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Lexicon-Enhanced Long Short-Term Memory (LSTM) for Detecting of Fake News using Deep Learning

A. Mohammed Yasar[1] and Dr. C. Meenakshi[2]

MCA Student, Department of Computer Applications[1]

Associate Professor, Department of Computer Applications[2]

Vels Institute of Science, Technology & Advanced Studies (VISTAS), Chennai, Tamil Nadu, India

yasar2052002@gmail.com and cmeenakshi.scs@velsuniv.ac.in

Abstract: *Due to its increasing popularity, low cost, and easy-to-access nature, online social media (OSM) networks have evolved as a powerful platform for people to access, consume, and share news.However, this has led to the large-scale distribution of fake news, i.e., deliberate, false, or misleading information. Spreading fake news is roughly as dangerous as spreading the virus. Fake news detection attracts many researchers' attention due to the negative impacts on the society Over the past years, many fake news detection approaches have been introduced, and most of the existing methods rely on either news content or the social context of the news dissemination process on social media platforms. In this work, we propose a lexicon-enhanced LSTM an automated model that is able to take into account both the news content and the social context for the identification of fake news. The model first uses sentiment lexicon as an extra information pre-training a word sentiment classifier and then get the sentiment embeddings of words including the words not in the lexicon. Combining the sentiment embedding and its word embedding can make word representation more accurate and to detect fake news and better predict fake user accounts and posts.We used five performance metrics to evaluate the proposed framework: accuracy, the area under the curve, precision, recall, and f1-score.The model achieves an accuracy of 99.55% compared to 93.62% against discourse structure analysis. Also, it shows an average improvement of 18.76% against other approaches, which indicates its viability against fake-classifier-based models*

Keywords: easy-to-access

I. INTRODUCTION

The aim of this project is to develop a lexicon-enhanced Long Short-Term Memory (LSTM) automated model capable of effectively discerning fake news by considering both the content of the news and the social context in which it is disseminated on online social media platforms.Develop a sentiment lexicon to enhance the word representation accuracy in the lexicon-enhanced LSTM model.Pre-train a word sentiment classifier using the sentiment lexicon to extract sentiment embeddings for words.Incorporate sentiment embeddings with word embeddings to improve the accuracy of word representation in the model.Design and implement an automated system that integrates both news content analysis and social context analysis for fake news identification.Evaluate the performance of the proposed model using metrics such as accuracy, area under the curve, precision, recall, and f1-score.Compare the performance of the lexicon-enhanced LSTM model with existing approaches, particularly fake-classifier-based models, to assess its superiority in detecting fake news accurately.Optimize the model parameters and architecture to achieve the highest accuracy performance possible.Provide insights into the effectiveness and feasibility of the proposed framework for detecting fake news in online social media networks

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II. LITERATURE SURVEY

1. "Context-Aware Deep Markov Random Fields for Fake News Detection" by Tien Huu Do, published in 2021, seems like a research paper focusing on the application of deep Markov random fields (DMRFs) in detecting fake news.[4][5]. Markov random fields are probabilistic graphical models used for modeling contextual dependencies in data, while deep learning involves training neural networks with multiple layers to learn complex patterns in data.[1][7] By combining these two techniques, the paper likely aims to develop a method that leverages both the contextual understanding of Markov random fields and the pattern recognition capabilities of deep learning to effectively identify fake news.

2. "Fake News Detection using Deep Recurrent Neural Networks" authored by Tao Jiang in 2020, appears to be another research paper focusing on fake news detection, this time employing deep recurrent neural networks (RNNs).[2][6] Recurrent neural networks are a type of artificial neural network designed to capture sequential information in data, making them well-suited for tasks involving sequences like natural language processing. [3][8]By utilizing deep RNN architectures, the paper likely aims to exploit the temporal dependencies in textual data to distinguish between real and fake news articles. [10][12]This approach could involve training RNNs on large datasets of news articles to learn patterns indicative of misinformation or deception.

3. "Fake News Detection by Decision Tree" authored by ShikunLyu in 2020 suggests an approach to identifying fake news using decision trees. [Decision trees are a type of supervised machine learning algorithm that partitions the feature space into segments based on certain criteria, which are learned from the training data. [11][9]In this context, the decision tree likely learns to classify news articles as either real or fake based on features extracted from the articles, such as linguistic patterns, source credibility, or social media engagement metrics. This method could provide interpretable insights into the factors that contribute to the identification of fake news.

III. METHODOLOGY

1. NoFake News Room Web App:

The NoFake News Room Service is an online platform designed for reading real news. It utilizes a classification model exposed as a REST API, which is consumed by a web application built using Python's Flask framework. The main features include an Admin dashboard for visualizing fake news activities, tweet search functionality, and automatic generation and emailing of reports regarding fake news activity. The Fake News Analysis API module focuses on keyword analysis of chat or post user data, categorizing content on a two-pole scale (positive and negative).

2. Training Phase: Fake News Classification

In the Training Phase for Fake News Classification, we annotated datasets sourced from Kaggle, which varied in the number of labels they contained, including positive, neutral, and negative categories. To enhance model efficiency, we performed extensive preprocessing on the raw text data. This included removing noise such as stop words, punctuation marks, and digits, as well as correcting spelling errors and handling non-English characters and emoticons. Additionally, we applied tokenization, lemmatization, and word normalization. Data splitting was then employed for training, validation, and testing.

After preprocessing, feature extraction was carried out using techniques like TF-IDF and word embeddings, which helped convert textual data into vector form for training deep learning classifiers. Furthermore, a Lexicon-enhanced LSTM model for sentiment analysis was implemented to incorporate prior sentiment information of words, enhancing word representations for improved classification accuracy.

Overall, the training phase involved meticulous data preprocessing, feature extraction, and model development to effectively classify fake news content.

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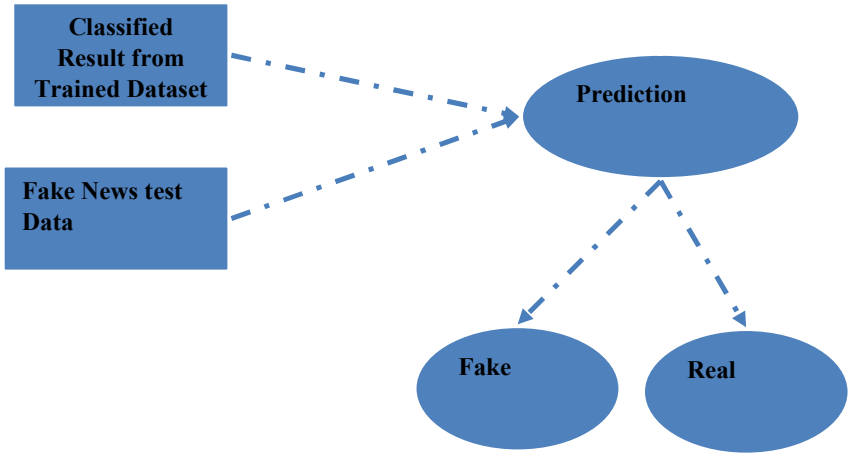
3. Testing Phase: Prediction

In this module, user login and post-test fake news data, the predictor module compared with the trained model and predict as fake or real news.

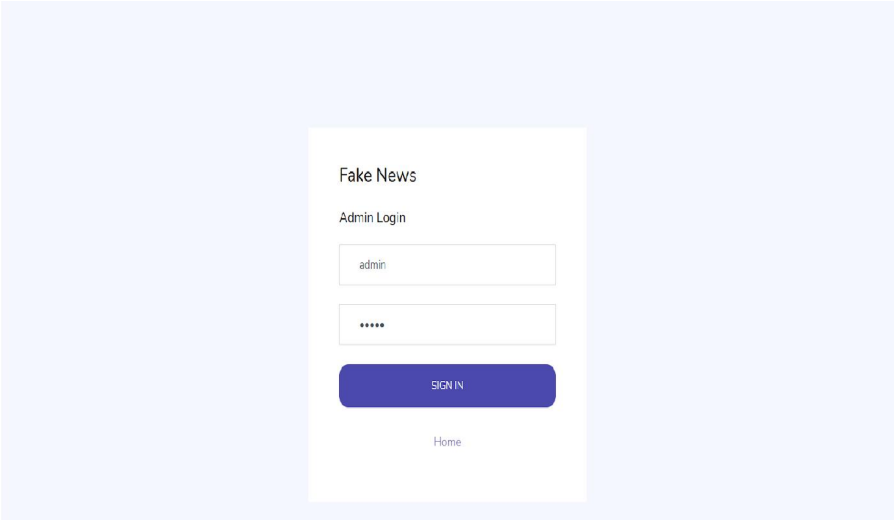


IV. EXPERIMENTAL RESULTS

The aim of this project is to develop a lexicon-enhanced Long Short-Term Memory (LSTM) automated model capable of effectively discerning fake news by considering both the content of the news and the social context in which it is disseminated on online social media platforms.TheNoFake News Room Web App is a comprehensive platform designed to address the growing challenge of fake news in online social media networks. With the widespread availability and accessibility of news content on social media platforms, there has been a corresponding rise in the dissemination of false or misleading information, which can have significant societal implications. In response to this issue, the project aims to provide users with a reliable source of authentic news content through a combination of advanced technologies and intuitive features.

OUTPUT SCREENS

Log in page:



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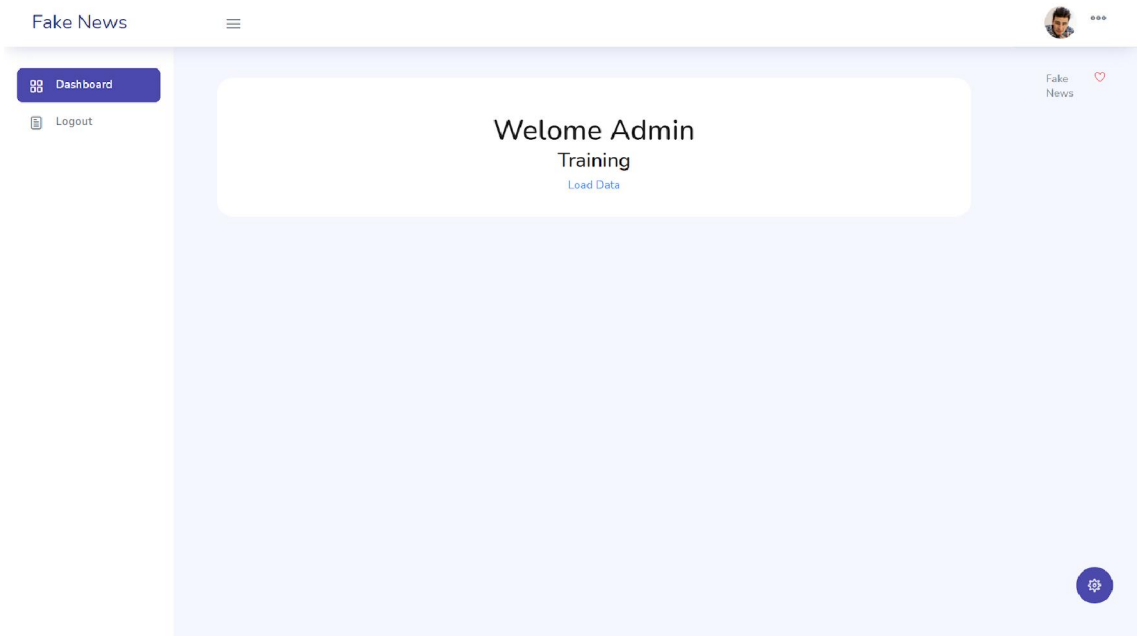
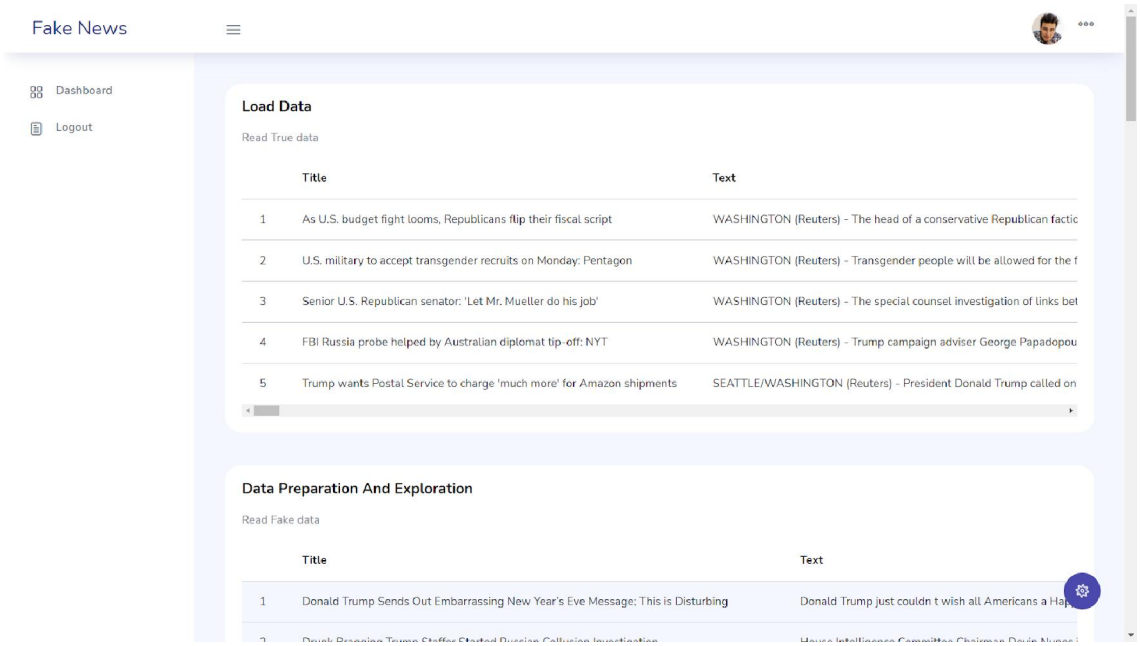
Admin page:



Dash Board:



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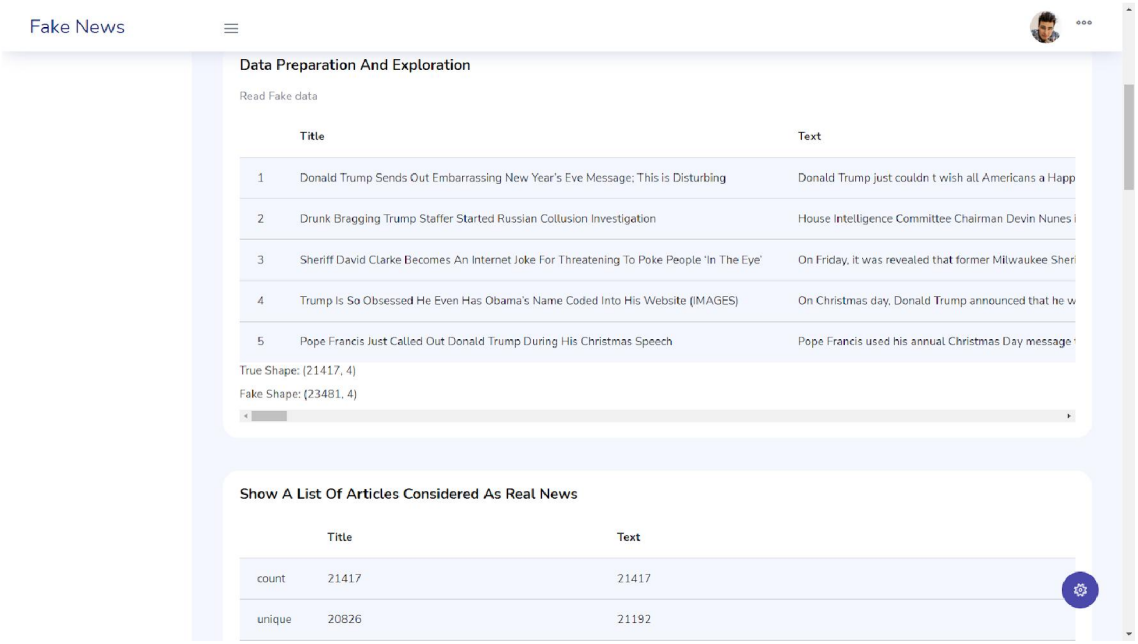
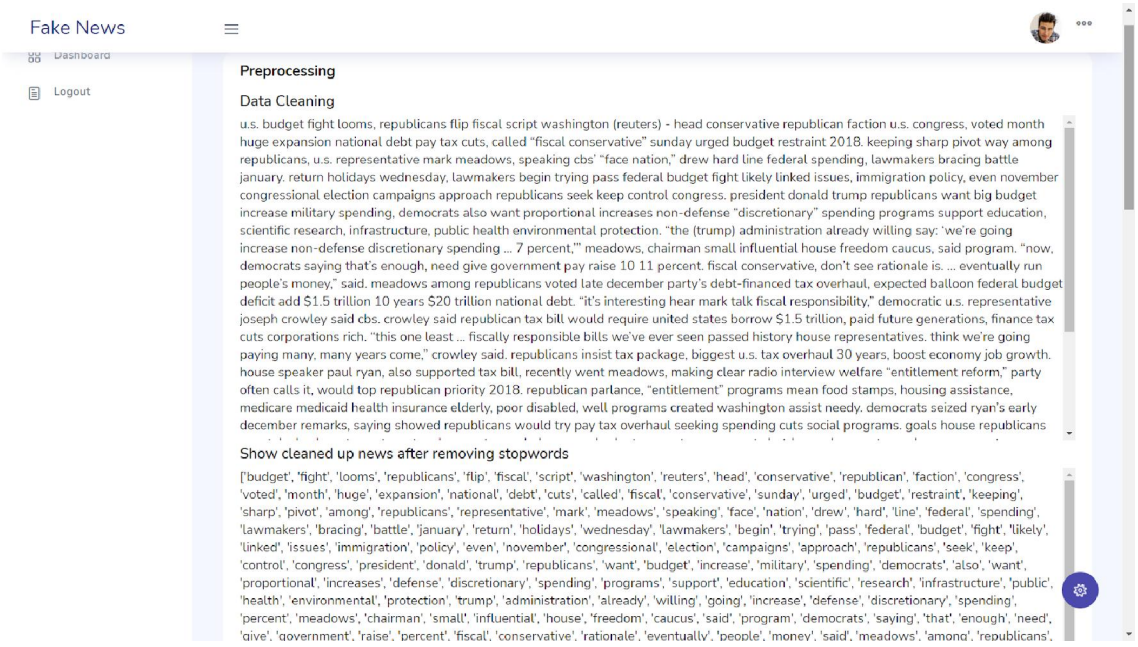


Testing:



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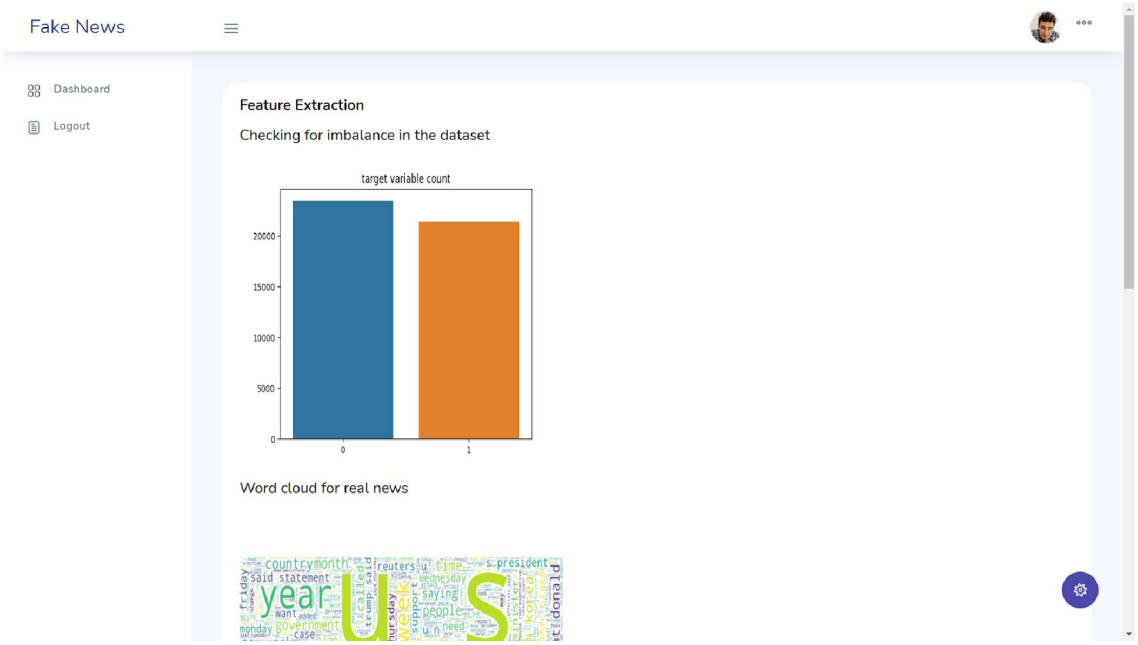

V. CONCLUSION

The fake news problem is not new, as disinformation has long been circulated in newspapers and radio. Because of the internet, false news spreads quickly through social media and blogs. This type of information might be harmful. Thus we must be able to distinguish between fake and actual news.This project has introduced a fake news detection system namely NoFake API using DL. In DL, we have proposed the Lexicon Enhanced – Long Short Term Memory(LE-LSTM) model that has achieved the best performance.In addition, for the proposed false news detection system, a real-time system for detecting fake news will be used on Facebook, Twitter, Instagram, and other platforms. The suggested method has the ability to bring benefits to a variety of new activities, including preventing the spread of fake news during elections, terrorism, natural disasters, and criminal activity for the good of humanity.

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