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# News Credibility Detection using Natural Language Processing

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**Abstract -** *Digital media consumption has been increased exponentially after the introduction of smartphones. Now, most of the data has been uploaded online, newspapers have become news blogs and there has been increased data consumption ever since this internet boom. The easy dissemination of information by way of sharing has exponentially increased its falsification. The credibility of the data that we consume through different apps and online blogs is also on stake due to its prevalent nature. Thus, it is necessary to filter out the data that is verified and is authenticated. Here, we provide some approaches through which we can measure or provide the credibility of the data to the users. We are using a source of input which is analyzed by our model and the model determines the category in which that particular news belong to, i.e., fake or authentic. Many techniques such as Bag of words, lemmatization, logistic regression, NLP are used. The proposed scheme obtains competitive results taking fake news detection into account. The empirical outcome shows the adopted method is elementary and productive*.

***Key Words***: News credibility, Fake news, authentic news, NLP, Logistic Regression, TF-IDF, Stance detection.

## 1. INTRODUCTION

Classification of the data based on its credibility is the primary purpose of this project. With the utilization of AI calculations, we are going to check whether the given piece of information is relevant or not [1]. This project intends to benefit the direct and indirect users as they will be provided with the data on which they can trust and hence will increase their share of knowledge. Most of the huge media companies have adopted this trend of spreading fake news because it increases traffic and helps in generating revenue from it [2]. That is why it is even more necessary to filter out the data that we came across every day [6]. These fake news cause a lot of adverse situations in the long run and the most affected percentage among the population are majorly innocent people. There are certain factors drive more traffic to the companies that provide false news some of them are: (1) chances of interacting with people is more through fake news. People have sympathy for the good things while they react to the bad ones. (2) Fake news attracts more attention due to the fact they have some evidence that encourages people to see them, either they are in acceptance of the general public or opposite to it. (3) It is difficult to spot misinformation and it is easy to fall into traps made by huge companies. They know that motivating our strong emotion will make it more likely to react and share information. (4) Most of the misinformation is shared by our trusted ones. This lets people trust fake information quite easily [4].

### 1.1 Types of fake news

Fake news is generally classified into 5 categories [5]. Including disinformation, others are due to biases or human error known as misinformation. All of these intend to deceive people and are loosely connected with the truth. (1) Satire or Parody – Several sites including The Daily Mash or The Onion can spread misinformation and deceive people when publishing fake news stories as of humor to entertain people if it is shared out of context. (2) Misleading news that is partially true but is used in wrong context – some facts that are catchy and attention grabber and are reported to gain headlines but are often misinterpretation in reality of some scientific research. (3) Careless reporting to fit an agenda –news that has some authenticity, but they are partially verified, that are used to support a certain view or position. (4) Misleading news that supports an on-going narrative and is not based on facts. Often opinions and ideologies of people and bodies come into play as there is no established benchmark for truth. (5) deliberately deceptive – news or information that is often deliberately fabricated to cause confusion among people or to make money in some way and even for some sensationalist propaganda [8]. These stories spread through hoax sites designed to create a real impression. They often employ media such as graphic video content and graphic images that have been exploited in some way [3].

Our system can utilize the model to differentiate the news into categories based on its stance, as discuss, disagree, agree or unrelated. Here, we have created data set especially for fake news detection, to distinguish fake/unauthentic incidents from normal occurrence [7]. The significant concern that emerges in hoax news recognition is because of the way that it is very difficult to interpret fake news in objective terms [9]. So, different approaches have been adopted for this problem. Here our approach is focused on text classification. Text classification is classifying the given text into some categories using some basis and it is a crucial

bit in numerous applications, such as sentiment analysis, language detection, and even in our research domain fake news detection [18]. With the utilization of Natural Language Processing (NLP), text order procedure process on data from data set and categorized text into organized groups. One of the foundational functions in text classification is feature representation which is done by using vectorization method [20]. In the vectorization approach, we are creating a dictionary of known words and the frequency of occurrence of those words which will be fed to the model. The overall motive of text classification resides to train and build a model that can classifying news-related data in 4 categories [15]. Here, once the classification is done model is trained by using logistic regression to obtain maximum accuracy. To show the maximum contribution of this approach, we have performed some experiments with the other machine learning models as well (i.e. Multinomial Naive Bayes' algorithm, Random Forest, SVM, SGD Classifier).

The formation of the paper is as per the following: Section 2 presents related work. Segment 3 presents the proposed strategy. Area 4 contains experimental reports of the performance of the framework. At long last, segment 5 talks about conceivable future work and finishes up this paper.

## 2. RELATED WORK

There are many existing methods for detecting fake news in different domains. We can analyze both linguistic and non-linguistic cues. Some related methods including deep syntax analysis identifies the lexicalization and parent nodes to detect deception. Another model detects fake news by categorizing propagation paths of news. But it may be less accurate if applied on fake news article that are relatively new because similar news story sets may not be accessible yet. Some predictive modelling-based methods are also used for detection of fake news for example logistic regression model that we have used in our case as this can be treated as a classification model. Fact checking can also be done for detection of fake news by accessing the truthfulness of news either manually by experts or regular people or automatically by a system. Other deception detection strategies focus on identifying fake news by looking at its style. It prominently uses a feature vector approach which represents the information residing in the machine learning algorithm which finally helps in determining if the information is deceitful or not by classification. It also helps in determining how much false it is by regression. The dispersal of the fake news can be analyzed by propagation based fake news detection. Cascade based fake news detection falls under this category which represents information as a tree like structure and also analyzing cascade similarity by utilizing graph-based kernels. There is network based fake news detectors as well which can determine fake news in either of homogenous network, heterogenous network, and hierarchical network as well. Credibility based fake news detection uses the approach of looking at fake news in terms of news and social related information. this overlaps with propagation method. This can be done either by assessment of the credibility of the headline of the news or by assessment of the credibility of the source of the news and by assessment of the credibility of the comments of the news. In the last assessment the models can be either content based which focuses on language features, behavior based which focuses on burstiness, activity, timeliness, similarity, and extremity, and finally graph based which emphasizes on relationship among reviewers, comments, products, etc. it can also be assessed by keeping track of the users who spread a particular news content and assess their reliability. Also, there is account analysis which creates a data set of defected tweets from trending topics. As far as click bait detection is concerned, we have various browser add-ons that can detect deceptive content including bias, misleading theories on media websites. With the evolving technology over the course of time, the detection of fake news is constantly becoming more challenging with its accelerating spread speed.

**Feature and cue-based methods**: These approaches involve the designing, evaluating and utilization of the features for finding the fake news. Here new feature must be designed for a specific situation which makes it complex to generalize the features and its engineering methods across different topics and domain areas.

**linguistic analysis-based methods**: this is generally said to be better than feature based methodology while solving the problem of fake news. These cannot deal with more complex interdependencies in data or text and it cannot extract rich semantical and syntactical information in the data. Syntactical cue is less impactful when used alone as compared to n-grams.

**Deep -Learning based solutions**: Even Convolutional neural network CNN, Recurrent neural network RNN, and other deep learning methods face challenges to detect fake news as the contents of fake news connect with truth deceiving people. Cross reference and fact checks are done here to check the correctness along with text analysis.

**Feedback based solutions**: here the kind of data that we train the model on plays a pivotal role. This method usually involves users' responses in a propagation process while having enough feedbacks. Degraded quality is a drawback here in terms of performance when enough responses are not recorded. Also, it cannot update itself afterwards.

**Intervention based methods**: These are not suitable for complex environment where there's free transaction and connection. Here assumptions are made in cases where it limits their applicability. Some Applications of the above approaches are:

1. BS Detector: BS Detector is a plug-in used by some browsers that detects the presence of fake news sources and alerts the user according. It searches through the web pages references of links which are flagged as unreliable in their database. BS Detector has been used by Facebook to solve its proliferation of fake news problem. But lately, they blocked

the extension stating that they have been working on their technique to curb the problem. It gives a warning message for fake articles. It does not tell the error percentage and also doesn't classifies the news into levels of "truthfulness" or "fakeness".

2. Politi Fact: PolitiFact is a fact-checking US-based website used by editors and writers which gives the credibility of claims by US officials involved American politics. It places classification in the form of Truth-O-meter which is a measure of accuracy of a statement. They decide firstly the news that they want to evaluate depending on some characteristics including worthiness and significance of the news. After that, the Truth-O-Meter is generated and a panel of more than two people thoroughly go through it to evaluate the final rating of the claim. The disadvantage that is associated with this system is that human intervention is needed. Secondly, it works only for US politics. Also, they do not fact check every claim. Now it depends upon them what choice of evaluation they opt.

3. Flock Fake News Detector: It is a feature added by flock which is a new generation collaborative and messaging platform. It gets activated when links get shared while chatting. It has database of websites and it checks the content of links with the database. It provides a statistical rating and generates a warning message if the source is not reliable. The database has more than 600 news URLs that are fact checked. The disadvantage of this system is that their database is less in chances and number of frauds still not being determined.

This article provides two major factors responsible for widespread acceptance of fake news by the user which are Naive Realism and Confirmation Bias. It also provides a two-phase general data mining framework which includes 1) Feature Extraction and 2) Model Construction and discusses the datasets and evaluation metrics for the fake news detection research. In [4], An SVM based algorithm has been proposed that has 5 predictive features namely absurdity, humour, grammar, negative effect, and punctuation and it uses satirical clues to detect misleading news. This paper intends to propose a new model for fake news detection which is using Stance Detection and IF□TDF method for analyzing the data which is taken from various datasets of fake and legitimate news and Logistic regression classifier for classifying the output into four classes namely: Agree, Disagree, discuss and unrelated.

## 3. PROPOSED METHOD

The proposed method is a logistic regression algorithm which comes under machine learning concept. To detect the news type first data has to go through data pre processing and feature extraction techniques and the implementation of the algorithm is done. The overall flowchart of the proposed methodology is given in Fig. 1 the subtleties are given in the accompanying areas.

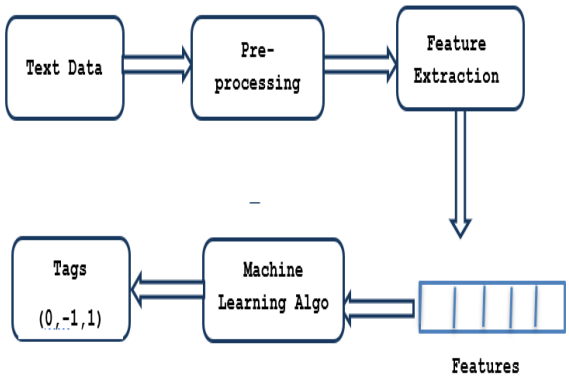


**Fig 1. The model and stage**

### Dataset Description

The dataset consists of around 50 thousand entries which are collected from various GitHub repositories. Initially, the data file which was in text format is converted into CSV format using python's Pandas library. The column for all the comments is labelled as "Headline". Then another column for recording stance is created and labelled as "Stance". To recording stance for each entry in column "Headline", the Text Blob library is used and the polarity is calculated which is the stance score of each headline. Fig 2 shows the distribution of unrelated, discuss, agree and disagree entries of comments in the dataset.

### Data pre-processing and feature extraction

Information pre-handling or information mining technique is a process of transforming raw data which is nothing but real-world information into a justifiable configuration. Crude information is consistently deficient with the goal that information can't be sent through a model else it causes certain mistakes. Hence, data get processed before sending through the model. In data pre-processing first phases is to collect data and make sure that the data collected must be of high quality as it will directly affect the quality of mined pattern. Here, the data set is collected. Now collected data and libraries are imported so that process of data cleaning begins. Data cleaning is done in several steps. Initially, Headline present in data set get analyzed and all the non-character data is removed. Having non-character sections will give invalid contribution to the model. Now stop words are removed. Here, stop words are referred to as the word which does not have any meaning or useless words. Commonly used words such as "the", "a", "an", "in" are some stop words that a search engine is trained to ignore. Well, stop words are removed but still words in the sentence are not tokenized. Tokenization is the process of fragmenting a sentence into pieces such as words, keywords and other elements called tokens. Due to the grammatical reasons, even after tokenization report can contain various types of a word, related words or a word with similar meaning. To

avoid the recurrence of words text lemmatization and stemming is done. The main purpose of using stemming and lemmatization is to decrease inflectional structures and derivationally related type of a word to the regular base structure. Even if Lemmatization and stemming are different, they are a special case of Normalization. Here, the output of normalization will provide a list of unique words. After this process, it will be easy to understand that which model will provide maximum accuracy because the lesser the unique words higher the accuracy. to increase accuracy fewer frequency words are removed from the normalized list as well. Now at this point pre-processing and tokenization step is about to complete as feature extraction process begins.

Feature extraction is a process of converting the text into vectors of numbers. ML algorithms do not understand the text therefore in feature extraction the word set is converted into number related format. In particular, vectors of numbers. There are many approaches to do this process and here Bag of words method is used. Sack of words is the most well-known and straightforward component extraction procedure in which data about the request or structure of words is disposed of. What is happening here is, taking input of X-axis and Y-axis and then predicting Y' for new X' data. Now TF_IDF is measured by multiplying matrix value to evaluate the importance of a word. TF_IDF is a factual measure that tallies the presence of the word arranged by rank.

### Model Building

By this time the feature list is created and the way toward making X-axis and Y-axis contributions for model takes place. So, when X and Y inputs are ready the data will get split into 2 sections i.e. training data and testing data to better understand the model performance. Here in this method data is split into 80 – 20 sections.

Next step is to import the logistic regression model because the counterfeit news location issue depends on content order. We utilize Logistic relapse in AI to anticipate the likelihood of an unmitigated ward variable. In this, the reliant variable is a double factor which gives binomial outcomes (y = 0 or 1). Logistic Regression is an important ML algorithm as it can provide probabilities and classify new data using continuous and discrete data sets. The sigmoid function gives an 'S' shaped curve which predicts two maximum values (0 or 1). The S-shaped curve indicated likelihood of something such as information is fake or not. The formula for the sigmoid function is:

Logistic Regression Model

$$P(1) = \frac{1}{1 + e^{-(\theta_0 + \theta_1 * x_1 + \theta_2 * x_2)}}$$

As mentioned, the train informational collection of X and Y is passed for the model to prepare. Next, the testing informational collections of highlights are passed into the model to get the anticipated position (y_pred). Here logistic regression model for abusive video detection based on text classification is providing outcome with 70% accuracy.

## 4. EXPERIMENTS

A number of machine learning classifiers were experimented, to come up with the final model. The logistic regression, Multinomial Naïve Bayes classifier, Support vector machine, random forest, SGD classifier were scrutinized properly to achieve the optimum accuracy.

- For Multinomial **Naïve Bayes** classifier, the dataset achieved an accuracy of **62.32%**.
- The **Logistic Regression Classifier** achieved an accuracy of **70.11%**. And it is adopted for final integration.
- The **Random forest Classifier** achieved an accuracy of **66.57%**.
- The **Support vector machine** achieved an accuracy of **67.90%**.
- The **SGD Classifier** achieved an accuracy of **61.87%**.

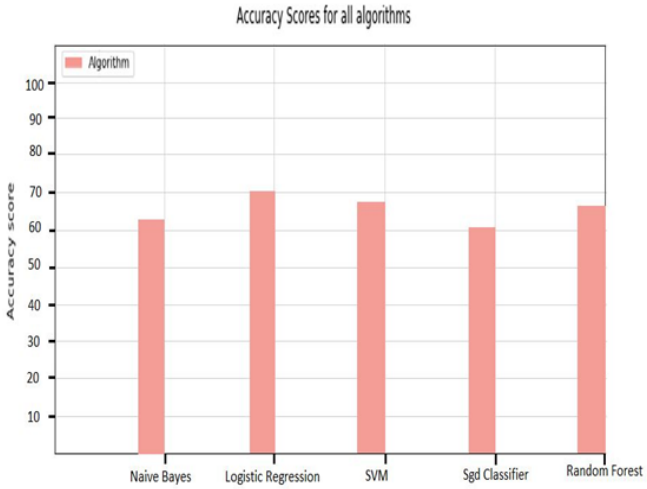


**Fig 2. Comparison Curve**

## 5. CONCLUSION

In this paper, we have defined different types of fake news and their effect on individuals and society. This paper discusses the ongoing trend of sharing information and

excessive presence of unreliable information on the web. The proposed system in an effective fake news detection approach based on logistic regression and stance detection. Performance comparisons with the available schemes further show the adequacy of the proposed approach. we analyzed a sample of about 50 thousand headlines. The experimental results provide the efficiency of the proposed approach by revealing maximum 90% accuracy. The proposed method exhibits efficacy of news credibility detection framework, and whether the news is authentic or not. Through this project, we can create several relatable fields on which other researches can be done for the collective welfare of the society.

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