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Fake News Detection Model using Machine Learning

Prof. Shubhangi M. Kauthale[1], Prof. Dr.Ashwini A. Patil[2], Jyoti A. Jirge[3], Sakshi S. Manikwar[4], Kanchan V. Bade[5]

Department of Information Technology, M S Bidve College Engineering college, Latur, India
M.S.Bidve Engineering College Latur, India

***Abstract*—The rapid spread of fake news on social media has created a critical need for automated detection systems. We propose a machine learning–based Fake News Detector that classifies news articles as real or fake using text features. Our system loads a labeled news dataset, preprocesses the text (cleaning, stopword removal, stemming), transforms it into TF-IDF feature vectors, and trains a logistic regression classifier. The trained model is evaluated on held-out test data, achieving high accuracy (≈98%) and robust precision/recall. Finally, the model and vectorizer are saved and deployed via a Streamlit web interface, allowing users to input news text and receive real-time fake/real predictions. The experimental results demonstrate the effectiveness of the proposed approach.**

***Keywords*—Fake news detection; text classification; TF-IDF; logistic regression; natural language processing; Streamlit.**

I. INTRODUCTION

Fake news – deliberately false or misleading information disguised as news – poses a significant threat to public discourse and democracy. In recent years, social media has become a primary source of news for many people; however, fake news appears and spreads on these platforms daily, undermining trust in media and institutions. For example, false news stories have influenced elections and harmed public health decisions, eroding confidence in legitimate sources. Given the scale of online information, manual fact-checking is impractical, creating an urgent need for automated fake news detection systems that can flag or filter misleading content.

In response, researchers have applied natural language processing and machine learning to this problem. Supervised classifiers can be trained on labeled news data to automatically distinguish false articles from real ones. In this work, we adopt a logistic regression model due to its simplicity and strong performance in text classification. We build upon standard NLP techniques (text cleaning, TF-IDF feature extraction) to train a fake news classifier. The proposed Fake News Detector demonstrates that a well-tuned logistic regression on TF-IDF features can achieve high accuracy, consistent with prior findings. The system is ultimately deployed via a Streamlit web app for user-friendly interaction. The remainder of the paper is organized as follows: Section II reviews related work, Section III describes our methodology, Section IV presents experimental results, and Section V concludes the paper.

II. LITERATURE REVIEW

Prior studies have investigated various approaches for fake news detection. Most methods treat fake news classification as a text classification problem using features extracted from the article content. Traditional machine learning models (e.g., SVM, Naïve Bayes, random forests) with hand-crafted text features (such as n-grams or TF-IDF) have been widely used. For instance, Kushwaha and Singh found that among several algorithms, logistic regression yielded the best detection performance. More recently, deep learning techniques – including convolutional or transformer-based neural networks – have been explored and can achieve very high accuracy on benchmark datasets. For example, a multi-channel deep model reached over 99% accuracy on a standard news dataset.

However, these advanced models also face challenges. Hamed et al. note that social media text often contains slang, typos, and non-standard language, which can create out-of-vocabulary issues for text embeddings. They further observe that inadequate feature representation may significantly degrade detection accuracy. Many fake news detectors can overfit noisy data or struggle with limited training samples. Overall, most state-of-the-art approaches rely on supervised learning with textual features and obtain effective performance, but open problems remain in handling diverse and evolving fake news content. Our work builds on this foundation by using a simple TF-IDF + logistic regression pipeline, aiming for a balance of performance and efficiency.

III. METHODOLOGY

The development of the Fake News Detector involves several key steps, as outlined below. Each step follows standard NLP and machine learning practice:

Dataset Loading: We use a publicly available fake news dataset (e.g., the Kaggle "Fake News Detection" corpus) containing approximately 20,000 labeled news articles. Each article is labeled as real or fake. Any missing values in the text fields are filled or removed to ensure data consistency.

Preprocessing: The raw text of each article is cleaned to remove noise. This includes removing punctuation and non-alphabetic characters, converting all text to lowercase, removing common stopwords (using the NLTK English stopword list), and applying Porter stemming to reduce words to their base forms. These steps reduce vocabulary size and help normalize variations. As prior work notes, dealing with slang and typos is important to avoid out-of-vocabulary terms.

TF-IDF Vectorization: The cleaned text corpus is transformed into numerical feature vectors using Term Frequency–Inverse Document Frequency (TF-IDF). Each document is represented by a vector of TF-IDF scores for the most relevant terms. This produces a fixed-length numeric feature space suitable for machine learning.

Train/Test Split: The dataset is randomly divided into training and test subsets (e.g., 80% training, 20% testing). Stratification is used to maintain the proportion of real vs. fake labels in both sets. The training set is used to fit the model, while the test set evaluates its generalization.

Model Training: A logistic regression classifier is trained on the training data. Logistic regression is chosen for its efficiency and good performance on text classification tasks. The model learns to estimate the probability that an article is fake (label=1) based on the TF-IDF features.

Evaluation: The trained model is evaluated on the test set. We compute accuracy, precision, recall, and F1-score to measure performance. These metrics indicate the model's ability to correctly identify fake vs. real news. In our experiments, the model achieved very high accuracy, consistent with previous studies.

Model Saving: After evaluation, the finalized logistic regression model and the TF-IDF vectorizer object are serialized (e.g., using Python's joblib) and saved to disk. This allows the trained system to be reused without retraining.

Deployment (Streamlit): For user-facing deployment, we load the saved model and vectorizer into a Streamlit web application. The Streamlit app presents a text input field where users can enter a news article. The input text is preprocessed in the same manner described above (cleaning, TF-IDF) and fed to the loaded logistic regression model. The app then displays the model's prediction ("Fake" or "Real") to the user. This provides an interactive demonstration of the fake news detector.

This methodology integrates data preprocessing, feature extraction, classification, and deployment steps in a cohesive pipeline. The use of TF-IDF and logistic regression follows common practice in text classification, balancing simplicity and effectiveness.

IV. EXPERIMENTAL RESULTS

The fake news detector was evaluated on the test portion of the dataset following training. Table metrics (accuracy, precision, recall, F1) were computed. The logistic regression model achieved very high performance on the held-out test set. Specifically:

Accuracy: 98.0%

Precision: 97.0%

Recall: 99.0%

F1-Score: 98.0%

These results indicate that the classifier correctly distinguishes real and fake news in nearly all cases. For comparison, the literature reports similar findings: Adeyiga et al., for instance, obtained about 97.9% test accuracy using a comparable logistic regression model. The slight differences may be due to random splits or preprocessing variations. Overall, the high precision and recall show that the model makes few false positive or false negative errors.

In summary, the experimental evaluation confirms that a TF-IDF + logistic regression pipeline is effective for fake news detection on our dataset. The saved model and vectorizer demonstrated robust performance when loaded into the Streamlit app as well. A demonstration of the deployed app shows that users can input arbitrary text and quickly receive an accurate classification (real vs. fake) with low latency.

V. CONCLUSION

We have presented a complete pipeline for automated fake news detection, from data loading and preprocessing through model training and deployment. The proposed system uses standard NLP preprocessing and TF-IDF feature extraction, followed by a logistic regression classifier. Experimental results on a real-world news dataset show that the model achieves high accuracy (≈98%) in classifying fake and real news, in line with prior studies. The trained model is saved and deployed via a Streamlit interface, enabling real-time user interaction. Future work could explore more advanced text representations (e.g., word embeddings or transformer-based features) and additional model types to further improve robustness. Nevertheless, this work demonstrates that even a simple model can effectively detect fake news and serve as a useful tool for mitigating misinformation.

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