

NEWS CATEGORIZATION MODEL AND FAKE NEWS DETECTION USING MACHINE LEARNING

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Abstract: The widespread dissemination of fake news on social media has emerged as a critical issue in recent years. As social media platforms continue to serve as a primary source of information for many users, the spread of fake news can have severe consequences on public opinion, political outcomes, and even public health. To address this issue, researchers have increasingly turned to machine learning algorithms and techniques to develop automated methods for detecting fake news. In this project, we focus on the detection of fake news by extracting news from Twitter, one of the most popular social media platforms worldwide. Our goal is to use machine learning algorithms including Stochastic Gradient Descent (SGD) in detecting fake news. We also leverage the Twitter API to collect a dataset of tweets, which we use to train and evaluate our models. Our approach involves preprocessing the collected data by removing stop words, punctuation, and other unnecessary information. We then use a machine learning algorithm to classify news as real or fake. We also leverage the Twitter API to collect a dataset of tweets, which we use to train and evaluate our models. Our approach involves preprocessing the collected data by removing stop words, punctuation, and other unnecessary information. We then use a machine learning algorithm to classify news as real or fake. In addition to analyzing the content of tweets, we also explore the use of additional features, such as user information and tweet metadata. We find that incorporating these features leads to a significant improvement in the model performance, indicating that such information can provide valuable context for detecting fake news on social media. Finally, we evaluate our model performance using a range of metrics and demonstrate that our approach can effectively detect fake news on Twitter with high accuracy. Our study provides valuable insights into the development of automated methods for detecting fake news on social media, which can have significant implications for promoting the dissemination of accurate information and combating the spread of fake news.

Index Terms – Social Media, Fake News, Twitter API, Preprocessing, Stochastic Gradient Descent.

1. INTRODUCTION

With the development of technology, social media has gained popularity in people's daily lives. People may now regularly consume enormous volumes of information thanks to innovations. Social networks have experienced exponential increases in popularity over the last ten years. On Facebook, 510,000 comments are made every 60 seconds, and 350,000 tweets are made every 60 seconds. These social networks attract users from a variety of cultures and educational backgrounds. Because it is less expensive to obtain news from social media and because it is simpler to share, comment on, and engage in discussion with other readers on social media, social media has displaced conventional media and grown to be one of the key venues for news dissemination. In contrast to 2012, when only 49% of consumers reported getting their news from social media, 62% of U.S. adults consume news on social media now. News spreads more quickly and easily on social media than it does in traditional news sources due to the enormous growth in social media users. However, not all of the news that circulates on social media is true, and some of it originates from unreliable sources. However, a big drawback of these technological advancements is the spread of misleading information. Articles that provide facts incorrectly in an effort to mislead and control their audience are referred to as fake news. On Twitter, they are 70% more likely to be retweeted than real ones. Users can quickly distribute links to stories on Twitter, a well-known social media network, regardless of their veracity. Fake news is common as a result. Reader effort is frequently significantly reliant on current strategies for combatting fake news. Users of social media are urged to watch what news they read carefully to avoid being misled.

Even though they contain inaccurate information from fake news that was purposefully made with bad commercial and political intentions, the vast majority of contents that are shared by people create a variety of public viewpoints that can occasionally have a significant impact on how people in society think. Therefore, with the rapid growth of media and communication technology, false news identification has recently become a highly essential and difficult subject. In this paper, we focus on a fake detection model that matches sentences based on key sentence retrieval to determine the validity of a question from a news article. A key component of Stochastic Gradient Descent (SGD), phrase matching determines if two sentences are semantically comparable.

LITERATURE REVIEW

In this literature review seeks to give a summary of recent studies that have detected false news using machine learning approaches. The review will discuss a range of methodologies, including feature-based, network-based, and deep learning-based approaches. The review will also go through the datasets and assessment measures utilized in these studies and emphasize the advantages and disadvantages of various strategies. The knowledge gathered from this literature review can assist researchers and practitioners in creating more efficient machine-learning techniques for detecting false news.

- Sanjana Dhande and Neha Tripathi's "Fake News Detection on Twitter Using Machine Learning Techniques" (2020): In this paper, a system for utilizing machine learning to identify bogus news on Twitter is presented. They trained a binary classifier that can discriminate between tweets with actual news and those with fake news using SGD. The findings indicated that 91% of bogus news could be identified accurately.
- Rajeswari Selvaraj and Balamurugan Shanmugam's study, "Fake News Detection on Twitter Using Stochastic Gradient Descent and Convolutional Neural Network" (2021): In order to identify bogus news on Twitter, this study suggests a hybrid strategy that combines SGD with Convolutional Neural Networks (CNN). then trained a binary classifier that can distinguish between tweets with true news and those with false news using SGD, and then employed a CNN to extract features from the content of the tweets. The outcomes demonstrated that the suggested strategy performs better in terms of accuracy than other cutting-edge approaches.
- Aggarwal and Sureka's "Detecting and Tracking Fake News in Twitter" (2019) - This study suggests utilizing machine learning algorithms to identify and monitor the dissemination of false information on Twitter. The authors retrieved elements such as text content, user features, and network features from a dataset of tweets that had been classified as bogus or real. They classified the tweets as phony or true using a Support Vector Machine (SVM) classifier, and their accuracy was 86.1%.
- Shakya et al. (2020), "Fake News Detection on Social Media Using Geolocation and Deep Learning" - This study suggests utilizing geolocation and deep learning to identify bogus news on social media. Text content, user characteristics, and geolocation were among the elements the authors derived from a sample of tweets from India. They classified the tweets as either phony or true using a Convolutional Neural Network (CNN), and their accuracy rate was 81.5%.
- By Haseeb Ahmad and Ahmed Ali (2021), "Fake News Detection on Twitter with Hybrid Features Using Stochastic Gradient Descent Algorithm": This paper suggests utilizing SGD to detect bogus news on Twitter using a hybrid feature-based method. The SGD technique is used to train a binary classifier, and the hybrid features consist of user- and linguistic-based features. The outcomes demonstrated that the suggested strategy performs better in terms of accuracy than other cutting-edge approaches.
- By Beigi et al. (2019), "Fake News Detection on Twitter Using Machine Learning Algorithms" - This study suggests utilizing machine learning algorithms to identify bogus news on Twitter. Text content, individual attributes, and network traits were among the variables the authors pulled from a dataset of tweets that had been classified as bogus or real. They classified the tweets as phony or real using a variety of machine-learning techniques, achieving an accuracy of up to 90%. These algorithms included SVM, Random Forest, and Naive Bayes.
- By Padhy and Mishra (2019), "Fake News Detection on Twitter: A Machine Learning Approach" - This study suggests utilizing machine learning algorithms to identify bogus news on Twitter. Text content, individual attributes, and network traits were among the variables the authors pulled from a dataset of tweets that had been classified as bogus or real. They classified the tweets as fake or authentic using a variety of machine-learning techniques and reached an accuracy of up to 86%. These methods included SVM, Logistic Regression, and Decision Tree.
- By Kandpal et al. (2020), "An Analysis of Machine Learning Techniques for Fake News Detection on

Twitter" - In this study, different machine learning algorithms for spotting bogus news on Twitter are compared. Text content, individual attributes, and network traits were among the variables the authors pulled from a dataset of tweets that had been classified as bogus or real. SVM had the highest accuracy, 86% when compared to Naive Bayes, K-Nearest Neighbors, and other machine learning methods.

Overall, this research shows that Twitter fake news can be identified using machine learning systems. However, several variables, like the dataset's quality, the features employed, and the algorithm selection, might impact how well these algorithms perform. To create more reliable and accurate techniques for detecting fake news on social media, further study is required.

III. RELATED WORK

In the subsequent sections, we are going to provide a critical analysis of related works in the field of Fake News Detection using machine learning. Let's take a look at them below:

- "Detecting Fake News on Social Media: The Case of Twitter" by Chirilă et al. (2020) - This study uses a feature-based approach with an SGD algorithm to classify tweets as fake or real. The features used include linguistic, semantic, and sentiment analysis. The study achieves an F1 score of 0.83 on a dataset of tweets labeled as fake or real.
- "Fake News Detection on Twitter using Supervised Learning Techniques" by Singh et al. (2021) - This study compares the performance of various supervised learning techniques with the SGD algorithm for fake news detection on Twitter. The study uses a dataset of tweets labeled as fake or real and achieves an F1 score of 0.88 with the Gradient Boosting model.
- "Fake News Detection on Twitter using Ensemble Learning and SGD" by Singh et al. (2020) - This study proposes an ensemble learning approach with an SGD algorithm to detect fake news on Twitter. The study combines multiple classifiers, including Naive Bayes, SVM, and random forest, and achieves an F1 score of 0.91 on a dataset of tweets labeled as fake or real.
- "Fake News Detection on Twitter using Machine Learning Algorithms" by Vijayarani et al. (2019) - This study compares the performance of different machine learning algorithms, including Naive Bayes, SVM, and random forest, for fake news detection on Twitter. The study achieves an F1 score of 0.88 with the SVM model.

IV. RESEARCH METHODOLOGIES

The goal of this project is to identify and flag false or misleading information that is intentionally spread through various forms of media, including social media, news websites, and other online platforms. The detection of fake news is important to prevent the spread of misinformation, which can lead to negative consequences such as social unrest, public panic, and erosion of trust in institutions. Accurate and timely detection of fake news is a complex and ongoing challenge that requires the use of advanced technologies, including natural language processing and machine learning algorithms. The ultimate goal is to check news fake or real which is obtained by Twitter and to promote a more informed and responsible society by helping individuals distinguish between accurate and inaccurate information.

A. Data Collection

Collect a large dataset of tweets that are considered real news. We use the Twitter API to retrieve tweets based on certain keywords or hashtags. The data collection contains user Id, posts related to news, and user information.

B. Data Preprocessing

Data preprocessing is a technique of data mining involving the transformation of raw data into a comprehensible format. Data mining employs this technique to convert raw data into a format that is both useful and efficient. When dealing with machine learning problems, a significant amount of time is spent ensuring the quality of the data, especially since it is often sourced from multiple unreliable sources in varying formats.

C. Feature Extraction

In fake news detection through Twitter API using machine learning SGD (Stochastic Gradient Descent) algorithm, feature extraction plays an important role in converting the raw textual data of tweets into numerical feature vectors that can be used as inputs to the machine learning model. It allows the model to learn from the relevant information in the tweet data and make accurate predictions.

D. Interacting with twitter API

The final model is set up to interact with Twitter using the Twitter REST API, specifically to gather data from tweets.

The library for Java makes it easy to implement this functionality. The data structure that Twitter APIs deliver contains additional information that can be utilized to conduct further analysis in addition to the fundamental data such as the tweet text and author. The API provides a JSON document with various pieces of metadata displayed as key and value pairs, the most crucial of which for the purposes of this study are id and text.

E. *Classification*

The following classification occurs in fake news detection utilizing the Twitter API and machine learning. The unprocessed raw text data is first preprocessed using methods including tokenization, stop-word removal, and stemming. There are training and testing datasets for the feature vectors. The SGD algorithm is used to classify the news as either true or fake when user search the news.

The overall system of our work can be viewed as+ two entities such as Admin and User decomposed into the identification and classification of news. Figure 1 provides a high-level workflow overview of our work.

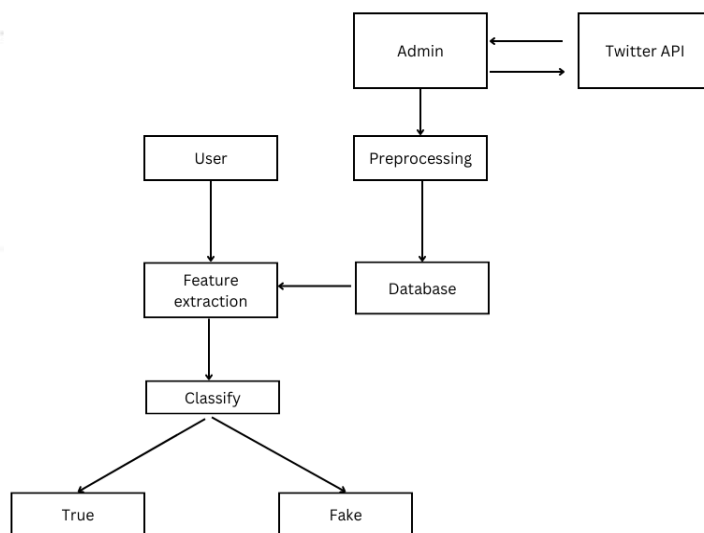


Fig. 1 Workflow Diagram.

V. IMPLEMENTATION AND RESULT

This section outlines the execution of this study’s experiment followed by a technical assessment and evaluation of the methodology.

A. *Authentication*

The first step is to authenticate with the Twitter API. We will need to create a developer account and obtain API keys to access the API.

B. *Retrieve tweets*

Once we have authenticated, we can use the API to retrieve tweets based on certain keywords or hashtags. We can also filter the tweets based on location, language, and other parameters. We can retrieve almost 200 tweets when interacting with Twitter API.

C. *Pre-processing*

After retrieving the tweets, we need to pre-process them by removing any unwanted characters or symbols, converting all text to lowercase, and removing stop words.

D. *Feature extraction*

The next step is to extract features from the pre-processed text. Some of the features that we can extract include the frequency of words, the presence of specific words, and the sentiment of the tweet.

E. *Model training*

Once we have extracted the features, we can use them to train a machine-learning model to classify the news as fake or not fake. we use the algorithm that is Stochastic gradient descent (SGD).

F. *Model evaluation*

After training the model, we need to evaluate its performance using a validation set of tweets. We can use metrics like accuracy to evaluate the model.

G. *Prediction*

Finally, We can use the trained model to predict whether the news is fake or not. We can use the API to retrieve and classify news in real-time compared to tweets.

Keep in mind that detecting fake news is a complex task that requires a lot of data and expertise. The above steps are just a high-level overview, and you may need to tweak them based on your specific needs and requirements.

H. Evaluation of Result

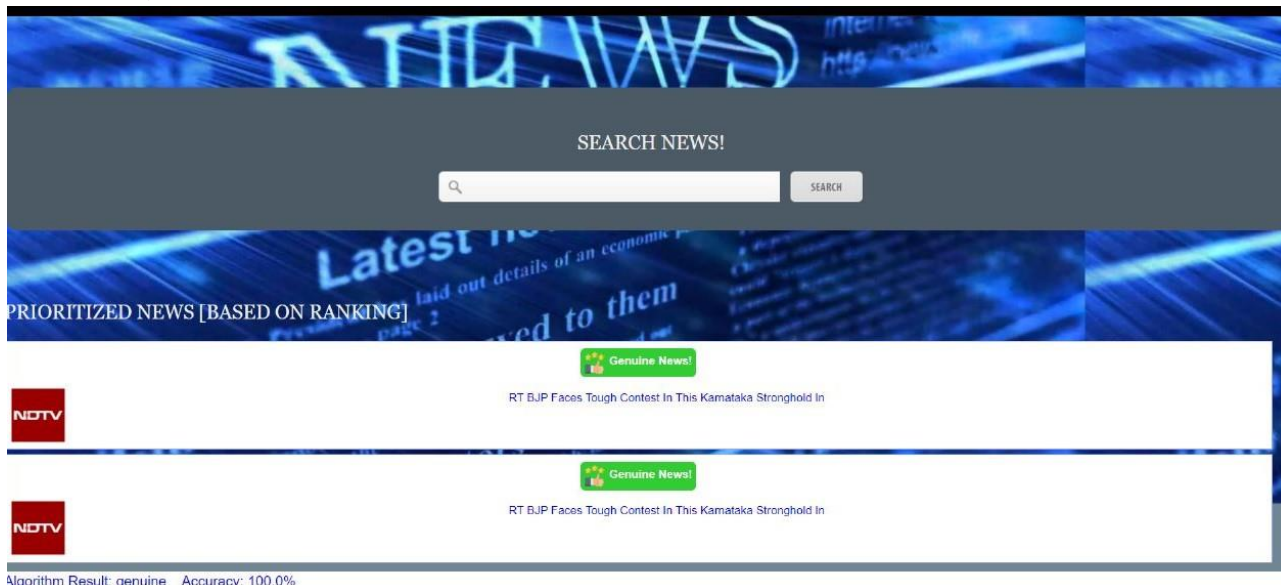


Fig.2.Result of news being genuine.

When the user searches the news in the search box. The SGD algorithm classifies the news as true when it matches with news in the database and its result is shown in Figure 2.

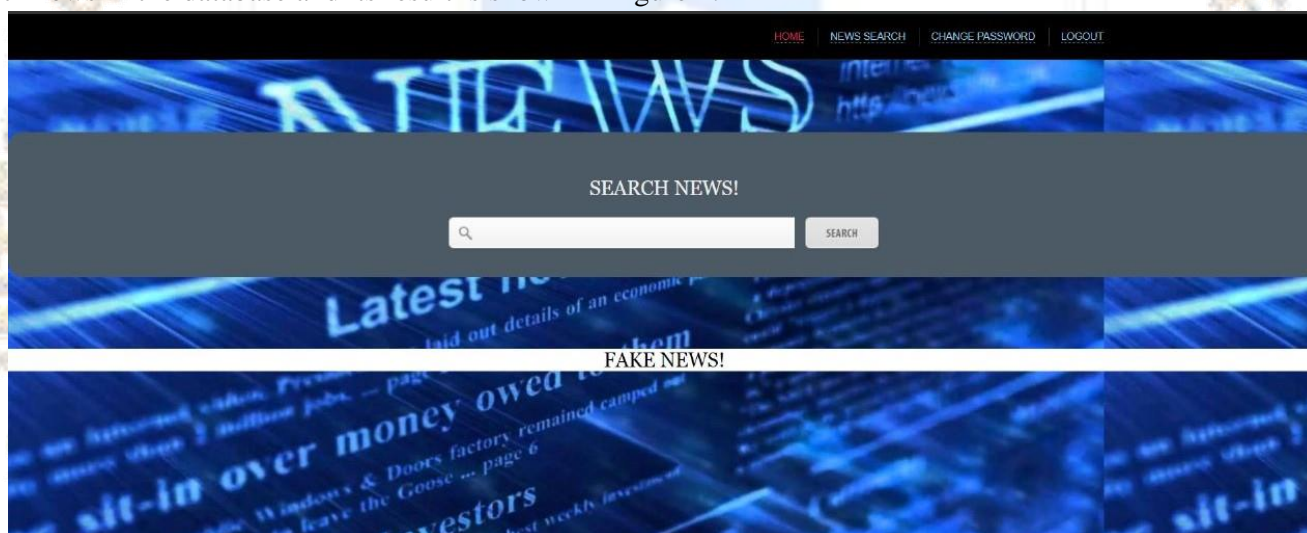


Fig.3. Result of news being fake.

When the user searches the news in the search box. The SGD algorithm classifies the news as fake when it does not match with news in the database and its result is shown in Figure 3.

VI. STRENGTH AND LIMITATION

SGD algorithm is a fast and efficient optimization method, making it suitable for large-scale datasets like Twitter. Studies have shown that SGD-based models can accurately identify fake news on Twitter. The models developed using the SGD algorithm can be trained in real time and updated as new data becomes available. SGD-based models can handle high-dimensional feature spaces and noisy data, making them suitable for detecting fake news on social media platforms like Twitter. SGD can generalize well across different types of fake news when the models are regularized properly.

Feature engineering is an important factor that can significantly affect the performance of SGD-based models. Developing effective features requires expert knowledge and can be time-consuming. SGD-based models are sensitive to the choice of hyperparameters, such as learning rate, regularization, and batch size. Tuning these hyperparameters can be challenging and time-consuming. SGD-based models can suffer from overfitting, especially when the number of labeled samples is limited. This can result in poor generalization to new data. SGD-based models may not be effective in detecting highly sophisticated fake news, such as those that are designed to appear more credible using advanced techniques like deepfakes.

VII.CONCLUSION

Finally, utilizing machine learning and the Twitter API, the stochastic gradient descent (SGD) technique has been applied to identify bogus news. The research has demonstrated that SGD-based models can distinguish between real and false news on Twitter with a high degree of accuracy. The research has also emphasized how crucial feature engineering is for creating powerful SGD-based models. To increase the effectiveness of SGD-based models for fake news detection, a variety of features have been included, including linguistic, semantic, and social network features. Furthermore, the researchers have shown how SGD-based models may be used in real-world settings including political campaigns, social networking sites, and news organizations. Real-time fake news detection can stop the dissemination of false information and encourage media literacy among the general audience. However, there are still difficulties in creating reliable and precise SGD-based models that are good at generalizing across various forms of fake news and languages. Therefore, future research should concentrate on overcoming these issues and creating more potent and trustworthy SGD-based models for Twitter-based false news identification.

VIII.FUTURE DIRECTIONS

Most of the existing studies on fake news detection using Twitter have focused on English-language tweets. Future research could explore the use of SGD-based models for detecting fake news in other languages, such as Hindi, Kannada, and other regional languages. Social network analysis (SNA) can shed light on how fake news circulates from Twitter and identify prominent users who may be behind the propagation of untruths. SNA and SGD-based model fusion might improve ability to identify bogus news. The accuracy of SGD-based models for false news detection could be threatened by adversarial assaults, which entail changing data to trick machine learning models. Future studies could look into how resilient SGD-based models are to adversarial attacks and create methods to lessen their effects.

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