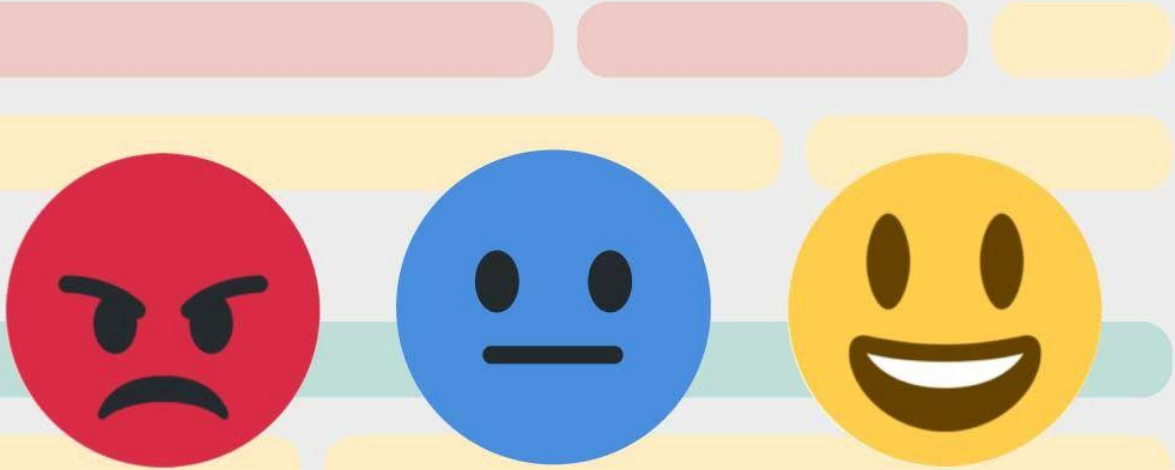
Sentiment Analysis



Overview

1. Problem Statement
2. Data Information
3. Frequency Analysis
4. Machine Learning Modeling (Classifiers)
    a. Preprocessing
    b. Model Evaluation and Optimization
5. Machine Learning Modeling (BERT)

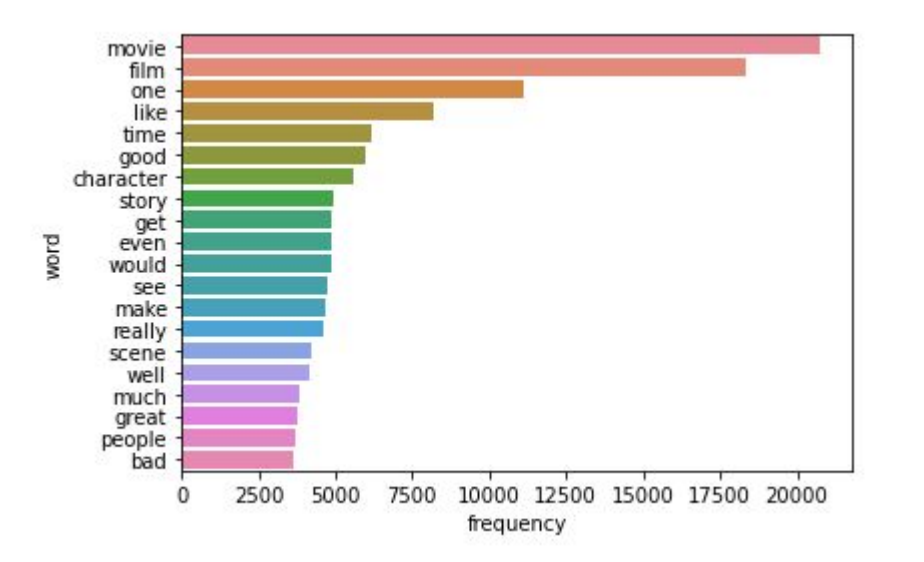
Problem Statement

IMDB wants to deeply analyze the movie review and figure out whether the review contains negative or positive sentiment.

Dataset: IMDB_Dataset.csv

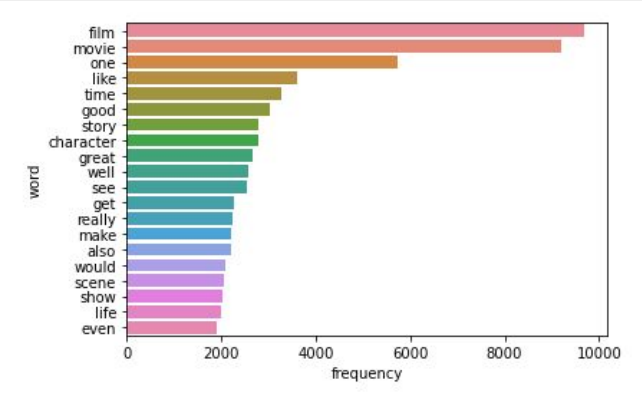
- The file has 2 columns with 50,000 observations.
- Data doesn’t have any missing values.
- Dependent Variable will be ‘sentiment’ variable.
- Independent Variable will be ‘review’ variable.

Frequency Analysis
Both Positive and Negative Sentiment

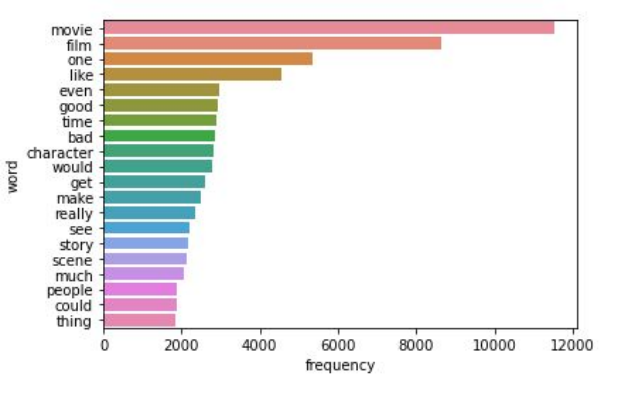


Top 2 mentioned words are ‘movie’ and ‘film’.
Since it includes both positive and negative reviews, chart presents both words ‘good’ and ‘bad’.

Frequency Analysis
Each Positive and Negative Sentiment



Positive Sentiment
Word ‘bad’ disappeared.



Negative Sentiment
On the other hand, the frequency chart for only negative review still has word ‘good’. This means that even though sentiment of review is negative, many reviewers still use the word ‘good’.

Machine Learning Model (Classifiers)
Step by Step

Data Subset & Data Cleaning	Modeling	Model Evaluation
The whole observation is 50,000. Since it took so long to train the dataset, I initially subset 10,000 observation samples to train and test the model.	I used two different natural language processing techniques (CountVectorizor and TFIDF) with multiple classifiers.	I chose f1 score as a measurement because it's the harmonic mean of precision and recall and is a better measure than accuracy.

Machine Learning Model (Classifiers)
Model Evaluation

	Cleaned	Model	F1 Mean	F1 Std	Time
0	Yes	KNeighborsClassifier(n_neighbors=3)	0.730401	0.016725	8.675263
1	Yes	RandomForestClassifier()	0.838274	0.013113	105.164559
2	Yes	XGBClassifier(base_score=None, booster=None, c...	0.834534	0.007772	187.428415
3	Yes	AdaBoostClassifier()	0.792533	0.013028	114.361226
4	Yes	GradientBoostingClassifier()	0.812637	0.010069	297.003249
5	Yes	LogisticRegression()	0.873159	0.010611	4.780288
6	Yes	MultinomialNB()	0.859104	0.008988	0.275744

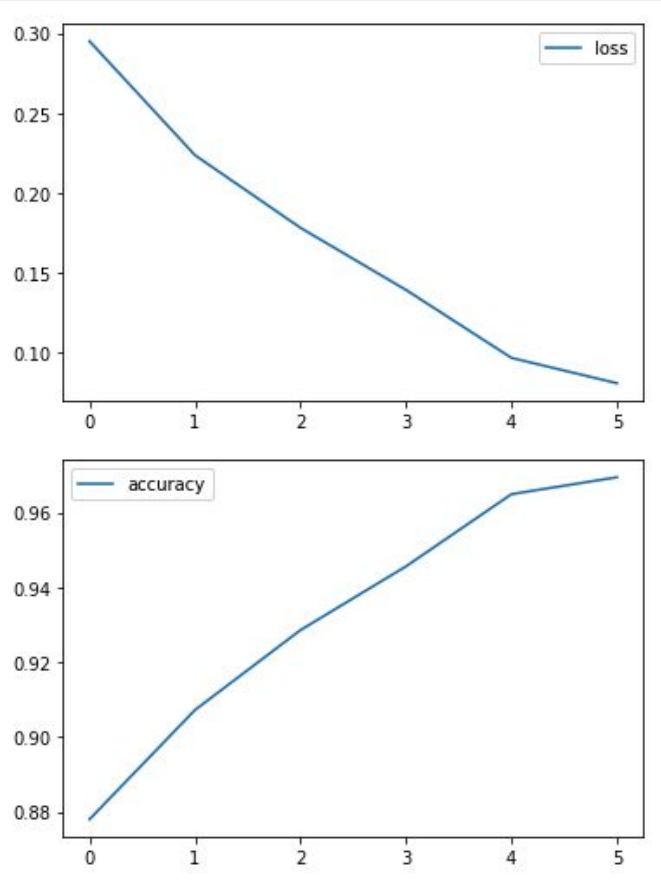
BERT

What is BERT?

BERT uses bidirectional capability which interprets contexts and ambiguity very well by using pre-trained text from wikipedia.

How was BERT result?

Both F1 score and accuracy reach to the 96% with loss less than 10%.



Conclusion

1. Logistic Regression classifies very well among the classifiers with TF-IDF technique. F1-Score after k–fold cross validation was about 87%.
2. The results of before and after cleaning were same. However, training cleaned dataset was much faster than not cleaned dataset.
3. BERT improves f1 score about 8%.