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FAKE NEWS DETECTION USING MACHINE LEARNING ALGORITHMS

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ABSTRACT

These days lot of information is being shared over social media, and we are not able to differentiate between which information is fake and which is real. People immediately start expressing their concerns or sharing their opinions as soon as they come across the past, without verifying its authenticity. Most of the time, fake news seems real to readers, at which point it becomes difficult to believe the real news. At such times we need to check fake news. A Fake news detection problem can be solved with the help of Artificial Intelligence algorithms which include Machine Learning algorithms.

Keywords: Fake News, Social Media, Machine Learning, Naive Bayes Algorithm, Passive Aggressive Classifier.

I. INTRODUCTION

Fake news contains misleading information that can be verified. Today's world is digital, we have advantages of the digital world but have some disadvantages too. Fake news is one of them, Anyone can easily spread fake news without knowing the impact it has on society. There are some online platforms where we can easily share fake information (Like Facebook, Instagram, Twitter, etc...). No doubt this application provides easy access to any information, but this platform gives cybercriminals a chance to spread fake news. Detecting fake news is a big challenge because it is a difficult task. So it has become important to detect fake news. Some researchers are working on the detection of fake news. Machine Learning [1] helps detect fake news, machine learning algorithms will detect fake news automatically once they are trained. There are different algorithms to detect fake news. Naive Bayes and Passive-aggressive classifiers are among the algorithms that are used to detect a fake. It is a probabilistic classifier. It is based on probability models that incorporate strong independence assumptions. It is a supervised machine learning that is widely used in classification and regression problems. This paper aims to collect the fake news dataset, apply both algorithms and find the accuracy rate in detecting fake news.

OBJECTIVE

The main objective of this paper is to detect fake news using the naive Bayes and passive-aggressive algorithm and then predict the accuracy level. These algorithms help us analyze and visualize the value of predicting data.

II. LITERATURE REVIEW

Fake news is one of the big problems in today's digital world. Many researchers working on the detection of fake news.

- Nguyen VO student at Ho Chi Minh City University of Technology Cambodia did his research on fake news detection and implemented it in 2017. He used bidirectional GRU with an attention mechanism in his project fake news detection; Yang et al. originally proposed this mechanism. He also used some Deep Learning and Machine Learning algorithms and tried to implement other deep learning models such as Autoencoders, GAN, and CNN.
- Samir Bajaj of Stanford University published a research paper on fake news detection. He detects fake news with the help of the NLP perspective and implements some other Machine Learning and Deep Learning algorithms. It took an authentic data set from the Signal Media News Dataset.
- Marco L. Della Vedova et al. [2] first proposed a novel Machine Learning fake news detection method that, by combining the news content and social context features, outperforms existing methods in the literature, increasing its accuracy to 78.8%. The main AIM was to classify them as news - or fake.
- Dr. M. Rajeshwari did this research on Fake News Detection using the machine learning algorithm. They used the naive Bayes algorithm to detect fake news and they achieved 81.4% accuracy.

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III. METHODOLOGY

How would classify the news as fake or real??

Fake news has a big impact on our society. Detecting fake news is an important step for human beings, for this, we are using two types of machine learning algorithms.

1. Naive Bayes Algorithm:

It is a Machine Learning algorithm that Works on Bayes theorem [3]. It is another supervised learning algorithm that is used for finding classification difficulty earlier it mentioned that it works with the Bayes theorem, so the formula of Bayes theorem is:

Probability of x divided by probability of y then is equal to = p(x, y)*p(x)/p(y)

P(x/y) is a likelihood probability

P(x) is prior probability

P(y) is marginal probability

2. Passive-Aggressive Classifier

The passive-aggressive algorithm [4] is an online algorithm; ideal for classifying large streams of data. It is easy to implement and very fast. It works by taking an example, learning from it, and then discarding it.

Such an algorithm remains passive for correct classification results and becomes aggressive in case of incorrect calculations, updates, and adjustments. Like many other algorithms, it does not converge. Its purpose is to perform loss-correcting updates, resulting in very little change in the magnitude of the weight vector.

$w(t+1) = w(t)+c*y*x$

w(t+1) represents the updated weight vector at time t+1

w(t) represents the current weight vector at time t

c is the regularization parameter that controls the aggressiveness of the updates.

IMPLEMENTATION STEPS :

Step 1: Data processing - starts with processing our dataset. Which may include removing immaterial information, cleaning text, and converting it into a suitable format for analysis.

Step 2: Features Extraction - Take out the pertinent features from preprocessed data. It may include a bag of words, TF_IDF, or other appropriate features that capture features of the text.

Step 3: Splitting the data – Classify your dataset into training and testing sets. The training set is used to train the classifier, and the testing set is used to assess its performance.

Step 4: Training the classifier: Train both classifiers using the training set. This involves evaluating the probabilities of each feature given the class labels (News is fake or real) using the naive Bayes assumption.

Step 5: Predicting the Labels: Use a trained classifier to predict labels (real or not real) for the test set.

Step 6: Confusion Matrix - A confusion matrix [5] is a table often used to describe the performance of a classification model on a set of test data for which the true values are known. This is the key to the confusion matrix. The matrix shows how your classification model is confounded when it makes predictions. This gives us insight into not only the errors made by the classifier but more importantly the types of errors being made.

Confusion matrix terms can be denominated as follows:

TPR – Occurrence of the true positive value when both actual and predicted results are correct simultaneously. It can also be defined as sensitivity.

TNR – Occurrence of true negative value when both actual and predicted results are incorrect simultaneously.

FP – If the actual results are incorrect and the predicted results are correct, it is a false negative phenomenon.

FN – If the actual results are correct and the predicted results are incorrect, it is a phenomenon of false-negative values.

Step 7: Performance Metrics: Calculate performance metrics such as accuracy, recall, and F1-score using values from the confusion matrix. These metrics provide insight into the classifier's performance in detecting fake news.

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IV. IMPLEMENTATION AND RESULT

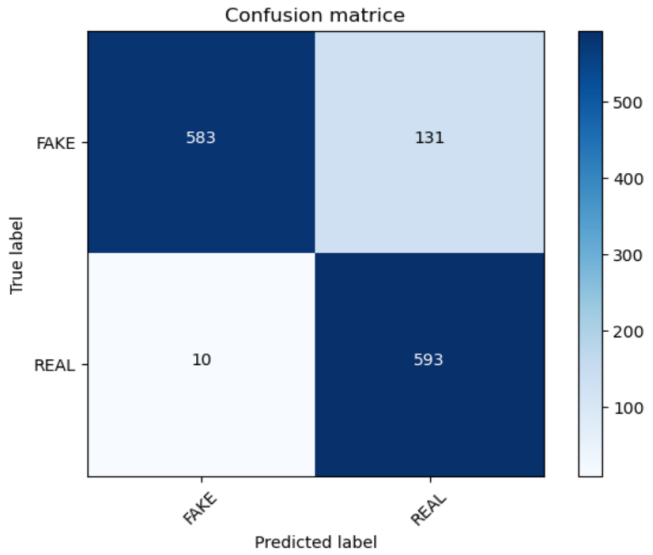
Using a naive Bayes algorithm

Accuracy level of fake news detection using naive Bayes algorithm.

```
classifier.fit(X_train,y_train)
pred = classifier.predict(X_test)
score = metrics.accuracy_score(y_test,pred)
print("accuracy : %0.3f" %score)
cm = metrics.confusion_matrix(y_test, pred)
cm.shape
plot_confusion_matrix(cm, classes=['FAKE', 'REAL'])
```

```
from sklearn.naive_bayes import MultinomialNB
classifier = MultinomialNB()
```

```
accuracy:   0.893
```




```
accuracy:   0.893
Confusion matrix, without normalization
```

Visualization of fake and real news in the confusion matrix.

Passive-aggressive classifier

Accuracy level of fake news detection using Passive-Aggressive classifier.

```
from sklearn.linear_model import PassiveAggressiveClassifier
```

```
linear_clf.fit(X_train,y_train)
pred = linear_clf.predict(X_test)
score = metrics.accuracy_score(y_test,pred)
print("accuracy : %0.3f" %score)
cm = metrics.confusion_matrix(y_test,pred)
plot_confusion_matrix(cm,classes = ['FAKE DATA','REAL DATA'])
```

```
accuracy : 0.986
```

```
accuracy : 0.986
Confusion matrix, without normalization
```

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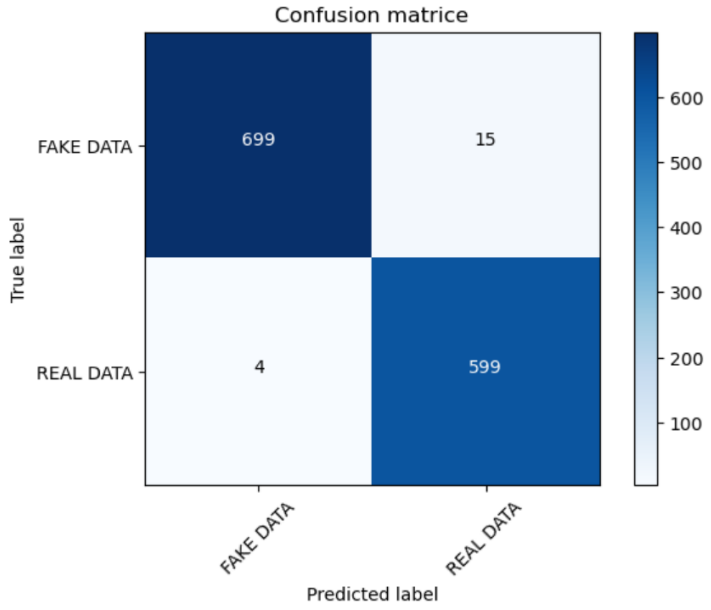

Visualization of fake and real news in the confusion matrix

V. CONCLUSION

Naive Bayes and passive-aggressive algorithms were used to predict the accuracy level. Fake news plays an important role in decision-making people should consider the spread of fake news as a serious problem and take appropriate steps to control it. Machine Learning helps detect news easily to control the spread of fake news.

Fake news detection system takes input from the user and classifies it to be true or false. For detecting whether the news is fake or real firstly we used naive Bayes algorithms and 0.893 (89.3) accuracy was achieved. After that, we used the Passive-Aggressive classifier, and we achieved 0.986 (98.6) accuracy.

This accuracy tells us how much of the news is real or fake.

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