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Implementing a Hybrid method For Fake News Detection

ABSTRACT

The increasing consumption of news on social media platforms is mainly due to its cheap and attractive nature and it's capable of spreading the fake news. The spread of fake news has negative effects on society. Some people make it up to get attention or gain political gain. Machine learning and deep learning techniques have been developed to detect fake news. However, they tend to generate inaccurate reports. To detect fake news, we used a Hybrid model that combines SVM and Naive Bayes (NBSVM) framework. It was able to classify the news with an accuracy of 84.85%. This model was tested and trained on a fake news challenge dataset. We used various evaluation metrics (precision, recall, F1- measure, etc.) to measure the model's efficiency.

Key words: Fake news Data mining, Naïve Bayes, SVM, NBSVM

1. INTRODUCTION

The rapid emergence and evolution of the internet has greatly contributed to the modern life. There is no denying that technology has made our lives easier and access to a wealth of information more feasible. [1]

The dissemination of information on various platforms such as social media has become the main source of news consumption for a young generation. Although social media has become more appealing compared to other traditional news sources, it is still inferior to other news sources. According to a survey conducted in 2016, around 62% of the people who consume news on social media outlets are unaware of the fact that there are no source of information available to them from where they can verify the news authenticity. It can also affect their ability to distinguish legitimate news from fake news. Even though the issue of fake

News is not a new one, detecting it is still very challenging or it is also because humans have tendency to get attractive towards negativity. The social media platforms have allowed the circulation of all kinds of misinformation and questionable news content. According to a survey conducted by Facebook, around 50% of its users are likely to visit a fake news site and 20% are likely to visit a genuine website. The findings reveal that the majority of users are more likely to visit a fake news site than a real one. Due to the nature of social media platforms, fake news Stories can easily spread across platforms and increase users' credibility. [2]

Unlike spams, fake news has significant differences when compared to traditional suspicious information, [3], [4] These differences include (1) the impact on society, the dissemination of fake news through social media networks, and the lack of a sense of correctness when it comes to news sources, (2) Audiences' initiative: users can get news updates and share them with their social networks without knowing whether it is correct or not and (3) identification difficulty: By comparison, regular emails are usually easier to identify spams. However, distinguishing fake news with erroneous content is harder since there are no similar articles available.

You can also prevent yourself from getting affected by fake news by following these simple steps. The first one is to determine if the source is legitimate or not. The second one is to read the article more than once to see if it gets attention. With the help of artificial intelligence, machine learning technology, we can easily detect fake news reports. This technology can also improve our classification problems [5]. We collect the social engagements data of our users. However, the data is incomplete and cluttered. Our main goal was to find a way to extract useful feature from the data.

Data mining is a process of extracting information from large amounts of data. It is a tool used to identify the hidden and crucial details from the data. Classification is a technique utilized in Data mining to identify the objects in a given set of data. It does so by estimating the label that will be assigned to the given object [6]. This method is divided into two parts. The first one is data training, and the second one is testing the data to see if it's related to the new object.

Understanding how to detect fake news on social media has become an evolving research area. There are various facets involved in this area.

- Application Oriented
- Data Oriented
- Model Oriented
- Features Oriented

Computational machine learning techniques have proven useful in this domain where data volumes outnumber human analysis abilities.

This paper presents a simple and effective way to detect fake news through the combination of the machine learning algorithms Naive Bayes and SVM. It can be easily applied to various social platforms like Facebook. This technique can be used to identify fake news by analyzing the latest news stories on social media platforms. Recent studies have shown that humans can identify fake news reports and other fake news in 65% of cases. The same a simple machine learning algorithm can identify over 75% of cases. And improved algorithm or little complex can give up results up to 80% [15].

The paper is organized into six sections. Section 2 is a review of related work. Section 3 presents the dataset analysis. Section 4, illustrates the methodology. Section 5 discusses the outcomes of our experiments. Section 6 concludes with conclusions and future work.

2. RELATED STUDIES

In machine learning, a number of experiments have been conducted to identify fake news. B. M. Amine, A. Drif and S. Giordano [7] the approach taken to identify fake news is through a deep convolutional neural network. This method works by building a model using multiple CNN-based models.

R. K. Kaliyar et al. [8] and they have used a multiclass fake news dataset to study the classification of news reports as false or real. The results of their study show that there is a lack of literature on multiclass estimation. Due to the complexity of problems with the binary class dataset, they decided to use a gradient boosting with advance feature. This method fits well to multi-class datasets.

In this paper, J. Lin et al [9] have proposed a machine learning model that is based on a long-term memory (LSTM) and is focused on attention-based learning. Attention-based learning model with LSTM are used to counter the issue, other models also have based as performance measure.

Ye-Chan-Ahn, Chang-Sung Jeong [10] A technique to counter fake news is proposed that takes advantage of the advantages of both CNN and LSTM, by using self-attention and feed-forward mechanisms they created transformer network.

Liang Wu and Huan Liu [11] argue that the classification of messages does not find the messages that are not appropriate and are not trusted on social media. And proposed method for detecting messages in social media. It uses the proposed LSTM-RNN Classification model.

Ahmed, Hadeer, Issa Traore, and Sherif Saad [12] Different techniques for extracting attributes from machine learning models have been studied and presented. These techniques can be used to improve the efficiency of various models. Their goal was to identify fake news sources and false feedback.

Hadder Ahmed's [13] study on the spread of fake news revealed how it caught the youngsters' attention mainly due to the fact that it was only available on social media platforms. He used Ngram analysis to identify the source of the misinformation. By using various feature extraction technique and proposed model such unigram feature and svm is able to achieve 92% accuracy.

XinYi Zhou [14] has proposed a method to detect fake news on social platforms. His model has achieved an accuracy of up to 88% on applying content-based, propagation-based and hybrid fake news detection. The fake news has become a sensation. It has replaced the real news with short words and less content.

3. METHODOLOGY

This presents our methodology design and details,

3.1 Dataset Analysis

Dataset Description

Data is gather from kaggle data world and has four columns, which are index, title, author, text and label. It contains 20800 samples, in which label 0 consist of 10413 samples and label 1 consists of 10387 samples.

- id: id for a news article,
- title: the heading of a news article,
- author: author of the news article,
- text: the text of the article,
- label: It marks the article as fake (1) or real (0).

Dataset Pre-processing

To split the data of the test and train sets, the sklearn train-test split function was used. Where the train set is used for training and the test set is used for testing. The columns title, Author, text, and label are used. The label is a dependent variable. Because the title words are repeated in the text column, there isn't much of a difference in accuracy scores when titles plus text or Title + Author are used instead of text.

3.2 System Design

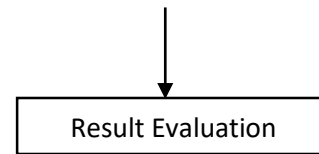
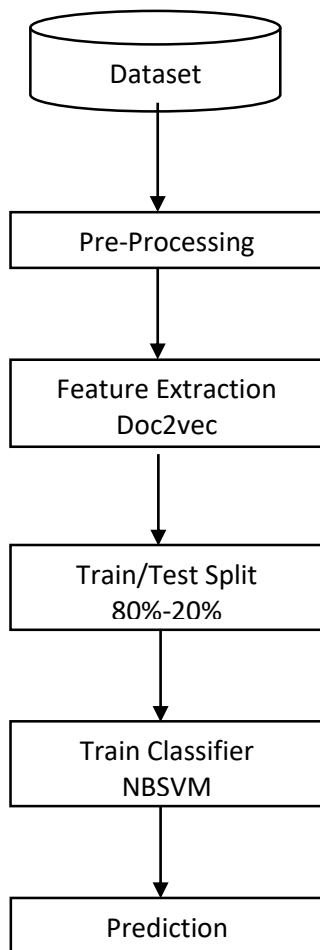


Figure 1 :Block Diagram

3.3 Pre-processing

In the pre-processing phase, we have removed the punctuations and stop-words that are the most common terms in a language. We use regular expressions to replace these words. In addition, we have applied a lemmatization process to bring words into their base form, so there are no repetition of words.

3.4 Tokenization

We have also implemented a tokenization technique which splits a given text into smaller pieces known as tokens. We then create sequences with a vocabulary of 130916.

3.5 Feature Extraction

We need a way to represent documents that we can mathematically modify to deduce the latent structure in our corpus. One technique is to represent each text as a function vector. We are using Doc2vec model technique for that purpose.

- Doc2vec: Create a vectored representation of a group of words taken collectively as a single unit

3.6 Validation method

To select the best possible models and parameters for our dataset, we used cross validation methods. The training dataset consists of 80% training data and the remaining 20% is used for testing. We used k-fold cross validation which have given us an accuracy of 84%.

4. NBSVM (NAÏVE BAYES - SVM) CLASSIFIER

Basically, this model takes a linear model (such as SVM or logistic regression) and incorporates Bayesian probabilities. Instead of using word count features, log-count ratios are used to classify text (15).

NB (D, S) where D= Documents and S= set of all possible target values

1. Compile a list of all terms that occur in D
2. Vocabulary \leftarrow all unique words features in D
3. Calculate the $p(S_j) \& p(W_k/S_j)$
4. For each target value S_j in S do
5. $Docs_j \leftarrow$ subset of D for which the target value is S_j
6. $P(S_j) \leftarrow \frac{|Docs_j|}{|D|}$
7. $Text_j \leftarrow$ a single document prepared by joining all members of $docs_j$
8. $N \leftarrow$ total no. of words in $Text_j$
9. For each word W_k in Vocabulary
 - o $N_k \leftarrow$ no. of times word W_k occurs in $Text_j$
 - o $P(W_k|S_j) \leftarrow \frac{nk+1}{n+|Vocabulary|}$

Log count ratio:

10. $r = \log \frac{\text{ratio of word } w \text{ in class 1}}{\text{ratio of word } w \text{ in class 0}} = \log \left(\frac{p/|p|}{q/|q|} \right)$
11. $x_nb = D.\text{multiply}(r)$

SVM (x_nb, v)

12. SVM constructs a Hyperplane
 $w \cdot x + b = 0$
13. The distance between the sets is maximized, by minimizing
14. $\phi(w) = \frac{1}{2} \|w\|^2 = \frac{1}{2} (w \cdot w)$

5. RESULT EVALUATION

Our model was trained with 80% data. It performed well on the fake news dataset. On the fake news dataset, the model's accuracy, precision, recall, and F1-measurement were evaluated. The entire experiment is run on a python setup with an Intel Core TM i5-2410M processor, 8GB of random access memory, and a 500GB hard drive running

on Windows 10. The model's performance is good, as we can see. The findings demonstrated that our algorithm is of high quality and can be used to identify fake news. We outline our empirical results in Table 1.

Table 1: Result

Data	Feature extraction method	Accuracy	Precision	Recall	F1-score
Text only	Doc2vec	84.41	81	83	82
Title only	Doc2vec	57.26	56	57	56
Text + Title	Doc2vec	83.45	81	83	82
Text + Author	Doc2vec	84.08	81	82	81
Text + Title + Author	Doc2vec	84.85	82	84	83

6. CONCLUSION

Fake news issues have gotten a lot worse in recent years, especially in politics. A model for detecting fake news was proposed in this research using NBSVM classification model by merging of Naïve Bayes and SVM model. To conduct the fake news identification, we used several information (text, title, and author). As a consequence, the model's accuracy with text, title, and Author input has achieved its pinnacle. The highest accuracy score is 84.85%.

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