Fake News Detection using Support Vector Machine

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Abstract: Social media is a rich source of information now days. If we look into the dark side of social media, we observed that fake news is one of the serious issues of society. Fake news is being used to spread false information over social media platforms. Fake news detection is the substantial area of research in the field of Natural Language Processing. Thispaper gives the comparative study of well-known machine learning approaches like Naïve Bayes, SVM, Decision tree classifier, Random Forest, Multinomial NB and Logistic Regression. The experimental result shows that SVM classifier outperforms the other approaches and achieved accuracy of 94.93%.

1 INTRODUCTION

Natural Language Processing(NLP) is a subfield of Artificial Intelligence that concerns about machines and humans interaction. If we look into the applications of NLP, there are numerous applications such as chatboats, social media monitoring, language translator, sentiment analysis, fake news detection, voice assistant, grammar checker and many more.Fake News detection is one of the substantial applications of Natural Language Processing.

In a growing phase of social networking sites, some of the dark sides come into the picture. Fake news is one of the dark sides of social media. It became serious issue of society nowadays. Fake news is about to spread false information over various social media platforms like facebook, twitter, instagram, whatsapp etc. In this paper, we are presenting a survey on fake news detection by using machine learning classifiers.

2 RELATED WORK

In order to do survey on fake news detection, many researchers have given their review on machine learning models in ongoing years. This section briefly elaborates on the numerous researches, related to fake news detection by using machine learning classifiers.

Fake news stands for misleading the information that comes from different sources. There are various machine learning algorithms that achieve better accuracy. In order to do analysis on fake news detection authors have presented different data mining perspective (Ruchansky N, 2017). A hybrid model has been proposed for fake news detection (Wang Y, 2018).

The authors have presented the novel approach that representsmulti model fake news detection. This model can derive event invariant features (Zhou X, 2019). Xinyi Zhou *et. al.*has shared fundamental theories, detection strategies and challenges about fake news (Granik M, 2017). The authors have achieved accuracy up to the mark by using naïve bayes classifier. The authors has shared their views on the role of social context for fake news detection. In this paper they discussed the social context that has been used to spread false information (Shu K, 2019). Social media is a huge source of information now days. The author F Montiet. al. have proposed a novel approach for detection of fake news using deep learning (Monti F, 2019).The authors have presented a deep neural network method for detection of fake news. In this paper, they have presented the three level hierarchal attention network for accurate and fast detection of fake news (Singhania S, 2017). The authors have proposed a novel approach named multi model variational auto

encoder for fake news detection. They have used different deep learning techniques to achieve the better result (Khattar D, 2019).Panet. al have given the survey on fake new detection using knowledge graphs (Ravi K,2015).

3 METHODOLOGY

In this paper fake news detection using machine learning approach such as data collection, data pre-processing and so on. Data preprocessing contains different techniques like cleaning, tokenization etc.

3.1 Machine Learning based Approach

This approach is used to predict fake news detection that is based on trained data sets as well as test datasets. It uses different Machine learning algorithms to train the dataset and these trained models are used for specific purposes. There are two learning approaches used for training model named as supervised learning method and unsupervised learning method (Jeff Z., 2018).

3.1.1 Supervised Learning Approach

This approach is used when there is finite number of classes defined named as positive or negative. It uses labelled dataset for training purpose. Decision tree algorithm, Artificial neural network, Random forest, Regression, Logistic Regression, Support Vector Machine, Nearest Neighbour, Naïve Bayes, are the several supervised learning algorithms.

3.1.2 Unsupervised Learning Method

This method does not require labelled datasets and it is work on document- level SA. The aim is to identify semantic orientation in given phrase. Partitioning clustering is the unsupervised learning algorithm.

3.2 Data Collection

This is very initial and important phase in order to perform fake news detection. Now a day, there are various freely available data sources that are public to everyone such as twitter dataset for analysis. Apart from this, data can be acquire from different world wide web, social media sites like twitter, facebook, instagram and online blogging sites and many more. These websites contains large amount of data that is used to perform analysis. This dataset

contains two parts of data i.e fake news and real news. This dataset includes 21418 numbers of data on true news and 23503 numbers of data on fake news from the kaggle website (Khattar D, 2019). This datasets used for the detection of fake news by using different machine learning approach.

3.3 Data Pre-processing

Data preprocessing method includes different essential phases such as data cleaning, data formatting and many more. The data sources contain raw information that is preprocessed by applying some data formatting and cleaning process (Shu K, 2017). There are some preprocessing techniques available named as tokenization, stemming, feature extraction, POS (part of speech) tagging, stop word removal and so on. In this research paper, we used preprocessing techniques for cleaning dataset. The detail information is following:

3.3.1 Tokenization

It is the procedure of breaking the sentences into phrases, symbols, words and other meaningful tokens. This process is done by applying different open source tools such as Natural Language Processing Tokenizers.

3.3.2 Stemming

The sentence or document contains different form of words like organize, organizing and organizes; stemming is the procedure of reducing this kind of word which is in derivationally related form.

3.3.3 Stop Word Removal

The sentence contains stop words. Stop word can be defined as 'a' and 'the' in article, 'he', 'they', 'it' in pronouns are stop words that leads the complexity in the process of sentiment analysis. The process of removing this kind of stop words are stop word removal process.

3.3.4 Feature Extraction

This procedure is related to extract the most relevant feature from text to perform sentiment analysis task. Feature extraction comes under the classification task. We select different feature from text and train the different models by using classification methods. Numerical feature and binary feature are the feature vector categories that show the frequency occurrences. Several texts feature is given below:

N-grams: It shows the frequently occurred letters or words in given text. It is categorized into unigram (one- word), bigram (two- words) and trigram (more than two-words).

Stop words: This is other text feature which is frequently occurred in texts. For example a, the, an, beside, near, he, she, it, they and so in.

Part of Speech tagging: This term is related to parts of speech named as adjective, noun, pronoun, adverb, verb and many more and in a text it holds the maximum sentiment.

Negation: Negation word shows the negative word in the text and it is related 'not'. Some sentences hold the positive meaning but the negation word inverts the meaning of whole sentence. For example 'Biryani is not good' in this sentence good holds the positive meaning but not inverts the meaning of whole sentence.

Table 1: Environmental Setup

Harware and Software specification	Configuration
Processor	Intel(R) Core (TM) i3-5005U CPU @ 2.00 GHz
Random Access Memory	4.00 GB
System Type	64 bit
Operating System	Windows 7
Development Environment	Anaconda 2.0.0 Keras

Table 2: Confusion Matrix

	Label 1 (Predicted)	Label 2 (Predicted)
Label 1 (Actual)	Tn	Fp
Label 2 (Actual)	Fn	Tp

Table 3: Accuracy Comparison of Machine Learning Approach for Fake News Detection

S.No.	Models	Accuracy(%)	Precision(%)	Recall(%)	F-1 Score(%)
1.	NB	88.58	93.99	93.26	93.62
2.	Decision Tree Classifier	89.70	89.90	90.79	90.34
3.	Random Forest	92.37	92.38	93.33	92.85
4.	Multinomial NB	92.98	93	92	93
5.	Logistic Regression	94.92	92.99	95.61	94.28
6.	SVM	94.93	93.98	96.04	94.99

3.4 Support Vector Machine

Support Vector Machine is a supervised learning method. It is a classification as well as regression algorithm that is used to find a hyperplane in an N-dimensional space (n is number of features you have). SVM is based on discrimination. Support vectors represent datapoints that are closet to hyperplane.

4 RESULTS AND DISCUSSION

This section provide the briefly information about the experimental setup and measures the performance of machine learning models. The following subsection represents detailed overview of experimental setup, confusion matrix, etc.

4.1 Environmental Setup and Parameter Setting

Anaconda is a package provider for machine learning models by using python language. Tensorflow is the framework that provides the environment for machine learning models. In this survey paper, we have used python version 3.6.5, jupyter notebook and keras for implementing machine learning models for analysis. Keras is the higher level API that is use tensorflow in backend and it is used for sequential modeling. The detail has given in below Table I.

4.2 Performance Measure

In order to evaluate the performance of the machine learning model, a confusion matrix has been used that contains some parameters such as Tp as true positive, Tn as true negative, Fp as false positive,

and Fn as false negative on test data. The confusion matrix is given in Table II.

The formula for calculating accuracy is given below:

$$\text{Accuracy} = \frac{Tp+Tn}{Tp+Tn+Fp+Fn} X\ 100\%$$

The parameter accuracy is used to validate machine learning model by using the test set and validate set. The Table III presents the comparative study of machine learning classifier.

The table III shows the comparative study of machine learning approaches for fake news detection. It contains the result analysis in the form of accuracy, precision, recall and F-1 score. If we look into the analysis process, we found that SVM performs better compare to other approaches. This analysis shows that SVM achieve the accuracy 94.93%. The below chart shows the graphical representation of result analysis.
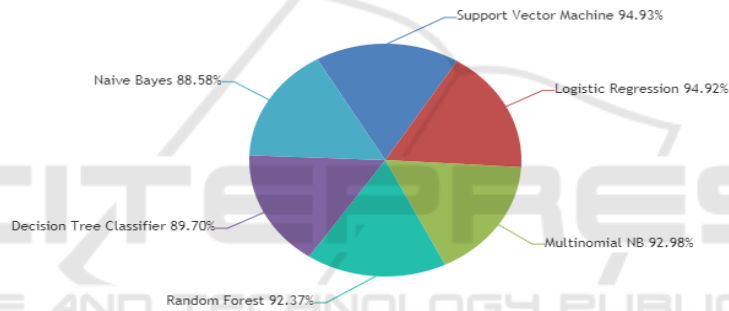

Figure 4.1: Summary of Machine Learning Approaches for Fake News detection

5 CONCLUSION

Fake news is being used to spread false information over social media platforms. Fake news detection is the substantial area of research in the field of Natural Language Processing. This paper provided the comparative analysis of machine learning approaches for fake news detection. To do the analysis process, this paper used fake and real news dataset. This paper provided the comparative analysis of well-known machine learning approaches like Naïve Bayes, SVM, and Decision tree classifier, Random Forest, Multinomial NB and Logistic Regression. The experimental result showed that SVM classifier outperforms the other approaches and achieved accuracy of 94.93%.

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