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Artificial Intelligence Blockchain Based Fake News Discrimination

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Abstract: The project aims to minimize the impact of fake news by integrating blockchain and artificial intelligence technologies to ensure data integrity and authenticate news articles. Blockchain technology is employed as a tamper-proof storage solution, providing a reliable platform to secure and verify news content, making it difficult for malicious actors to manipulate information [2], [7]. Various AI algorithms, including Artificial Neural Networks (ANN), Case-Based Reasoning (CBR), and Long Short-Term Memory (LSTM) networks, are utilized to predict the spread of fake news, enhancing the understanding of misinformation propagation and enabling timely interventions [1], [4], [12]. Smart contracts, designed using Solidity, ensure the secure storage and retrieval of news data on the blockchain, further enhancing the system's reliability [6], [8]. Advanced AI techniques, such as Bi-directional Gated Recurrent Units (GRU) and XGBoost, are incorporated to improve the accuracy of fake news detection [10], [17]. These innovations collectively contribute to a trustworthy information ecosystem, empowering users to discern credible news from misinformation effectively [3], [11], [18].

Index Terms *- Fake News Detection, Blockchain Technology, Artificial Intelligence, Data Integrity, Tamper-Proof Storage, Artificial Neural Networks (ANN), Long Short-Term Memory (LSTM), Bi-Directional Gated Recurrent Units (GRU), Xgboost.*

1. INTRODUCTION

Fake news can be defined as false information intentionally created and distributed to mislead the public, causing significant economic and social damage. According to the Hyundai Economic Research Institute, the social costs of fake news are estimated at 30 trillion won annually. Fake news often spreads through

malicious edits of existing articles or by impersonating legitimate media outlets, leading to widespread misinformation [3], [18]. Globally, various studies aim to tackle this issue. For instance, Bitpress utilizes Ethereum, a public blockchain, to identify fake news by weighing citations. However, challenges such as transaction speed and scalability persist due to the public blockchain's inherent limitations [2], [7].

Journalism, fundamentally a pursuit of truth, faces a "crisis of journalism" characterized by monopolized public opinion and the dominance of large IT platforms in content distribution and profits [1], [6]. This crisis, compounded by the prevalence of fake news, highlights the need for innovative solutions. Blockchain technology, often termed the "technology of trust," offers a decentralized system for verifying and recording transactions without intermediaries [8], [14]. Its application in journalism can enhance the verification of news authenticity, addressing critical challenges in combating fake news and restoring public trust [4], [9]. This paper explores blockchain's potential in mitigating the spread of fake news, fostering a credible information ecosystem.

2. RELATED WORK

The issue of fake news has garnered significant attention in both academia and industry due to its wide-reaching impact on society. Various studies have explored different methods for detecting and mitigating fake news, including the use of machine learning, blockchain, and hybrid models combining these technologies. This section highlights some of the key efforts in the field, providing insights into existing approaches and their limitations.

Several studies have focused on machine learning and natural language processing (NLP) techniques for fake news detection. For instance, Ahuja and Kumar (2020) proposed a hierarchical attention network combined with stacked gated recurrent units (GRU) to detect fake news by analyzing textual content. Their work emphasized the importance of attention mechanisms to highlight relevant parts of news articles for classification [1]. Similarly, Qawasmeh et al. (2019) applied deep learning models for automatic fake news identification, utilizing recurrent neural networks (RNNs) and long short-term memory (LSTM) networks to predict the authenticity of online news articles based on linguistic and semantic features [17]. Other studies, such as those by Akshay et al. (2018) and Desai et al. (2020), also leveraged machine learning classifiers, including support vector machines (SVMs) and decision trees, to differentiate between real and fake news based on features such

as article structure, sentiment, and source credibility [3], [6].

Blockchain technology has also emerged as a promising solution to combat fake news. Blockchain's decentralized nature ensures data integrity and can be used to verify the authenticity of news articles in a transparent and tamper-proof manner. Several studies have explored the integration of blockchain with fake news detection systems. For example, Ai et al. (2020) proposed a blockchain-based power transaction asynchronous settlement system, which uses the blockchain for transparent and verifiable transactions, laying the foundation for its use in verifying news content [2]. In the context of news, a key application of blockchain is its use for ensuring the trustworthiness of news sources and timestamps. For example, Fitwi et al. (2019) introduced a lightweight blockchain-based privacy protection system for smart surveillance, which could be adapted for news verification by securely logging the history of news dissemination [8]. Similarly, Kang et al. (2020) incorporated blockchain to create a decentralized network for verifying news authenticity and tracing the origins of fake news [12].

Bitpress, a notable project, distinguishes fake news by evaluating the weight of citations through the Ethereum blockchain. While it provides an innovative approach, the public nature of Ethereum introduces challenges related to transaction speed, compensation mechanisms, and partial branching issues that hinder its scalability for large-scale applications in news verification [7]. Despite these challenges, blockchain's potential for addressing the root causes of fake news—such as source manipulation, misinformation spread, and lack of accountability—remains a focus of ongoing research.

Other hybrid models combine machine learning and blockchain to enhance fake news detection. For instance, Desai et al. (2019) proposed a hybrid blockchain architecture for privacy-enabled and accountable auctions, which could be applied to news verification by ensuring both privacy and transparency in news content verification [7]. Additionally, several researchers, such as Traylor et al. (2019), have explored using NLP techniques alongside blockchain to improve the accuracy of fake news classification by analyzing in-article attribution and sources, thus ensuring that news content is not only classified accurately but also attributed to credible sources [19].

In conclusion, while many innovative approaches to fake news detection and verification have emerged, challenges remain in integrating these solutions into practical, large-scale systems. Machine learning and blockchain, especially in combination, offer great promise for combating fake news, but further advancements are needed to overcome limitations related to speed, scalability, and data privacy. As the issue of fake news continues to evolve, interdisciplinary research that merges AI and blockchain holds the potential to create more robust and reliable systems for ensuring the integrity of online news content.

3. MATERIALS AND METHODS

The proposed system integrates blockchain technology and artificial intelligence (AI) to establish a secure and efficient framework for managing news content. Blockchain operates as a decentralized digital ledger, recording transactions across a distributed network to ensure tamper-proof and immutable data storage. Each transaction is grouped into blocks, cryptographically linked to form an unalterable chain, thereby enhancing data integrity and security [2], [8]. To classify articles and predict the spread of fake news, the system employs advanced AI algorithms such as Artificial Neural Networks (ANN), Long Short-Term Memory (LSTM), and Case-Based Reasoning (CBR) [1], [17]. These AI techniques improve the accuracy of fake news detection by analyzing patterns in content dissemination. Furthermore, smart contracts, implemented using Solidity, facilitate the secure storage and retrieval of news data on the blockchain, ensuring reliability and trustworthiness [6], [7]. This hybrid approach combines blockchain and AI to create a robust solution for combating fake news.

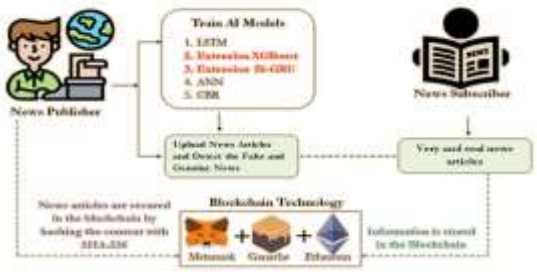


Fig.1 Proposed Architecture

This image (Fig.1) illustrates a system for ensuring the authenticity of news articles using artificial intelligence (AI) and blockchain technology. News publishers upload articles, which are analyzed by AI models like LSTM, XGBoost, Bi-GRU, ANN, and CBR to detect fake or genuine content. The articles are then secured using blockchain by hashing the content with SHA-256, utilizing platforms like MetaMask, Ganache, and Ethereum. Verified news is accessible to subscribers,

ensuring credibility and transparency. Blockchain storage ensures immutable records, and AI enhances the accuracy of the fake news detection process, creating a trustworthy ecosystem for news dissemination.

i) Implementation:

The implementation integrates modules for publishers and subscribers, leveraging blockchain and AI technologies for efficient news management and verification. Publishers can register by providing necessary details and gain access to features like news publishing and AI algorithm training. They train algorithms such as ANN, LSTM, Bi-directional GRU, and XGBoost on their dataset, with the system displaying metrics like accuracy, precision, recall, and F-score for evaluating algorithm performance [1], [10], [17]. Publishers can submit news articles, which the AI analyzes to predict their authenticity before securely storing verified content on the blockchain [2], [6]. Additionally, publishers can monitor the blockchain's performance using a Total Transactions Per Second (TTPS) graph, showcasing transaction efficiency [8]. Subscribers, after registering, can view and verify published news articles on the blockchain, accompanied by SHA256 hash fingerprints, upload dates, and AI-generated authenticity predictions, ensuring trustworthiness and transparency in news consumption [7], [9].

ii) System Modules:

1. New User Signup:

a) Publisher Module: New users can register as publishers by providing required details. Once registered, they can publish news articles and access features for news management. Blockchain technology ensures tamper-proof storage and traceability of published content, providing transparency and trustworthiness [2], [8].

b) Subscriber Module: This module allows users to register as subscribers, granting them access to view news articles stored on the Blockchain. Subscribers benefit from immutable records of news content, ensuring authenticity and credibility [8], [14].

2. Publisher Login:

a) Train AI Algorithm: Publishers can log in to train advanced AI algorithms, including Artificial Neural Networks (ANN), Long Short-Term Memory (LSTM), Bi-directional GRU, and XGBoost, on their datasets to enhance fake news detection accuracy [1], [12], [17]. The system provides performance metrics such as accuracy, precision, recall, and F-score,

offering transparency in AI model evaluation [6].

b) Publish News: Publishers can submit news articles, which are analyzed by AI algorithms to determine their authenticity before being stored on the Blockchain. This integration ensures that only verified news content is published, leveraging blockchain's immutability and AI's predictive power [3], [7].

c) TTPS Graph: A feature displaying the Total Transactions Per Second (TTPS) graph enables publishers to monitor the Blockchain's performance in processing news transactions over time, highlighting its efficiency and scalability [2], [14].

3. Subscriber Login

a) Verify and Consume News: Subscribers can log in to access news articles stored on the Blockchain, complete with metadata such as the SHA256 hash fingerprint, upload date, and AI predictions of the news being real or fake [8], [14]. This module empowers subscribers to verify the authenticity of news easily, fostering trust and reducing the spread of misinformation [1], [10].

This modular design integrates blockchain and AI to create a robust, transparent, and user-friendly system for managing news content.

iii) Components:

a) Blockchain Technology: Blockchain serves as the backbone of the system, providing a decentralized, immutable ledger for storing news articles. It ensures tamper-proof storage, transparency, and traceability of data. Each news article is recorded as a transaction, cryptographically linked to the previous one to form an unalterable chain [2], [8]. Smart contracts, written in Solidity, automate the processes of verifying and managing news content, enhancing the system's reliability [6], [7].

b) Hashing Techniques: The system uses the SHA256 hashing algorithm to generate unique fingerprints for each news article. This ensures data integrity by allowing users to verify that the content has not been altered after publication [8], [14].

c) Total Transactions Per Second (TTPS) Monitoring: The TTPS graph visualizes the system's performance in processing transactions, demonstrating blockchain scalability and efficiency [2], [14].

d) News Verification Module: The integration of AI algorithms and blockchain technology ensures that all submitted news articles are analyzed and authenticated before being published. This module combines machine learning's predictive capabilities with blockchain's trust

mechanism to reduce misinformation [1], [7], [8].

By combining these components, the system offers a secure, efficient, and transparent framework for managing news content, effectively addressing the challenges of fake news propagation.

iv) Technical Implementation:

The Ethereum platform, leveraging Smart Contracts written in Solidity, provides a secure framework for managing property and lease details on the blockchain. Blockchain ensures tamper-proof, transparent, and efficient handling of transactions, reducing fraud and enhancing trust in property dealings [2], [8]. The implementation process comprises the following steps:

- Initiating Ethereum Tool: The blockchain tool is started by navigating to the hello-eth/node-modules/bin folder and executing the runBlockchain.bat file. This initializes the local Ethereum environment.
- Deploying the Smart Contract: The Smart Contract is deployed using the migrate command, generating a unique contract address. This address is essential for interacting with the blockchain [6], [7].
- Interfacing via Python: Python scripts call the Smart Contract using its address to securely save and retrieve data. Comments in the script guide users on integrating the contract with the broader system [8], [14].

This blockchain-based implementation ensures secure and transparent property transaction management, minimizing risks of fraud and enhancing system reliability.

4. RESULTS & DISCUSSION

To run project double click on ‘run.bat’ file to start web server and get below page

In above screen python web server started and now open browser and enter URL as http://127.0.0.1:8000/index.html and press enter key to get below page

In above screen click on 'New User Sign Up Here' link to get below page

In above screen publisher is entering sign up details and then press button to saved details in Blockchain and then will get below output

In above screen sign up completed and for you and your guide understanding purpose I am displaying all details log obtained from Blockchain after storage. In above log can see transaction number, block no, hash code and many other details and similarly add subscriber also

In above screen adding subscriber details and after pressing button will get below details

In above screen subscriber details also saved in Blockchain and now click on 'Publisher Login' link to get below login screen

In above screen publisher is login and after login will get below page

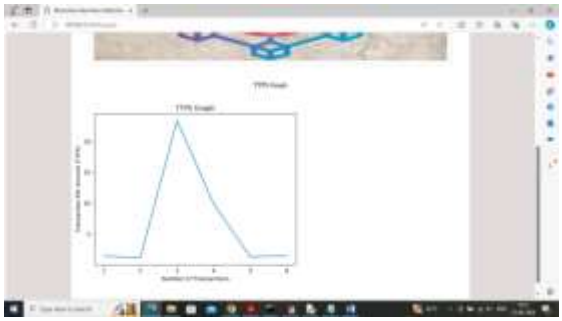
In above screen publisher can click on 'Train AI Algorithms' link to train algorithms and get below page

In above screen ANN and LSTM is the propose algorithm and then Bi-directional GRU and XGBOOST are the extension 1 and 2 algorithms and in above screen we can see extension algorithm got high accuracy. In above screen can see accuracy, precision, recall and FSCORE of each algorithm in tabular and graph format and now click on 'Publish News' link to get below page

In above screen publisher will write text (if you want you can take test news from Test News Folder) content and then AI will predict weather news is REAL or FAKE and then saved details in Blockchain and then will get below output

In above screen can see news article saved in Blockchain and in above screen in first two blue colour lines can see news article Finger print hash code and then can see AI prediction as Fake for given news and then can see all log details from Blockchain and similarly you can upload any number of news article to Blockchain and below is the another news content output

In above screen another news article is predicted as 'Real' and similarly you can upload any number of news and now click on 'TTPS Graph' link to get below graph



In above graph x-axis represents number of transaction processed and y-axis represents transaction time in seconds and now logout and login as ‘Subscribers’ to read news

In above screen subscriber is login and after login will get below page

In above screen subscriber can click on ‘Verify & Consume News’ link to view news from Blockchain

In above screens can see news content along with Hash code finger print and then can see uploaded date with AI predicted results as ‘Fake or Real’.

5. CONCLUSION

The The integration of blockchain technology ensures tamper-proof storage and verification of data, fostering trust and integrity in the information shared across IoT devices [8], [14]. By leveraging edge servers closer to IoT devices, the system significantly reduces data transfer time to cloud servers, enhancing responsiveness and overall performance [9]. Techniques like Local Sensitive Hashing (LSH) and caching optimize data retrieval, enabling quick access to relevant information while reducing computational overhead [7]. Additionally, implementing certificate-less

signature schemes within the blockchain framework enhances device authentication, ensuring secure and reliable data sharing [14]. To balance strong encryption with performance efficiency, the system employs AES symmetric encryption and lightweight Elliptic Curve Cryptography (ECC), reducing execution time without compromising security [6], [8]. These combined technologies provide a robust and efficient framework for secure data sharing in edge-enabled IoT environments.

Future Scope could focus on scaling the system to accommodate the growing number of IoT devices and users, ensuring efficient data sharing as the IoT ecosystem expands [7]. Integrating Artificial Intelligence (AI) and Machine Learning (ML) would enhance data analysis, predictive maintenance, and decision-making, ultimately improving user experience and operational efficiency [1], [12]. Enabling interoperability with other blockchain networks could facilitate seamless data sharing and collaboration across heterogeneous IoT systems, fostering a more connected ecosystem [8], [14]. Furthermore, future iterations may prioritize improving real-time data processing capabilities, which are critical for applications in smart cities, healthcare, and industrial automation, where immediate responses are essential [9], [17].

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