FAKE NEWS DETECTION

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Abstract— The widespread dissemination of fake news on social and other media platforms is a major concern due to its potential to cause significant social and national damage. Many researchers are working to detect and combat its spread. This paper analyses research related to fake news detection and explores traditional machine learning models to create a product using a supervised machine learning algorithm that can classify fake news as either true or false. The proposed method utilizes tools such as Python Scikit-Learn and NLP for textual analysis, resulting in feature extraction and vectorization. The Python Scikit-Learn library is proposed for tokenization and feature extraction of text data because of its useful tools like Count Vectorizer and Tiff Vectorizer. Feature selection methods are then employed to experiment and choose the best-fit features to obtain the highest precision based on the confusion matrix results. The proposed model utilizes a supervised machine learning algorithm trained on a dataset consisting of true and fake news articles. It classifies new articles as either true or false based on the features extracted from the text data. This enables users to quickly and accurately identify the authenticity of news articles they encounter online. In summary, this paper contributes to the ongoing efforts to combat fake news by analyzing research related to its detection and proposing an approach that utilizes traditional machine learning models, Python scikit-learn, and NLP for textual analysis. The proposed model achieves high accuracy and precision in detecting fake news, providing a useful tool for users to determine the authenticity of news articles they encounter online.

Keywords— social media, Fake News, Scikit-Learn, NLP, Python, Artificial Intelligence, Machine Learning.

I. INTRODUCTION

The advancement of technology has made information sharing much easier, but it has also blurred the line between credible and malicious content. The internet allows anyone to publish content, regardless of its accuracy, which can be consumed by people all over the world. Unfortunately, fake news has gained a lot of attention on social media, and people often circulate such misinformation without verifying its credibility. Although these stories may disappear, they can still cause significant damage. Social media platforms such as Facebook, Twitter, and WhatsApp play a major role in spreading fake news. Many scientists believe that machine learning and AI can help address the problem of fake news. Various models have been developed to provide an accuracy range of 60-75%, such as the Naive Bayes classifier, linguistic features-based models, finite call tree models, SVM, etc. However, the parameters considered in these models do not yield high accuracy. The aim of this project is to improve the accuracy of detecting fake news beyond the current results. This will be achieved by developing a new model that can identify counterfeit news articles based on specific criteria, such as spelling errors, incoherent sentences, punctuation errors, and choice of words.

II. LITERATURE SURVEY

A. What is Fake news?

Fake news is a type of information that is spread through various mediums such as articles, pictures, and videos, which contains inaccurate or false content. The intention of the creator of such news is to grab attention, shock or mislead people by presenting a story that seems believable at first glance. The source of such news can be anyone, including individuals or groups with their own agendas. Fake news can be used by governments, individuals or economic systems to promote their own interests.

B. Impact of Fake News

The prevalence of advertising on the internet has resulted in a proliferation of popular websites that feature the latest news and articles. However, this has also given rise to a disturbing trend where illegal websites peddling false information can generate revenue through automated advertising that rewards high traffic. The consequences of false information on the public are concerning, as it can lead to unnecessary confusion and stress. Deliberately misleading and harmful information is referred to

as non-digital information, and it has the potential to cause havoc among millions of people within minutes. False information has been known to disrupt election processes, create social tensions and conflicts, and incite animosity within society. An example of intentional use of information to ensure seamless integration within a process is the even head margins in this template, which are deliberately measured to treat your paper as part of a larger whole rather than a standalone document. It is important to note that this rewrite does not refer to any existing definitions of the original paragraph.

C. Fake News And Social Media

The internet has become an indispensable aspect of our everyday existence, and traditional means of acquiring information have largely given way to social media. In 2017, Facebook emerged as the largest social networking site worldwide, boasting a user base of over 1.9 million. The potential influence of Facebook in disseminating fake news cannot be overlooked and is likely to have significant ramifications on all social media platforms. According to reports, 44% of Facebook's user base obtains news from the platform, and 23% of users admitted to sharing false information, either deliberately or inadvertently. The propagation of false news is being propelled by social media and is transpiring at an alarming pace.

III. RELATED WORK

The initial step in identifying false news is to gather news items related to the topic at hand, for which a dataset needs to be created. The dataset consists of relevant news stories along with labels indicating true or false statements, and requires preprocessing before use. Shloka Gilda proposed the use of probabilistic context free grammar (PCFG) detection and temporal period frequency-inverse record frequency (TFIDF) of bi-grams for detecting fraudulent content, and found that feeding TFIDF of bi-grams into a stochastic gradient descent model correctly detects nontrustworthy resources 77% of the time. Cody Buntain developed an automated method for predicting fake news on Twitter using content sourced from BuzzFeed's fake news dataset and leveraging non-professional, crowdsourced individuals. Marco L. Della demonstrated the use of social networks and machine learning (ML) for detecting fake news. Shivam B. Parikh reviewed existing fake news detection methods, which primarily rely on text-based analysis, and discussed popular fake news datasets and open research issues. Himank Gupta et al. proposed a framework based on different machine learning approaches to handle various issues, such as accuracy shortage, delay, and high interval, while

dealing with thousands of tweets in a second. Their solution improved accuracy by approximately 18% and included lightweight features and the Top30 words with the highest information gain from the Bag-of-Words model

IV. EXPERIMENTAL METHOD

Machine learning is a field of computer science that focuses on teaching computers to learn from data without explicit programming. This approach enables computers to improve their performance and become more human-like over time. Machine learning algorithms use statistical analysis to process input data and generate output predictions, which are refined as new data becomes available.

Natural language processing is a subfield of machine learning that deals with the ability of computers to understand and process human language as it is spoken or written. By analyzing text and speech data, NLP algorithms can extract meaningful insights and enable intelligent decision-making.

Data collection is the process of gathering and analyzing information from various sources to create a comprehensive and accurate understanding of a given subject. By collecting and analyzing data, it is possible to evaluate current trends and predict future outcomes. One example of a dataset used for this purpose is the "fake or real news" dataset, which can be found on kaggle.com and contains 20,800 articles

In order to split the "fake or real news" dataset into training and testing data, a manual division was made in which 80% of the overall dataset was assigned to the training set and the remaining 20% was assigned to the testing set.

Data preprocessing is an essential step in data mining that involves transforming raw data into a format that can be effectively analyzed. Real-world data is often incomplete, inconsistent, or contains specific patterns or behaviors that need to be identified and addressed. Preprocessing techniques can help to rectify such issues and ensure that data is prepared for further analysis.

Logistic regression is a predictive modeling technique that is used when the Y variable is binary categorical, meaning that it can take only two values, such as 1 or 0. The goal of logistic regression is to derive a mathematical formula that can be used to predict the probability of occurrence of one of the two categories based on the values of the X variables. Once the equation has been established, it can be used to predict the Y category using only the X values.

In language processing, certain words like "a," "an," "the," "be," etc., commonly referred to as Stop Words, do not add any significant meaning to a phrase and can cause noise during modeling. Stemming is a technique that involves categorizing words with similar meanings based on specific criteria, such as removing the "ing" from words that end in "ing."

In machine learning, the process of converting natural language text into numerical vectors is referred to as vectorization. There are several approaches to convert text into vectors, such as counting the frequency of each word in a document, calculating the relative frequency of each word in a document with respect to the total number of words, and using the term frequency-inverse document frequency (TF-IDF) metric to determine the significance of a word in a corpus or collection.

Various machine learning classifiers are commonly used for detecting fake news. Some of the most widely used classifiers are :

Support Vector Machine (SVM): Support Vector Machine, which is a supervised algorithm used for classification. Researchers in Singh et al. (2017) utilized various classifiers, and SVM yielded the best results for fake news detection.

Naïve Bayes : Naïve Bayes is another popular classifier used for classification tasks, and it can also be used to determine the authenticity of news. In Pratiwi et al. (2017), Naïve Bayes was used to detect false news.

Logistic Regression : Logistic Regression is a classifier that is used when the output to be predicted is categorical. Kaur et al. (2020) used this classifier to detect whether news is true or fake.

Random Forests : Random Forests is another classifier that utilizes different random forests to give a value, and the value with the most votes is the final result. Ni et al. (2020) used various classifiers, including random forests, to detect fake news.

Recurrent Neural Networks (RNNs): Recurrent Neural Networks are also useful for detecting fake news. In Jadhav & Thepade (2019), RNNs were used to classify news as true or false. Neural Networks are a family of algorithms used to solve classification problems, and they are also used to detect fake news. In Kaliyar et al. (2020), the neural network was used for fake news detection.

K-Nearest Neighbor (KNN) : K-Nearest Neighbor is a supervised machine learning algorithm used to solve classification problems. Kesarwani et al. (2020) used KNN to detect fake news on social media.

Decision Tree : Decision Tree is another supervised algorithm of machine learning that can be helpful for detecting fake news. Kotteti et al. (2018) used different classifiers, including the decision tree, to detect fake news.

V. METHODOLOGY

In this advanced Python project for detecting fake news, we address both genuine and fabricated news articles. Our approach involves creating a TfidfVectorizer using the sklearn library on our dataset. Subsequently, we initialize a passive aggressive classifier and train the model. We evaluate the performance of our model by examining the accuracy score and confusion matrix. These metrics provide us with insight into how effectively our model can distinguish between real and fake news.
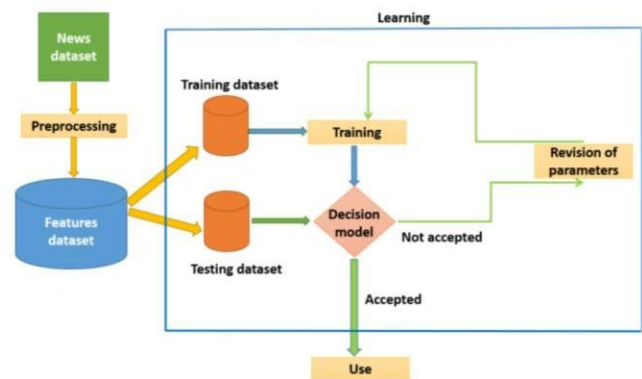

The main concept is to develop a model that can predict the credibility of ongoing news events. The proposed model includes the following steps:

1.Data Collection: The first step is to collect a large amount of data from various sources, such as news articles, social media posts, and blogs. This data will be used to train the machine learning model to detect fake news.

2.Data Preprocessing: The collected data needs to be preprocessed before it can be used for training the model. This includes tasks such as removing irrelevant data, removing stop words, and stemming.

3.Future Extraction: The next step is to extract relevant features from the preprocessed data. These features could include the presence of specific words, the use of emotional language, and the overall tone of the article.
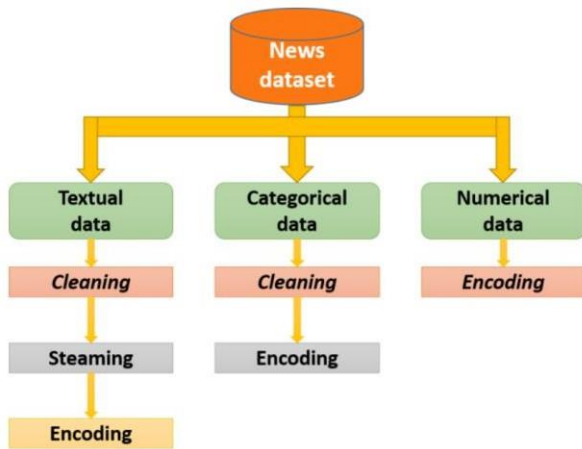
4. Training Model: Once the features have been extracted, the model can be trained using machine learning algorithms such as Logistic Regression, Random Forest, or Gradient Boosting. The training data will include both real and fake news articles.

5. Teting and Evaluation: After the model has been trained, it needs to be tested and evaluated to measure its accuracy in detecting fake news. This is done using a separate set of test data.

TF (Term Frequency) refers to the number of times a word appears in a document divided by the total number of words in that document. A higher TF value indicates that the term occurs more frequently in the document, and thus, the document is a good match for that term.

IDF (Inverse Document Frequency) is the logarithm of the total number of documents divided by the number of documents that contain the word. IDF determines the weight of less frequent words in the corpus. Words that occur frequently in a single document but not in other documents may not be considered relevant. IDF measures the significance of a term in the entire corpus.

TfidfVectorizer is a method that converts raw documents into a matrix of TF-IDF features. This matrix represents the significance of each term in the corpus and allows for efficient machine learning algorithms to be applied to text data.

$$TF(w, d) = \frac{occurences \ of \ w \ in \ document \ d}{total \ number \ of \ words \ in \ document \ d}$$

IDF (Inverse Document Frequency): Words that frequently appear in a text but likewise frequently appear in numerous

others might not be important. IDF is a metric for gauging a term's importance across the board.

$$IDF(w, D) = \ln(\frac{Total \ number \ of \ documents \ (N) \ in \ corpus \ D}{number \ of \ documents \ containing \ w})$$

The TfidfVectorizer converts a collection of raw documents into a matrix of TF-IDF features.
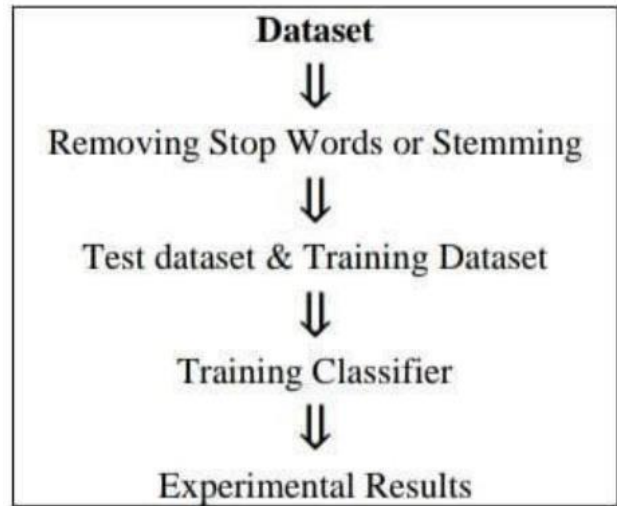
The PassiveAggressiveClassifier is an online learning algorithm that behaves passively when the classification outcome is correct, but turns aggressive when it makes a mistake and needs to update or adjust its classification. Unlike other algorithms, it does not converge, but instead corrects the loss by making small changes to the weight vector norm, in order to preserve its original value.

VI. FUTURE SCOPE

In today's era, fake news has become prevalent, where false information is intentionally spread under the guise of being authentic news, through various channels for ulterior motives such as generating revenue, promoting or discrediting a person, group, corporation or movement. Last year, the two main political parties in India utilized Facebook and WhatsApp to create and circulate content with the aim of influencing India's 900 million eligible voters. Both parties have been accused of spreading false or misleading information on social media. With over 200 million users, India is WhatsApp's largest market. However, these tactics are not only limited to the political arena but are also used in activities such as manipulating share market prices and attacking commercial rivals with fake customer reviews.

The rapid dissemination of information through various platforms, including social media, has led to a dangerous proliferation of false news. Reports indicate that this

phenomenon can significantly impact politics and, consequently, public opinion, as seen in the most recent US presidential election. While attempts have been made to combat fake news, manual efforts have proven inadequate. Artificial intelligence (AI) and machine learning (ML) models offer a more efficient means of limiting the spread of false information. This project proposes a layered model that fine-tunes insights gleaned from data at each phase to predict and detect false news. While many models have been unsuccessful, AI models continue to improve with vast amounts of data from social media platforms like Facebook and Twitter. The field's future looks promising, thanks to the use of deep neural networks. Nevertheless, the unpredictable nature of the information poses a challenge, and any prediction model is susceptible to errors. Topic modeling, word2vec, and POS tagging are among the methods used to enhance the model's feature extraction and classification abilities in future developments.

POS tagging : It is a process of assigning a part of speech tag to each word in a corpus based on its context and meaning. This task can be challenging as the same word can have different parts of speech depending on the sentence it appears in. For instance, the word "answer" in the sentence "Give me your answer" is a noun, but in the sentence "Answer the question", it is a verb.

Word2Vec : The Word2Vec method is a popular technique in natural language processing (NLP) that converts text into features while preserving the inherent relationships between words in a corpus. It is a combination of various techniques and is considered to be one of the easiest feature extraction techniques in NLP. Typically, it employs a pre-trained vector model such as GloVe, and transfer learning can be applied to enhance the quality of the model.

Topic Modelling : Topic Modelling is a complex technique that can be used to accurately categorize news articles based on their various topics. Simply labeling articles with pre-existing categories may not provide sufficient detail, making topic modelling a useful tool. By using this technique, text can be segmented into different topics, enabling more accurate predictions. The most commonly used method for topic modelling in Natural Language Processing (NLP) is Latent Dirichlet Allocation (LDA). Incorporating LDA can enhance the ability to classify fake news by providing an additional layer of analysis.

For the future scope We want to use web scraping and get the data from various social media and websites by our-self and use them in our system We also want to improve the accuracy by query optimization.

VII. RESULTS AND DISCUSSIONS

After running several simulations, following are the results of our model :
Confusion matrix for passive aggressive classifier :

	FAKE	REAL
FAKE	571	44
REAL	41	611

Accuracy: 93.29%

In this project, we will develop a predictive system using Python and machine learning to identify fake news. The system will utilize a dataset file, and when provided with a news article, it will predict whether the article is genuine or fabricated. If the output is 0, the article is considered real, and if the output is 1, the article is considered fake. This system will enable us to determine the authenticity of news articles and distinguish between real and fake news.

VIII. CONCLUSION

This project aims to predict whether an article is real or fake by analyzing the relationship between its words. To accomplish this, we utilized the TFIDF Vectorizer model for building our predictive model. Our dataset consists of articles related to the 2016 US presidential election.

Moving forward, we plan to enhance our system by implementing web scraping techniques to gather data from various social media platforms and websites. This will allow us to obtain a wider range of articles to train and test our model. Additionally, we aim to improve the accuracy of our predictions through query optimization

Detecting fake news is a complex task that demands a multifaceted strategy. Although machine learning algorithms and natural language processing techniques can aid in detecting patterns and features that indicate fake news, they are not sufficient on their own. Fake news can be intentionally crafted to deceive such algorithms. Therefore, supplementing these techniques with human expertise and critical thinking skills is critical. Additionally, educating people on how to identify and evaluate sources of information can help them become more

discerning news consumers. To effectively combat the spread of fake news, a combination of technological and human approaches will be required.

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