SMART FAKE NEWS DETECTION SYSTEM

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Abstract—Fake news is described as a fictional story meant to draw attention, mislead, deceive, or harm a reputation by confusing or distorting the real one. It's a condition that has a big impact on people's lives, particularly in politics. Fake news detection is a rising field of study that confronts various challenges due to the scarcity of resources (databases, published research). In this paper, machine learning(ML) methods are used to solve the problem of detecting fake news. According to Gartner research, by 2022, the majority of individuals in developed economies will consume more misleading information than correct information. The exponential rise in the creation and distribution of fake news requires the development of automated identification and detection of such warped material. On the other hand, automated methods for the identification of fake news are difficult to achieve because they require the model's understanding of natural language characteristics. Therefore, we have come up with the Smart Fake News Detection System, which is the new generation of fake news classifier that classifies news as real or fake using Passive Aggressive Classifier, takes speech as input using webkitSpeechRecognition API, and categorizes the real news into appropriate categories using Multinomial Naive Bayes Classifier.

Index Terms—Passive Aggressive Classifier, webkitSpeechRecognition API, Multinomial Naive Bayes Classifier.

I. INTRODUCTION

Ever since the invention of printed news 500 years ago, misinformation has existed in many forms, long prior to de- pendable, impartial journalism becoming the norm. According to Politico, fake news has indeed existed, "sensationalist and excessive, aiming to inflame passions and biases." Fake stories, like Orson Welles' renowned 1938 radio show about an alien invasion, which terrified listeners, have also been used as instances of fake news.

The internet and social media have made it much easier and much more comfortable to obtain the latest news. Users of the Internet can frequently follow events of interest in an online manner, which is made easier by the growing use of mobile devices.

Great potential, on the other hand, comes with a lot of responsibility. As the press has a big influence on society, as is common, somebody else seeks to benefit from it. The media can manipulate information in a variety of ways to achieve specific goals. As a result, news stories that aren't fully true, if not entirely false, are produced.

Fake news detection is frequently confused with other forms of deception detection, such as trash, rumor, and satire detection. Fake news, often known as hoaxes, is information that is portrayed as true and seems to have no foundation in truth. Junk news, alternative facts, pseudo-news, false news, and hoax news are all terms used to describe fake news. Fake news prediction is defined in this paper as a prediction of specific news articles that are purposely created to deceive people.

There are four forms of hoaxes, as per Melissa Zimdars, a communication professor at Merrimack University. Fake, dishonest, or constantly deceptive sites posted on Facebook as well as social media fall into category 1. By employing false headlines and contextualised or contested content, a few of these sites may depend on "outrage" to attract likes, shares, and income. Websites in the category 2 may transmit information that is possibly misleading

or erroneous. Websites that use click-bait headings as well as social media profiles on a regular basis fall into group 3. Last but not least, there are satirical and comedy sites that can provide important, critical comments on society and politics while still being able to be disseminated as actual, literal news.

Google established the Google News Initiative (GNI) in March 2018, aimed at combating the outspread of disinfor- mation. GNI was formed on the belief that excellent report- ing and the capacity to find the truth on the internet are essential. GNI's mission statement states, "To elevate and improve quality journalism, create commercial models to drive sustainable growth, and empower news organizations through technological innovation."

This paper describes a smart fake news detection system that uses a passive aggressive classifier to classify news as real or fake, translates speech to text using the webkitSpeechRecog- nition API, and categorizes true news into relevant categories. The purpose of this study is to see how well this strategy performs for this problem when using a manually tagged news data-set.

II. MOTIVATION

The persistent problem of fake news is exceedingly difficult to combat in today's competitive environment, when there are dozens of information sharing platforms via which fake news or disinformation can be propagated. It's becoming more of an issue as AI improves, bringing with it artificial bots that might be exploited to create and spread fake news. The issue is crucial because many people trust what they read on the internet, and those who are unskilled or new to digital technologies are particularly vulnerable to deception. Another issue that might occur as a result of spam or potentially haz- ardous emails and conversations is spam. As a consequence, it really is compelling enough to recognize the problem and accept responsibility for decreasing crime, political unrest, and suffering, as well as resisting attempts to spread fake news.

Political propaganda attempts to persuade people to alter their minds about their political convictions or other view- points. Fake news has a similar goal, but it will use lies to influence public opinion more quickly and across a larger audience. It can employ misleading occurrences to turn in- dividuals away from a current idea, rather than giving reasons to persuade people to turn towards a new view.

III. RELATED WORK

Lovedeep Singh et al.[1] developed a false news detector that uses a combination of fundamental mathematical operations and vector space representations to test existing Deep Learning approaches by describing news events in vector space. Researchers used two different datasets: LIAR, a document dataset, and the public fake news dataset on Kaggle.

Shikun Lyu et al.[2] The four major parameters are taken from the dataset: URL, text, author, and title. They were able to effectively deploy a decision tree, which provided an accuracy of more than 95%. This model can evaluate the authenticity of news on a website and provides a better percentage of accuracy.

Mykhailo Granik el al.[3] The fake news detection system was developed using a simple approach involving the use of a naive Bayes classifier. On the test set, this approach was implemented and tested against an information collection of Facebook news articles, and it achieved a classification accuracy of approximately 74%. This analysis revealed that a simple artificial algorithm can effectively classify false news, which is a vital challenge.

Tao Jiang et al.[4] A deep learning system has been built that correctly distinguishes fake news from true news with a 99.82% accuracy rate. The BilSTM model is trained and validated on a data-set, with various model evaluation metrics such as precision, recall, F1 measure, and execution time being used to illustrate the model's efficiency. The model is used to automate the news validation process, which saves users a lot of time and relieves them of the burden of rapid checking work.

Selvakumar Manickam et al.[5] discuss the history of the fake news problem as well as the effects it has on users. Aesthetic Inspired Deception Detection (Knowledge-Based), Pictorial-focused, Hybrid-centered, and Social Context-driven material techniques were also studied in fake news detection methods.

Zhenzhong Li et al.[6] The paper focuses on news text classification, and it utilises a Latent Dirichlet Allocation- based news text

classification model (LDA). The LDA algorithm, which is based on a probabilistic model, is a sort of text analysis algorithm. Each text is given a subject from the list of data and a term from the word distribution that is related to the topic. Unsupervised learning approaches, such as the topic model, are an example of this.

Guang Yang et al.[7] A graphical ontology model called the domain ontology graph (DOG), identifies the vital as well as important domain-specific representational elements by identifying highly dependent concepts. DOG's categorization performance is compared to that of classic DOG in this study. Traditional DOG has two flaws: it overlooks the relationship between terms and classes, and it measures the relations between various terms inaccurately.

Upasana Parida et al.[8] Text categorization is one of the techniques used to classify documents into pre-determined groups based on their contents. In the news classifier constructed using ML algorithms like the Random Forest Classifier and Naive Bayes Classifier, TFIDF and Count vectorizers are utilized to efficiently extract features from the dataset.

Tomi Yahya Christyawan et al.[9] The visualisation of the Self Organization Map method for text classification of news titles is proposed in this study. The SOM topographic map is used to gather new knowledge about the neural network training process. The primary focus of this study will be to develop and create a text classification approach to make use of high data reduction and visualization.

Pei Yan et al.[10] deployed a weighted news text classification model, abbreviated as WNTC, which adds a different weight to each model based on its prediction effect and scores each predicted objective as accurate as its prediction effect and weight.

IV. PROPOSED METHODOLOGY

The project allows the user to enter the text for which they want to check for fake or authentic news via a website. If the news is true, the category button will appear, and the news will be classified into the appropriate category. The website also allows users to offer input in the form of speech. The speech is turned to text, which is then used to determine whether the news is true or not. If the information is accurate, it will be classified into the appropriate category.

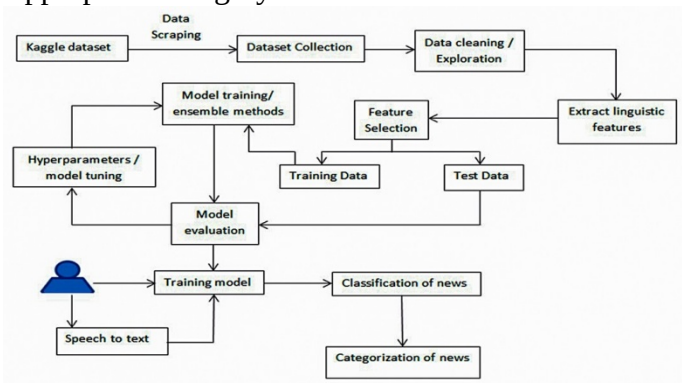

Fig. 1. Data Flow Diagram.

A. Algorithms:

The website includes four models viz. Passive Aggressive Classifier, webkitSpeechRecognition API, Multinomial Naive Bayes Classifier, Tfidf Vectorizer, and Count Vectorizer.

1) Passive Aggressive Classifier: This algorithm is an ML technique that is commonly used in big data projects. For large-scale studies, passive-aggressive algorithms are commonly used. In contrast to batch learning, when the full training data-set has been used once, the in- coming data is in chronological sequence and, indeed, the ML model is updated progressively. Whenever there is a large amount of information and training the complete data-set is virtually impossible, especially with the amount of information, this is extremely helpful.

This algorithm is called so because:

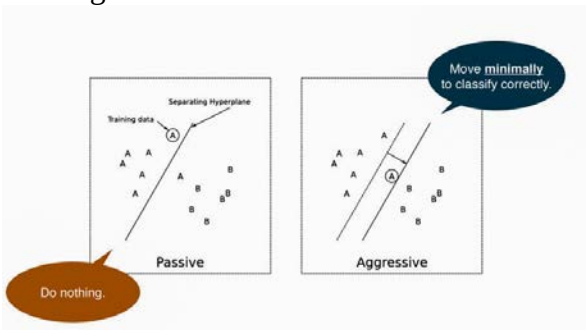

Fig. 2. Passive Aggressive Classifier

- Passive: If the prediction is correct, keep the model and don't make any changes. I.e., there isn't enough data in the case to make any model adjustments.
- Aggressive: If the prediction is incorrect, modify the model. Changing the model, in other words, could fix the problem.

2) webkitSpeechRecognition API: The fields of voice synthesis and speech recognition (sometimes known as TTS or text-to-speech) are distinct areas of technology that provide interesting new accessibility and management choices.

Speech recognition is the process of a speech recognition service receiving speech through the microphone of a device and comparing it to a grammar list. When a word or phrase is correctly identified, the result (or set of results) is delivered as a text string, which may be used to execute additional actions.

A basic controller interface and a series of closely linked interfaces covering results, grammar, and other speech recognition-related data make up the Web Voice API. The device's built-in speech recognition software will often be used to recognize the voice.

Fig. 3. Speech to Text conversion using webkitSpeechRecognition API.

3) Multinomial Naive Bayes Classifier: Although numerous software programmes and applications are available to analyse various statistical data, there are just a few for analysing words. Multinomial naive Bayes is one of the most popular supervised learning classifications for categorising text data analysis.

Text data categorization has become more popular as there is a great volume of data available in e-mails, documents, the internet, as well as other sites that needs to be investigated. Understanding the context of a particular type of text might help to figure out how an audience will respond to a bit of software or a product.

In Natural Language Processing (NLP), the Multinomial Naive Bayes algorithm is one of the popular probabilistic learning methods.

The computer estimates a text's tag using the Bayes theorem. It appears in a newspaper article or email. For a specific sample, it will evaluate the likelihood of each tag and return the tag with the highest likelihood.

The Naive Bayes classifier is made up of many approaches, which all have one thing in common: each piece of data being categorised is unrelated to any other attribute. One trait's presence or absence has no bearing on another trait's presence or absence.

Operation of Multinomial Naive Bayes Classifier: For text data analysis and problems with several classes, Naive Bayes is a useful technique. Since the Bayes theorem is used to build the Naive Bayes theorem, it is a must to understand the Bayes theorem concept.

Thomas Bayes invented the Bayes theorem, which calculates the probability of an event occurring depending upon an event's prior knowledge. This algorithm can be used to calculate the likelihood of tags in a text. It's based on the mathematical equation shown below:

$$P(H|E) = P(H) * P(E|H)/P(E)$$

where,P(E) = E's previous probability.
P(H) denotes the class H prior probability

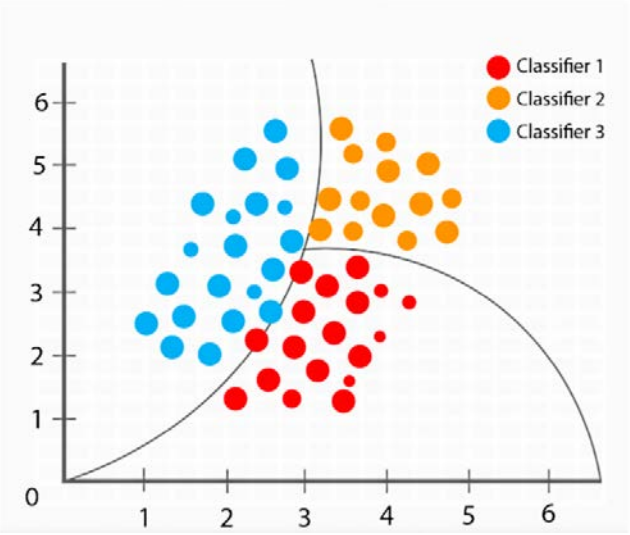

Fig. 4. Multinomial Naive Bayes Classifier.

4) Tfidf Vectorizer: The term TF-IDF stands for "term frequency-inverse document frequency," which refers to records with an inverse document frequency. It involves assessing a word's significance to a corpus or series of words in a text. The frequency of a word in the corpus cancels out the meaning of a phrase, which expands in proportion to the number of times it appears in the data- set.

Term Frequency: Consider a document 'd', the term frequency shows the count of a specific word 't' appears. As an outcome, one can see that as a term appears in the content, it becomes more relevant, which makes sense. One can use a vector to express the text in the bag of word models because the order of the

terms isn't important. The word frequency acts as the value for each entry for each phrase in the document. In a document, the weight of a word is simply proportionate to its frequency.
It is calculated using the equation:
tf (t, d) = number of t in d / count of words in d
Document Frequency: This is comparable to TF in that
it examines the text's meaning over the entire corpus collection. The sole distinction is that in document d, TF denotes a term's frequency counter, whereas in document set N, df denotes the frequency of the phrase in question.
It is calculated using the equation:
df (t) = frequency of t in documents
The Inverse Document Frequency (IDF) test determines
if a word is relevant. Finding information relating to the need is the scan's main goal. Because tf views all terms as having equal meaning, the term frequencies cannot be utilised to determine a term's weight in the document. Start by counting the number of documents that include the phrase t to calculate its document frequency.
Equation:
idf (t) = N/df (t) = N/N is used to calculate it (t) where,
df(t) = N where (t).
df(t) is the term's document frequency.
N(t) = Number of records that contain the letter t.

5) Count Vectorizer: A fantastic Python utility from the scikit-learn package is CountVectorizer. It is used to convert text into a vector based on the frequency (count) of each word in the text. This is useful when working with a large number of such texts and turning each word into a vector (for use in further text analysis). Each distinct word is represented by a column in the matrix, and each text sample is represented by a row in the matrix. Each cell's value represents the number of words in the specific text sample.

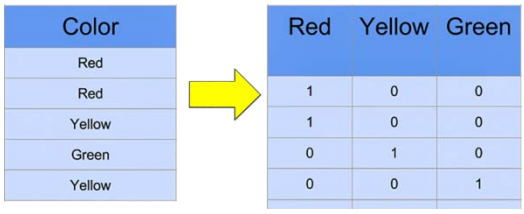

Fig. 5. A sparse matrix in the Count Vectorizer.

- The report contains 12 different terms, which are displayed in the table as columns.
- The document has three text samples, each of which is shown as a table row.
- The number of words in the text is indicated by a count in each cell.
- The sentence has been redone entirely in lowercase letters.
- All of the words in the columns have been alphabetized.

V. EXPERIMENTS AND RESULTS

The dataset deployed for the Smart Fake News Detection System is the News Dataset, which has over 40,000 rows and four columns with the fields NewsID, Title, Author, and Label. The dataset contains information about the United States of America. The dataset was divided into 2 parts: 70% training and 30% testing.
To detect whether the presented news is true or false, the model was trained using a passive aggressive classifier and a TFIDF vectorizer, and it achieved a 75% accuracy rate in the dataset under consideration.
The model was trained using a multinomial Nave Bayes classifier and a count vectorizer to categorise news into predetermined categories such as politics, sports, entertainment, and business. Only if the news has now been classified as real will it be directed to the categorization page, where additional data will be displayed in the interface.
This application also accepts speech input and classifies news into appropriate categories. The voice detection module is likewise constructed using the webkitSpeechRecognition API, as one of the key goals of the designed interface is to make the application user-friendly.

Various measures are employed to assess ML classifiers. One of the parameters for assessing classification models is accuracy. The percentage of predictions that the model correctly predicts is known as accuracy.
Accuracy = Number of correct predictions / Total number of predictions.

Precision is the percent of values that fall into a positive class out of all the values that are projected to do so. precision = true positives / (predicted true positives + predicted false positives)

The recall is determined as the proportion of positive samples that were correctly identified as positive to all positive samples. The recall evaluates how well the model can identify positive samples. The more positive samples that are identified, the larger the recall.

Recall = True Positive/True Positive + False Negative

An evaluation metric for a classification that is defined as the harmonic mean of recall and precision is the F1-Score or F-measure. It is a term used in analytics to evaluate how effective a test or model is.

F – measure = 2*Recall*Precision / Recall + Precision

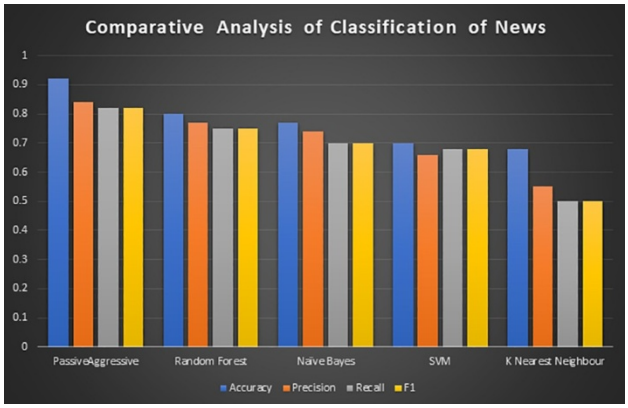

Fig. 6. Comparative analysis for classification of news.

Figure 6 shows a comparative analysis for classifying news using several classifiers and a tfidf vectorizer using various metrics. This comparison analysis demonstrates that the Passive Aggressive Classifier outperforms other classifiers employing the tfidf vectorizer with an accuracy of 92%, precision of 0.84, recall of 0.82, and an F1 score of 0.82.

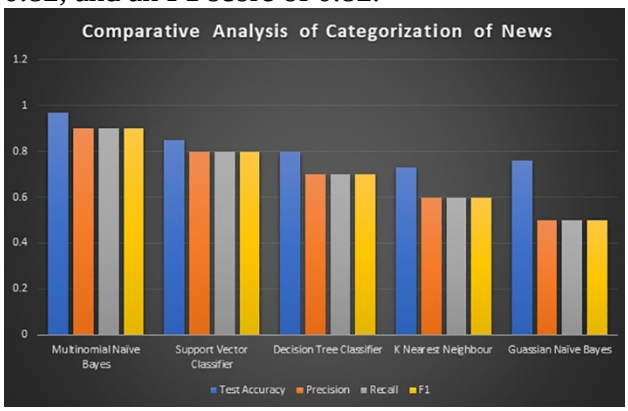

Fig. 7. Comparative analysis for categorization of news.

Figure 7 shows a comparative analysis for the categorization of news using several classifiers and a count vectorizer using various metrics. This comparison analysis demonstrates that the Multinomial Na¨ıve Bayes Classifier outperforms other classifiers employing the count vectorizer, with an accuracy of 97%, precision of 0.97, recall of 0.97 and F1 score of 0.97.

VI. CONCLUSION AND FUTURE WORK

In a matter of minutes, fake news is influencing a huge number of citizens, and people are prone to believing it without even validating the information. Due to technological advancements, fake news nowadays is reaching a larger audience. To combat this issue, the current work successfully implements the Smart Fake News Detection system, which overcomes the shortcomings of other applications or systems developed by offering high accuracy rates along with

additional features to make it more user-friendly. To give users the results they desire, the application employs algorithms like passive aggressive classifier and multinomial naive bayes classifier. The future work will mainly concentrate on adding several other features, such as the automatic collection of real-time news and storage of it in the database to provide users with speech output in addition to more accurate results.

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