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MACHINE LEARNING APPROACH FOR FAKE NEWS DETECTION IN TWITTER USING VADER ALGORITHM

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Abstract

Intense news flash from social media is becoming increasingly popular nowadays. Social media brings benefits to users due to the inherent nature of fast dissemination, cheap cost, and easy access. In the last year's big social networks like Facebook or Twitter admit that on their networks are fake and duplicate accounts, fake news, and fake likes. With these accounts, their creators can distribute false information, support, or attack an idea, a product, or an election candidate, influencing real network users in deciding. Detecting fake news becomes very important and increasing attention due to the detrimental effects on individuals and the society. In our work, we present our system build with the aim of identifying fake news in the Twitter social network.

Keywords: Naïve Bayes Classifier, VADER, NLP, TF-IDF.

I. INTRODUCTION

The information that we procure from the Internet and the Web cannot be relied on. Over the past few years spreading of rumors and fake information has reached a tipping point so much so that it has begun to affect social issues and political problems as well. Online news has the power to influence millions of people, but there are no ways to establish what it is true and what it is false. We might guess what common sense says it's true, but sometimes we might just need some impartial, trustable news source. Due to lack of constant supervision and an overseeing authority has allowed the wrongdoers to run amok and spread false information. Fake news is the deliberately falsified news which is sent out to fool people and make them believe in otherwise false information. This disinformation may be spread to re-establish popularity or just for fun. In either case we need to figure out an effective way to identify fake and falsified information and prevent it from spreading further. Hence in our project we focused on the detection of fake news on twitter so that it helps to lessen the negative impact on individuals and society.

II. LITERATURE SURVEY

In [1], Amitabha Dey, Rafsan Zani Rafi, Shahriar Hasan Parash, Sauvik Kundu Arko and Amitabha Chakrabarty proposed Fake News Pattern Recognition using Linguistic Analysis. In this paper, they discussed the computational linguistics implementations they have used to perform linguistic analysis on tweets to observe patterns exhibited by legitimate and fake or ambiguous news.

In [2], Bhavika Bhutani Neha Rastogi Priyanshu Sehgal Archana Purwar proposed Fake News Detection Using Sentiment Analysis. In this paper they analyze different text preprocessing techniques and selects tf-idf with similarity score as the best approach using accuracy as an evaluation metric.

In [3], Mykhailo Granik, Volodymyr Mesyura proposed Fake News Detection Using Naive Bayes Classifier. In this paper they showed a simple approach for fake news detection using naive Bayes classifier. Their approach was implemented as a software system and tested against a data set of Facebook news posts. They achieved classification accuracy of approximately 74% on the test set which is a decent result considering the relative simplicity of the model.

In [4], Subhadra Gurav, Swati Sase, Supriya Shinde, Prachi Wabale, Sumit Hirve proposed Survey on Automated System for Fake News Detection using NLP & Machine Learning Approach. In this paper, they developed an innovative model for fake news detection using machine learning algorithms.

In [5], Chaitra K Hiremath, Prof. G.C Deshpande proposed Fake News Detection Using Deep Learning Techniques. In this paper they presented different algorithms for classifying statements made by public figures. In their proposed system LR, RF, SVM NB and DNN classification techniques are utilized which helps to detect fake news.

III. METHODOLOGY

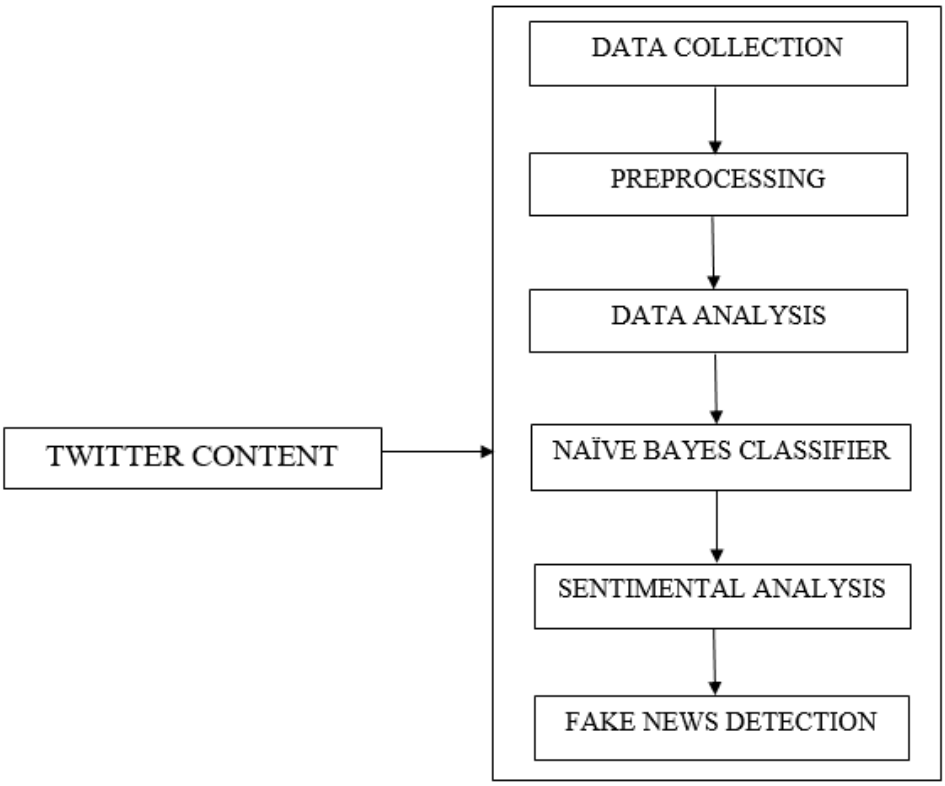

Figure 1: Block Diagram of Proposed System

The basic idea of our project is to build a model that can predict the credibility of real time news events. As illustrated in the Figure 1, the proposed framework consists of six major steps: Data collection, Data pre-processing, Data analysis, Naive Bayes classifier analysis, Sentiment analysis and Analysis of result. We first take the dataset, followed by cleaning of dataset. The data pre-processing unit is responsible for preparing a data for further processing. The final dataset has 653 observations Data Analysis step includes the conversion of text using Tf-Idf Vector algorithm and classifying text into train set and test set.80 percent of the dataset, which has 550 observations, is given for training purpose and the remaining 20 percent, which has 90 observations of data is used for testing. After that live data is collected from Twitter Streaming API and given as input to the developed model to detect weather the provided input is fake or real, We are going to describe fake news detection method based on one artificial intelligence algorithm –Naïve Bayes Classifier and another on Sentiment analysis where score will be calculated using VADER algorithm. By doing the evaluation of effects acquired from classification and analysis, we can decide the share of news being fake or real.

IV. IMPLEMENTATION

4.1 DATA COLLECTION

Detection of fake news on twitter starts with cleaning of considered dataset. For cleaning of dataset, we used two functions i.e., regex function and lemmatization function. Regex function i.e., regular expression is a special sequence of characters that helps to match or find other strings or sets of strings, using a specialized syntax held in a pattern. Lemmatization is the process of grouping together the different inflected forms of a word so they can be analysed as a single item.

4.2 PREPROCESSING

TF-IDF is an abbreviation for Term Frequency Inverse Document Frequency and is a very common algorithm to transform text into a meaningful representation of numbers. Calculation of TF-IDF,

$$TF(w) = \frac{(Number\ of\ times\ term\ w\ appears\ in\ a\ document)}{(Total\ number\ of\ terms\ in\ the\ document).}$$

$$IDF(w) = \log_e\left(\frac{\text{Total number of documents}}{\text{number of documents with term w in it}}\right)$$

Considering simple example, a document containing 100 words wherein the word cat appears 3 times.

1. The term frequency (i.e., TF) for cat is then (3/100) =0.03.
2. Then, the inverse document frequency (i.e., IDF) is calculated as log (1,00,00,000 / 1000) = 4.
3. Thus, the TF-IDF weight is the product of these quantities: 0.03*4 = 0.12.

4.3. NAÏVE BAYES CLASSIFIER

1. Consider a training data set D consists of documents which belongs to different classes, class A and B.

2. Prior probability of both classes A and B is calculated as shown

$$P(C) = \frac{Nc}{N}$$

Where P(C) is probability of class, Nc is the Total count of particular class in training set and

N is the Total count of class in training set.

3. Now calculate the total number of word frequencies of both classes A and B i.e.,

na = the total number of word frequency of class A.

nb =the total number of word frequency of class B.

4. Calculate the conditional probability of keyword occurrence for given class

P (word1 / class A) = wordcount / count (c) +v

P (word1 / class B) = wordcount / count (c) +v

P (word2 / class A) = wordcount / count (c) +v

P (word2 / class B) = wordcount / count (c) +v

……

P (wordn / class B) = wordcount / count (c) +v

5. Now computing posterior probability for classes A and B

a) Find P (A / W) = P(A) * P (word1/class A) * P (word2/class A)..* P(wordn / class A)

b) Find P (B / W) = P(B) * P (word1/class B) *P (word2/class B)..* P(wordn / class B)

6. Now determining the class of the test set. After calculating probability for both the classes A and B the class with higher probability is the class of test set.

Naive Bayes is a classification algorithm that is suitable for binary and multi-class classification. It is a simple technique for constructing classifiers. All naive Bayes classifiers assume that the value of a particular feature is independent of the value of any other feature, given class variable. For example, a fruit may be considered to be an apple if it is red, round, and about 10cm in diameter. A naive Bayes classifier considers each of these features to contribute independently to the probability that this fruit is an apple, regardless of any possible correlations between color, roundness, and diameter features.

4.4 SENTIMENT ANALYSIS USING VADER ALGORITHM

Sentiment analysis (also known as opinion mining or emotion AI) refers to use of natural language processing, text analysis, computational linguistics and biometrics to systematically identify, extract, quantify and study affective states and subjective information from web mostly social media and similar sources. It is the interpretation and classification of emotions (positive, negative, neutral) within text data using text analysis techniques. For example: “I really like the new design of your website!” – Positive. VADER stands for Valence Aware Dictionary and Sentiment Reasoner is a lexicon and rule-based sentiment analysis tool that is specifically attuned to sentiments expressed in social media. It uses a combination of a sentiment lexicon is a list of lexical features (e.g., words) which are generally labelled according to their semantic orientation as either positive or negative.

V. RESULT AND ANALYSIS

A. Confusion Matrix:

For Naïve Bayes Algorithm, exhibits an accuracy of 83.4, however combination of Naïve Bayes algong with VADER algorithm displays an accuracy of 93.52.

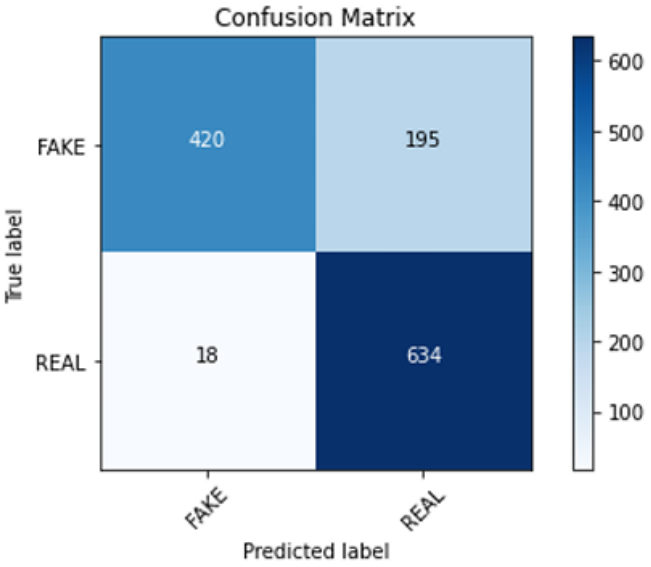

Figure 2(a): Confusion Matrix for only Naïve Bayes Algorithm.

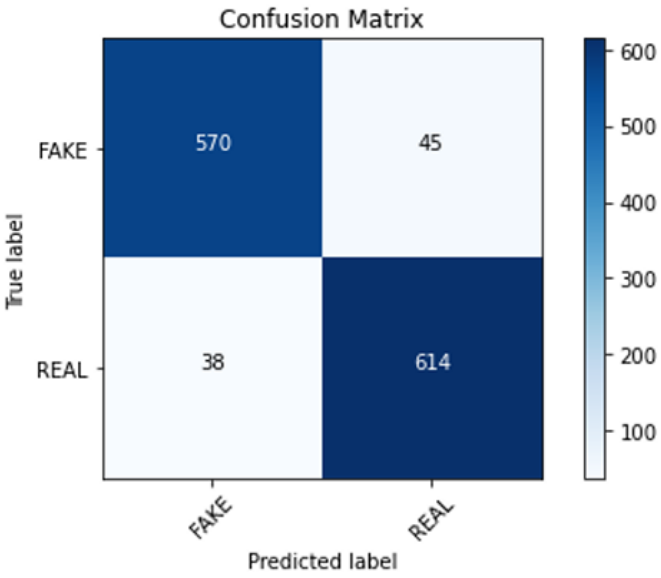

Figure2(b): Confusion Matrix for Naïve Bayes and VADER Algorithm.

	Precision	Recall	F1-Score	Support
FAKE	0.94	0.93	0.94	617
REAL	0.93	0.96	0.94	654
Accuracy			0.94	1271
Macro Average	0.94	0.94	0.94	1271
Weighted Average	0.94	0.94	0.94	1271

Table1: Classification report(Naïve Bayes and VADER)

B. EXAMPLE 1: Real Twitter Data detected as FAKE in combination of Naïve Bayes and VADER algorithm.

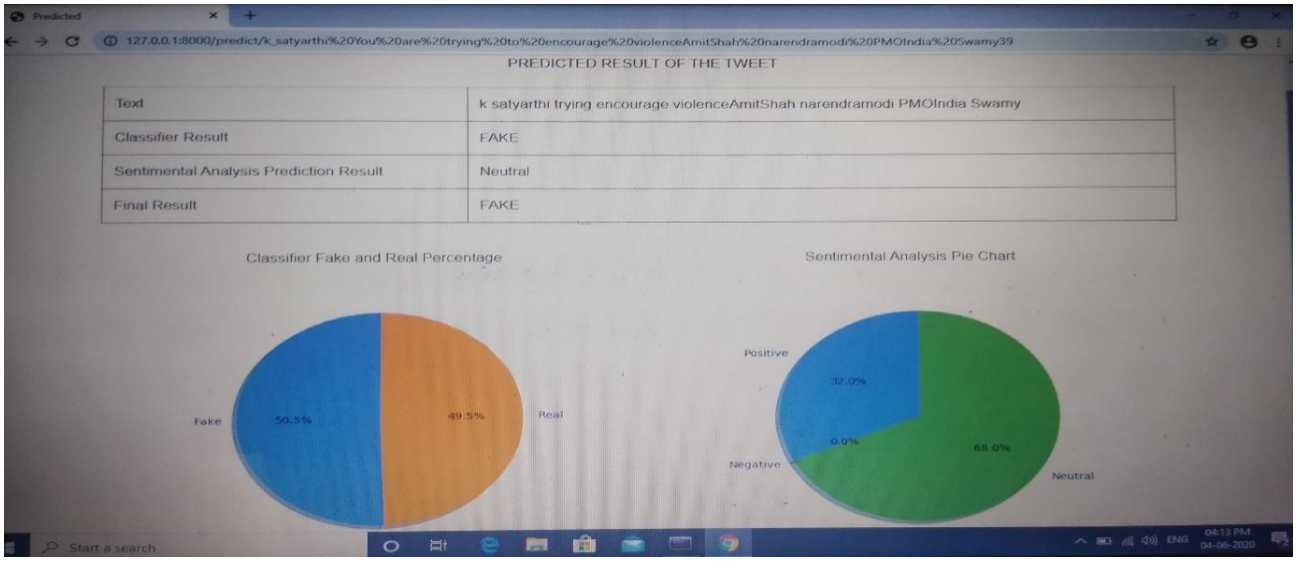

Figure 3: Fake News Detected using Naïve Bayes and VADER algorithm.

C. EXAMPLE 2: Real Twitter Data detected as REAL in combination of Naïve Bayes and VADER algorithm.

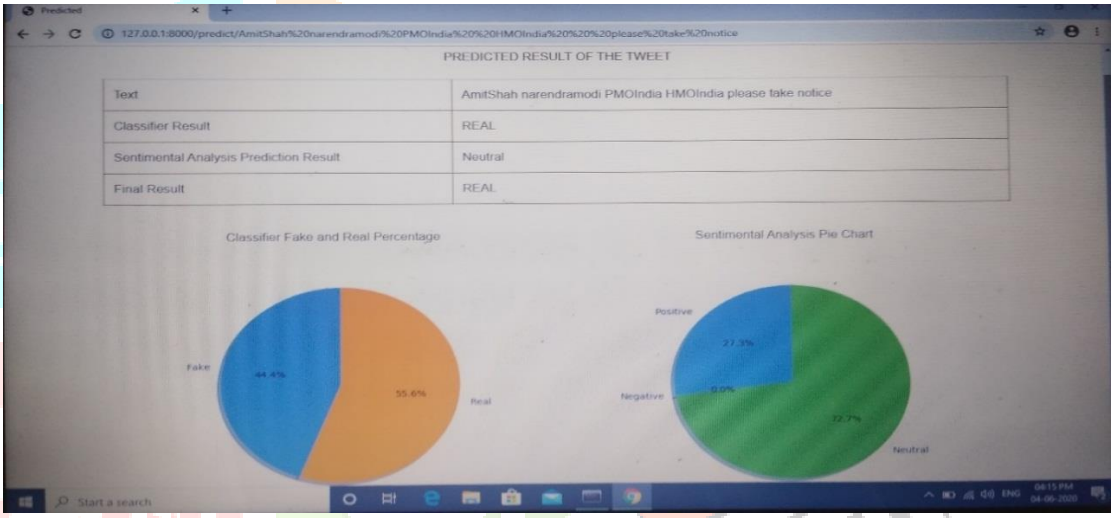

Figure 4: Real News Detected using Naïve Bayes and VADER algorithm.

6. CONCLUSION

News that we consume every day change our view of the world. Defining, identifying, and stopping fake news from spreading has always been a top priority of governments and corporations. However, social media has also been used to spread fake news, which has negative impacts on individual people and society. In our project, we discussed about how Naive Bayes Classifier helps in detection of fake news in twitter i.e., after classifying dataset as train set and test set, classifier detects whether news is fake or real. And we used another method to get accurate prediction in detection of twitter news i.e., Sentiment analysis using VADER algorithm. In this method VADER algorithm is a rule-based sentiment analysis tool that is specifically attuned to sentiments expressed in social media which helps in detection of news in twitter. So, when we provide twitter content to our built model it predicts whether it is real or not by considering results of two methods. In our future work we want to use same model with some modification for detection of news in other social media. And we want to use other methods for detection of fake news in twitter and others social media so that to get more accuracy in prediction.

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