An AI-Based Framework for Real-Time Fake News Detection with Browser Integration

[1]Mrs N. Samatha, [2]Andapally Guna Shekar, [3]Apeksha Tolwala, [4]Chedurpally Sreeveda, [5]Gopu Stephanie Abigail
[1]Dept. of CSE (DS), [2345]Dept. of AI & DS
Vidya Jyothi Institute of Technology, Hyderabad, India

***Abstract*—**The issue of misinformation has turned out to be a highly prominent and problematic issue in the last ten years or so, especially in reference to the rise of fake news stories pertaining to universal themes. In response, fact-checking content has also gained substantial traction on the web. However, the role of the media as a fundamental source of news cannot be overlooked, especially in reference to pre-existing notions of readers. The consumption of news influences opinions, and such opinions can be changed through the consumption of false information, which can have a permanent impact. Several scholars have proposed complex and numerous open-source development frameworks for the prevention of the dissemination of false content and the occurrence of fake news on the web or for fact-checking in reference to scientific articles.

***Keywords*—**Fake News Detection, Machine Learning, Natural Language Processing, Chrome Extension, BERT, RoBERTa.

I. INTRODUCTION

The rapid development of digital platforms and communication channels for online information sharing has greatly influenced the creation and consumption of information. Information is now readily available to the global population within a matter of seconds through various platforms such as social media and online news platforms. However, this ease of access to information has also led to the rapid dissemination of misinformation and fake news, which is a major issue in the current digital age. Misleading and false information plays a critical role in influencing public opinion and decision-making at various levels of society. Traditional means of checking and confirming information accuracy, such as manual checking and relying on credible sources, are not effective in managing the large amounts of information created and shared daily.

In order to overcome such a challenge, it has become a growing need to have an automated system that is capable of efficiently detecting fake news and giving instant feedback to users. Machine Learning (ML) and Natural Language Processing (NLP) have come to be recognized as effective tools for analyzing information and identifying patterns related to fake news. The AI-Based Fake News Detection System proposed in this paper provides a new approach to the problem of fake news by developing a Chrome extension that enables users to check the authenticity of information while they browse the internet.

A. Significance of Fake News Detection

The detection of fake news is of great importance in the digital world. The widespread dissemination of false information can cause confusion and lead to various problems in society, including panic, bias, and misinformation-based conflicts. The implementation of automated fake news detection is of great importance in ensuring that users have access to quality and authentic information, promoting digital awareness, and fostering an informed society.

B. Theoretical Background

The rapid rise of digital platforms has completely changed how people consume information. Today, news spreads instantly through social media, online websites, and messaging apps. While this has made information more accessible, it has also led to the widespread circulation of fake news. Traditional methods like manual fact-checking are simply too slow to handle the massive volume of content being generated every second. Because of this, researchers started exploring automated solutions using Machine Learning (ML) and Natural Language Processing (NLP) to detect fake news efficiently.

C. Fake News and Misinformation Concepts

Fake news refers to news that presents false information which functions as authentic news. This news may have been created with the intent to mislead people. The spread of misinformation can create highly damaging outcomes at individual and societal levels. Therefore, it is important to understand what fake news entails and the mechanisms through which it propagates.

D. Machine Learning in Text Classification

Machine learning techniques are widely used for classifying textual data into different categories. Supervised learning algorithms including Logistic Regression, Decision Trees, and Random Forests train on labeled datasets to identify fake and real news content. The models acquire knowledge from the data, enabling them to process new unseen data effectively.

E. Natural Language Processing (NLP)

Natural Language Processing enables machines to understand human language through interpretation and analysis. Tokenization, normalization, and feature extraction serve as the main methods for preprocessing textual data in NLP systems. Advanced NLP models such as BERT and RoBERTa enable systems to achieve improved accuracy in fake news detection through their ability to deliver deeper contextual insights.

F. Browser-Based Detection Systems

Browser extensions provide a practical and user-friendly way to integrate fake news detection into everyday browsing activities. These systems enable users to verify content in real-time, analyzing material directly from the browser without requiring users to change their work platforms, thereby providing better usability through seamless operation.

G. Role of Automation and AI

Automation serves as an essential system which allows organizations to manage their extensive digital content needs. AI-based systems enable organizations to process data at massive volumes while delivering real-time predictions, eliminating the requirement for human checking. This leads to enhanced efficiency, greater capacity to handle more cases, and improved system dependability.

II. LITERATURE SURVEY

Research on news detection has shown that there is a significant need for automated systems to find misleading content on digital platforms like Facebook and Twitter. Traditional approaches involved fact-checking and rule-based methods, which were slow and difficult to scale. Machine learning models using Logistic Regression and Random Forests, along with TF-IDF and n-gram representations, improved detection but struggled to understand deeper meaning and context.

Deep learning models like CNNs and LSTMs offered better pattern recognition but required large amounts of data and powerful computing resources, limiting real-time applicability. Transformer-based models like BERT and RoBERTa showed superior contextual understanding and classification accuracy but pose challenges in terms of computational demands and browser deployment. Research also indicates that source credibility and user behavior analysis can assist detection, though privacy and external data dependency remain concerns.

New research emphasizes the importance of making news detection systems that are accessible, such as browser extensions that allow users to check information in real time while browsing. Overall, fake news detection systems have advanced considerably, but challenges with scalability, speed, and accessibility indicate the need for efficient, user-friendly systems that combine machine learning with web browser integration.

III. METHODOLOGY

The AI-Based Fake News Detection System's approach revolves around creating a scalable and automated framework for detecting deceptive content on digital platforms. The proposed methodology replaces the manual verification tradition with a machine learning verification system incorporated into a Chrome extension to analyze information from the internet in real time. The system is designed to extract and analyze only the textual contents from webpages and to perform the entire operation using a pipeline model comprising preprocessing, feature extraction, and classification modules.

A. Existing System

Fake news detection in traditional systems heavily depends on manual fact-checking, with verification of information being done by users through external sources or specialized fact-checking platforms. It is a time-consuming process requiring large human resources and is unsuitable for real-time applications. Most existing automated systems operate at the platform level without direct access by individual users, and lack proper integration into browsing contexts.

B. Proposed System

To overcome these limitations, an AI-Based Fake News Detection System integrated with a Chrome extension is proposed. It uses machine learning and natural language processing to automate detection and offer users instant feedback. The Chrome extension serves as the front-end interface for verification purposes without the aid of any external tools. The analysis of content may be done directly during browsing, and the user is immediately given the classification results along with the degree of confidence in the classification.

IV. SYSTEM DESIGN

The system workflow starts with the extraction of text content from the webpage via the Chrome extension. The data extracted is subjected to preprocessing including tokenization, normalization, and stop word removal. The processed text is then fed to the machine learning model where feature engineering strategies such as TF-IDF or embeddings are deployed. The model undertakes a classification function to detect authentic and fake content, and this feedback is sent back to the extension and presented to the user via visual cues and confidence scores.

A. Content Classification and Analysis

The system classifies content into predetermined categories: authentic, fake, and uncertain. This classification process ensures that content is evaluated in a timely and accurate manner, reducing ambiguity in identifying misinformation. A structured classification framework enables high confidence in predictions, leading to better user decisions.

B. User and System Interaction Modules

The system allows interaction between users and the detection model through a Chrome extension interface. Classification results, confidence scores, and highlighted suspicious elements with red borders are displayed on the webpage itself. The system works in the background to ensure that there are no interruptions in browsing, making the system highly usable and efficient.

C. Data Processing and Model Execution

The full-text data goes through a standardized pipeline to ensure the consistency and soundness of any textual data. Preprocessing and feature extraction stages prepare raw data in a form suitable for model inference. The classification task is performed with a machine learning model built and optimized for instantaneous forecasting, designed to manage data at any volume while maintaining accuracy.

D. Security and Privacy Considerations

Security and privacy are two significant aspects of the system. The processing of data is safe and secure, and no unnecessary information about the user is saved without explicit permission. The communication between the extension and backend is protected to maintain data integrity. The system follows privacy-aware practices, including minimizing data collection and ensuring that user interactions are secure.

E. Flowchart

The flowchart outlines the sequence of operations involved in processing and classifying news content within the Fake News Detection System. It begins with the user submitting input through the interface, followed by input validation, preprocessing (text cleaning, tokenization, feature extraction), model classification, result display, and optional feedback submission for future model improvement.

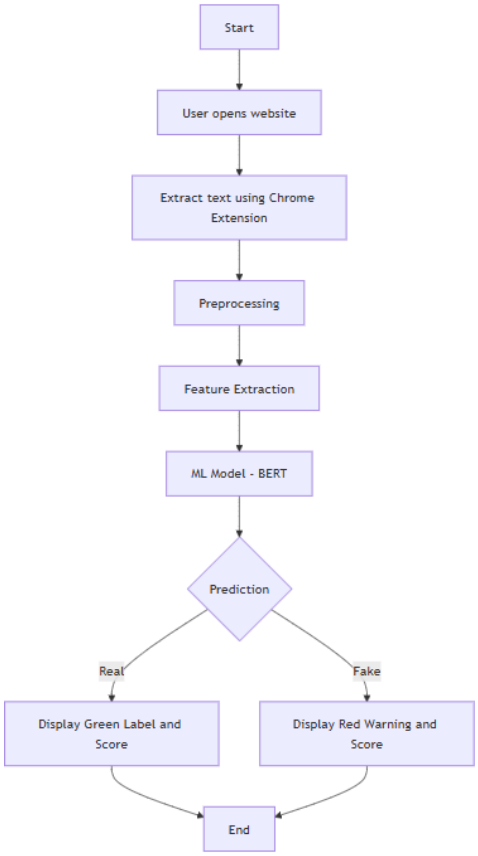

Fig. 1. System Flowchart

F. Use Case Diagram

The Use Case Diagram outlines how external entities interact with the Fake News Detection System. It highlights two main roles: the User and the Administrator. Users can input news content in various forms to assess credibility. Administrators are responsible for updating datasets, retraining the model, monitoring performance metrics, and managing user access.

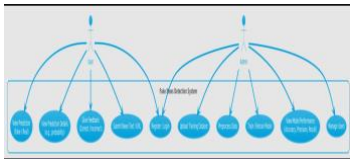

Fig. 2. Use Case Diagram

G. Class Diagram

The Class Diagram illustrates the internal structure of the Fake News Detection System by outlining its key components and their interactions, including User, Article, Feedback, Dataset, Preprocessor, Machine Learning Model, and Database. Each class is designed with attributes and methods aligned to its function within the system.

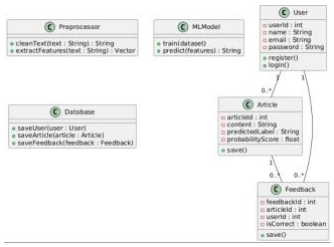

Fig. 3. Class Diagram

H. Activity Diagram

The Activity Diagram outlines the sequence of operations involved in classifying news content within the system. It traces the workflow from user submission through preprocessing, model classification, result storage, and optional user feedback submission, which can be leveraged to refine and improve the model over time.

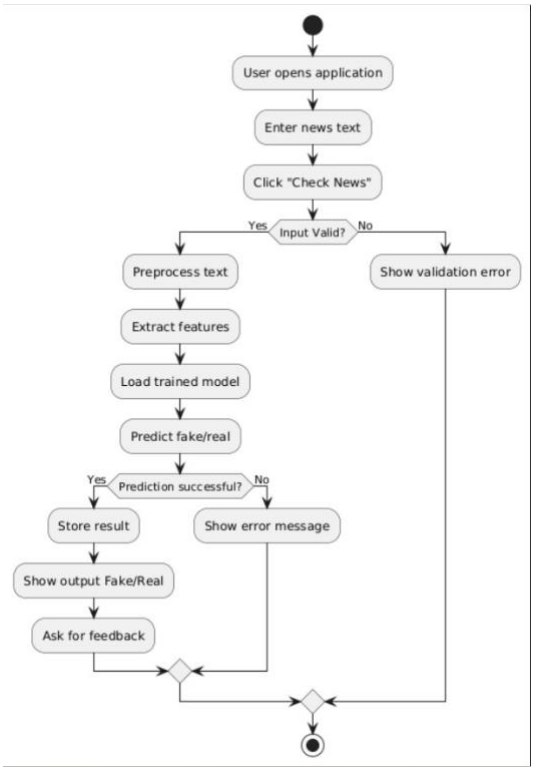

Fig. 4. Activity Diagram

I. Software Requirements

The system relies on a combination of machine learning frameworks, API tools, and front-end technologies. TABLE I summarizes the key software components and their roles.

TABLE I
Software Requirements and Tools

Software / Tool	Version / Type	Purpose
Python	3.8 or above	Core programming language for ML and NLP
PyTorch / TensorFlow	Latest stable release	Deep learning framework for training models
Hugging Face Transformers	Latest version	NLP models for fake news classification
Scikit-learn	Latest version	Baseline ML algorithms and evaluation
FastAPI / Flask	Latest build	Backend API for verification services
Elasticsearch / FAISS	Stable build	Evidence retrieval and indexing
Chrome Extension (Manifest v3)	-	Real-time detection UI

V. RESULTS

Testing each core part of the AI fake news detector — pulling text, cleaning it, sorting it, and showing results — confirmed how well things worked. Webpage material moved through smoothly, ending in a verdict: real or false, tagged with certainty levels. Text sorting turned out clear once the system weighed each piece carefully, producing trustworthy predictions that cut down guesswork around false information. Right inside the browser window, a small tool displayed updates fast, so people saw truth scores on the spot while still browsing normally. The solution worked faster, opened up access, and cut down delays typical in older verification methods. Results remained steady and the system hit its goals well, spotting false stories quickly even as events unfold live.

Fig. 5. Extension

Fig. 6. Extension in Chrome

Fig. 7. Working

Fig. 8. Working Example-1

Fig. 9. Working Example-2

VI. CONCLUSION

This paper presents an artificial intelligence tool that spots false information online, built right into the web browser through a Chrome extension. Rather than waiting for slow human reviews, it offers instant checks while browsing. Built to be easy to reach, it works directly where people read news. By acting quickly inside the browser, it tackles delays and gaps found in older checking systems. Smart algorithms sort data behind the scenes, assigning trust levels using a smooth step-by-step process. Tests show the method spots issues faster than before, cutting down how much humans need to check by hand. Spotting fake news using AI shows real promise on today's crowded digital stages. Should upgrades continue and wider rollout happen, trust in what we read online might actually grow stronger over time.

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