Detecting Fake News

Prepared by Ji Hoon Chung

Overview & Business Problem

Client : Social Network Platforms (Facebook, Twitter, LinkedIn, etc.)

We are living in an unprecedented era where we are easily being exposed to tons of news on social media which we did not intend to spot.

From juveniles to mature adults with higher degrees of education, fake news could easily deprive their factual senses and having them fallen down to imperfect beliefs.

My mission is to bring a machine learning model to detect Fake News to prohibit their exposure to public.

Data Exploration

Dataset is obtained from: <u>https://drive.google.com/file/d/1er9NJTLUA3gnRuyhfzuN0XUsoIC4a-_g/view</u>
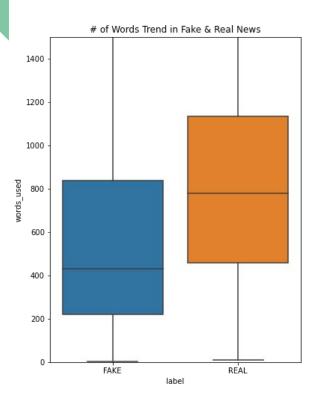
Dataset contains: 6,335 Rows of Data containing 3,171 REAL vs. 3,164 FAKE News. (Class is almost perfectly balanced) - Mostly Political Articles.

Dataset is re-touched as below for model building:

1. Title & Text were combined. (Original Text)
2. Original Text was Lemmatized.
3. Original Text was Stemmed.
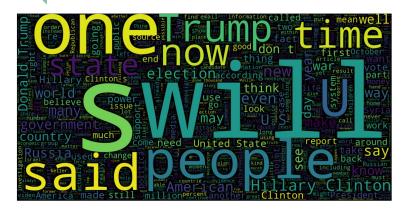4. Class was resampled to 0.17:1.0 FAKE to REAL News ratio for testing.

So for each model I built, performance was evaluated against all **3 types of texts above.**
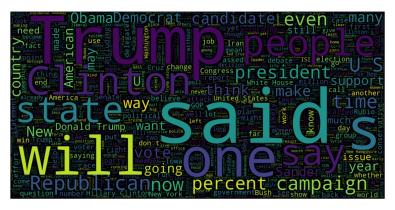
Data Exploration

# of Words Trend in Fake & Real News

Generally, it is shown that FAKE news is shorter in terms of its length compared to REAL news.

Data Exploration

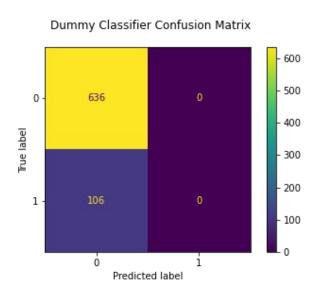FAKE

REAL
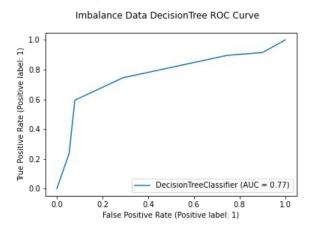
- Not a drastic difference between FAKE vs REAL News.
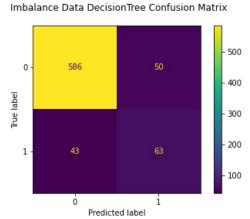- Many of the words were related to politics.

Model #1 - Dummy Classifier Model

Dummy Classifier Confusion Matrix

- Accuracy: 0.86
- Weighted AVG F-1 Score: 0.79

Class was re-sampled with 0.17 : 1 (FAKE vs. REAL) ratio.
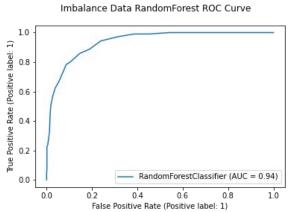
Model # 2 - Decision Tree Classifier Model

Imbalance Data DecisionTree ROC Curve

Imbalance Data DecisionTree Confusion Matrix
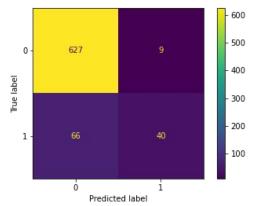
- Accuracy: 0.87
- Weighted AVG F-1 Score: 0.87
- Original Text TFIDF Vectorizer

Class was re-sampled with 0.17 : 1 (FAKE vs. REAL) ratio.

Model # 3 - RandomForest Classifier Model

Imbalance Data RandomForest ROC Curve

Imbalance Data RandomForest Confusion Matrix
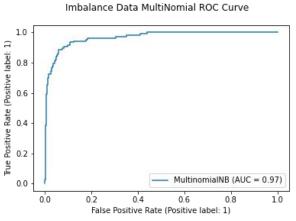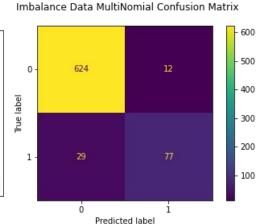
- Accuracy: 0.89
- Weighted AVG F-1 Score: 0.89
- Original Text TFIDF Vectorizer

Class was re-sampled with 0.17 : 1 (FAKE vs. REAL) ratio.
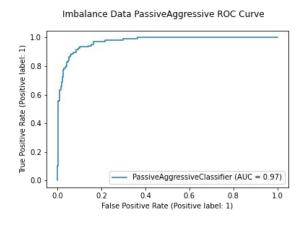
Model # 4 - MultinomialNB Classifier Model

Imbalance Data MultiNomial ROC Curve

Imbalance Data MultiNomial Confusion Matrix
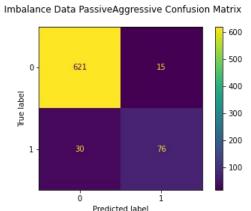
- Accuracy: 0.94
- Weighted AVG F-1 Score: 0.94
- Stemmed TFIDF Vectorizer

Class was re-sampled with 0.17 : 1 (FAKE vs. REAL) ratio.

Model # 5 - PassiveAggressive Classifier Model

Imbalance Data PassiveAggressive ROC Curve

Imbalance Data PassiveAggressive Confusion Matrix

- Accuracy: 0.94
- Weighted AVG F-1 Score: 0.94
- Lemmatized TFIDF Vectorizer

Class was re-sampled with 0.17 : 1 (FAKE vs. REAL) ratio.

Conclusion

Best Model = **MultinomialNB Classifier Model**

Metrics	Score
Accuracy	0.94
Precision	0.87
Recall	0.73
F1-score	0.79

Compared to PassiveAggressive Model:

- Higher Accuracy & F1-Score
- Classified higher # of Fake News
- Classified higher # of Real News
- Lower False Negative

Next Steps

1. Try Unsupervised Learning Models. (Deep Learning)

2. Try Web-Scraping from Fake News sites like Onions and see how well our model performs.

3. Try Web-Scraping from Social Media and see the Fake News Detection Rate.

Thank you!