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Implementation of Machine Learning Techniques to Identify Fake News

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ABSTRACT

Misinformation on social media and other forms of media is widely disseminated and is a major source of concern owing to its potential to create significant social and national harm. The popularity of social media platforms has aided the spreading of fake news. This form of news, spread by electronic media, has the potential to mislead thousands of people in a brief period, causing significant damage to individuals, businesses, and society. Fake news has influenced several social media sites, including Facebook, WhatsApp, Twitter and Instagram. Fake news has the power to change a political situation, lead to disease spread, and even cause deaths. Nowadays, detecting false news has become an onerous task. Fake News are creating problems for common people to designate people who all are running our country. If we can't stop the spread of fake news in quick time, then it will be an impossible task for future. In this work, the Machine learning classifiers include Logistic Regression, Naive Bayes, Decision Tree, SVM and Random Forest, are used to improve the accuracy of misinformation prediction. By using these classifiers, there is a high chance of getting good results.

KEYWORDS

Fake news, social media, Misinformation, Machine learning

1. INTRODUCTION

In recent years, the importance of social media in our daily lives has grown dramatically. Online social media is a widely used medium that allows millions of people to connect in real-time. These are interactive data sources that enable users to build their profiles and interact with one another regardless of their geographic location. It offers a large-scale and wide-ranging contact network. As these social media platforms gain in popularity, cybercriminals have begun to use them as a new medium for communicating various forms of cybercrime. The role of social media in our daily lives has expanded substantially in recent years. Online social media is a widely used medium that allows millions of people to connect in real-time. These are interactive data sources that enable users to build their profiles and interact with one another regardless of their geographic location. It offers a large-scale and wide-ranging contact network. As these social media platforms gain in popularity, cybercriminals have begun to use them as a new medium for communicating various forms of cybercrime. Twitter, a micro-blogging site, and Facebook link to millions of people worldwide, enabling real-time information and news dissemination. Fake news is a false, sensationalized story intended to attract attention, mislead, or damage a person's credibility. When fake news offers misinformation that is consistent with the audience's point of view, it spreads rapidly because such material is unlikely to be challenged or dismissed.

Twitter, on the other hand, has been used to disseminate both true and false information. Many cybercrimes, such as phishing, spamming, malware spread, and fake news, are now considered a major problem, due to the recent growth of social media. It's a technique in which users are exploited by other users in the network. Facebook, as well as other online social media sites, has played a major role in our life's ups and downs. As a result, these websites have become the most popular platform for the distribution of fake news. A false story, often sensationalistic, is created to obtain attention, confuse, mislead, or damage a reputation. The goal of fake news is to generate credible material that would elicit popular reactions and either completely persuade or confuse readers. As a result, such material drives readers to change their views and responses, diverting attention away from the actual news. Fake news identification is an essential topic in society that is now attracting a lot of attention from researchers. It's difficult to create a model that can distinguish between false and actual news. There is a great chance that two articles with the same number of words have completely different meanings. The data science community has reacted by taking steps to fix the issue.

2. LITERATURE REVIEW

In this study, they proposed a supervised machine learning-based fake news identification method. For training and testing, they used an ensemble technique comprised of random forest, decision tree, and extra tree classifiers [1].

The bagging strategy was used for output aggregation, and in comparison, to the other techniques, our model outperformed it. Explicit feature selection and hyper parameter adjustment were two critical aspects that bestow to improved performance. [2] The goal of this project was to develop a new model for swiftly detecting fake news is described as information that is solely dependent on a story's title rather than an analysis of the complete body of the narrative. A complete news text analysis was also carried out. as a comparison to the proposed method. To inspect the headline and text of news, NLP approaches were utilized, and then for prediction, machine learning techniques, including single classifiers and ensemble methods, were used. [3] In this paper Bernoulli's Naive Bayes Classifier is used as a machine learning technique to detect false news. An advanced form of Multinomial Naive Bayes is Bernoulli's Naive Bayes Classifier with predictors represented as Boolean values, i.e. 0 and 1. Their proposed method categories the input data into two groups: 0 and 1. The number '00' represents a phoney news report, while the number '10' denotes a genuine news article. Furthermore, the findings are superior to Gaussian Naive Bayes. According to the experiments, using Bernoulli's Naive Bayes Classifier increases classification outcomes over Gaussian Naive Bayes. [4] In this work, an overall performance analysis of 19 distinct machine learning algorithms on three different datasets in this paper. Eight of the 19 models are classical learning models, six are deep learning models, and five are advanced pre-trained language models such as BERT. [5] By combining web data mining into the solution technique, one attempt was made to improve Fake-News identification. FNN and LSTM-based deep learning models were developed and combined with various word vector representations. [6] The primary purpose is to assist with effective study. The system recognizes reality in text and depicts it in a straightforward and consistent manner within the circumstance. [8] This paper discusses experiment of several deep learning algorithms, including ResNet, Bidirectional LSTM, and CNN were also tested on four different datasets. Word2Vec, GloVe, and fastText deep learning approaches are all combined with pre-trained word embeddings. On all test datasets, bidirectional LSTM outperformed CNN and ResNet, according to the results. GloVe and fastText also performed well since they excelled in two independent datasets. [9] They assessed four machine learning techniques in this paper. For text process, they used NLP techniques. SVM classification, Tree Classification, K-NN classification, and Random Forest Classification were used. SVM has the lowest accuracy. Among all classifiers, Random Forest produces the best results. [14] It is critical to determine the accuracy of news available on the internet. The components for spotting fake news are described in the study. A mindfulness that not all fake news will spread via web-based networking media. Currently, SVM and NLP are utilized to test the suggested Nave Bayes classifier algorithm.

3. PROPOSED METHODOLOGY

In the proposed approach machine learning techniques has applied to detection of false news. Machine learning approaches are being implemented all over the place. Most machine learning algorithms are mathematical operations

based. When there are numerical values in the input dataset, implementing a method is a simple operation. However, if the dataset includes categorical data, certain transformations must be performed before implementing machine learning algorithms. Since the dataset for detecting fake news includes text, additional processing is required. Textual datasets can be handled with Natural Language Processing techniques provided by ML. By studying the major properties of a dataset with the model that is suitable for that task, good results can be obtained. Machine learning algorithm has been used for identifying the fake news. Five classifications have been used for identifying fake news. Those algorithms are Naïve Bayes, Decision Tree classification, Logistic Regression, Random Forest classification algorithms and Support vector machine. The Data set has been opted from kaggle. It has a total of 23,481 false news items and 21,417 factual news pieces in all.

Following algorithms are used in proposed work:

Naive Bayes:

The Naive Bayes method, which is based on the Bayes theorem, is a supervised learning algorithm that handles classification problems. It is most commonly used for text classification with a big training dataset.

Logistic Regression:

In logistic regression, a logistic function is used to represent a binary dependent variable. Extensions that are more difficult to use are also available. Logistic regression is a type of regression model that uses categorical values like True/False. It's a form of mathematical analysis that predicts the outcome of a previous experiment.

Decision Tree Classification:

The Decision Tree classifier is the most widely used classifier. It is a supervised learning method as well. Since tree analysis is simple to understand, Decision Tree classifiers are more common. It divides a large data set into smaller pieces. Decision trees can use both numerical and categorical data.

Random forest classification:

Random forest is a classifier that improves the predicted accuracy of the data set on multiple subsets of the defined meetings by using the average of a series of decision trees. Rather than depending on a decision tree, the random forest gathers forecasts for each of them and predicts the ultimate performance based on the projections that received the most votes.

Support Vector Machine:

SVM is a type of supervised machine learning approach that can be used for classification as well as regression. However, in Machine Learning, it is most typically utilised for Classification problems.

Architecture of proposed system:

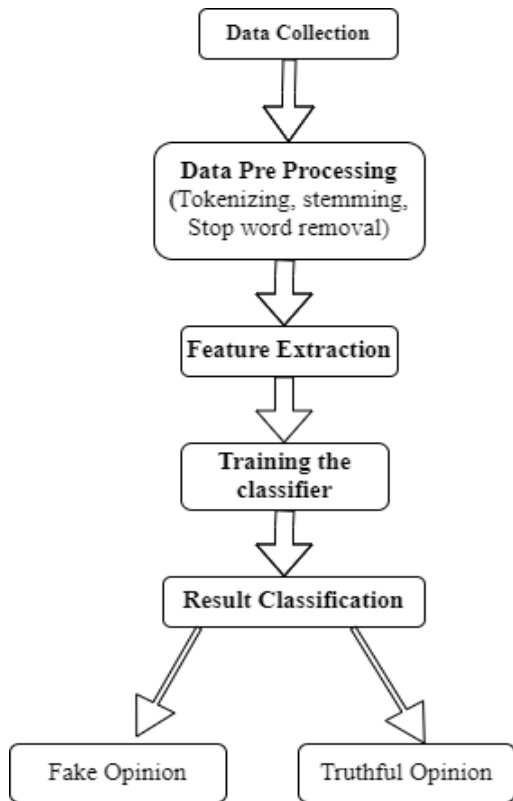


Fig. 1 Roadmap of the Proposed System

3.1 Data Collection

News datasets can be obtained from a variety of sources, including Kaggle, UCI Machine Learning, and others. The purpose of this study, on the other hand, is to train a machine learning model to classify authentic or phoney news on the basis of title or the content of news without being aware of the source of the news.

3.2 Data Preprocessing

The datasets provided were pre-processed to remove noise like punctuation marks, html tags, stopwords, emoji, and so on. The NLTK toolkit, which is a free and commonly known NLP package, was utilised for pre-processing. It has in-built function and algorithm such as nltk.

The following is the procedure for pre-processing datasets:

- **Tokenization:** Tokenization is the process of splitting a text/string into a list of tokens and is the first stage in natural language processing before the feature extraction process. Tokenization is accomplished using the nltk.tokenize method (a built-in function of the nltk library).

- **Stopwords Elimination:** This stage involves removing stopwords after the text has been tokenized. Stopwords are meaningless words in a language that create a lot of noise when used as text categorization feature. These terms are commonly used in phrases to connect two or more words or to help with sentence building. Stop words include articles, prepositions, conjunctions, and some pronouns. We eliminated words like a, an, about, be, are, for, as, by, from, at, how, in, is, of, too, the, these, on, this, was, when, where, who, will, and so on.

- **Stemming:** The practice of reducing words to their origin is known as stemming. The primary goal of stemming is to decrease the number of derived terms. Words like singing sang, and singer, for example, will be reduced to its lemma, which is the word sing. We used it for this reason.

3.3 Feature Extraction

Feature extraction is a dimensionality reduction approach that divides a large amount of raw data into smaller groupings for processing. Because of the vast number of variables in these massive data sets, processing them requires a great number of computer resources. Methods for selecting and/or combining variables to obtain features are referred to as feature extraction, hence minimising the volume of data that must be processed while properly and thoroughly representing the original data set.

3.4 Training the classifier:

After all the preceding operations were finished, then using the kfold method, datasets were divided into training and testing sets. To pick the best hyper-parameters, the arbitrary search hyper-parameter tuning approach is utilised. Machine learning models' default variables are hyper-parameters and can have an immediate impact on their training performance. Although each model provides default parameter values, this does not ensure optimum performance. Moreover, it is doubtful that the perfect value of hyper-parameters will be determined prior to training. As a result, many combinations were evaluated.

3.5 Result Classification:

By implementing all above steps further, we move for the classification of result whether the obtained result is fake or real. On the basis of various ML technique we conclude that the output of generated result. Fake denotes 0 as well as real denotes 1. Finally we determine that how much accuracy

attend by the implemented ML algorithm.

4. IMPLEMENTATION

In this work, Python is used to perform all of the experiments. Python is the most commonly used machine learning method. The selection of a dataset is essential since the entire procedure is based upon fields and records. The dataset for fake news is taken from kaggle. In fig.1. It has a total of 23,481 false news items and 21,417 factual news pieces in all. The dataset has been split into two categories firstly a training data and secondary testing data. While splitting a training data and testing data, a training set is marked by 80% of whole dataset where as 20% of dataset has marked by test set. Stopwords, html tags, punctuation marks, url, and other noise were removed from the provided datasets. For pre-processing, the NLTK toolkit, which is a free and commonly known NLP package, is used. It has built-in algorithms and functions. Stopwords are meaningless words in a language that create a lot of noise when used as text categorization feature. These terms are commonly used in phrases to connect two or more words or to help with sentence building. Popular terms like a, about, an, are, as, at, be, and so on were removed. Then, using the Python NLP packages Count Vectorizer and Tf idf Vectorizer, you can extract features. Count Vectorizer is useful tool which is provided by scikit-learn Python library. It converts a document into a vector based on how frequently each word appears in the text. When converting a series of raw documents into a matrix of TF and IDF functions, the Tf -idf Vectorizer is used. It uses the same dataset to compute word counts, IDF values, and Tf-idf values at once. Tf-idf scores are computed on documents in the "training" dataset.

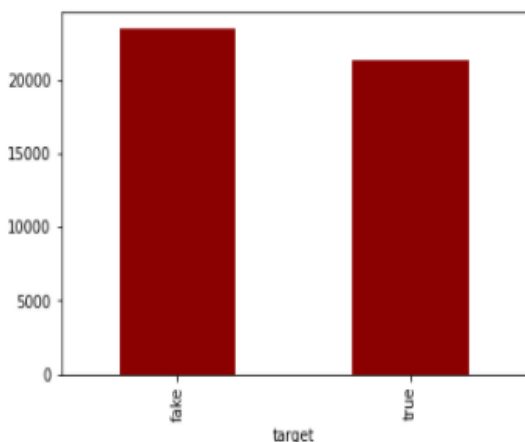


Fig. 2 Fake and Real Count

The data is now ready to be analysed. Three classification has been applied those algorithms are Decision Tree classification, Logistic Regression, and Random Forest classification algorithms. After applying that algorithm, A confusion matrix is prepared. A confusion matrix is a tabular format that can be used to compare the output of a classification model. Accurate

and inaccurate prediction counts are recorded in the confusion matrix. It demonstrates how our model gets confused when it comes to predicting outcomes. In fig.3 the bar graph shows that the most frequent words in fake news and In fig.4 the bar graph shows that the most commonly used words in real news.

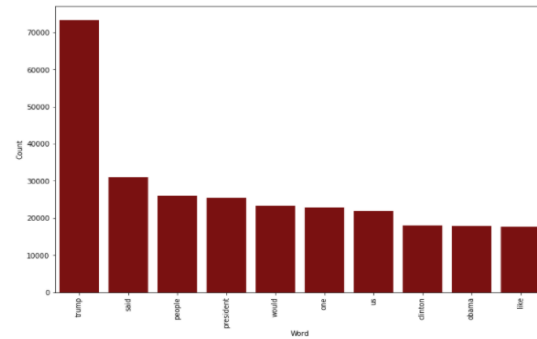


Fig. 3 Most commonly used words in fake news

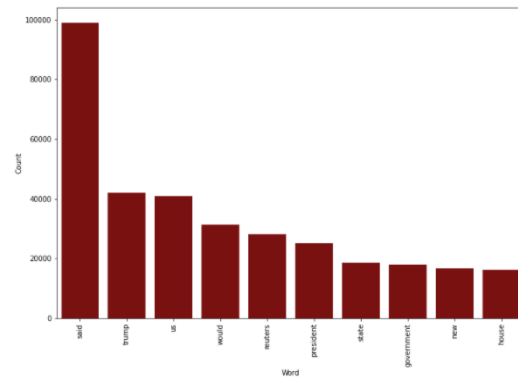


Fig. 4 Most commonly used words in real news

Using Naive Bayes:

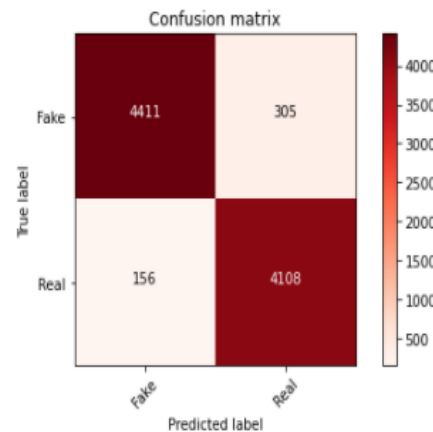


Fig. 5 Confusion Matrix of Naive Bayes

Here, True positives (TP) = 4411

False Positives (FP) =305

False Negatives (FN) =156

True Negatives (TN) =4108

Accuracy of Classifier

$$= \frac{TP + TN}{TP + FN + TN + FP}$$

$$= (4411+4108)/8980 = 94.86\%$$

Fig.5 shows a confusion matrix of Naive Bayes. In which value 4411 is TP means that 4411 news is true and model is also correctly classified, 305 is FP means that 305 news is true but model is incorrectly classified as fake news., 156 is FN means that 156 news is Fake but model is incorrectly classified as true news and 4108 is TN means that 4108 news is fake but model incorrectly classified as true news. There is a formula which is useful to find accuracy of model where aggregate of true negative and true positive is divided by total aggregate of all value. The resultant value is accuracy of that model.

Using Logistic Regression:

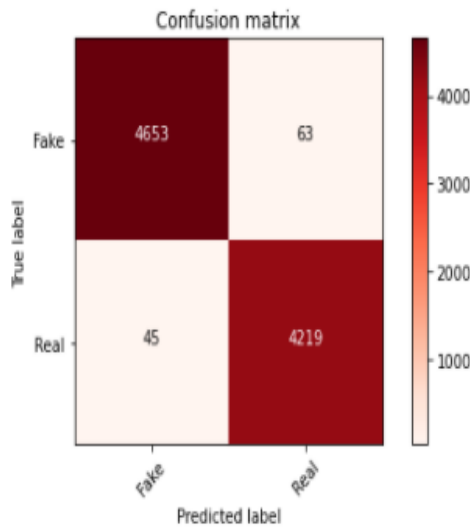


Fig. 6 Confusion Matrix of Logistic regression

Here, True positives (TP) = 4653

False Positives (FP) = 63

False Negatives (FN) = 45

True Negatives (TN) = 4219

Accuracy of Classifier

$$= \frac{TP + TN}{TP + FN + TN + FP}$$

$$= (4653+4219)/8980 = 98.79\%$$

When Logistic regression applied for identifying of fake news a confusion matrix is prepared. Fig.6 shows a Logistic regression confusion matrix of two rows and two columns. Where the value 4653 is TP, meaning the news is real and the model is correctly classified, 63 is FP, meaning the news is true but the model is incorrectly classified as fake news, and 45 is FN, meaning the news is false but the model is incorrectly classified as true news and 4219 is TN means that 4219 news is fake but model incorrectly classified as true news. There is a formula that can be used to determine the accuracy of a model

in which the aggregate of TP and TN is divided by the total aggregate of all values. The calculated value represents the model's accuracy.

Using Decision Tree:

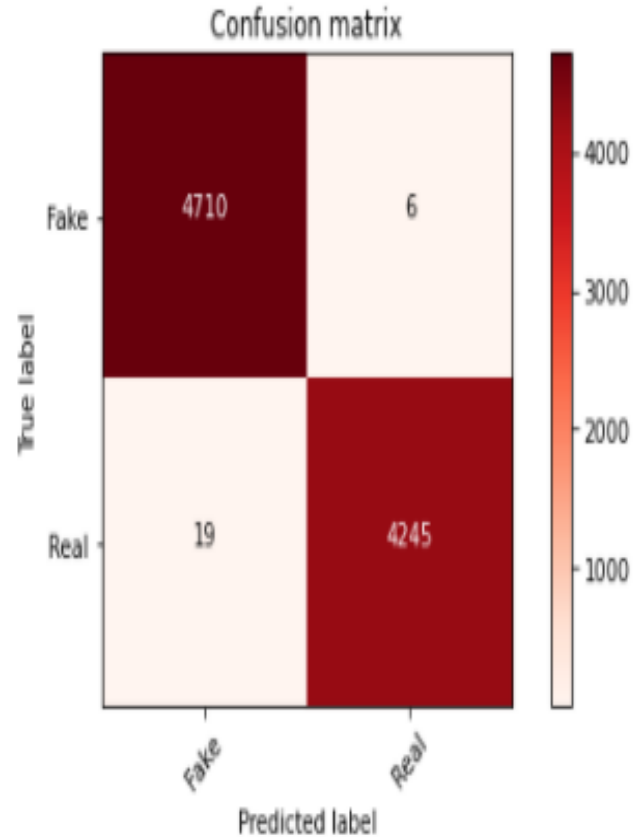


Fig. 7 Confusion Matrix of Decision Tree

Here, True positives (TP) = 4710

False Positives (FP) = 6

False Negatives (FN) = 19

True Negatives (TN) = 4245

Accuracy of Classifier

$$= \frac{TP + TN}{TP + FN + TN + FP}$$

$$= (4710+4245)/8980 = 99.72\%$$

Fig.7 shows a confusion matrix of Decision Tree. In which value 4710 is TP means that 4710 news is true and model is also correctly classified, 6 is FP means that 6 news is true but model is incorrectly classified as fake news., 19 is FN means that 19 news is Fake but model is incorrectly classified as true news and 4245 is TN means that 4245 news is fake but model incorrectly classified as true news. There is a formula which is useful to find accuracy of model where aggregate of TP and true TN is divided by total aggregate of all value. The resultant value is accuracy of the model.

Using Random Forest:

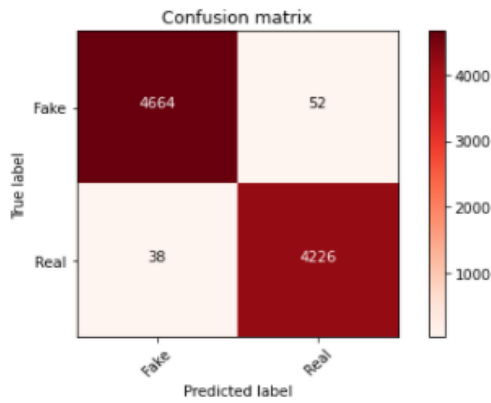


Fig. 8 Confusion Matrix of Random Forest

Here, True positives (TP) = 4664
 False Positives (FP) = 52
 False Negatives (FN) = 38
 True Negatives (TN) = 4226
 Accuracy of Classifier

$$= \frac{TP + TN}{TP + FN + TN + FP}$$

$$= (4664+4226)/8980 = 98.99\%$$

Fig.8 shows a confusion matrix of Random Forest. In which value 4664 is TP means that 4664 news is true and model also correctly classified , 52 is FP means that 52 news is true but model incorrectly classified as fake news., 38 is FN means that 38 news is Fake but model incorrectly classified as true news and 4226 is TN means that 4226 news is fake but model is incorrectly classified as true news. There is a formula that can be used to determine the accuracy of a model, which divides the aggregate of TP and true TN by the total aggregate of all values. The calculated value is the accuracy of random Forest Classifier.

Using SVM :

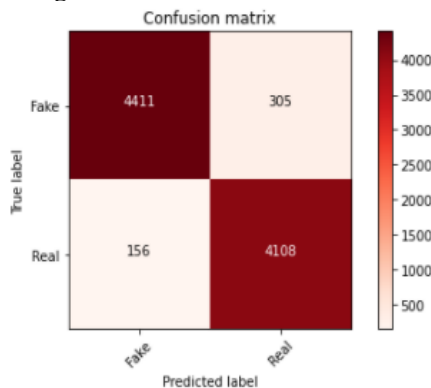


Fig. 9 Confusion Matrix of SVM

Here, True positives (TP) = 4411
 False Positives (FP) = 305
 False Negatives (FN) = 156

True Negatives (TN) = 4108

Accuracy of Classifier

$$= \frac{TP+TN}{TP+FN+TN+FP}$$

$$= (4411+4108)/8980 = 94.86\%$$

Fig.9 shows a confusion matrix of SVM. In which value 4411 is TP means that 4411 news is true and model is also correctly classified , 305 is FP means that 305 news is true but model is incorrectly classified as fake news., 156 is FN means that 156 news is Fake but model is incorrectly classified as true news and 4108 is TN means that 4108 news is fake but model incorrectly classified as true news. There is a formula which is useful to find accuracy of model where aggregate of TP and TN is divided by total aggregate of all value. The resultant value is accuracy of the SVM model.

5. RESULTS

In this work, after applying five different Machine learning algorithms which is Random Forest classification, Naive Bayes, Decision Tree classification, Logistic regression, and SVM, After all classification algorithms have been implemented, a comparison table is generated to compare Machine Learning methods. After training the classifier model when classifier model is testing dataset then the Decision tree classifier gives less number of incorrect prediction means that if news is true then the Decision tree classifier will predict as news is true and if news is fake then the model is correctly identified as fake news. So, in this work the Decision Tree gave better accuracy of 99.72% as compared to Logistic regression and Random Forest to detecting fake news. Which shows that Decision tree has better accuracy level. The dataset has been same for each classifier but when it came about result Decision tree shows the very high accuracy in compare of all five.

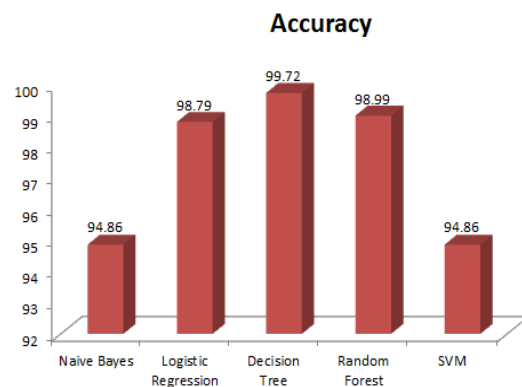


Fig 10 : Comparison of accuracy attended by different models

In the above given Fig 10, Logistic regression having 98.79% which is standing 3rd in accuracy similarly Random Forest having 98.99% and standing 2nd in accuracy level. In spite of all the five the Naive Bayes and SVM has the less accuracy of 94.86% as compared to Random Forest, Logistic regressing.

Deflection of Accuracy is very minor but it deflected in points which is easily visible here in the table1. Decision tree accuracy level has 99.72% which is highest among all.

6. CONCLUSION

In this work, there is five types of machine learning algorithms are used. Those algorithms are Naive Bayes Logistics Regression Support Vector Machine Decision Tree Classification & Random Forest Classification Techniques. These five algorithms are providing the best results for building a tool to detect fake news. Naive Bayes has lowest accuracy despite other four classifiers. Decision Tree has the highest accuracy level among five with 99.72%. In the future, using multiple meta-data about the source and author's news, as well as social media knowledge diffusion features and using Deep Learning approaches for large datasets, could be a potential enhancement.

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