

Fake News Detection using Machine Learning

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Abstract- Fake News has become one of the major problems in the society. It is due to its ability to change opinions and cause lot of social and national damage with destructive impacts. Sometimes it gets very difficult to know if the news is genuine or fake. Therefore, it is very important to detect if the news is fake or not. The proposed project uses NLP techniques and Machine Learning to create models which can help to detect fake news. The datasets in the comma separated values format, different attributes like the title and text of the news headline/article were used to perform Fake News Detection. The results show that the proposed solution performs well in terms of providing an output with good accuracy, precision, recall, F1 score. So, the proposed project uses datasets that are trained using count vectorizer method for the detection of fake news and its accuracy will be tested using machine learning algorithms.

Keyword- Accuracy, Comma Separated Values(csv), Counter Vectorizer, Machine Learning, NLP(Natural Language Processing), precision, recall, F1 Score

I. INTRODUCTION

Fake news is untrue information presented as news. It often has the aim of damaging the reputation of a person or entity or making money through advertising revenue. Once common in print, the prevalence of fake news has increased with the rise of social media, especially the Facebook News Feed. During the 2016 US presidential election, various kinds of fake news about the candidates widely spread in the online social networks, which may have a significant effect on the election results. According to a post-election statistical report, online social networks account for more than 41.8% of the fake news data traffic in the election, which is much greater than the data traffic shares of both

traditional TV/radio/print medium and online search engines respectively Fake news detection is becoming increasingly

difficult because people who have ill intentions are writing the fake pieces so convincingly that it is difficult to separate from real news. What we have done is a simplistic approach that looks at the news headlines and tries to predict whether they may be fake or not. Fake news can be intimidating as they attract more audience than normal. People use them because this can be a very good marketing strategy. But the money earned might not live up to fact that it can harm people. Intentionally deceptive content presented under the guise of legitimate journalism (or 'fake news', as it is commonly known) is a worldwide information accuracy and integrity problem that affects opinion forming, decision making, and voting patterns. Most fake news is initially distributed over social media conduits like Facebook and Twitter and later finds its way onto mainstream media platforms such as traditional television and radio news. The fake news stories that are initially seeded over social media platforms share key linguistic characteristics such as excessive use of unsubstantiated hyperbole and non-attributed quoted content. The results of fake news identification study that document the performance of a fake news classifier are presented and discussed in this project.

II. LITERATURE REVIEW

PAPER 1:

Title: Fake news detection using Naïve byes, SVM, Neural Network and LSTM [1]

Author: Poonam Tijare

Overview: Accounting to the expeditious digitization across all channels and mediums, the menace of fake news has been burgeoning at a colossal scale. Majority of the Countries all across the world are trying to combat this challenge. This paper explores the application of Natural Language Processing and Machine Learning techniques to identify fake news accurately. Pre-processing tools are used to clean the data and apply feature extraction on them. Then a fake news detection model is built using four different techniques. Finally, the paper investigates and compares the accuracy of techniques which are Naive Bayes, Support Vector Machine (SVM), neural network and long short-term memory (LSTM) to find the best fit for the model. Introduction: Over

the last decade, there have encounters of flux in misinformation that spread like wildfires. The surge in fake news was noticed during the 2016 presidential elections that happened in the US that determined the fate of these elections. In many cases, it is seen that the sharing of hoax news has been more than that of accurate news. In a massive market like India, the scope of fake news propaganda has been artfully misused by many groups. Researches indicate that Facebook and WhatsApp are the platforms that are utilized for spreading fake news. An approximate of one in two Indians have agreed to have received fake news during the 2019 Lok Sabha elections.

Table 1: Dataset Description

ID
HEADING
AUTHOR
CONTENT/TEXT
FAKE OR REAL CLASSIFICATION

Results: Below table shows the algorithms used and the corresponding Accuracy.

Table 2: Results of Algorithm

Model	Accuracy
Naive Bayes	71.84%
Support Vector Machine	87.37%
LSTM	94.27%
Keras Based Neural Network	90.62%

PAPER 2:

Title: Fake news detection using NLP

Author: Lakshmi Panneerselvam

Year: June 2021 [2]

Overview: The major objective of watching or reading news was to be informed about whatever is happening around us. There are several social media platforms in the current modern era, like Facebook, Twitter, Reddit, and so forth where millions of users would rely upon for knowing day-to-day happenings. Then came the fake news which spread across people as fast as the real news could. Fake news is a piece of incorporated or falsified information often aimed at misleading people to a wrong path or damage a person or an entity’s reputation

Problem Statement: A fake tweet on Twitter spreads six times faster than the real one. Thus, it becomes necessary to find whether a piece of news is true or fake whenever we

read any information on the web.

Methodology: NLP Techniques, appropriate Machine Learning algorithms and Datasets.

Algorithms: Multinomial Naive Bayes algorithm and Passive Aggressive algorithm.

Dataset: The dataset downloaded from Kaggle has the following

attributes: Id, Title, Author, Text, and the Label (where 1 is unreliable and 0 is reliable).

Conclusion: The PAC algorithm responds aggressively to incorrect predictions and remains passive for the correct predictions. By using this algorithm, the accuracy is 92%. Multinomial naïve bayes algorithm considers the integer feature counts where it represents how often or how many times a specific word appears. It is much suitable for the classification of discrete features. i.e. word counts for classifying a text. The Prediction Accuracy we’ve got here is 90%. We can print a confusion matrix to gain insight into the number of false and true negatives and positives.

PAPER 3:

Title: Fake News Detection Using N-Gram Analysis and Machine Learning Algorithms [3]

Author: Asha J. and Meenakowshalya A.

Year: February 2022

Overview: Fake news is untrue information presented as news. Fake news easily spread than real news amongst social networking sites. The main challenge in fake news detection is limited availability of resources (datasets). This project work detects fake news using n-gram analysis and machine learning algorithms

Introduction: Today’s revolutionary false information is news, stories or hoaxes created to deliberately misinform. The ‘false information’ is a term refer to a diverse range of disinformation covering topics such as health economics and education so on. It often has the aim of damaging the reputation of a person or object, or making money through advertising income. The main concept of fake news is not an emerging concept.

Methodology:

N-gram Model, Data Pre-processing, Feature Extraction, Term Frequency, K-Nearest Neighbor.

Conclusion: In this paper, a detection model for fake news was using n-gram analysis through different features extraction techniques and machine learning algorithms. Furthermore, project investigated two different features extraction techniques and six different machine learning techniques. The proposed methodology gives highest accuracy when using unigram features (N=1) and SGD classifier (Machine learning). The highest accuracy score is 93.5%, performance tuning is applied on SGD, to find best parameter for enhance the accuracy by using Grid Search CV and Random Search CV, among both Random Search CV yields more accuracy of 94.2%.

III. METHODOLOGY

A. Existing System:

Existing ML models have been focusing on classification of online reviews and publicly available social media posts. Some of the approaches used n-grams and parts-of-speech (pos) tagging that have proven insufficient for classifying task. → How to enforce user privacy preferences. → How to secure data when store in to the PDS. → Users are not skilled enough to understand how to translate their privacy requirements into their privacy preferences. → Average users might have difficulties in properly setting potentially complex privacy preference.

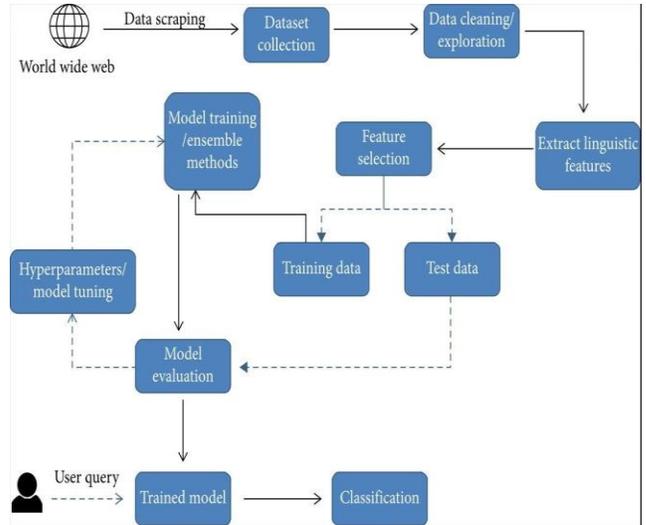
B. Proposed System:

The proposed system when subjected to a scenario of a set of news articles, the new articles are categorized as true or fake by the existing data available. This prediction is done by using the relationship between the words used in the article with one another. The proposed system contains a Word2Vec model for finding the relationship between the words and with the obtained information of the existing relations, the new articles are categorized into fake and real news. → Personal data Storage (PDS) has inaugurated a substantial change to the way people can store and control their personal data, → By moving from service-centric to a user-centric model. PDSs enable individuals to collect into a single logical vault personal information they are producing. → Such data can then be connected and exploited by proper analytical tools, as well as shared with third parties under the control of end users.

IV. SYSTEM ARCHITECTURE

A. pseudocode:

- Step 1: Start
- Step 2: Input is collected from various sources and prepare a dataset.
- Step 3: Pre- processing of data is done and dataset is divided into 2 parts training and testing data.
- Step 4: Count vectorization technique is used to convert the train data into numerical.



- Step 5: PAC (Passive aggressive classifier) algorithm is used to build the predictive model using the train data.
- Step 6: Confusion matrix is obtained.
- Step 7: Accuracy, Precision, Recall, F1 score is calculated.

Above figure shows the workflow for training the model and evaluation of model

1. Dataset Collection: Input is collected from various sources such as newspapers, social media and stored in datasets. System will take input from datasets.
2. Data Cleaning: The datasets undergo preprocessing and the unnecessary information is removed from it and the data types of the columns are changed if required. Jupyter notebook and python libraries are used in the above step. Count vectorizer technique is used in the initial step. For fake news detection, we have to train the system using dataset.
- 3.Feature extraction: is the process of selecting the feature from the data set
4. Classification of data set: Before entering to the detection of fake news, entire dataset is divided into two datasets. 80% is used for training and 20% is used for testing.
5. Model Training: During training, PAC, SVM algorithms are used to train the model using the train dataset.
6. Model evaluation: In testing, the test dataset is given as input and the output is predicted. After the testing time, The predicted output and the actual output are compared using confusion matrix obtained. The confusion matrix gives the information regarding the number of correct and wrong predictions in the case of real and fake news.
7. The accuracy is calculated by the equation No of Correct Predictions/Total Test Dataset Input Size.

V. IMPLEMENTATION

A. MACHINE LEARNING

Machine Learning (ML) is a sub-category of artificial intelligence that refers to the process by which computers

develop pattern recognition, or the ability to continuously learn from and make predictions based on data, then make adjustments without being specifically Programmed to do so. Machine learning algorithms build a mathematical model based on sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to perform the task. Machine learning is closely related to computational statistics, which focuses on making predictions using computers. The study of mathematical optimization delivers methods, theory and application domains to the field of machine learning. "A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P if its performance at tasks in T, as measured by P, improves with experience E." This is Alan Turing's definition of machine learning. Deep learning is a class of machine learning algorithms that utilizes a hierarchical level of artificial neural networks to carry out the process of machine learning. The artificial neural networks are built like the human brain, with neuron nodes connected together like a web. While traditional programs build analysis with data in a linear way, the hierarchical function of deep learning systems enables machines to process data with a nonlinear approach.

B. NATURAL LANGUAGE PROCESSING

NLP stands for Natural Language Processing, which is a part of Computer Science, Human language, and Artificial Intelligence. It is the technology that is used by machines to understand, analyze, manipulate, and interpret human's languages. It helps developers to organize knowledge for performing tasks such as translation, automatic summarization, Named Entity Recognition (NER), speech recognition, relationship extraction, and topic segment

Count Vectorizer:

Count Vectorizer tokenizes (tokenization means breaking down a sentence or paragraph or any text into words) the text along with performing very basic preprocessing like removing the punctuation marks, converting all the words to lowercase, etc. The vocabulary of known words is formed which is also used for encoding unseen text later. An encoded vector is returned with a length of the entire vocabulary and an integer count for the number of times each word appeared in the document.

Input to count vectorizer:

Document having 3 sentences

Sam Sam is super happy

Sam Sam is very sad

Sam Sam is scary

Output:

id	title	author	text	label
0	House Dem Aide: We Didn't Even See Comey's Let...	Darrell Lucus	House Dem Aide: We Didn't Even See Comey's Let...	1
1	FLYNN: Hillary Clinton: Big Woman on Campus - ...	Daniel J. Flynn	Ever get the feeling your life circles the rou...	0
2	Why the Truth Might Get You Fired	Consortiumnews.com	Why the Truth Might Get You Fired October 29, ...	1
3	15 Civilians Killed In Single US Airstrike Hav...	Jessica Purkiss	Videos 15 Civilians Killed In Single US Aistr...	1
4	Iranian woman jailed for fictional unpublished...	Howard Pottroy	Print InAn Iranian woman has been sentenced to...	1
5	Jackie Mason: Hollywood Would Love Trump if He...	Daniel Nussbaum	In these trying times, Jackie Mason is the Voi...	0
7	Benoît Hamon Wins French Socialist Party's Pre...	Alissa J. Rubin	PARIS — France chose an idealistic, traditi...	0
9	A Back-Channel Plan for Ukraine and Russia, Co...	Megan Twohey and Scott Shane	A week before Michael T. Flynn resigned as nat...	0
10	Obama's Organizing for Action Partners with So...	Aaron Klein	Organizing for Action, the activist group that...	0
11	BBC Comedy Sketch 'Real Housewives of ISIS' Ca...	Chris Tomlinson	The BBC produced spoof on the 'Real Housewive...	0

3. DATASET

VI. RESULTS AND DISCUSSION

1. Defining the Metrics Some common intrinsic metrics to evaluate NLP systems are as follows:

$$Accuracy = \frac{\# \text{ of correct predictions}}{\# \text{ of total predictions}}$$

2. Accuracy: Whenever the accuracy metric is used, we aim to learn the closeness of a measured value to a known value. It's therefore typically used in instances where the output variable is categorical or discrete — namely a classification task.

3. Precision: In instances where we are concerned with how exact the model's predictions are we would use Precision. The precision metric would inform us of the number of labels that are actually labeled as positive in correspondence to the instances that the classifier labeled as positive.

$$Precision = \frac{\# \text{ of True Positives}}{\# \text{ of True Positives} + \# \text{ of False Positives}}$$

4. Recall: Recall measures how well the model can recall the positive class i.e., the number of positive labels that the model identified as positive.

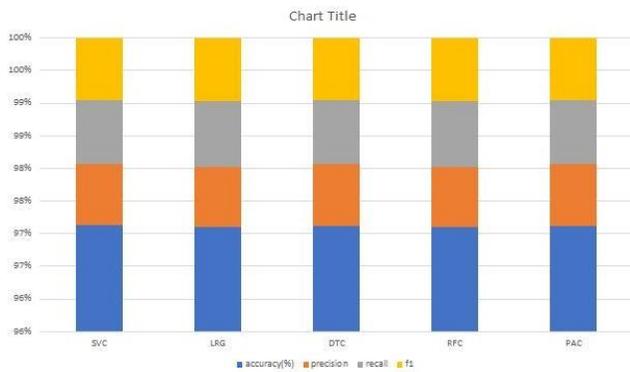
$$Recall = \frac{\# \text{ of True Positives}}{\# \text{ of True Positives} + \# \text{ of False Negatives}}$$

5. F1 Score: The F1 score is defined as the harmonic mean of precision and recall. The F1 score is a machine learning metric that can be used in classification models

$$F1 \text{ score} = 2 * \frac{Precision * Recall}{Precision + Recall}$$

Visualization of Results:

Sl	Models	Accuracy	Precision	Recall	F1 Score
1	SVM	92.33	0.896	0.931	0.913
2	Logistic Regression	92.87	0.880	0.967	0.922
3	PAC	91.96	0.896	0.921	0.908
4	Random Forest	92.95	0.878	0.973	0.923
5	Decision Tree	91.49	0.887	0.917	0.903



VII. CONCLUSION

In this project, we are predicting whether an article is true or Fake article based on the relationship between the words. We have used the US president election datasets for creation of this system. We used the counter vectorizer, PAC, SVM, Logistic Regression, Decision Tree, and Random Forest

Algorithm for building model and predicting the Accuracy, precision, Recall, F1 score. PAC Algorithm Accuracy increases when The training Data increases, when training data size is 50% Random forest has higher Accuracy of 92.95, PAC has 91.96, Logistic Regression has 92.87, SVM has 92.33, and Decision Tree has lowest Accuracy of 91.49 Accuracy of Random Forest has high, We selected This as The best ML model to Detect The Fake News. So overall, the performance for our Dataset was better with Random Forest Classifier. Also, The Confusion Matrix has been plotted and Accuracy values has been measured for the performance Analysis purpose.

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