IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

FAKE BANANAS

Fake News Detection System

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Project Guide ,Student, Student, Student, Student, Student

Abstract: In the era of digital information, the rapid dissemination of fake news has emerged as a significant challenge, with the potential to mislead the public and cause widespread misinformation. This research paper presents the development of a website dedicated to the detection of fake news using advanced machine learning techniques. The website integrates various supervised classifiers, including Support Vector Machines (SVM), Naïve Bayes, and Deep Neural Networks, to automatically analyze and classify news articles as genuine or fake. Leveraging sentiment analysis and Natural Language Processing (NLP), the system identifies key features indicative of false information. Our approach also incorporates a Multiple Imputation Chain Equation (MICE) to handle missing data and enhance the robustness of the detection model. The website provides a user-friendly interface for real-time fake news detection, offering an essential tool for individuals, organizations, and policymakers to combat misinformation. Preliminary results demonstrate high accuracy in identifying fake news, underscoring the efficacy of machine learning algorithms in maintaining the integrity of information on digital platforms.

Keywords - Fake News Detection, Machine Learning, Natural Language Processing (NLP), Misinformation, User-friendly Interface

I. INTRODUCTION

The proliferation of social media and online news platforms has revolutionized the way information is disseminated and consumed. However, this rapid and widespread access to information has also facilitated the spread of fake news, posing significant risks to individuals, organizations, and society at large. Fake news, characterized by false or misleading information presented as news, can influence public opinion, disrupt democratic processes, and cause real-world harm.

Traditional methods of identifying fake news, such as manual fact-checking, are time-consuming and labor-intensive, making them insufficient to address the scale and speed at which fake news spreads. Consequently, there is an urgent need for automated solutions capable of effectively detecting and mitigating the impact of fake news. Machine learning, with its ability to learn from data and make predictions, presents a promising approach to this problem.

This research paper introduces a website designed to detect fake news using advanced machine learning techniques. The website employs a variety of supervised classifiers, including Support Vector Machines (SVM), Naïve Bayes, and Deep Neural Networks, to automatically analyze and classify news articles. By integrating sentiment analysis and Natural Language Processing (NLP), the system can identify linguistic and emotional patterns that are indicative of fake news.

To enhance the robustness of the detection model, our approach incorporates the Multiple Imputation Chain Equation (MICE) method to handle missing data, ensuring that the system remains effective even when dealing with incomplete information. The website offers a user-friendly interface, allowing users to input news articles and receive real-time feedback on their authenticity.

This paper details the development and implementation of the fake news detection website, evaluates its performance, and discusses its potential impact as a tool for combating misinformation. By leveraging the power of machine learning, this research aims to contribute to the ongoing efforts to maintain the integrity of information in the digital age.

of five years. The time series monthly data is collected on stock prices for sample firmsand relative macroeconomic variables for the period of 5 years. The data collection period is ranging from January 2010 to Dec 2014. Monthly prices of KSE -100 Index is taken from yahoo finance.

II. LITERATURE REVIEW

[1] The paper "A SMART SYSTEM FOR FAKE NEWS DETECTION USING MACHINE LEARNING" by Anjali Jain, Harsh Khatter, and Avinash Shakya, from KIET Group of Institutions and ABES Engineering College, introduces a machine learning model using Support Vector Machine (SVM) and Naive Bayes classifiers to detect fake news with 93.6% accuracy. The system features an aggregator to collect news, an authenticator to verify it against reputable sources, and a suggestion system to provide context and related news. This model leverages AI techniques for precise classification, demonstrating superior accuracy in combating misinformation. The research highlights the critical need for such systems to curb the spread of rumors, especially in developing countries, and suggests potential future improvements like hybrid approaches and enhanced user interfaces.

[2] The research paper "Fake News Detection Using Machine Learning Approaches" by Z. Khanam et al., presented at the ASCI-2020 IOP Conference, explores various machine learning methods to detect fake news. The study analyzes traditional algorithms like De

cision Trees, Random Forests, Support Vector Machines (SVM), Naive Bayes, and K-Nearest Neighbors (KNN). Utilizing Python's scikit-learn library for feature extraction and vectorization, the paper emphasizes the importance of Natural Language Processing (NLP) in understanding and classifying news text. The methodology includes dataset collection, preprocessing, feature selection, training, and testing. The research highlights the effectiveness of combining classifiers to enhance accuracy, demonstrating significant improvements in detecting fake news across social media platforms.

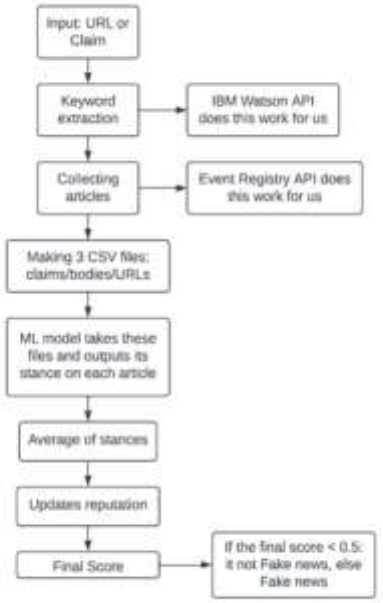
[3] The paper "Sustainable Development of Information Dissemination: A Review of Current Fake News Detection Research and Practice" by Lu Yuan and colleagues addresses the growing issue of fake news proliferation, which poses threats to social stability and sustainable development. The study reviews existing technologies for detecting fake news, emphasizing the importance of multidisciplinary approaches and the need for explainable methods. It categorizes fake news into five types: deceptive news, rumors, false comments, sensationalist headlines, and fact-based recombinations. The research outlines three primary detection methods: content-based, which analyzes linguistic features; social network-based, which examines dissemination patterns and user behavior; and knowledge-based, which involves fact-checking against established knowledge bases. The authors propose a novel explainable human-machine-theory communication system to enhance the credibility and effectiveness of fake news detection, aiming to foster a people-centered, sustainable information environment.

[4] The research paper "Fake news detection in social media based on sentiment analysis using classifier techniques" by Sarita V Balshetwar, Abilash RS, and Dani Jermisha R explores a multi-step approach to identifying fake news on social media. It integrates sentiment analysis as a key feature using a lexicon-based scoring algorithm and employs Term Frequency-Inverse Document Frequency (TF-IDF) for feature extraction. The study addresses missing data issues with a Multiple Imputation Chain Equation (MICE) strategy and evaluates the effectiveness of Naïve Bayes, passive-aggressive, and Deep Neural Network (DNN) classifiers. The proposed method achieves an accuracy of 99.8% in detecting fake news, outperforming existing methods. This research underscores the importance of automated fake news detection systems due to the unstructured and large-scale nature of social media data.

[5] The paper "Detecting Fake News using Machine Learning: A Systematic Literature Review" by Alim Al Ayub Ahmed, Ayman Aljarbouh, Praveen Kumar Donepudi, and Myung Suh Choi, addresses the pressing issue of fake news propagation through digital platforms. Given the challenges of manually identifying fake news, this review focuses on the necessity and efficacy of machine learning classifiers for automatic detection. It employs a systematic literature review methodology, drawing from databases like Clarivate Analytics, ACM Digital Library, IEEE Xplore, and Elsevier, to identify relevant studies. The paper aims to answer key research questions regarding the necessity of machine learning in fake news detection, the types of supervised classifiers used, and the methods of training these classifiers. The review identifies several effective machine learning classifiers such as SVM, Naïve Bayes, Logistic Regression, Random Forests, Recurrent Neural Networks, Neural Networks, K-Nearest Neighbor, and Decision Trees. These classifiers are trained using labeled datasets to enhance their accuracy. The paper concludes that while machine learning provides a viable solution for fake news detection, the dependency on labeled data presents challenges. Future research could explore unsupervised learning methods to mitigate these issues.

III. METHODOLOGY

3.1 Flowchart



3.2 Method

DESIGN AND IMPLEMENTATION OF FAKE BANANAS

3.2.1 Overview:

The stance detection model of Fake Bananas inspired from (FNC-1) is a single, end-to-end system consisting of lexical as well as similarity features fed through a multi-layer perceptron (MLP) with one hidden layer. Although relatively simple in nature, the model appears to perform on par with more elaborate, ensemble-based systems submitted.

3.2.2 Features:

The features extracted consist of three overarching elements only:

- A bag-of-words term frequency (BoW-TF) vector of the headline
- A BoW-TF vector of the body
- The cosine similarity of term frequency-inverse document frequency (TF-IDF) vectors of the headline and body

Tokenization is performed by the standard scikit-learn tokenizer as part of applying CountVectorizer, TfidfTransformer and/or TfidfVectorizer. The bag-of-words (BoW) used to calculate the term frequency vectors is based on the vocabulary of the training set, excluding a specified set of stop words and limited to a total of 5,000 most frequent words. The set of stop words consists of a subset of the standard scikit-learn stop word list for the English language. For the TF-IDF vectors of the headline and body in the cosine similarity calculations, the BoW is based on the vocabulary of both the train and the test set. All other parameters used

in the corresponding scikit-learn vectorizer are identical to those described for the term frequency vectors. 1 These three overarching elements are concatenated in a feature vector of total size 10,001 which is fed into the classifier.

3.2.3 Classifier:

The classifier is a MLP with one hidden layer of 100 units with rectified linear unit (ReLU) activation. Prediction is based on the argmax of the softmax on the output of the final layer.

3.2.4 Training:

The loss minimized during training was the sum of the L2 loss calculated on the MLP weights and the sparse softmax cross entropy between the logits and the labels. Optimization was carried out using Adam and gradient clipping by a global norm clip ratio. Moreover, the setup was regularized using a dropout on the output of both perceptron layers. Batch training was thus performed on the entire training set and stopped early. The criterion used for early-stopping was a qualitative combination of the plateau of the loss on the training set and mean performance of the model on 50 random splits of the data into training and hold-out sets as defined in the official baseline setup.

3.2.5 Hyper parameters:

The hyperparameters of the model were optimized during development using random search on a grid of combinations and (cross-validation on) various splits of the data. The full set of hyperparameter labels, their description, the range of values considered and corresponding optimized values are provided below.

Label	Description	Range	Optimized
`lim_unigram`	BoW vocabulary size	1,000 - 10,000	5,000
`hidden_size`	MLP hidden layer size	50 - 600	100
`train_keep_prob`	1 - dropout on MLP layers	0.5 - 1.0	0.6
`l2_alpha`	Alpha level in L2 loss	0.1 - 0.0000001	0.0001
`learn_rate`	Learning rate of Adam	0.1 - 0.001	0.01
`clip_ratio`	Global norm clip ratio	1 - 10	5
`batch_size`	Size of training batch	250 - 1,000	500
`epochs`	Number of training epochs	$\leq 1,000$	90

Table: Hyperparameter details

3.3 Testing

3.3.1 Implementation and working:

The project works in way where users input a claim like "The Afghanistan war was bad for the world". Our program will search the thousands of global and local news sources for their 'stance' on that topic. We run sources through our Reputability Algorithm. If lots of reputable sources all agree with your claim, then it's probably true! Then we cite our sources so our users can click through and read more about that topic!

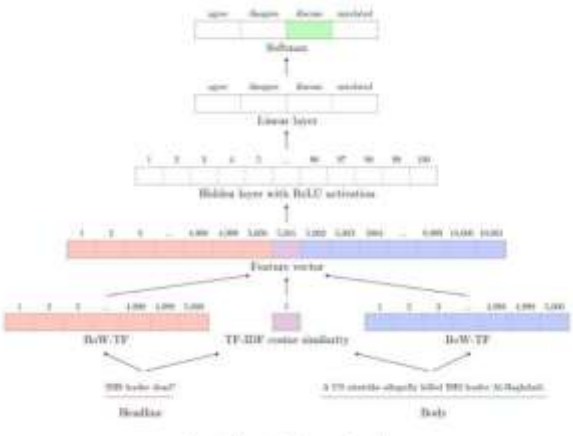


Figure: Schematic diagram of model

Schematic Diagram of model:

Determining Reputation : Using a large set of default sources with hard coded reputability, our database of sources continues to become more accurate with each web scraping by adding new sources and articles. To ensure this makes our algorithm better, the weights of each source are adjusted according to how much each

new article agrees or disagrees with sources determined to be reputable. In the future, we would love to implement deep learning to further advance this 'learning' aspect of our reputability, but the current system more than supplies a proof of concept.

3.3.2 Technologies and APIs used:

- Our stance detection model was built on python using Google's Tensorflow and Scikit-learn.
- We used ReactJS for our front end and a Flask dev server as our backend.
- We used Event Registry and IBM Watson Natural Language Understanding (NLU) 2 powerful APIs to support the web scraping functionality of project.

3.3.3 PROTOTYPE PHOTO :

IV. RESULTS AND DISCUSSION

The MLP model was trained and tested using datasets from 2017 FNC challenge. The model achieved an accuracy of approximately 82% on the test set for individual stance detection, demonstrating its effectiveness in identifying fake news. The confusion matrix and other performance metrics indicate that the model performs well, though there are areas for improvement, particularly in reducing false positives and false negatives as well as averaging of stances. The system's additional features provide valuable support to users sources and URLs and models stances on them helps user navigate towards the real deal, avoiding misinformation. This ensures the system attacts not only as a classifier but as a mentor guiding towards truth.

V. FUTURE SCOPE

The future scope for improving a fake news detection website using machine learning encompasses several key areas. Firstly, exploring unsupervised and semi-supervised learning techniques can reduce the reliance on labeled data, enhancing scalability and adaptability. Secondly, incorporating advanced NLP techniques like word embeddings and transformers can improve feature extraction, capturing deeper semantic relationships within the text. Additionally, developing models for multimodal analysis, integrating visual and textual data, can provide a comprehensive assessment of news authenticity. Enhancing real-time data processing capabilities using frameworks like Apache Kafka can facilitate immediate detection and response to fake news. Extending the model to support multilingual detection will broaden its applicability, addressing the global spread of misinformation. Implementing a user feedback mechanism can improve accuracy over time through continuous learning. Ensuring the explainability and transparency of machine learning models is crucial for user trust, while developing robust defenses against adversarial attacks is

essential for safeguarding the system. Collaborating with social media platforms to integrate detection mechanisms can reduce the spread of fake news more effectively. Finally, addressing ethical and privacy concerns will be critical for broader acceptance and compliance with regulations, making the system a more robust and widely applicable tool in combating misinformation globally.

VI. CONCLUSION

To sum up, our stance detection-based method offers a reliable and approachable defense against false information. It provides a useful method of evaluating the reliability of information by emphasizing agreement among reliable sources rather than fact-checking every claim. This approach provides users with a strong research tool while streamlining the verification process. Our approach is a useful tool for promoting accurate information and creating a more educated society since disinformation undermines the ability to make informed decisions.

VII. ACKNOWLEDGMENT

We extend sincere thanks to our college for granting us the opportunity to create an ML based fake news classifying project in our first year as in the form of an EDAI course , enriching our academic journey. Special gratitude to our project guide, Prof. Rutuja Sanagade and Prof. Dr. C. M. Mahajan , for invaluable support. We would also like to express our gratitude to Miss. Nikita Naidu, a former software engineer at TATA TCS for her technical guidance. The Fake News Challenge provided great inspiration for our project and guiding principles for tackling the task. This experience enhanced our technical skills and instilled confidence. Our college's commitment to holistic learning beyond textbooks has been pivotal, shaping our academic and professional growth.

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