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# A Machine Learning Modelling Approach to Detect Fake News in Online Social Network

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**ABSTRACT:** This Project comes up with the applications of NLP (Natural Language Processing) techniques for detecting the 'fake news', that is, misleading news stories that comes from the non-reputable sources. Only by building a model based on a count vectorizer (using word tallies) or a (Term Frequency Inverse Document Frequency) tf-idf matrix, (word tallies relative to how often they're used in other articles in your dataset) can only get you so far. But these models do not consider the important qualities like word ordering and context. It is very possible that two articles that are similar in their word count will be completely different in their meaning. The data science community has responded by taking actions against the problem. There is a Kaggle competition called as the "Fake News Challenge" and Facebook is employing AI to filter fake news stories out of users' feeds. Combatting the fake news is a classic text classification project with a straightforward proposition. Is it possible for you to build a model that can differentiate between "Real" news and "Fake" news? So a proposed work on assembling a dataset of both fake and real news and employ a Naive Bayes classifier in order to create a model to classify an article into fake or real based on its words and phrases.

## I. INTRODUCTION

These days' fake news is creating different issues from sarcastic articles to a fabricated news and plan government propaganda in some outlets. Fake news and lack of trust in the media are growing problems with huge ramifications in our society. Obviously, a purposely misleading story is "fake news" but lately blathering social media's discourse is changing its definition. Some of them now use the term to dismiss the facts counter to their preferred viewpoints. The importance of disinformation within American political discourse was the subject of weighty attention, particularly following the American president election. The term 'fake news' became common parlance for the issue, particularly to describe factually incorrect and misleading articles published mostly for the purpose of making money through page views. In this paper, it is seemed to produce a model that can accurately predict the likelihood that a given article is fake news. Facebook has been at the epicenter of much critique following media attention. They have already implemented a feature to flag fake news on the site when a user sees it; they have also said publicly they are working on to distinguish these articles in an automated way. Certainly, it is not an easy task. A given algorithm must be politically unbiased – since fake news exists on both ends of the spectrum – and also give equal balance to legitimate news sources on either end of the spectrum. In addition, the question of legitimacy is a difficult one. However, in order to solve this problem, it is necessary to have an understanding on what Fake News is. Later, it is needed to look into how the techniques in the fields of machine learning, natural language processing help us to detect fake news.

## II. LITERATURE SURVEY

A literature review is a text of a scholarly paper, which includes the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic. Literature review are the secondary sources and do not report new or original experimental work.



**Title:** Parallelizing word2vec in shared and distributed memory

**Author Name:** S. Ji, N. Satish, S. Li, P. Dubey

**Year Of Publish:** 2016

**Related work:**

Word2Vec (Word to Vector) processes natural language by calculating the cosine similarity. However, the serial algorithm of original Word2Vec fails to satisfy the demands of training of corpus text because of the explosive growth of information. It has become the bottleneck owing to its comparatively low processing efficiency. The High Performance Computing (HPC) specializes in improving the calculation efficiency; therefore, the training efficiency of corpus texts can be greatly improved by parallelizing Word2Vec algorithm. After analyzing the characteristics of the Word2Vec algorithm in detail, we design and implement a parallel Word2Vec algorithm and use it to train corpus text on HPC. Furthermore, the corpus texts of different sizes are collected and trained, and the speed-up ratio is calculated by using the serial algorithm and parallel algorithm of Word2Vec, respectively. The experimental results show that there is a higher speed-up ratio when using the Word2Vec parallel algorithm running on HPC

**Title:** Optimal network modularity for information diffusion

**Author Name:** A. Nematzadeh, E. Ferrara, A. Flammini, Y. Y. Ahn

**Year Of Publish:** 2014

**III. PROPOSED SYSTEM**

In the existing system, they classify the news, only based on the content related n-grams and shallow part-of-speech, it's hard to prove that a news is fake or not by analysing the tagging, even if the news is genuine it is detected as fake news .it seems to be very complicated when a genuine news is published on the social media failed to classify the valuable news. In this project a model is build based on the count vectorizer or a tf-idf matrix can help . Since this problem is a kind of text classification, implementing a Naive Bayes classifier will be best as this is standard for text-based processing. The actual goal is in developing a model which was the text transformation (count vectorizer vs tf-idfvectorizer) and choosing which type of text .Now the next step is to extract the most optimal features for count vectorizer or tf-idfvectorizer, this is done by using a n-number of the most used words, and/or phrases, lower casing or not, mainly removing the stop words which are common words such as “the”, “when”, and “there” and only using those words that appear at least a given number of times in a given text dataset.

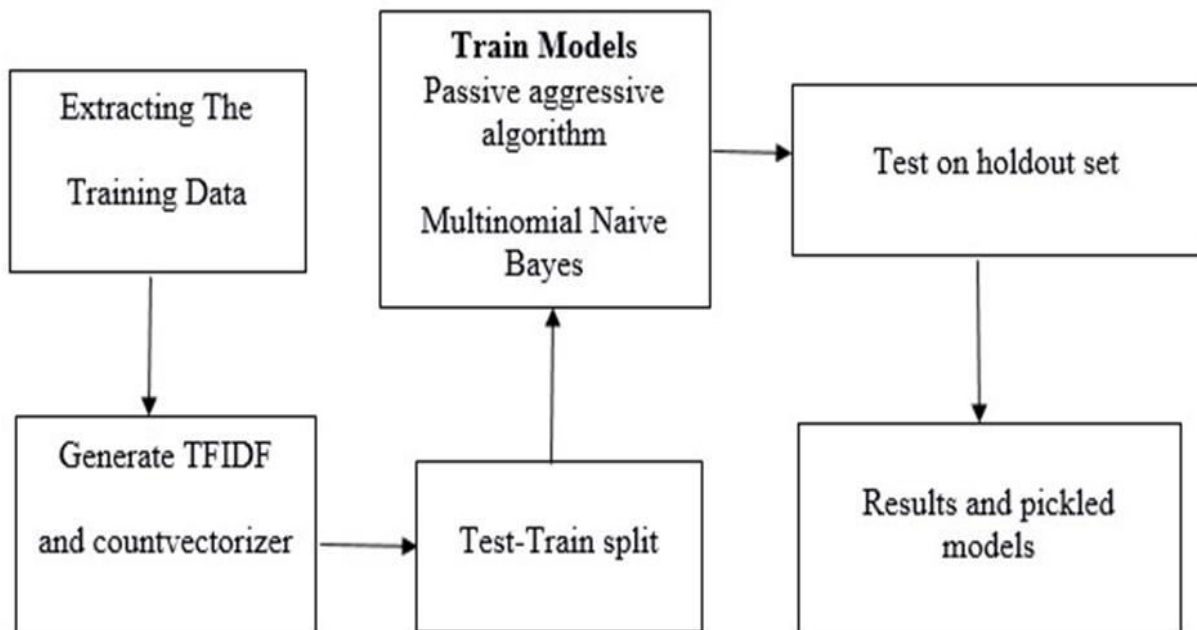


Figure 1:Architecture Diagram



**Data Pre-processing**

This file contains all the pre-processing functions needed to process all input documents and texts. First we read the train, test and validation data files then performed some pre-processing like tokenizing, stemming etc. There are some exploratory data analysis is performed like response variable distribution and data quality checks like null or missing values etc.

**Feature Extraction**

In this file we have performed feature extraction and selection methods from sci-kit learn python libraries. For feature selection, we have used methods like simple bag-of-words and n-grams and then term frequency like tf-idf weighting. We have also used word2vec and POS tagging to extract the features, though POS tagging and word2vec has not been used at this point in the project

**Classification**

Here we have built all the classifiers for predicting the fake news detection. The extracted features are fed into different classifiers. We have used Naive-bayes, Logistic Regression, Linear SVM, Stochastic gradient decent and Random forest classifiers from sklearn. Each of the extracted features were used in all of the classifiers. Once fitting the model, we compared the f1 score and checked the confusion matrix. After fitting all the classifiers, 2 best performing models were selected as candidate models for fake news classification. We have performed parameter tuning by implementing GridSearchCV methods on these candidate models and chosen best performing parameters for these classifier. Finally selected model was used for fake news detection with the probability of truth. In Addition to this, we have also extracted the top 50 features from our term-frequency tfidfvectorizer to see what words are most and important in each of the classes. We have also used Precision-Recall and learning curves to see how training and test set performs when we increase the amount of data in our classifiers.

**Prediction**

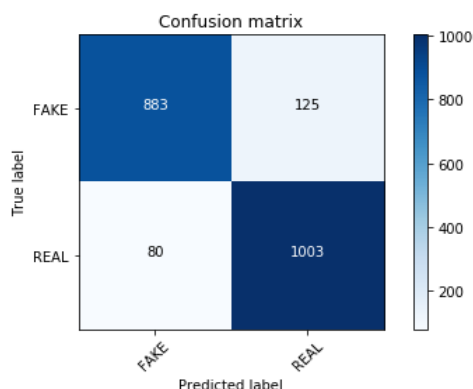
Our finally selected and best performing classifier was algorithm which was then saved on disk with name final\_model.sav . Once you close this repository, this model will be copied to user's machine and will be used by prediction.py file to classify the fake news. It takes a news article as input from user then model is used for final classification output that is shown to user along with probability of truth.

**IV. EXPERIMENTAL RESULTS**

```
In [34]: clf = MultinomialNB(alpha=.01)

In [35]: clf.fit(hash_train, y_train)
pred = clf.predict(hash_test)
score = metrics.accuracy_score(y_test, pred)
print("accuracy: %0.3f" % score)
cm = metrics.confusion_matrix(y_test, pred, labels=['FAKE', 'REAL'])
plot_confusion_matrix(cm, classes=['FAKE', 'REAL'])

accuracy: 0.902
Confusion matrix, without normalization
```



**Figure 2: Mutinomial**



## V. CONCLUSION

The primary aim of the research is to identify patterns in text that differentiate fake articles from true news . We extracted different textual features from the articles using an LIWC tool and used the feature set as an input to the models. The learning models were trained and parameter-tuned to obtain optimal accuracy. Some models have achieved comparatively higher accuracy than others. We used multiple performance metrics to compare the results for each algorithm. The ensemble learners have shown an overall better score on all performance metrics as compared to the individual learners

## FUTURE ENHANCEMENTS

The project can be further enhanced where random forest algorithms can be combined with other machine learning algorithms like Naïve Bayes and see how well the model predicts. Instead of the count vectorizer and Term Frequency Inverse Document Frequency vectorizer , we can use some other vectorizer and extract the essential features

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