News headlines on Reddit

Using Data Science to reduce the spread of satire as news

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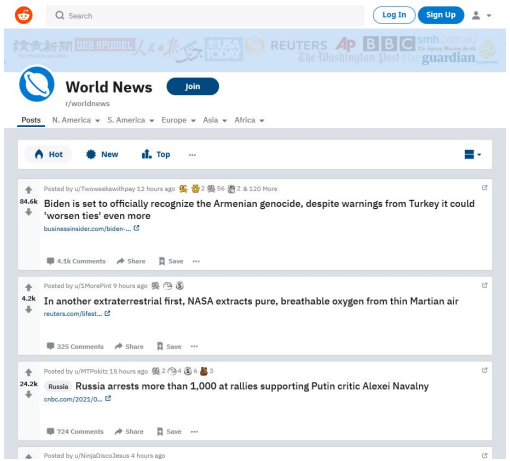
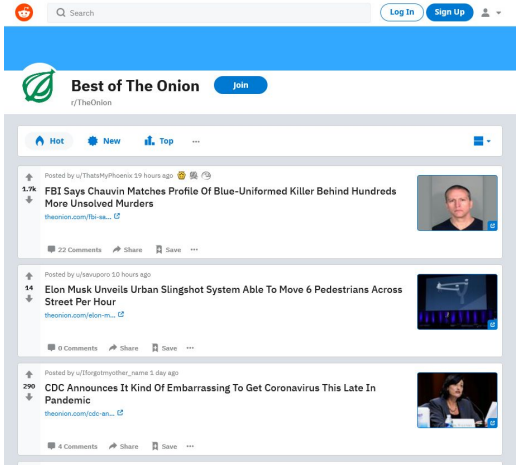
Overview

- Reddit is a social news aggregation and discussion site.
- Consists of many subreddits
- Popular subreddits include WorldNews and TheOnion





Problem Statement

- Fake news and misinformation has become a large feature of social media.
- 59% of links shared on social media have never been clicked
- To combat this recurring issue, we have come up with an algorithm to classify satirical and non-satirical news on Reddit
- Our aim is to reduce the spread of misinformation using machine learning algorithms
- Aim to minimise the rate of incorrect satire predictions

Methodology

- Performed Exploratory Data Analysis
- Transformed words to numbers using CountVectorizer and TfidfVectorizer
  - r/TheOnion stop words added to stopwords list for modeling
- Explore RandomForestClassifier, Naive-Bayes, and Logistic Regression models

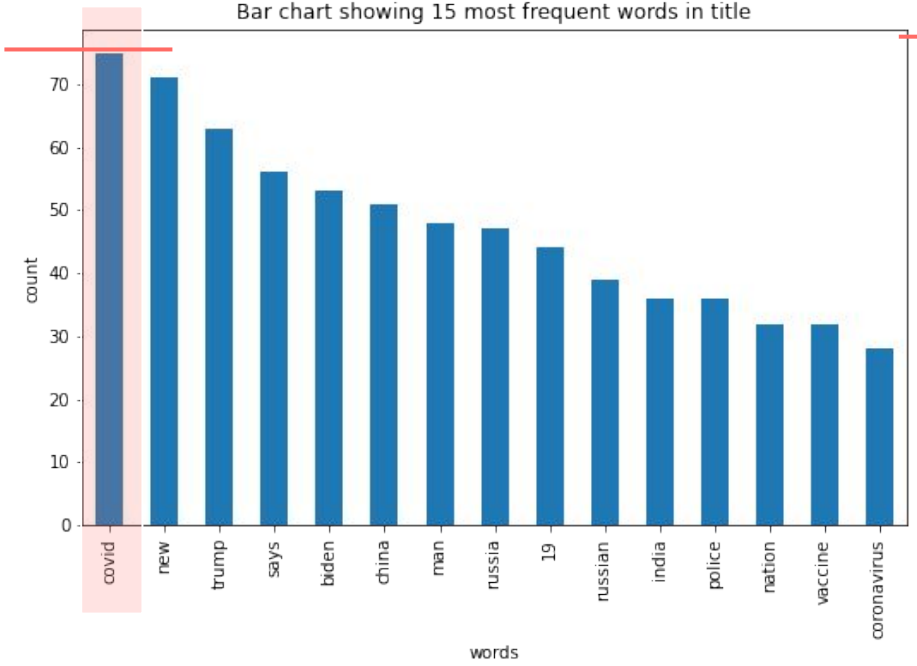
Data Collection and Cleaning

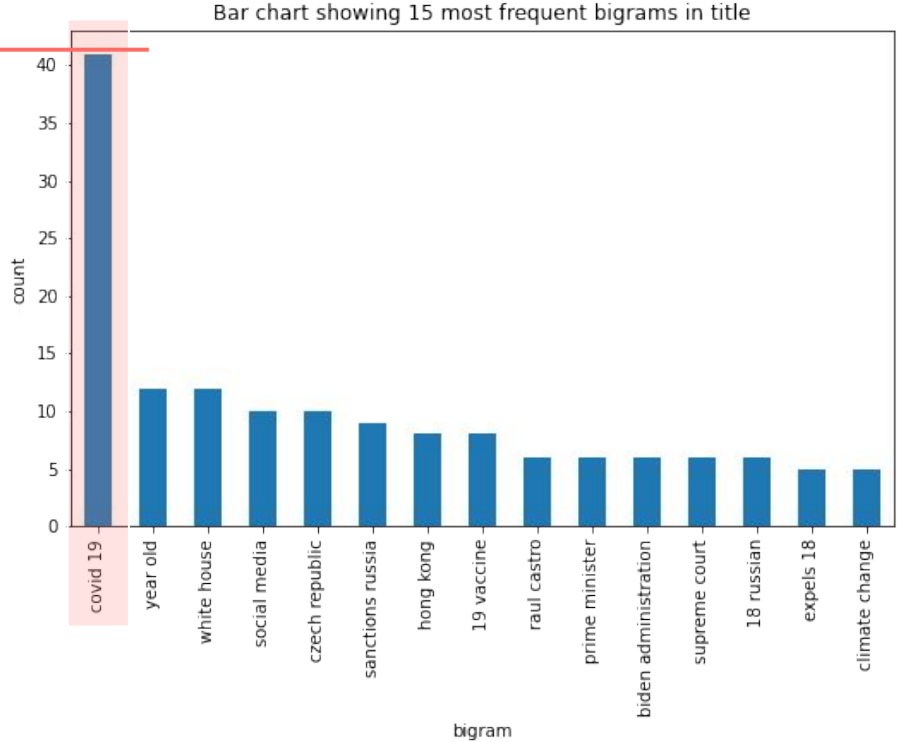
- Using Pushshift's Application Programming Interface (API) to collect posts from r/TheOnion and r/worldnews
- Spam posts removed in collection process
- Posts contained only headlines and links
- Heavy focus on headline analysis in data exploration
- Features for character length and word count created from headlines

General observations

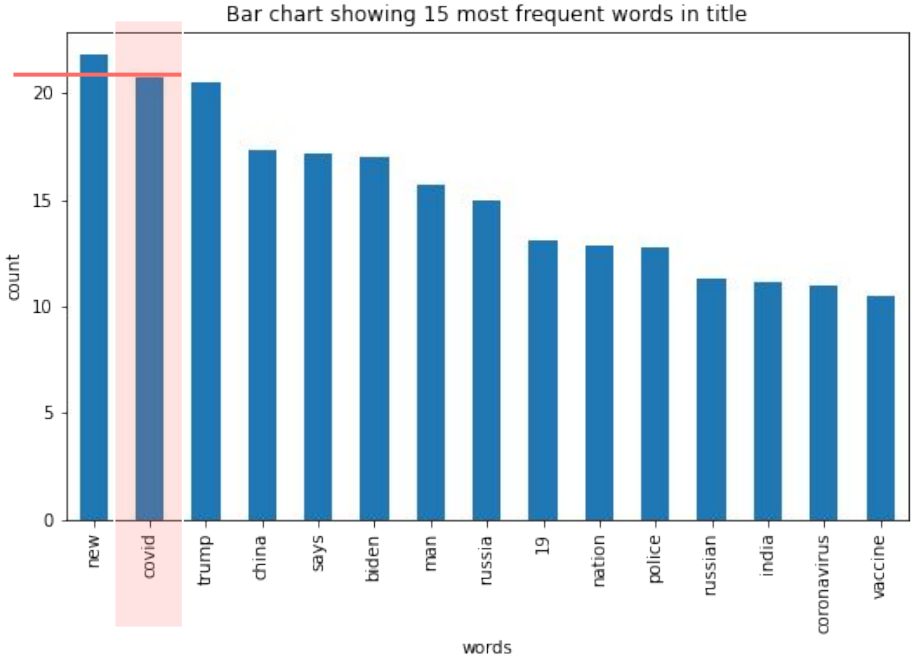
- r/worldnews headlines are from a mix of sources
  - Business Insider, CNBC, Reuters, Newsweek
- r/TheOnion headlines exclusively from The Onion
- Top unigrams and bigrams were related to significant events
- r/TheOnion top words had a heavier emphasis on USA current events
- r/worldnews top words had a wider variety with emphasis on COVID-19

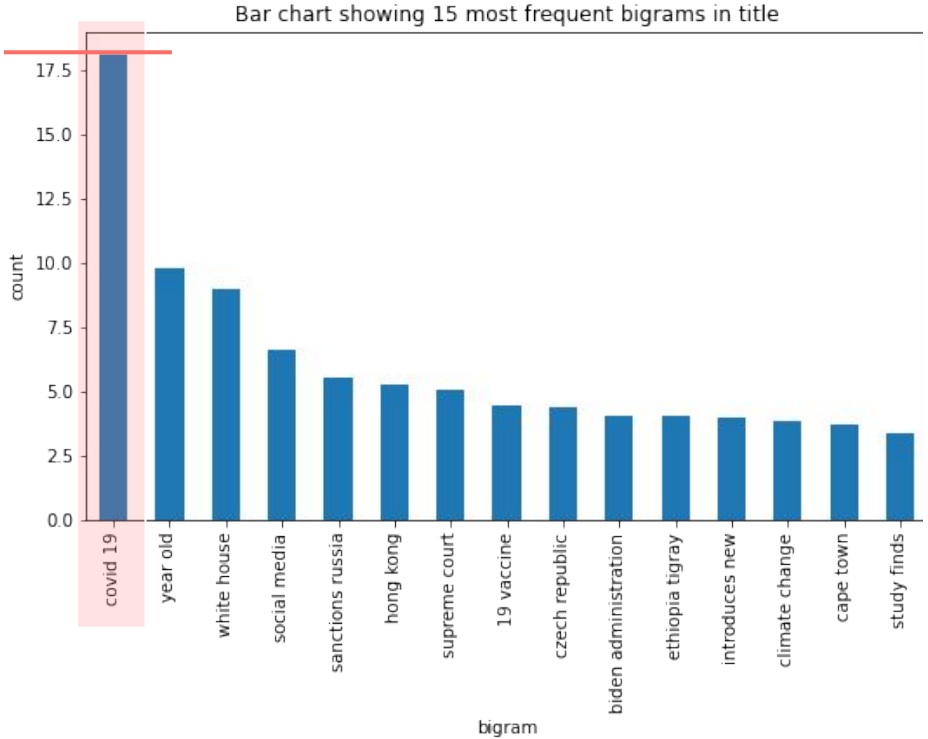
Countvectorizer had a high bias to 'covid'



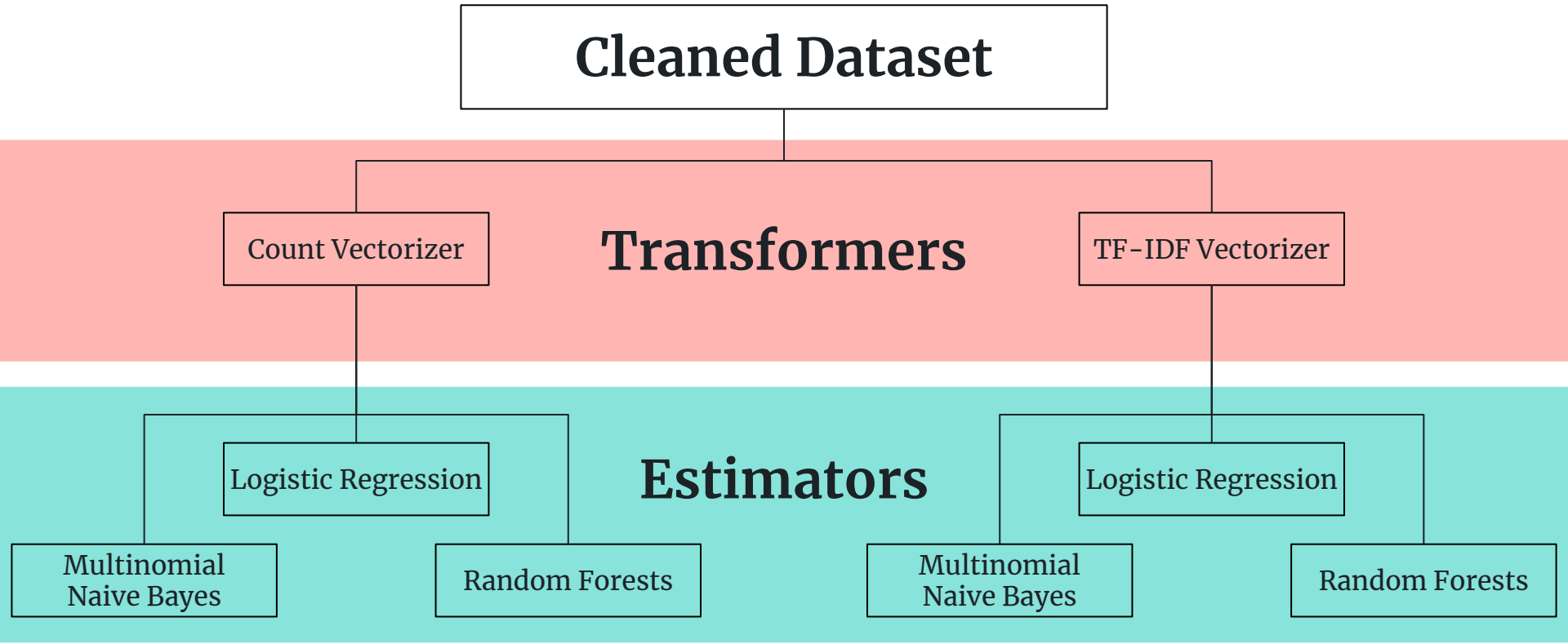


TF-IDF Vectorizer reduced the bias towards ‘covid’





Modelling Workflow



Model Evaluation Metrics

Word & Character Count taken into account

	log	log2	log_gs	log_gs2	tvec_log	tvec_log_gs	nb	tvec_nb	nb_gs	tvec_nb_gs	rf	tvec_rf
BestModelScore	0.860	0.864	0.868	0.871	0.855	0.871	0.862	0.857	0.868	0.865	0.841	0.858
TrainScore	0.924	0.923	0.945	0.948	0.908	0.927	0.892	0.895	0.909	0.914	0.990	0.990
TestScore	0.857	0.860	0.859	0.859	0.853	0.852	0.845	0.845	0.858	0.864	0.836	0.859
TrueNeg	426.000	429.000	427.000	429.000	418.000	421.000	400.000	397.000	400.000	399.000	388.000	420.000
FalsePos	44.000	41.000	43.000	41.000	52.000	49.000	70.000	73.000	70.000	71.000	82.000	50.000
FalseNeg	87.000	87.000	86.000	88.000	83.000	87.000	72.000	69.000	60.000	54.000	68.000	79.000
TruePos	359.000	359.000	360.000	358.000	363.000	359.000	374.000	377.000	386.000	392.000	378.000	367.000
Accuracy	0.857	0.860	0.859	0.859	0.853	0.852	0.845	0.845	0.858	0.864	0.836	0.859
Sensitivity	0.805	0.805	0.807	0.803	0.814	0.805	0.839	0.845	0.865	0.879	0.848	0.823
Specificity	0.906	0.913	0.909	0.913	0.889	0.896	0.851	0.845	0.851	0.849	0.826	0.894
Precision	0.891	0.898	0.893	0.897	0.875	0.880	0.842	0.838	0.846	0.847	0.822	0.880
F1	0.846	0.849	0.848	0.847	0.843	0.841	0.840	0.842	0.856	0.862	0.834	0.851
ROCAUC	0.856	0.859	0.858	0.858	0.852	0.850	0.845	0.845	0.858	0.864	0.837	0.858

- Metrics to optimize are:-
  - Specificity (Reducing False Positives) the closer value is to 1
  - Sensitivity (Reducing False Negatives) the closer value is to 1
  - F1 Score (Balance of Sensitivity and Specificity)
- False Positives refers to posts that are predicted to be news, but is actually satire.
- Important to reduce false positives rather than false negatives as it is more harmful to incorrectly predict satire as news.

Conclusions and Recommendations

- Logistic Regression model that includes word and character length as features is the recommended as the classification model for satirical and non-satirical news on Reddit
- This model can be improved by including the contents of the linked articles to further increase the specificity scoring
  - This will also ensure that the headlines will not be able to mislead and by-pass the classification model if the linked article is actually a satire piece.
- Collecting more data
  - from other satirical news media that is not purely from The Onion to reduce bias
  - More headlines from both satirical and official news sources
- Ideally, we want optimize for both specificity and sensitivity to decrease the both the false positives and false negatives