A Machine Learning Approach to Fake News Detection

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Abstract— **In today's world, social media platforms are important means of information diffusion, and people trust them without questioning their authenticity. Social media is a major factor in propagating fake news. Thus, to mitigate the conse- quences of fake news, we create an NLP model to differentiate fake and real news. Here machine learning algorithms has been used for enhancing fake news detection performance with NLP. Models trained using max entropy classifier, where news content is scanned for sentences that could indicate the news is fake based on existing NLP libraries. TF-IDF weighting is used to score certain pieces of text, so that detection is fast on any updates or incoming messages due to its fast com- putation time and high recall rate (low mistake rate). Here the proposed project's purpose is to detect fake and misleading news from social media networks.** ***Index Terms*****—Fakenews, Recurrent Neural Network, TF-IDF,NLP**

I. INTRODUCTION

Fake news is an information that has been modified to look like news media content but differs in terms of management structure and intent. It's exploding on social media all the time. Newspapers, online blogs, forums, and magazines are all contributing to the growth of the online publishing industry. It's difficult to determine which news sources are trustworthy. The rise of false news necessitates the development of effective analysis tools capable of revealing the truthfulness of informa- tion. The falsity of news has a substantial (positive/negative) impact on people who use social media on a regular basis. To avert a disaster, it must be caught as soon as feasible. As a result, researchers are concentrating their efforts on devel- oping algorithms and approaches that can successfully detect fake news. The mainstream media's editing procedures and standards to assure the dependability and trustworthiness of information. Fake news primarily attracts the attention of those who are interested more concerned in political debates and stock prices as well as have an impact on their mental health, resulting in tension, anxiety, and depression. To counteract the spread of fake news, one should concentrate on the original stories that were first published by the authorised publishers, rather than individual articles.

The continuous growth of social media platforms has resulted into high level of diversification for sources of information, enhanced by easy accessibility for users and affordability for publishers. Social media makes it easier and more accessible to connect and communicate with others, improving the quality of our interpersonal interactions. However, the quality of interpersonal relationships is under jeopardy. People have made social media programmes important to their lives because of the internet's integration into daily life. With ad- vancements in technology, the world has become a domestics world where people may easily communicate with anyone from anywhere. As a result, social media has a significant impact on interpersonal relationships when people rely heavily on it and allow it to dictate communication.

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 DOI:10.5281/zenodo.8019338

Fake news is one of the most serious problems in today's digitally connected world.. The spread of fake news and inaccurate information can lead to confusion and rumours, and the victims may suffer greatly as a result. People may be unaware of how fake news might affect matters in their lives or how to respond when it occurs. Thus to avoid misinformation and fake news spreadingaround, fake news detection is much needed

. Solution proposed in this study aims to be applied in real- world social media and eliminate the bad experience for user to receive misleading stories that come from non-reputable source

II. LITERATURE REVIEW

In [1], nowadays the spread of fake news or information is having a detrimental effect on society. Due to the widespread spread of fake news, we sometimes believe a lot of fake news is true. As a result, we face issues and deprive ourselves of a lot of good and realistic news. To protect people's lives from these various problems, we need to work to automatically detect fake news. Fake news detection is very complex task. In this paper we present our approach to address multi class fake newsdetection using Deep Learning. We used a Long Short Term Memory (LSTM) model for multi class fake news detection using data provided by the task organizers. Our best performing model on the training data achieved an accuracy of 0.98. Our trained model gave an accurate response to the detection of fake news.

In [2], web-primarily based media is a stage to state one's perspectives and viewpoints unreservedly and has made corre- spondence simpler than it became previously. This moreover opens up a risk for people to get out counterfeit phrase in- tentionally. The trustworthy entry to an collection of statistics sources on the net likewise brings the issue of people being provided to counterfeit facts and doubtlessly accepting such information. This makes it considerable for us to understand furthermore, banner such substance through on-line media. With the modem-day tempo of information created via online media, it's far hard to split between certifiable information and fabrications without knowing the wellspring of the news. In this paper, we propose various techniques to verify that the collected news is fake or not. For this, the approach named Natural Language Processing (NLP) is used. Various other methodologies like text classification, classification modeling is also used, and analysis of results has been done. Data from various sources was collected and to verify that the news is correct or not various techniques like SVM, Naive Bayes LSTM are used.

In [3], to address the aforementioned issue, a hybrid Neural Network architecture, that combines the capabilities of CNN and LSTM, is used with two different dimensionality reduction approaches, Principle Component Analysis (PCA) and Chi- Square. This work proposed to employ the dimensionalityreduction techniques to reduce the dimensionality of the feature vectors before passing them to the classifier. To develop the reasoning, this work acquired a dataset from the Fake News Challenges (FNC) website which has four types of stances: agree, disagree, discuss, and unrelated. The nonlinear features are fed to PCA and chi-square which provides more contextual features for fake news detection. The motivation of this research is to determine the relative stance of a news article towards its headline. The proposed model improves results by 4and F1 score. The experimental results show that PCA outperforms than Chi-square and state-of-the-art methods with 97.8

In [4],Fake news has spread widely on the Web in recent years due to the massive amount of information exchanged on digital media. This has motivates our study to determine

the best-performing model among two Machine Learning models: Na¨ıve Bayes (NB), Support Vector Machine (SVM), and three Deep Learning models: Long Short-Term Memory (LSTM), Neural Network with Keras (NN-Keras), and Neural Network with TensorFlow (NN-TF). We examined five models using two different English language news datasets. The performance of the models was evaluated using four metrics; accuracy, precision, recall and F1-score. The obtained results showed that deep learning models had achieved better accuracy than traditional ML models. The LSTM model has outper-formed all other models examined. It achieved an average accuracy of 94.21 percent.

In [5], in recent years, a lot of fake news are generated on the web in order to attract readership, influence opinions, and increase internet click revenue. The generation of this false in- formation has become a worldwide phenomenon and its effects are notorious as it leads to confusion over facts and causes wrong decision-making.However, evaluating and detecting the veracity of news can be a complex and cumbersome task. Thisis simply because most of the studies carried out so far on the detection of such news, especially in real time, are not really performant. Our objective in this work is, therefore, to review the major works that have addressed this problem. Results of this study have revealed that two major approaches have been put forward, namely linguistic and network. In this article, we will try to quote a set of automatic detection of false news on the web and social networks.

In [6], this paper reviews the literature on fake news detection and categorizes detection approaches into Knowledge Based approaches and Machine Learning based approaches. Machine Learning based approaches that have been covered in this paper are divided into Conventional approaches and Neural Network approaches. It provides Support Vector Ma- chines (SVMs) and Na¨ıve Bayes for Conventional approaches. In addition to Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) for Neural Network ap- proaches. Also, the paper discusses the provided approaches.

In [7], a strategy is used for device mastering, particularly surveyed reading, to reap fake information. Specifically, this work used a database of non-fiction tales to educate the device mastering version, the use of the Scikit-study which is alibrary in Python. Records were extracted by us from the database theuse of textual content illustration fashions together with a bag of words, the term frequency Inverse document frequency, andthe bi diagram frequency. After which we tested strategies of type, particularly the feasible type and the linear department of the name and content material, searching at whether it changed into a typical/no-click on feed, in a fake / real sequence. The end result of our take a look at is that line segregation works high-quality with the TF-IDF version with inside the content material segmentation process. The Bi-gram frequency version furnished an awful lot of decrease accuracy of theme separation as compared to the term bag of words and TF-IDF.

III. METHODOLOGY

The project consist of two main half, (1) Train machine learning model. (2) Deployment of model. The workflow begins with dataset collection and then followed by data exploration, data cleaning and preparation, machine learning model training, and finally model deployment.

A. Data collection and cleaning

News data can be gathered from a variety of places, includ- ing Kaggle, UCI Machine Learning, and others. At the data cleaning stage, besides removing the ID and URL columns, all the empty, repetitive and problematic rows are also removed from the dataset. This is because only about 3% of the total rows in the combined dataset have empty or repeating entries in any column.The problematic rows are also removed because some of the news title or content are having newlines (" n") or\tabs (" t") that\makes the texts in the (.csv) file go into new row or column, causing mess to the dataset.

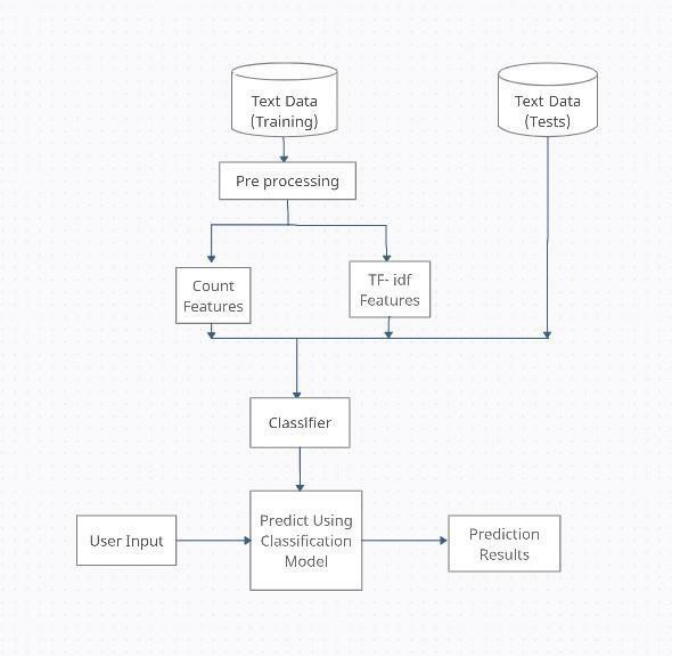

Fig. 1. Flowchart

A. Data collection and cleaning

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B. Data Exploration

After data collection, the data exploration is to comprehend the features and patterns of the data. Exploring data can also help to reduce the chance of having severely unbalanced data, which can have a significant impact on the model trainedlater. Following the collection and cleaning of the dataset, data exploration is carried out to display the distribution or ratio of fake news to actual news, word counts, or even constructing a word cloud to display the most frequently occurring words.

C. Data Preparation

Data preparation is the process of preparing and transforming data into a context that a machine can understand, which is then fed into the machine learning model to be trained. Regular expressions are a crucial tool for specifying text search strings in natural language processing and are particularly good at pattern matching. Word segmentation and normalisation, sentence segmentation, and stemming are some of the core functions it does. A simple regular expression substitution is used to tokenize words in a cascade. Stop words are terms that are frequently used in sentences and will be removed from the index when it is built.

In this project,data preparation entails preprocessing of newstitles and contents using text processing methods such as reg- ular expression to remove punctuation and special characters, tokenization to split the text into words, lemmatization to transform the words back to their root word, and stop words removal to remove common and meaningless words.After get- ting the keywords, vectorization must be carried out in order to turn the keywords into numerical vectors that machines can interpret.

The N-gram model is a frequently used method in language processing that is a contiguous sequence of n items from a sample of text. It calculates the likelihood by counting in the corpus and normalising to a sentence/any other sequence of words based on the preceding words. The TF-IDF stands for ”term frequency in information retrieval.” It’s a figure that shows how essential a word is in a paper. It aids in increasing the proportionate where a word appears in the number oftimes and adjusting for the fact that some words appear infrequently. Because machines can only recognise numbers, one-hot encoding is another option for converting words to number vectors.

D. Model Training

Mainly there are 3 machine learning models used SVC, Naive Bayes, MaxEnt Classifier.

SVC (Support Vector Classifier) is to fit to the data you provide, returning a ”best fit” hyperplane that divides, or cat- egorizes, your data. From there, after getting the hyperplane, you can then feed some features to your classifier to see what the ”predicted” class is. This makes this specific algorithm rather suitable for our uses, though you can use this for many situations.

Naive Bayes classifiers are a collection of classification algorithms based on Bayes’ Theorem. It is not a single algorithm but a family of algorithms where all of them sharea common principle, i.e. every pair of features being classifiedis independent of each other.

Maximum entropy (maxent) classifier has been a popular text classifier, by parameterizing the model to achieve maxi- mum categorical entropy, with the constraint that the resulting probability on the training data with the model being equal to the real distribution

Since MaxEnt Classifier has highest accuracy rate than the others we use this model as the training model in this project.

E. Model Deployment

In this project the model is deployed by creating a website using flask. The website is designed with column of daily news. All the news has been categorized by news headlines. We create a page for detecting fake or real news. The UI created can collect the news and propagate whether the newsis real or fake.

IV. RESULTS AND DISCUSSION

In this section, outcomes for each stage of the machine learning workflow are shown.

A. Training Model

In this project the model is trained by maxent classifier. The given data is featured into, Explicit POS tagging, TF-IDF weighting and Trigram vectorizer.

B. POS Tagging

Adding a prefix to each word with its type (Noun, Verb, Adjective,. . .). e.g: I went to school =¿ PRP-I VBD-went TO-to NN-school Also, after lemmatization, it will be ‘VB-go NN-school’, which indicates the semantics and distinguishes the purpose of the sentence. This will help the classifier differentiate between different types of sentences

C. TF-IDF Weighting

We calculate the TFIDF score of each term in a piece of text. The text will be tokenized into sentences and each sentence is then considered a text item.We will also apply those on the cleaned text and the concatinated POS tagged text.

D. Trigram vectorizer

We use the Trigram vectorizer, which vectorizes triplets of words rather than each word separately.

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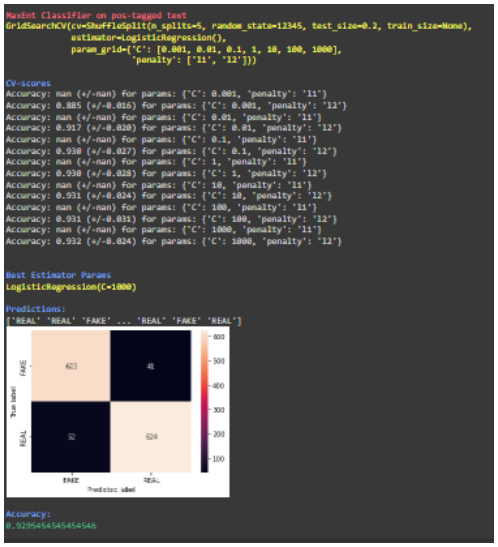

Fig. 2. POS tagging

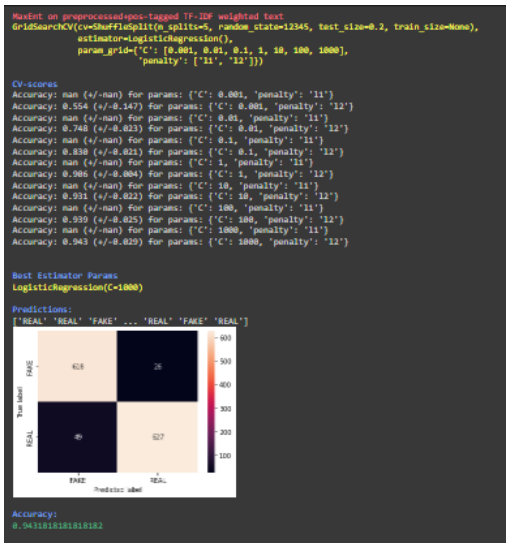

Fig. 3. TF-IDF Weighting

V. MODEL DEPLOYMENT

There are two phases in the deployment. First phase of the website shows daily news. All the real time news has been shown in the website. The website has been developed by using flask.

In the second phase we classify whether the news is fakeor real. The UI also enables the user to type the text or copya news from any other media

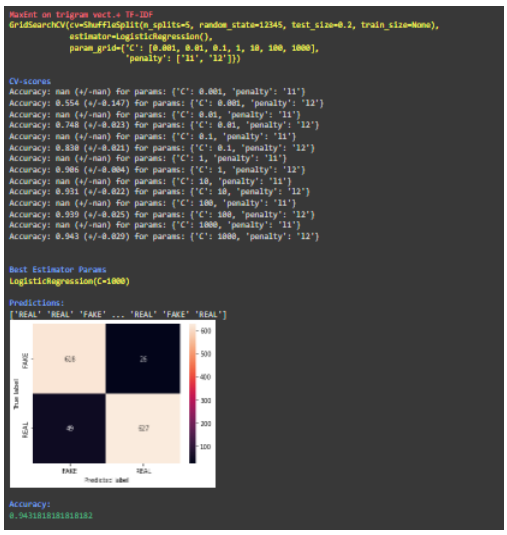

Fig. 4. Trigram vectorizer

The user can also view the text processing pipeline.It shows the original text, preprocessed text and pos-tagged text. So the user are able to understand how the text are processed.

After applying the machine learning algorithms, the news will be predicted as real or fake. The prediction results willbe shown after searching the URL link based on the backend classifiers.

Fig. 5. Real News Detection

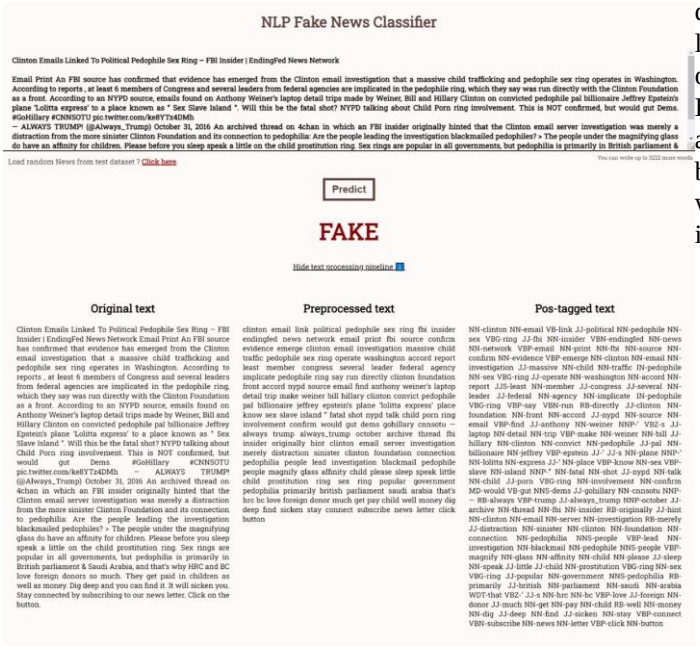

Fig. 6. Fake News Detection

CONCLUSION

In this project, we built a platform to detect fake newson social media, the machine learning model trained in this project work can achieve up to 94.3 percent accuracy that can accu- rately detect fake news. The Modes have been trained with news title and news content which are suitable to be used in social media applications that users would response fast on any updates or incoming messages due to its fast computation time and high recall rate. Also recent news can be taken from News API and can added into our website. As future works, models can be further improved by tuning the parametersto achieve even higher accuracy and recall. Besides, further research can also be done on the images, videos, texts on images of the news to further improve the models in future. We have explored machine learning techniques to detect the news, real or fake. In our project we have characterized two parts i.e., parsing of data and classification. For pars- ing of data, we have explored many libraries, tools, but the simplest and easiest way was through using python libraries. By using them we were able to extract the data and store in structured form. This system can predict the news up to 80 to 90accurate. This will be helpful for mil- lions of social media users. The input is human dependable. Until and unless a URL is not given for the detection we cannot get the result. Hence makingthis system automate can be down in future.

Therefore, the prediction of news being fake or real depends on the input. In our project, there are some limitations such as, the data setsare stored in the format of spreadsheets, which are located in the local system. Due to this reason, any developer will not be able to access this accumulated data until and unless it is shared by any other means. Another limitation is, it is difficult to work on large amount of data. This limitation can be improved in future. 13

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