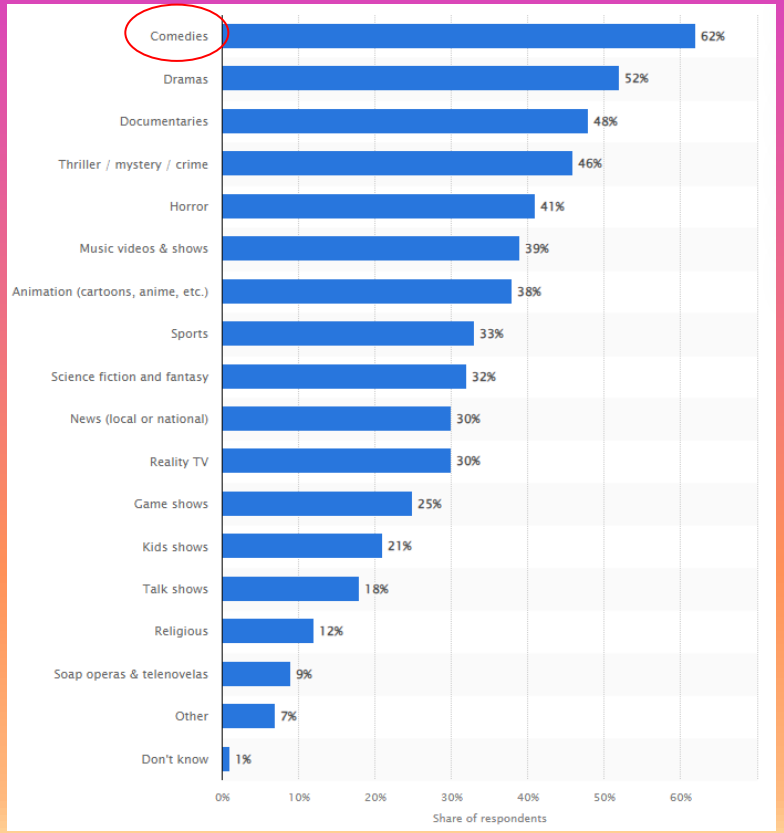
Analyzing Viewer Preferences And Sentiment Towards Popular Sitcoms

01

Background Of The Problem



Source: https://web.archive.org/web/20190517210539/https://tvbythenumbers.zap2it.com/daily-ratings/thursday-final-ratings-may-16-2019/



Preferred digital video content by genre in the U.S. as of March 2023

Source: https://www.statista.com/forecasts/997166/preferred-digital-video-content-by-genre-in-the-us#:~:text=%22Comedies%22%20and%20%22Dramas%22,the%20United%20States%2C%20in%202023.

Streaming Services Market

01

Netflix

223.09 million subscribers

02

Prime Video

200+ million subscribers

03

Disney+

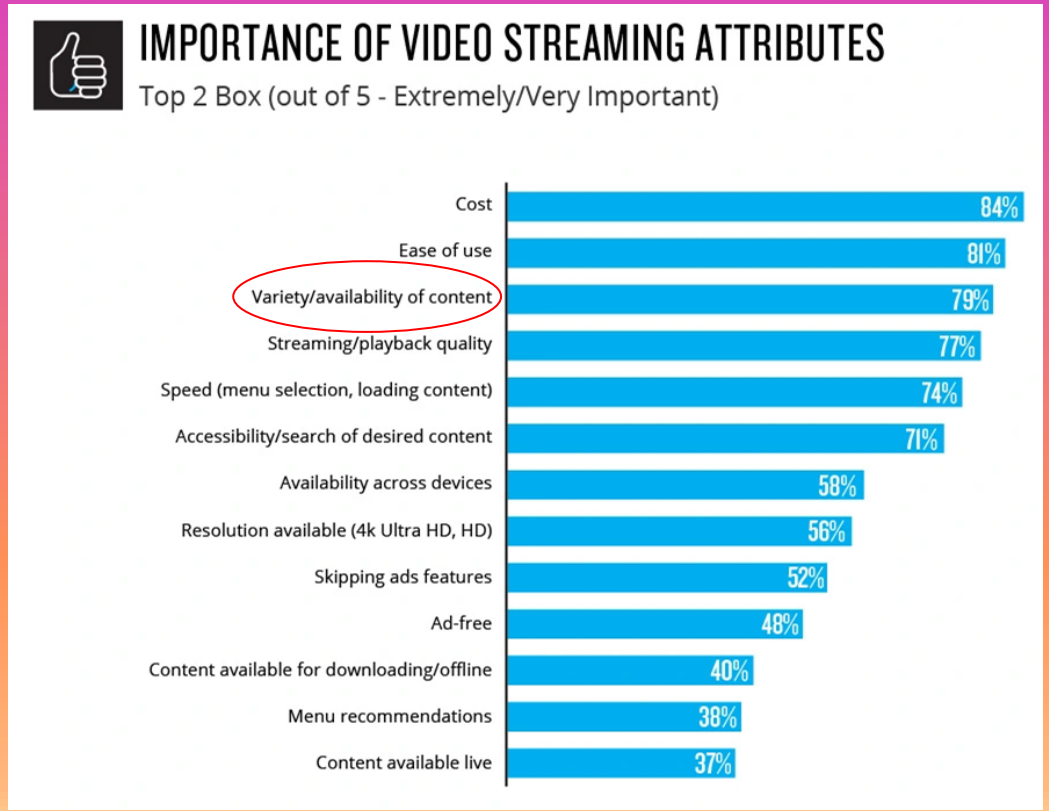
164.2 million subscribers

04

HBO Max

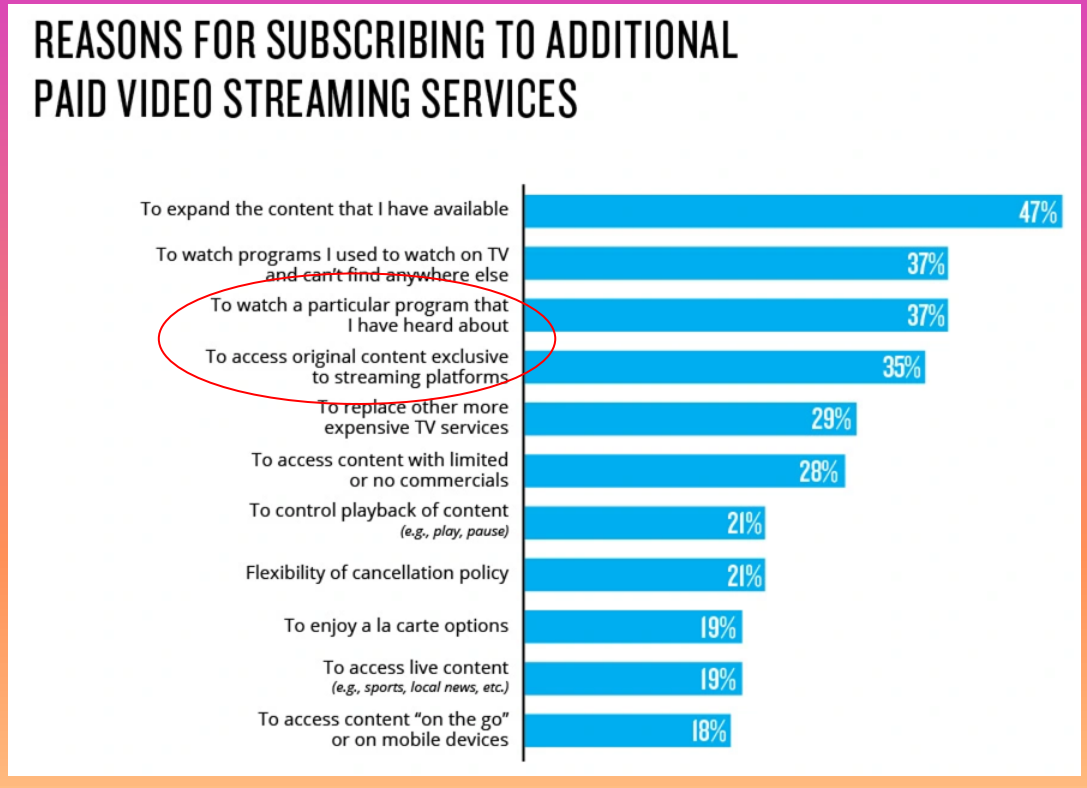
94.9 million subscribers

Source: https://headphonesaddict.com/video-streaming-statistics/



Availability of content is top 3 in importance of video streaming attributes

Source: https://www.nielsen.com/insights/2020/playback-time-which-consumer-attitudes-will-shape-the-streaming-wars/



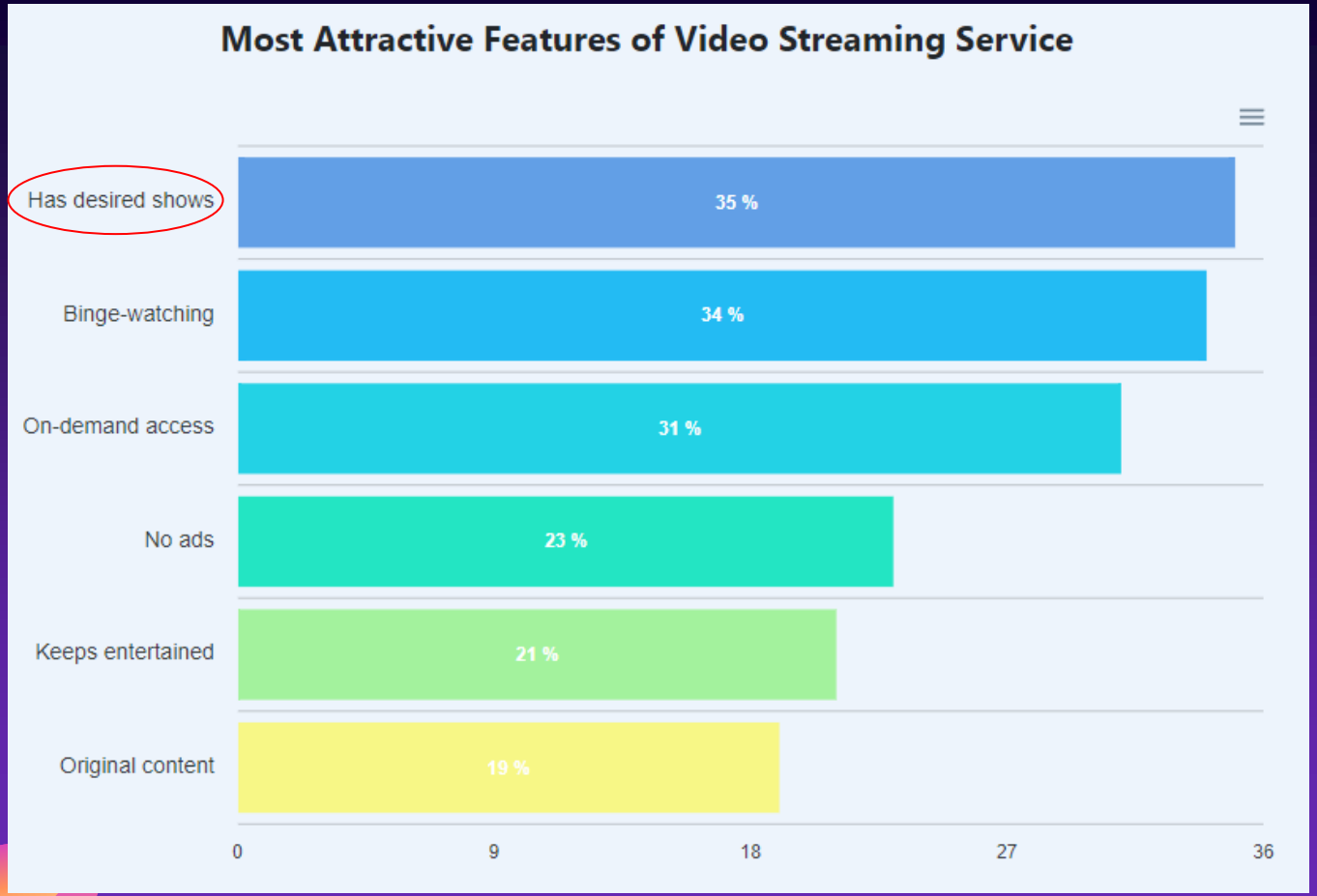
"Wanting to watch programs they've heard about"

&

"To access original content exclusive to streaming platforms"

Are cited as top 3 & 4 reasons for subscribing to additional paid video streaming services

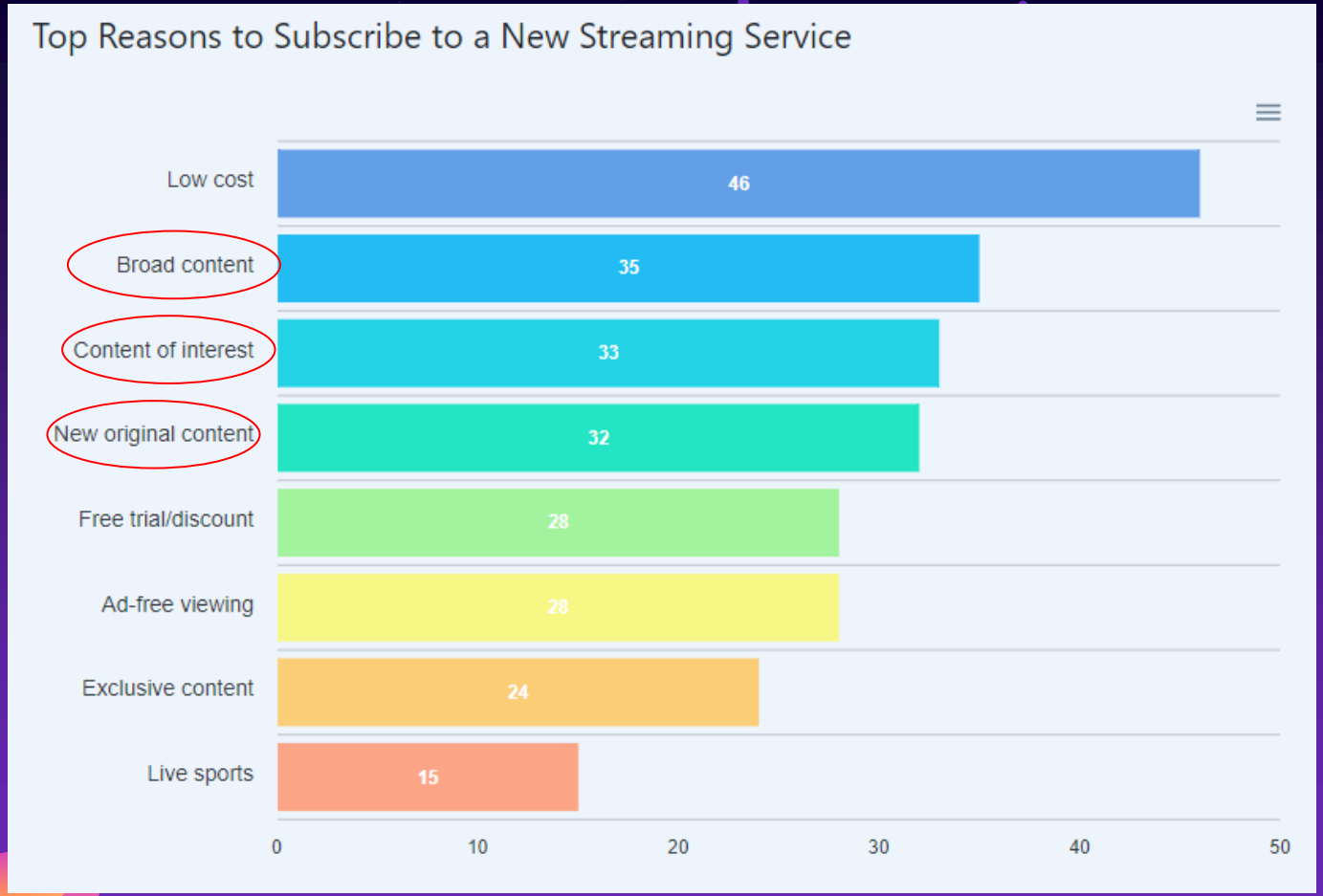
Source: https://www.nielsen.com/insights/2020/playback-time-which-consumer-attitudes-will-shape-the-streaming-wars/



Desired shows

Is cited as the top reason that consumers found to be the most attractive feature of video streaming services

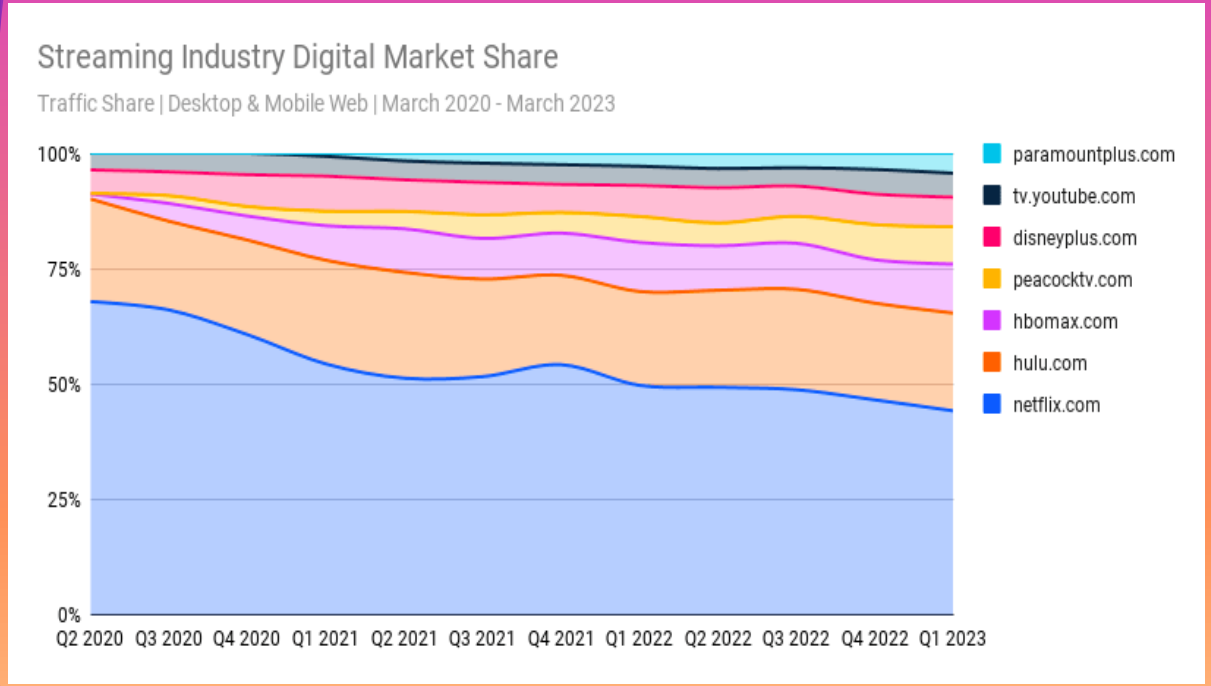
Source: https://www.cloudwards.net/streaming-services-statistics/



Content related reasons

Are also cited as the top reason that incites consumers to subscribe to new streaming services

Source: https://www.cloudwards.net/streaming-services-statistics/

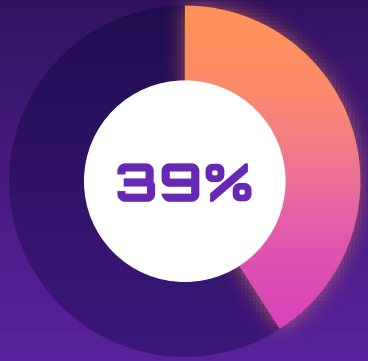


SVoD industry competitiveness

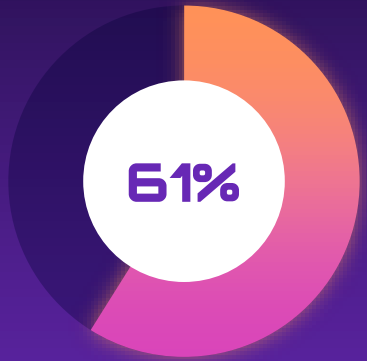
Netflix has been losing market share every year from 2020 - 2023, reason being that there are more competition in the market.

Source: https://www.similarweb.com/blog/insights/media-entertainment-news/streaming-q1-2023/#:~:text=The%20streaming%20industry%20has%20shown,in%20a%20post%2Dpandemic%20world.

When Singaporeans are asked if they would discontinue one of their streaming services in the next six months

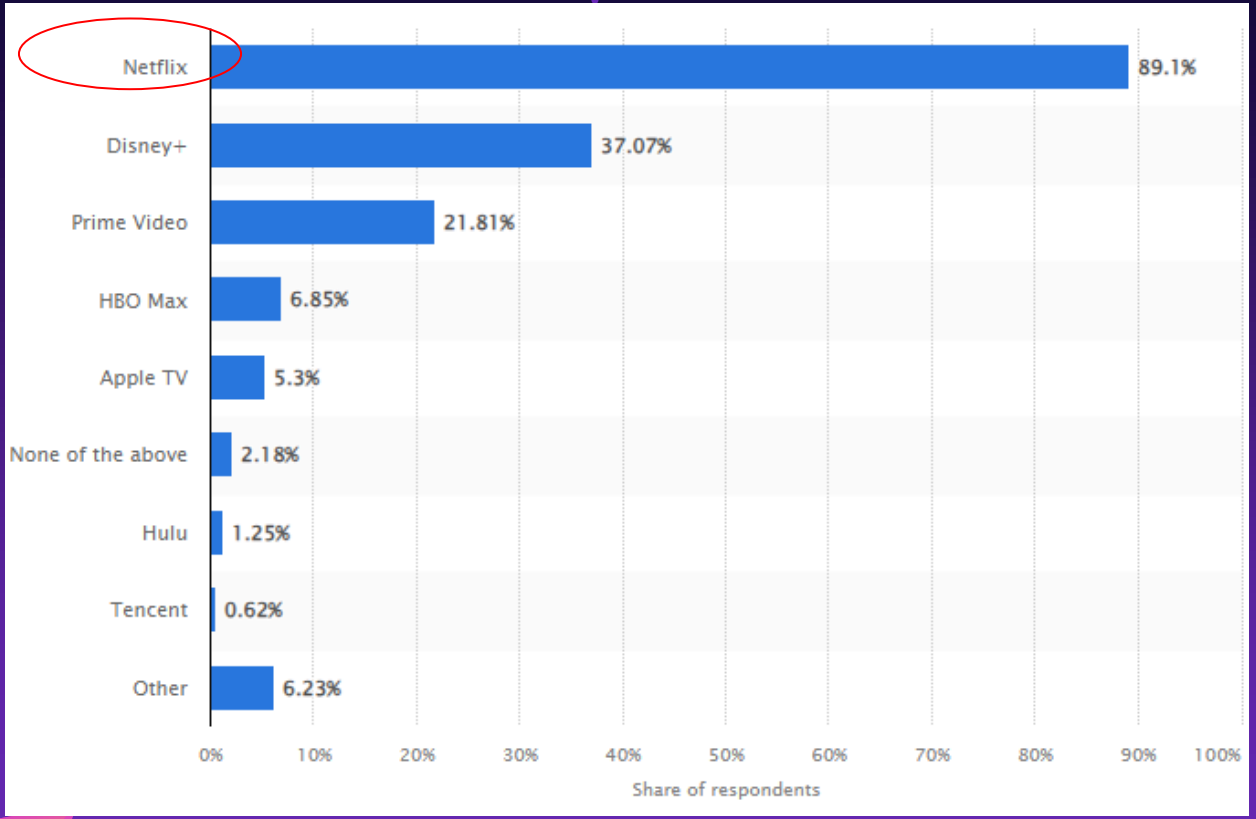


Unlikely



Likely

Source: https://blackbox.com.sg/everyone/streaming-services-in-singapore



Most used streaming platforms among Singapore consumers in 2022

Source: https://www.statista.com/statistics/1341646/singapore-popular-streaming-platforms-among-consumers/

Problem Statement:

Short term problem

a. Identify what show elements in the sitcom are popular among the viewers

01

Brooklyn Nine-Nine

The team's favorite sitcom that inspired the team's name

02

The Big Bang Theory

One of the all time best sitcom and also one of the team's favorites

Problem Statement:

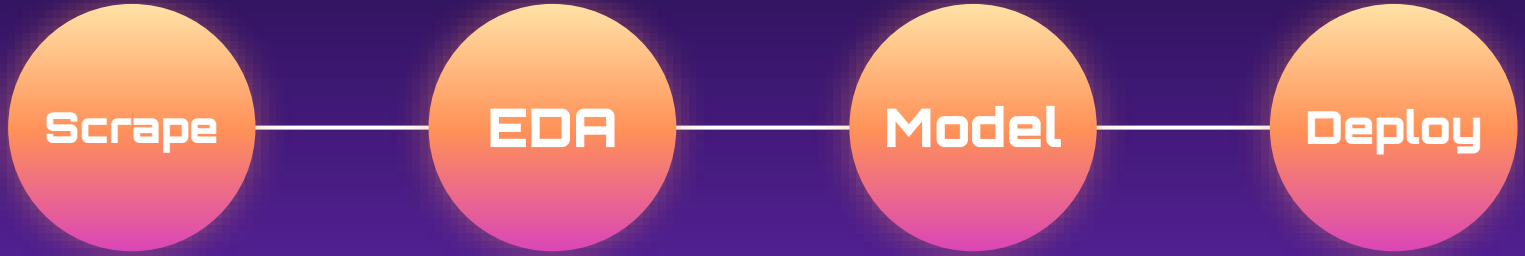
Long term

a. To build an infrastructure that can help to classify and analyse user's comments about the show from various platforms.

01 Classify comments by shows

02 Analyse sentiments from the comments

How we went about this



Reddit

We figured that the best way is to listen to the fans' sentiment of their favourite shows

Discover

Any unexpected discoveries along with cleaning the data that will be used to train the model

Classification

Building and training classification models that would help to classify and determine the fans' sentiment

Decision making

Model would be deployed and the findings will be used in the decision making process of the problem

02

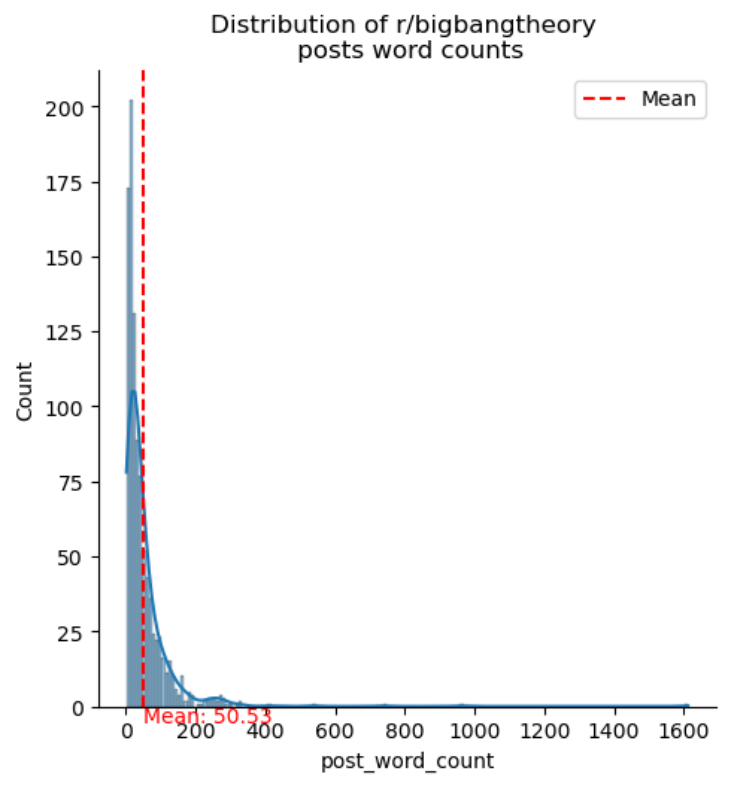
Exploratory Data Analysis

Why Reddit?

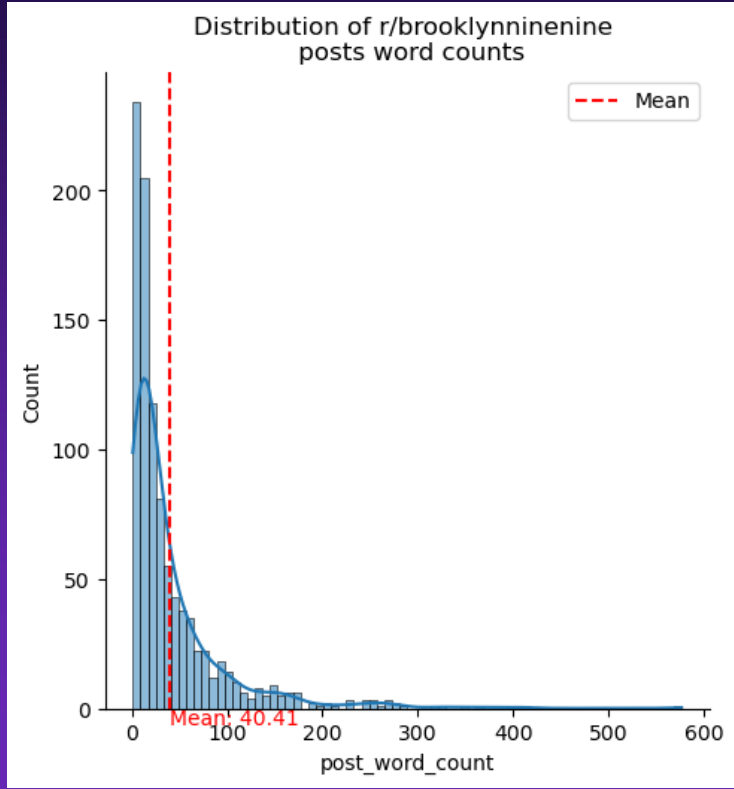
- Free to use
- Freedom to express (unbiased input)
- Simple Accessibility of Data
- Large number of datasets (reduced biasness towards)
  - A genuine user reviews

Word Counts per Post

r/bigbangtheory
50 words



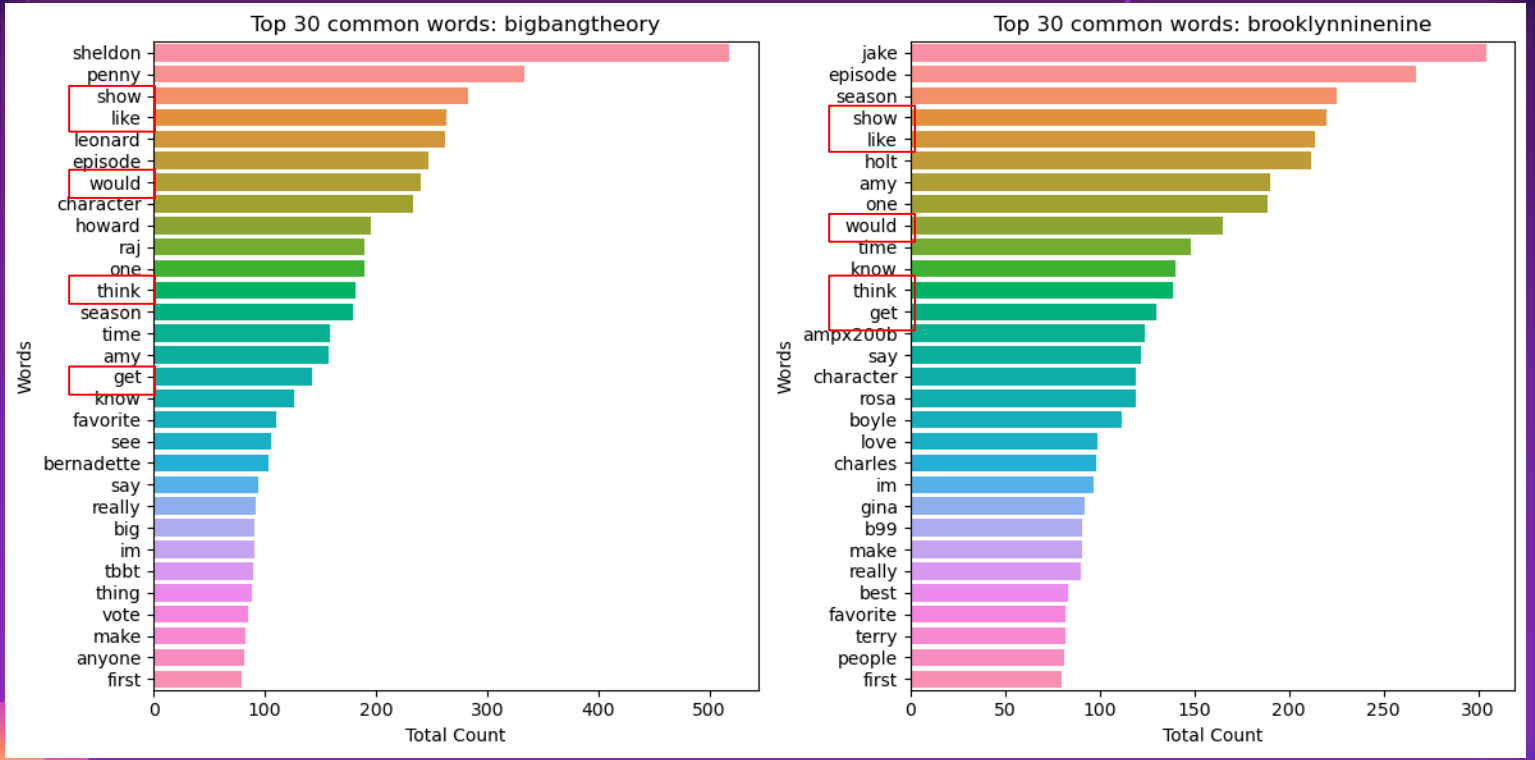
r/brooklynninenine
40 words



Source: https://www.cloudwards.net/streaming-services-statistics/

Top 30 Common Words

r/bigbangtheory

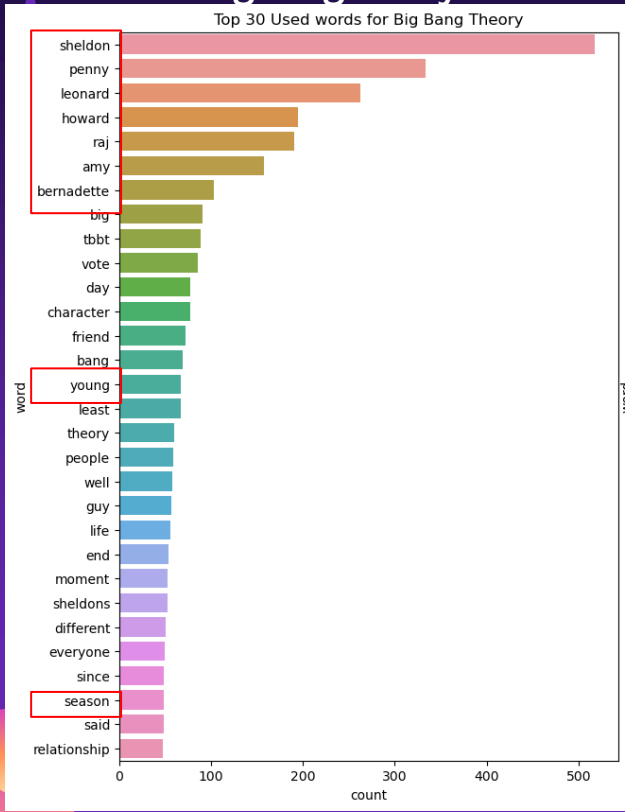


r/brooklynninenine

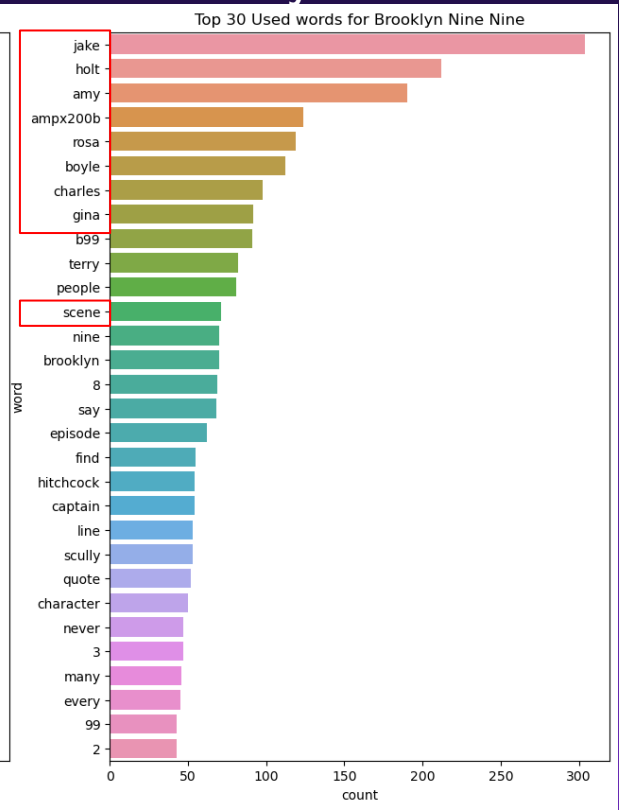
Common Words were observed for both subreddits

Top 30 after Countvectorizer

r/bigbangtheory



r/brooklynninenine



1. Character names are widely observed

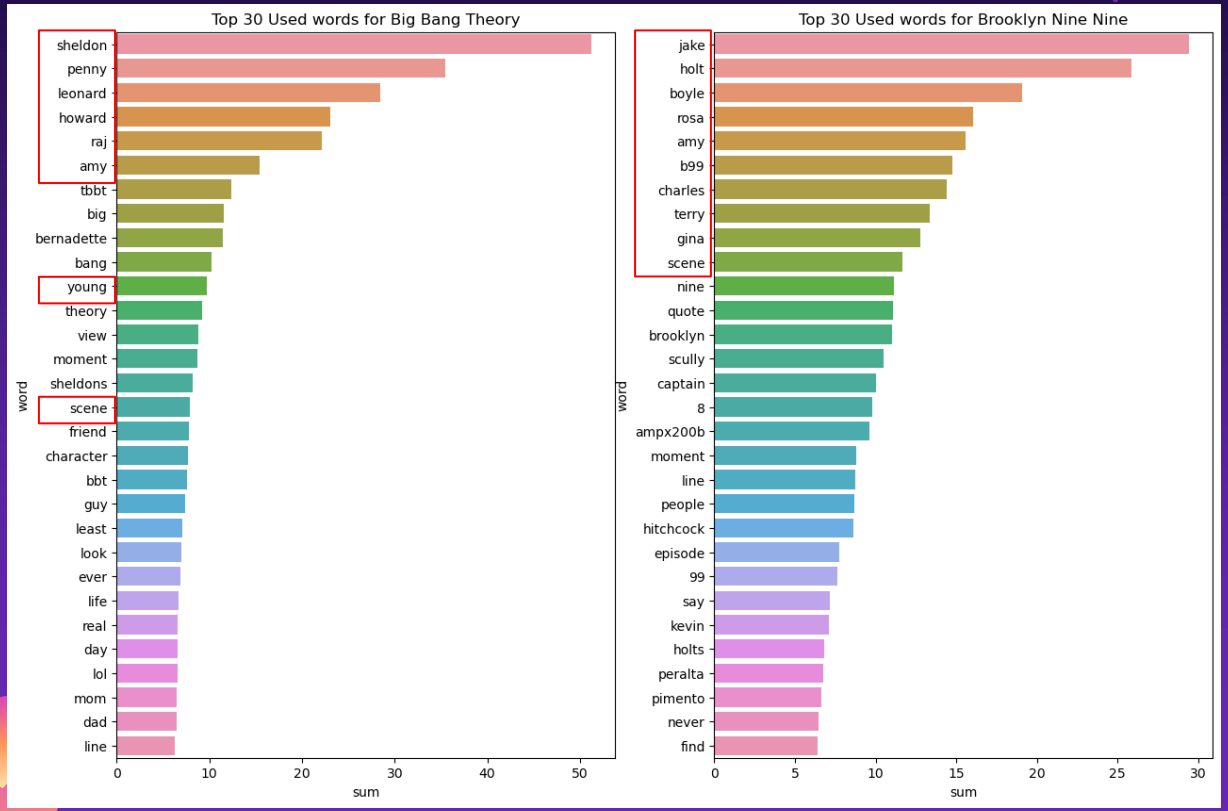
1. ‘Young’ is seen on BBT very often due to sequel

1. ‘Season’ in BBT vs ‘Scene’ in B99

Similar Observations are found after TF-IDF Vectorizer with the same stopwords

r/bigbangtheory

r/brooklynninenine



1. Character names are widely observed

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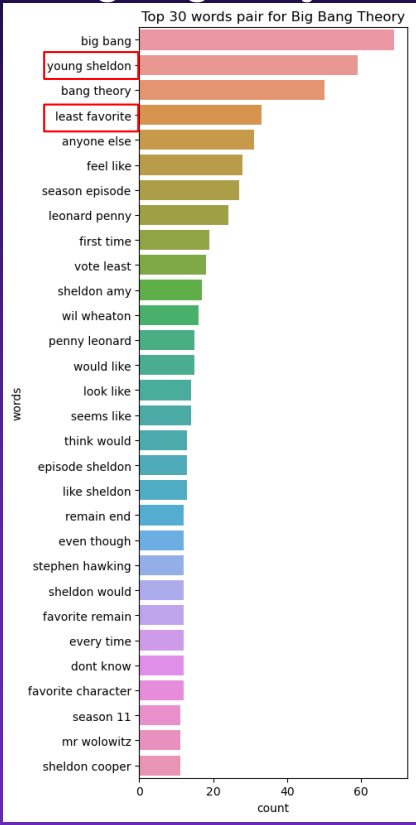
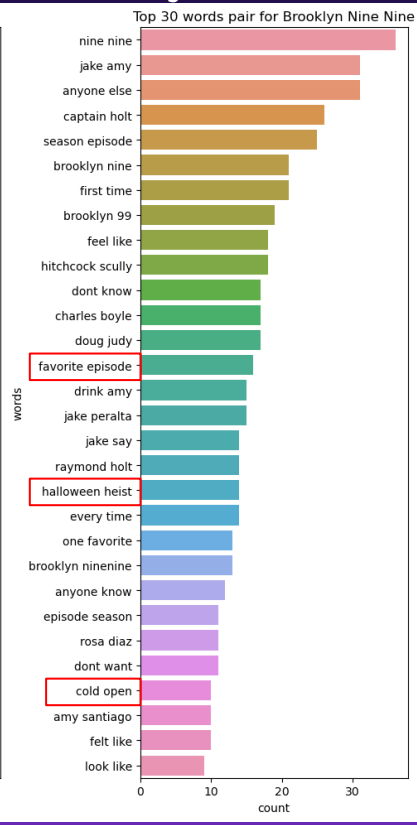
1. ‘Season’ in BBT
   vs
   ‘Scene’ in B99

Top 30 Common Words after Bigrams

r/bigbangtheory



r/brooklynninenine



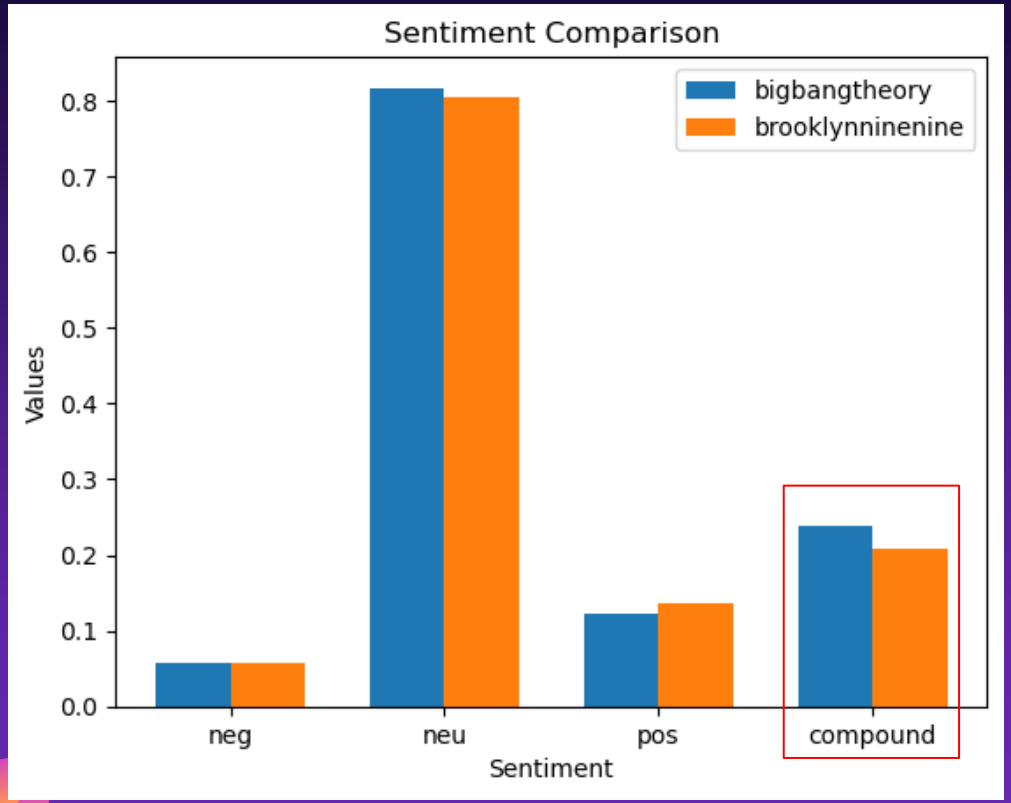
1. ‘Least Favourite’ in BBT vs ‘favourite episode’ in B99

1. ‘Sheldon’ has strong impact on viewers

1. ‘Cold Open’ is a unique X-factor in B99

1. ‘Halloween Heist’ is also a unique X-factor in B99

Sentiment Comparison



1. Majority are **neutral** words

1. Positive are **2x** of Negative

1. BBT has SLIGHTLY HIGHER positive response than B99

‘Compound’ is **Aggregate Score** of the words

03

Classification Model

“Disclaimer: This model is trained to predict the classification of a subreddit post based on the **fans’ comments** about the show, and not the **content of the show** itself.

Ming Fatt et-al, 2023

What did we do?

18

Models

18 Models were made during the process of training and building this classification model

>9k

Hyperparameter tuning

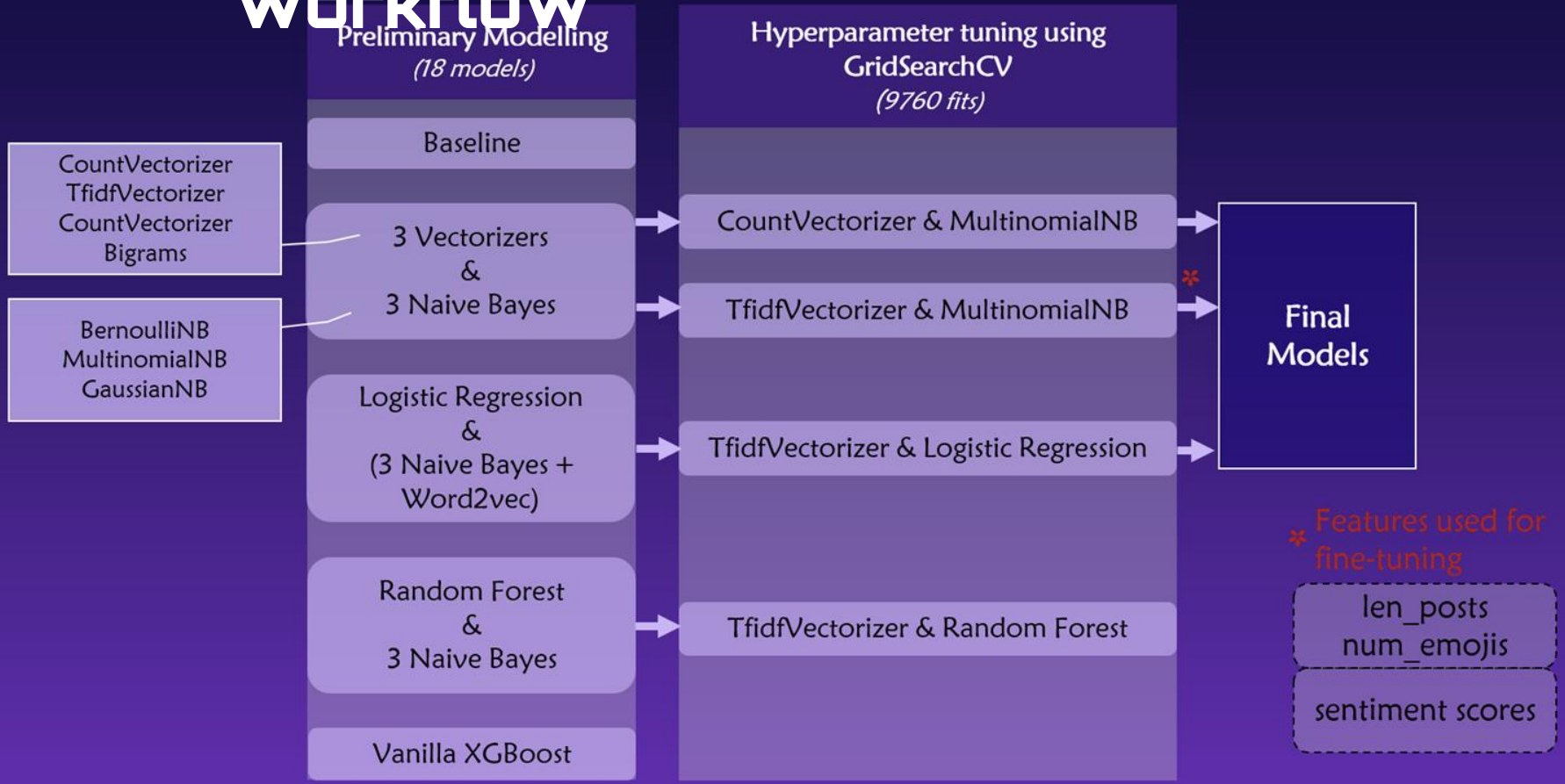
More than 9,000 fits was attempted to tune the hyper parameters of the model

01

Baseline XG Boost

Boosting method was attempted to increase the performance of the model

Modelling workflow



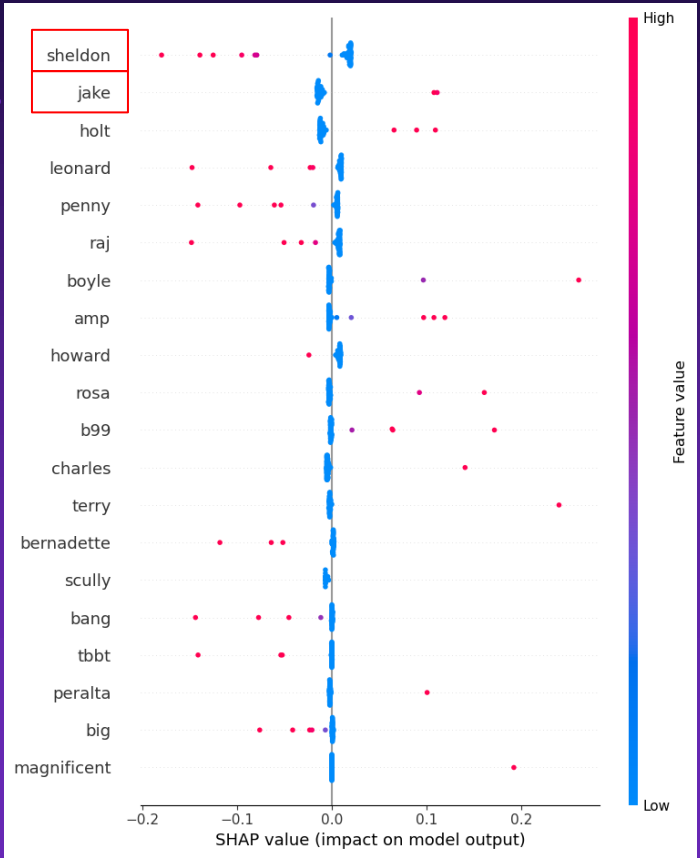
Summary Table Score

	Accuracy (Train)	Accuracy (Test)	Cross Validation Score
Baseline Model	0.520833		NA
Multinomial(NB) + CountVect + GridSearchCV	0.97050	0.90653	0.88123
Logistic Regression + TF-IDF + GridSearchCV	0.97957	0.90652	0.87368
Multinomial(NB) + TF-IDF + GridSearchCV	0.98865	0.92063	0.87973

Best Model Hyperparameters:
TfidfVectorizer: max_df=0.9, max_features=max_features, min_df=1
MultinomialNB: alpha=0.5, fit_prior=True

Features Importance

brooklynninenine *bigbangtheory*



The character importances was doubly assured by the SHAP plot.

Sheldon is the most important feature for bigbagtheory

Jake is the most important feature for brooklynninenine

Features Importance (Without Characters)

brooklynninenine

tbbt	-2.880121
view	-2.583689
bbt	-2.308415
bang	-2.134076
vote	-2.097841
gang	-2.031267
father	-1.924593
flag	-1.886893
comet	-1.801713
science	-1.709959
knock	-1.708414
young	-1.665038
nobel	-1.623368
hbo	-1.542135
dating	-1.538068
star	-1.521292
max	-1.444057
big	-1.434441
coffee	-1.429333
prize	-1.396606

bigbangtheory

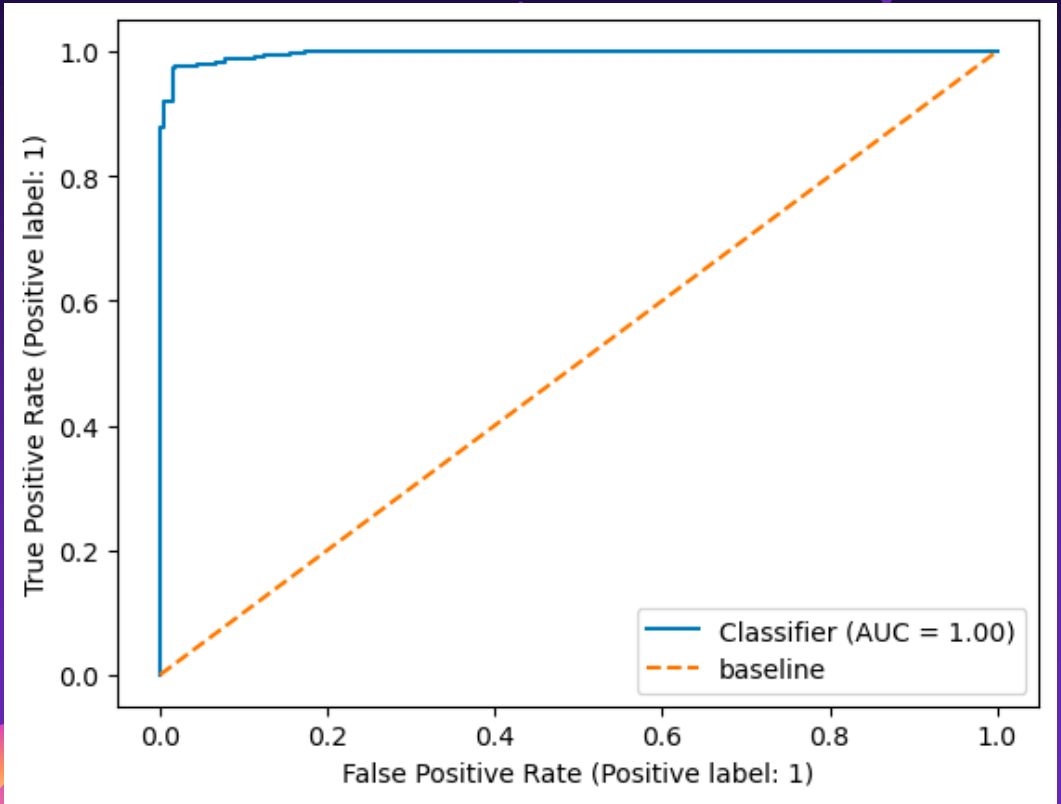
b99	3.041289
nine	2.887422
brooklyn	2.878999
99	2.365311
captain	2.128342
ninenine	2.067835
heist	1.933225
cop	1.774538
magnificent	1.747412
police	1.705123
blank	1.683344
8	1.675029
detective	1.668509
fill	1.651269
tonight	1.628251
quote	1.627586
precinct	1.615997
drink	1.568819
cheddar	1.559990
prison	1.550717

1. There are distinct features from each class.

1. Positive: Class 1
   Negative: Class 0

1. HBO is mentioned but netflix is not.

ROC AUC curve

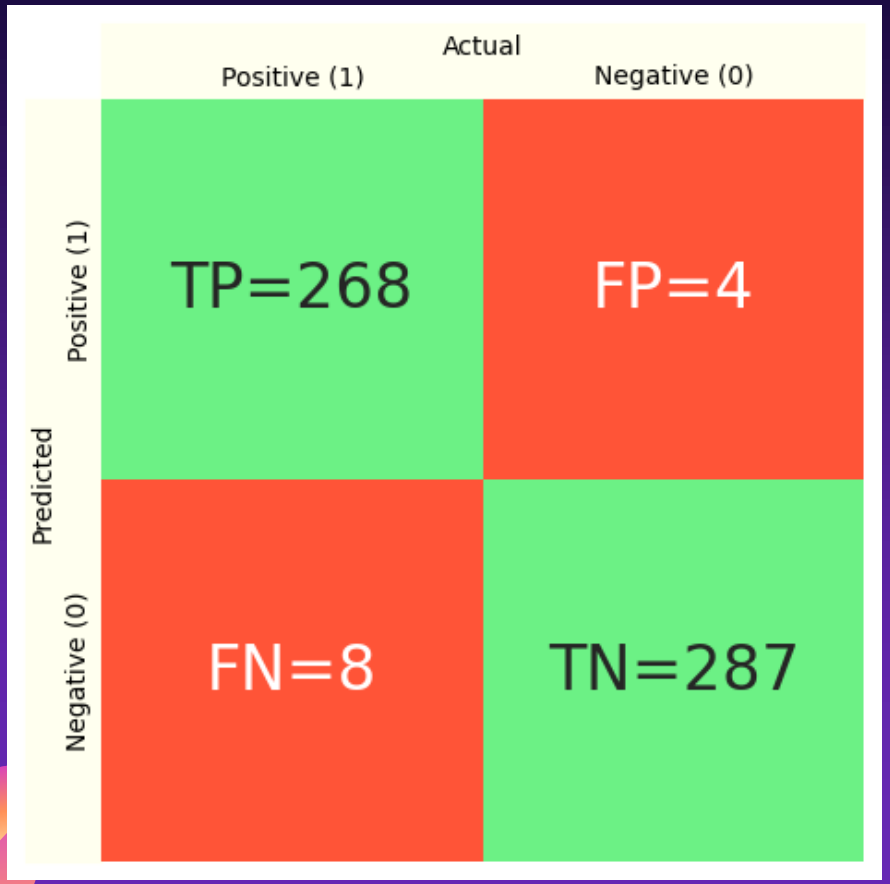


1. The bigger the area under curve, the better our model accuracy.

1. The best score one can get in AUC Classifier is 1.

1. Our best model achieved an accuracy of 0.996, rounded to 1 by machine.

Confusion Matrix



Misclassified posts analysis

- For FP and FN posts, after TF-IDF Vectorisation was carried out, only the word ‘season’ was wrongly classified
- ‘Season’ is in top 30 common words for both sitcoms

04

Product Demonstration

05

Recommendation and Key Insights

Project Goals Revisit:

a. Identify what show elements in the sitcom are popular among the viewers

a. To build an infrastructure that can help to classify and analyse user’s comments about the show from various platforms.

Key Insights

Show Elements

‘Cold Open’
‘Halloween Heist’
‘Potential Sequel’

Hot Topics

Favorite Character
Least Favorite Scene

Character Names

All characters are
repeatedly mentioned

Key Recommendations

In new shows/future seasons,

01

Build Memorable Characters

02

‘Cold Open’ for every episode

03

Periodical events like ‘Halloween Heist’

The characters come with a moment/scene!

Future Work

- Model can be expanded to Multi-Class Classification
- Further collect text inputs from other sources periodically
- To perform further sentiment analysis

06

Key Limitations

Misclassified Words

Predicted as B99 with 51.51% probability.

Caltech

Supersymmetry

Anakin Skywalker

Yoda

Amy

Cheese Cake

Future Work

- Model can be expanded to Multi-Class Classification
- Further collect text inputs from other sources periodically
- To perform further sentiment analysis

Thank you!

Grid Search Results (top 3 out of 4)

CountVectorizer with MultinomialNB

```
Best Hyperparameters: {'cv__max_df': 0.9, 'cv__max_features': 9425, 'cv__min_df': 1, 'nb__alpha': 0.5,
'nb__fit_prior': False}
Best training accuracy: 0.881232132647227

 Test set accuracy score for best params: 0.9065255731922398
```

TfidfVectorizer with MultinomialNB

```
Best Hyperparameters: {'nb__alpha': 0.5, 'nb__fit_prior': True, 'tf__max_df': 0.9, 'tf__max_features':
9425, 'tf__min_df': 1}
Best training accuracy: 0.8797284162378503

 Test set accuracy score for best params: 0.9206349206349206
```

TfidfVectorizer with LogisticRegression

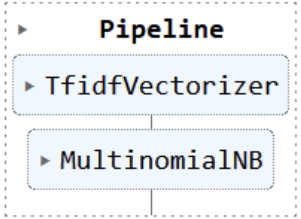
```
Best Hyperparameters: {'lr__C': 1.0, 'lr__penalty': 'l2', 'lr__solver': 'liblinear', 'tf__max_df': 0.9,
'tf__max_features': 5000, 'tf__min_df': 1}
Best training accuracy: 0.8736821040594627

 Test set accuracy score for best params: 0.9065255731922398
```

Final models (parameters taken from grid search)

CountVectorizer

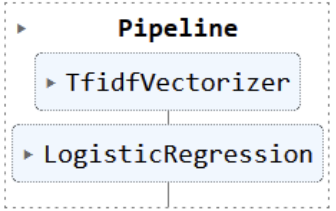
	precision	recall	f1-score	support
	0.89	0.91	0.90	265
	0.92	0.90	0.91	302

MultinomialNB with TfidfVectorizer



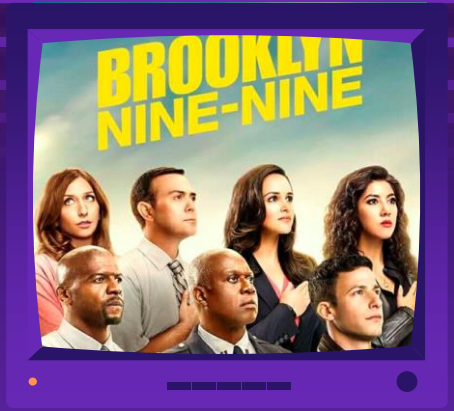
	precision	recall	f1-score	support
0	0.90	0.93	0.92	265
1	0.94	0.91	0.92	302

Logistic Regression with Tf



	precision	r
0	0.95	
1	0.88	

Meet the production team



Show Classifier

Classifies the show

Sentiment Analysis

Analyse Sentiments

END