Fake news filtering with Supervised Machine Learning for Social Life Digital Sustainability

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Abstract: Fake news is an unethical process done with some malicious intension for social disturbance. Fake news causes big losses in terms of business reputation, social disruptions, affecting mental and social health of person and society. Therefore, to get the social life digital sustainability, we need to work on fake news identification. In this proposed research paper, researchers have worked on filtration of fake news using SML-supervised machine learning. SML algorithms are used for training and test the data. It divides the data as per the ratio chosen into training & test datasets having labelled data based on which training ism to be given using various algorithms like SVM-support vector machines, LR-logistic regression, MNB-multinomial naïve based classification, RFC-random forest classification and based on the correct predictions made on the test data, the accuracy of each model is found. The core objective of this research work is to find the analysis of the given news bulletin as it is real or fake using supervised machine learning. This paper takes the data from Kaggle - news_dataset.csv where two fields are there as label and text to check whether the news is actually fake. Here, training test ratio is 75:25. The authors get 99.0%, 99.0%, 95% and 100% accuracy with RFC, MNB classifier, LR, and SVM respectively.

Keywords: Fake news Filtering, Supervised Machine Learning, logistic regression, multinomial naïve based classification, random forest classification, social sustainability.

I. INTRODUCTION

The internet and digital media have transformed the way people acquire and distribute information, making it more accessible and widely available. However, this rapid growth has also results to the viral of misinformation and false news, also raising significant challenges for individuals, institutions, and society as a whole. Given its influence on public opinion, political decisions, and social harmony, identifying and preventing the spread of false news. The growth of false news has become a significant focus of research. In this landscape, machine learning plays a crucial role in automating the identification of false information, enhancing the accuracy and efficiency of detection methods.

Social sustainability is a practice to sustain the peaceful communities without compromising the future. Digital fake news destroyed the social life through digital social media. Social sustainability can create safe environment where people can live peacefully.

The identification or detection of fake news is a text problem of classification. For that supervised machine learning techniques have shown considerable promise. These algorithms work with labelled datasets, where each data point is assigned a specific label. To enable models to learn patterns and relationships during training and evaluate their performance on unseen data during testing, the dataset is typically distributed into training and test subsets. By employing various algorithms, such as SVM, RFC, MNB, and LR, researchers can assess the correctness of these models in distinguishing between fake and real news.

Global standard motivates the organizations to

maintain the social and environment impacts through ISO26000. GRI standards given guidelines for ethical business practices, social responsibility and sustainability. Fake news filtration can give partial social life sustainability. The proposed research paper addresses the issue of fake news detection using supervised learning techniques. For this study, researchers utilized the news_dataset.csv from Kaggle. This dataset is specifically designed for supervised learning, consisting of two key components: a label that identifies whether a news article is real or fake, and the actual news content in text format.

Our study supervises how effectively different SML algorithms can classify news articles based on these labels. This research paper is planned as follows: Section 2 literature reviews prior studies on machine learning-driven fake news detection. Section 3 details the dataset and its preparation process. Section 4 outlines the classification techniques and algorithms employed. Section 5 presents the experimental results and their relevance. Finally, Section 6 summarizes the study and proposes directions for future advancements in this domain.

II. RESEARCH OBJECTIVE

This study aims to apply supervised learning methods to find fake news. The specific objectives include:

1. Detecting Fake News: Implement and analyse different supervised learning algorithms such as Random Forest model, Support Vector Machines (SVM), Multinomial Naïve Bayes, and Logistic Regression, to determine the authenticity of news articles.
2. Improving Social Stability: Reducing the dissemination of fake news promotes a more reliable information environment, lessens societal upheavals, and stops the propagation of false information.
3. Algorithm Performance Evaluation: Labelled dataset is use to confirm the performance of algorithm and compare the precision and effectiveness of machine learning algorithms.
4. Classification of News Dataset: Dataset source can be a kaggle, which has news stories with labels to assess and train the machine learning model.
5. Optimization of Dataset splitting for Training and Testing: To get the highest accuracy and generalizability, use 75:25 ratio of training and testing data can be used.
6. Assessment of Effectiveness of Model: Evaluate news article on the basis of authenticity using machine learning classification methods.

III. LITERATURE REVIEW

Research study have developed the efficacy to automate the detection of fake news using supervised machine learning methodologies. It helps in controlling the spread of false information on such a digital platform. Natural language Processing expanding the field of machine learning which provides valuable and insightful information to identify false news with enhanced accuracy.

The LSTM – Long Short Term Memory, Random Forest and Naïve Bayes models, Passive Aggressive algorithms are used in fake news identification learned from this research work. It combines the LSTM and Naïve Bayes (NB) methods to form hybrid method.

The outcome shows that Naïve Bayes performance is better in recall. Hybrid NB-LSTM model had 92.34% maximum accuracy rate in finding out errorneous fake information. When using TF-IDF, classification accuracy result is 92.26% whereas LSTM given an accuracy of 92.34% in standalone models.[1]

Random Forest model showed highest prediction accuracy at 94%, while the lowest accuracy given by Neural Network model at 92.1%. This was the overall observations studied.

The research work focused on current fake news identification methods and presents a new approach that uses Twitter. Fake news detection can be affected by the word sentiments, users in degree centrality, total number of tweets and word similarity. The user interactions, content,

properties, and network structure in to account considered for analysis.

The ranking of accuracy is started with CART and Neural Network is 94.6% and The Random Forest model accuracy is 94.1%. The results focused on the significance of linguistic and network based features in improvising fake news identification accuracy. Therefore, this study presents the total number of tweets formed by each account of social media. This system is used to detect fake news, it is really a very crucial role in finding out the accuracy.[2]

Experiments employed the LIAR1 and LIAR2 datasets for fake news classification, illustrating the necessity of extracting and analyzing news features for accurate identification [3]. Further research is required in this domain, with deep learning techniques leveraged to address misleading multimedia content [4].
Deep learning and natural language processing serve as key linguistic tools. Governments also encounter cyberwarfare challenges due to fake news, prompting reliance on computational detection methods to mitigate its effects [5].
In this paper, various Machine leaning algorithms like Support Vector Machine (SVM) algorithm, Multinomial Naïve Bayes algorithm and Random Forest Classifier.

Support Vector Machine (SVM):
SVM classifiers utilize support vectors—coordinates representing individual observations. The algorithm establishes a hyperplane that best separates two distinct categories. If a clear linear hyperplane is not feasible, an additional feature is introduced to optimize separation (S. Vanaja, , 2018).

Multinomial Naïve Bayes (MNB):
This algorithm operates based on term frequency (TF), which reflects the occurrence rate of words in a document. It determines not only whether a word appears but also its frequency, contributing to accurate classification (Tyagi, A., 2019).

Random Forest Algorithm (RFC):
Random Forest is a supervised classification algorithm that employs ensemble learning. Multiple decision trees analyze different subsets of data, and the final classification is derived from the majority prediction among all trees (Sarraf, T., 2020).

Logistic Regression (LR):
Although named "regression," logistic regression is a classification technique designed for binary prediction tasks. By applying the sigmoid function, it transforms inputs into probabilities, indicating the likelihood of a given data point belonging to a specific category.

IV. RELATED WORK

Data Collection:
We have used Kaggle dataset ‘news_dataset.csv' file for Indian Fake News, for our study, which has 3729 rows and 2 columns – label (Fake / Real) and the text, which contains the actual text data related to the news. The URL for this file is https://www.kaggle.com/datasets/imbikramsaha/fake-real-news. Figure 1 shows the first few lines of the dataset.

Dataset Sample:

	label	text
0	REAL	Payal has accused filmmaker Anurag Kashyap of ...
1	FAKE	A four-minute-long video of a woman criticisin...
2	FAKE	Republic Poll, a fake Twitter account imitatin...
3	REAL	Delhi teen finds place on UN green list, turns...
4	REAL	Delhi: A high-level meeting underway at reside...

Figure 1: ‘news_dataset.csv' file for Indian Fake News

B. Data Pre-processing:
We have applied data preprocessing technique – handling missing values by dropping the row for the missing values. The ‘x’ parameter is taken as the text content of the news itself and the ‘y’ parameter is the label – real or fake, to be predicted for the text data based on the training data and compare each one against the actual label and to find the accuracy using four various models of supervised machine learning. Figure 2 shows the handling of missing values.

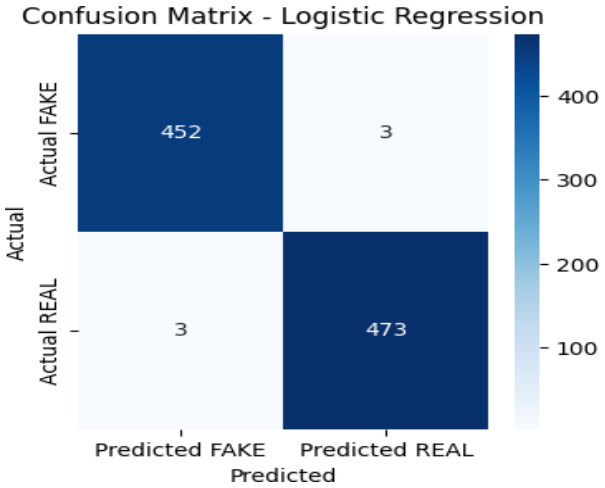
```
Handling missing values...
0       1
1       0
2       0
3       1
4       1
       ..
3724    1
3725    1
3726    0
3727    1
3728    1
Name: label, Length: 3721, dtype: int64
```

Figure 2: handling missing values

The total rows reduces to 3721 from the original 3729 rows.

C: Applying Supervised Learning Algorithms: After defining 'x' as the text data and 'y' as the label for the text of 'x', the labels – 'REAL' and 'FAKE' are encoded to 1 and 0 respectively to classify them as per each four supervised machine learning algorithms one by one. The splitting of data executed as training and test data sets split and converted the text data to numerical data using TF-IDF Vectorizer. Each of the four models has been trained one by one by calling the fit() method of python on the model's object. The accuracy score, confusion matrix and the classification report have been found, which are listed in the figure 3, figure 4,figure 5 and figure 6 respectively.

Logistic Regression
Accuracy: 0.99



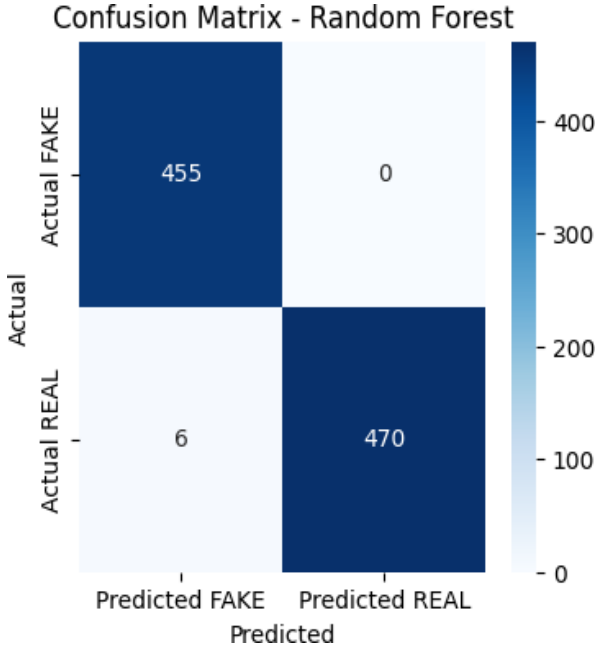

```
Classification Report:
              precision    recall  f1-score   support

           0       0.99      0.99      0.99       455
           1       0.99      0.99      0.99       476

    accuracy                           0.99       931
   macro avg       0.99      0.99      0.99       931
weighted avg       0.99      0.99      0.99       931
```

Figure 3: accuracy score, confusion matrix and classification report for Logistic regression

Random Forest
Accuracy: 0.99



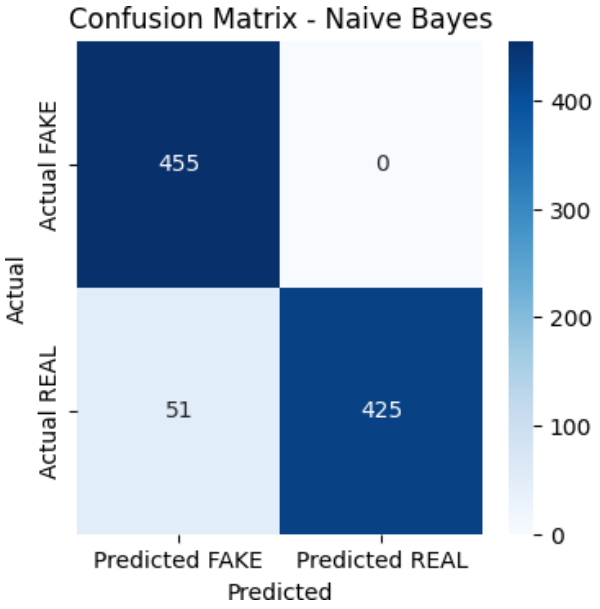

```
Classification Report:
              precision    recall  f1-score   support

           0       0.99      1.00      0.99       455
           1       1.00      0.99      0.99       476

    accuracy                           0.99       931
   macro avg       0.99      0.99      0.99       931
weighted avg       0.99      0.99      0.99       931
```

Figure 4: the accuracy score, the confusion matrix and the classification report for RFC-Random Forest classification

Naive Bayes
Accuracy: 0.95

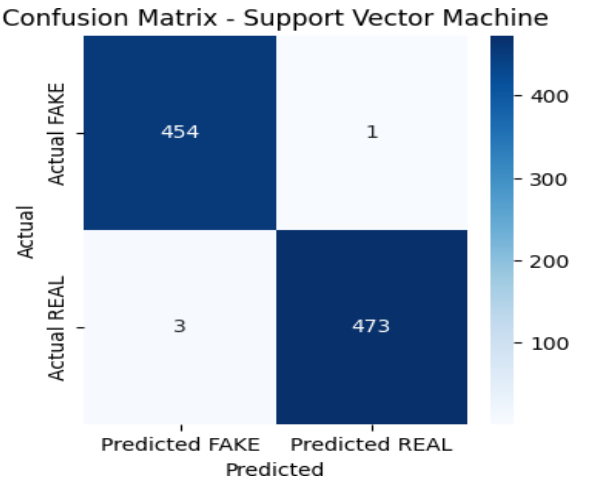


Classification Report:

	precision	recall	f1-score	support
0	0.90	1.00	0.95	455
1	1.00	0.89	0.94	476
accuracy			0.95	931
macro avg	0.95	0.95	0.95	931
weighted avg	0.95	0.95	0.95	931

Figure 5: accuracy score, confusion matrix and classification report for Multinomial Naïve Bayes

Support Vector Machine
Accuracy: 1.00



Classification Report:

	precision	recall	f1-score	support
0	0.99	1.00	1.00	455
1	1.00	0.99	1.00	476
accuracy			1.00	931
macro avg	1.00	1.00	1.00	931
weighted avg	1.00	1.00	1.00	931

Figure 6: accuracy score, confusion matrix and classification report for support vector machine

V. CONCLUSION AND FUTURE WORK

Our research paper worked on fake news filtration using supervised learning algorithms. In the Table 1, it depicts the accuracy classification for all four supervised machine learning classification.

Algorithm	Accuracy score
Support Vector Machine	1.0
Multinomial Naïve Bayes	0.95
Random Forest	0.99
Logistic Regression	0.99
Hybrid Ensemble Model	0.9937

Table 1: Comparative data of accuracy score for four different supervised machine learning algorithm.

As per the table 1, we have drawn the conclusion that Support Vector Machine has the highest and 100 % accuracy to detect the fake news. So if any software is to be developed to filter the fake news then the support vector classifier can be used for that. Fake news filtering with Supervised Machine Learning helps to bring Digital Sustainability in our social life.

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