

RESEARCH ARTICLE

Artificial Intelligence Blockchain Based Fake News Discrimination

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ABSTRACT This paper minimizes fake news, which has been a hot topic recently, using blockchain and artificial intelligence technology, and verifies it with blockchain. Also, using Artificial Intelligence technology, we want to create an algorithm that predicts how fake news will spread in the future. You can see various attempts at a news media platform based on Blockchain technology. However, the Blockchain news media platform is still not getting the market response we expected. It is questionable whether the reason is simply because it is a new technology, so it takes a long time to gain trust from consumers, whether consumers are not yet expecting an innovative news media platform, or whether the explosive growth of the Blockchain news media platform is difficult for other reasons. Research to answer this or direct research between Blockchain and media platforms is still lacking. In addition, the method of verifying fake news using artificial intelligence was verified, ANN, CBR, and MDA were changed, and the experiment was verified for progress. In addition, the use of 5-fold cross-validation as a comparative method was added as described above to more closely examine the possibility of its usefulness even in general situations. Also, through various fields of artificial intelligence and blockchain, verification work was done with blockchain, and fake news prediction was made using artificial intelligence. Various experiments were conducted and performance tests were performed, while the performance of about 5,000 TTPS was recorded through the third experiment. In the future, we think it is necessary to combine Artificial Intelligence and blockchain technology.

INDEX TERMS Blockchain, super node, artificial intelligence, fake news, multi-channel, parallel processing.

I. INTRODUCTION

In this paper, fake news can be defined as false information produced and distributed to cause a misunderstanding of facts. Fake news causes serious economic and social damage, and according to the Hyundai Economic Research Institute, the social cost incurred by fake news is estimated to be 30 trillion won per year. Fake news is spreading in a way that maliciously edits existing articles or impersonates media companies. As a result, studies are being conducted at home and abroad to detect fake news. Among overseas studies,

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there is a study called Bitpress that distinguishes fake news as a weight for a citation using Ethereum, a public Blockchain, but due to the nature of the public Blockchain, compensation, partial branching, and processing according to nodes is created.

There is a problem of solving problems, such as speed and journalism is essentially an act of pursuing 'Truth'. News content [1], the result of journalism, has different characteristics from any other content. Above all this is the performance of public duties.

Therefore, it is common for 'Reporters' to take charge of the production of news content [2]. Today, we stand in the middle of the Clichane era with the term 'Crisis of

journalism'. Oxford Dictionary selected 'Exhaustion Room' as the word of the word in 2016. It is diagnosed that exhaustion is not a local phenomenon, but a characteristic of the era that appears worldwide. As if to prove this diagnosis, 'Fake News' emerged as a global controversy around the time of the U.S. presidential [3]. The fake news problem is still being solved.

It is prevalent online and offline, remaining as homework that has not been done. The reason why journalism is facing a crisis is multi-layered. And at the center of it lies a huge monopoly. In other words, there are large media structures that erode diversity and monopolize public opinion, and large IT platform operators that monopolize the distribution and profits of content, such as portals and Social Network Services (SNS). It is very important to verify fake news of journalism in crisis with Blockchain technology. Blockchain is often referred to as a 'technology of trust'. In other words, it is a system that trades between individuals participating in the network without a third party acting as a middleman, then verifies and records the information together. Until the advent of Blockchain technology [4], we did not find a way to trust the counterparty when dealing with someone on an online network.

So, it is the third broker who appeared. It is a way to set up a reliable broker in the middle and make a deal. Transactions between individuals without a third party are possible through distributed ledger technology. Distributed ledger technology encrypts and records transaction details in the ledger released with encryption technology. Anyone participating in the network can look into Director Lee and check their transaction records [5]. It is a system in which all participants in the network notarize transaction details together.

In this paper, we design a platform to reduce fake news by giving authorized reporters the authority to record fingerprints on articles in the Blockchain ledger using private Blockchain so that subscribers can verify the reliability of authorized news. The news verification platform consists of four parts: news producers, media servers, private Blockchain, and subscribers. As a news producer, he or she becomes a party that provides articles or information [6], such as editors, as defined in the News Communication Promotion Act. The media company server plays a role in storing articles written by news producers [7], recording fingerprints on the Blockchain, and providing news to subscribers. The private Blockchain plays a role in ensuring the reliability of articles and storing meta information about articles [8].

The Blockchain ledger consisted of the ID of the article, the author, the date of creation, the title, the content of the article hashed with SHA256, and the number of times of reading. In addition, we would like to predict fake news through artificial intelligence algorithms Figure 1.

As the phenomenon of fake news has become an issue worldwide, there is widespread debate that a legislative response is necessary. However, the prevailing view in the academic world is that regulations beyond the existing laws and regulations for spreading false information should not be

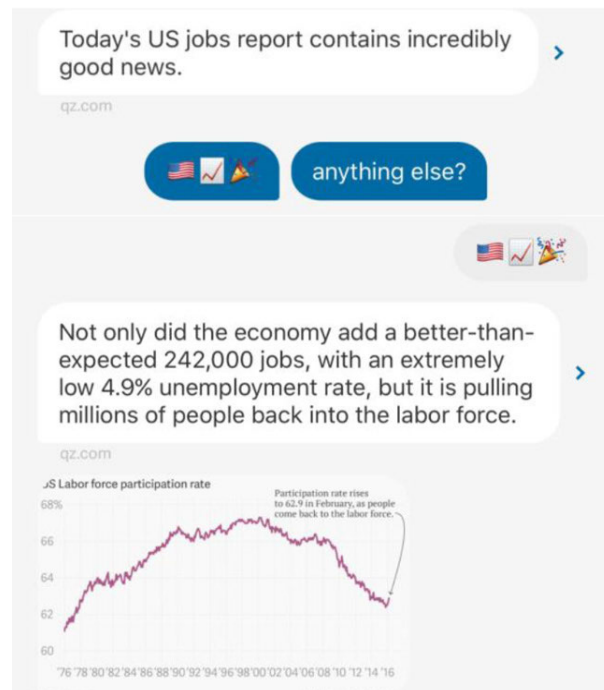


FIGURE 1. Artificial intelligence news journalism.

set, and such additional regulations can be excessive restrictions on freedom of expression. However, considering that the rapid and widespread distribution of false information and fake news is being maximized, measures to strengthen media literacy education for information consumers are emerging. In other words, there is a limit to implementing direct regulations to prevent harmful effects such as fake news and false information, so an alternative has emerged to support users in increasing their cognitive ability to identify false information. In particular, since fake news and indiscriminately spreading false information have a great influence on adolescents and the elderly, this reinforcement of media literacy education is gaining convincing power.

The concept of fake news is different for each scholar, and it is often interpreted from a different perspective from the definition of fake news mentioned above. Here, fake news is a similar term to Paid News, Stealth Advertising, and Sponsorship-linked News, and refers to an article-type advertisement that imitates the form of news that is not news. Concepts related to fake news include misinformation and deceptive information in which the truth is distorted and referred to by Karlova & Fisher. Distorted information is 'false information, not true', and deceptive information means 'intentionally' manipulated false information. In this sense, deceptive information can be classified into sub-concepts of distorted information. However, deceptive information is divided into concepts of different categories, not sub-concepts.

Chapter 1 mentions the overall introduction of the paper as introduction, and describes why this paper should be written. In Chapter 2, related research studied the papers and

research that should be examined in advance before studying this paper. In Chapter 3, a research methodology for fake news verification artificial intelligence blockchain research methodology was created and the theory was established. Chapter 4 describes the method for the experiment. Chapter 5 describes conclusions and future research.

II. RELATED RESEARCH

A. DIGITAL MEDIA

Digital media usually refers to electronic media that operates based on digital code. It contrasts with analog media. Today, computers are mainly based on binary systems. At this time, digital divides states as 0 and 1 when displaying arbitrary data. A computer is a device that expresses the dominant class of digital information processing devices by interpreting binary digital data as information. Digital media (in the form of expressing information), such as digital audio, digital images, and other digital content, can be created and shared through digital information processing computers. Digital media has brought about significant changes compared to previous analog media.

Any succession of digital codes, such as “0100 0001”, is interpreted as decimal 65. The hexadecimal number is interpreted as the number 41 or the letter “A”. For more information, see Asky, Code [9].

Florida’s Digital Media Alliance Florida defines digital media as “the creative focus of digital art, science, technology, and business for human expression, communication, social interaction, and education”. Also, these forms of media are called mass media. Mass media refers to media that plays a role in delivering large amounts of information, current events, and current issues to the unorganized general public. Among these forms of media, the Internet is a very interactive mass media. The Internet is a worldwide web that transmits data through packet exchange using standard Internet Protocols (IP). Millions of governments, academic, and corporate sites are connected that provide a variety of information and services, including e-mail, online chat, file transmission, and linked web pages.

At the end of the 20th century, the advent of the World Wide Web became a form of mass media that individual users could easily access. With the use of broadband networks and the development of P2P technology [10], vast amounts of information and images can be obtained, but it has become very difficult to judge the reliability of web page content. Breaking news can be delivered to the world in minutes through the Internet. As immediate and distributed communication became possible, the social role of mass media was changed.

The Internet is rapidly becoming the center of mass media. Everything has become accessible through the Internet. Instead of picking up newspapers or watching the 9 o’clock news, people now access the Internet to get the news they want. In addition, public television broadcasting through the mass media is a broadcast that transmits image information

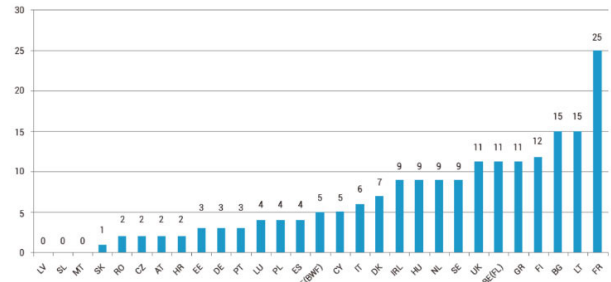


FIGURE 2. The number of media literacy networks by country (Source: mapping of media literacy and actions in EU-28).

using radio waves. In the Korean Broadcasting Act, it is defined as broadcasting that transmits broadcasting programs consisting of instantaneous images of objects that are stationary or moving, followed by voice or sound.

In addition, it is a broadcast that transmits image information using cable [11] and Internet transmission networks. Local cable broadcasters and IPTV operators, such as KT and SK Broadband, attract subscribers to connect coaxial cables and network terminals to subscribers’ televisions and deliver information [12].

Channels vary flexibly from operator to operator. Recently, YouTube has been the most influential channel as a form of media. YouTube was acquired by Google in 2006, followed by YouTube and Google releasing live streaming apps.

On YouTube, live streaming can be saved in the app, and users can watch the saved live streaming. Manuel Bronstein, director of YouTube production and consumer production, noted that live streaming provides YouTube creators with ‘an opportunity to create more live broadcasts with fans.’

In the past, anyone could broadcast through live streaming [13], but now only when the number of subscribers exceeds 1,000 can users create live streaming broadcasts. There are also various forms of digital media [14]. Through digital media, a large amount of news is being produced day by day.

However, it can be seen that there is a lot of fake news produced in this way. Therefore, we would like to examine what is in this fake news Figure 2.

B. ARTIFICIAL INTELLIGENT FOR MEDIA

The media field is a field that requires artificial intelligence. Artificial Intelligence (AI) is a computer program or computer system that includes human learning ability, reasoning ability, perceptual ability, and other artificially implemented computer programs [15]. It is a different concept from the intelligence of animals [16], including humans, which is known as natural intelligence.

It is a computer system that functions with intelligence, and it is an artificial demonstration (implementation) of human intelligence in machines, etc [17]. In general, it is assumed that it is applied to general-purpose computers. The term also refers to the field of science that studies methodologies and feasibility that can create such intelligence. In addition,

Artificial Intelligence (AI) is a field of computer science that mainly focuses on solving cognitive problems connected to human intelligence, such as learning, problem-solving, and pattern recognition [18]. Artificial intelligence, commonly abbreviated as “AI,” may imply robotics or the future [19], but AI is becoming a reality of advanced computer science beyond the small robots in science fiction. Professor Pedro Domingos, a renowned scientist in this field, explains the “five groups” of machine learning [20], consisting of symbolicists based on logic and philosophy, connoisseurs derived from neuroscience, evolutionists related to evolutionary biology, Bayesian dealing with statistics and probabilities, and psychology-based analogies.

With the recent improvement in statistical computing efficiency, Bayesian has been able to successfully develop several areas in the field of “machine learning.” Likewise, with the advancement of network computing [21], connectionists can further develop their subfields under the name of “Deep Learning”. Both Machine Learning (ML) and Deep Learning (DL) are computer science fields derived from the field of artificial intelligence.

These techniques are largely divided into “supervised” learning techniques and “unsupervised” learning techniques [22], where “supervised” techniques use educational data containing desired output values and “unsupervised” techniques use educational data excluding desired output values. Machine learning is a name that is mainly applied to several Bayesian techniques used for pattern recognition and learning. Machine learning is a collection of algorithms that can learn from recorded data and predict based on it, optimize basic utility functions under uncertainty, extract hidden structures from data, and classify data into concise explanations [23]. Machine learning is mainly distributed when explicit programming is too strict or impractical [24]. Unlike general computer codes developed by software developers to generate outputs for each program code according to a given input, machine learning uses data to generate statistical codes (ML models). This statistical code outputs “Appropriate results” based on the pattern recognized in the previous input (output for supervised techniques) example. The accuracy of ML models mostly depends on the quantity and quality of historical data.

With appropriate data, ML models [25] can analyze high-dimensional problems through billions of examples to find the optimal functionality to predict outputs using given inputs.

The ML model provides statistical confidence in overall performance as well as prediction. If you want to use an ML model or other individual prediction, these evaluation scores play an important role in decision-making. Machine learning is mainly used to predict future outcomes based on historical data.

For example, organizations use machine learning to predict how many products will be sold in the future accounting quarter based on specific demographics [26] or predict customer

profiles that are most likely to increase or be dissatisfied with the brand. These predictions can improve business decisions, provide a more personal user experience, and reduce customer retention costs. ML, which complements Business Intelligence (BI), which focuses on reporting past business data, predicts future results based on past trends and transactions.

There are several steps necessary to successfully implement ML in the business. First, there is a step of identifying the exact problem. Once you find out, you figure out what predictions will help your business.

Next, data should be collected based on past business indicators (transactions, sales, reductions, etc.).

Once the data is aggregated, an ML model [27] can be built based on the data. The ML model is executed and the model’s prediction results are re-applied to the business system to make more information-based decisions.

Weak AI, also known as consultative AI or Artificial Narrow Intelligence (ANI), is AI trained and centralized to perform specific tasks [28]. Weak AI drives most of the AI that surrounds us today. Since it is never weak, ‘consultation’ will be a more accurate description of this AI type. This is the basis for several very strong applications, including Apple’s Siri, Amazon’s Alexa, IBM Watson, and self-driving cars.

Strong AI consists of Artificial General Intelligence (AGI) and Artificial Super Intelligence (ASI). Artificial General Intelligence (AGI) or general AI is a theoretical form of AI in which machines have the same intelligence as humans [29]. It has a consciousness perceived by those who can solve problems, learn, and make plans. Artificial Super Intelligence (ASI), also known as superintelligence, surpasses the intelligence and ability of the human brain. Although strong AI is still purely a theory, without actual cases in use today, AI researchers are still preoccupied with its development. Meanwhile, the best examples of ASI can be found in science fiction novels, such as HAL, Superhuman, and Villain Computer Assistant by A Space Odyssey in 2001.

C. BLOCKCHAIN FOR MEDIA

Journalism is essentially an act of pursuing ‘truth’. The news content, the result of journalism, has different characteristics from any other content [30]. Above all, it is for performing public duties. Therefore, it is common for ‘reporters’ to take charge of the production of news content.

Today, we stand in the middle of the Clichane era with the term ‘crisis of journalism.’ Oxford Dictionary selected “Exhaustion Room” as the word of the word in 2016. Exhaustion is not a local phenomenon, but a characteristic of the world [31].

As if to prove this diagnosis, “Fake News” emerged as a global controversy before and after the U.S. presidential election in the same year. The problem of fake news is still widespread online and offline, remaining unsolved homework [32]. The reason why journalism is facing a crisis is multi-layered and at the center of it lies a huge monopoly.

In other words, there are large media structures that erode diversity and monopolize public opinion, portals, and large IT platform operators that monopolize the distribution and profits of content, such as Social Networking Services (SNS) [33]. Blockchain is often referred to as a ‘technology of trust’ [34]. In other words, it is a system that trades between individuals participating in the network without a third party acting as a middleman, then verifies and records the information together. Until the advent of Blockchain technology, we had not found a way to trust the counterparty when dealing with someone on an online network.

So, it is the third broker who appeared. It is a way to set up a reliable broker in the middle and make a deal. Transactions between individuals without a third party are possible through distributed ledger technology. Distributed ledger technology encrypts and records transaction details in the ledger released with encryption technology. Anyone participating in the network can look into Director Lee and check their transaction records. It is a system in which all participants in the network notarize transaction details together. If this is expressed in the network, it represents a ‘centralized’ network, a ‘differentiated’ network, and a ‘decentralized’ network [35]. What should be noted is the third decentralized network. Distributed computing networks have a long history and are not new, but what is new is decentralization.

First, censorship resistance means ‘non-stoppable’. When condition ‘A’ is met in the Blockchain [36], the transaction or contract is automatically implemented by the protocol. Since there is no third party acting as an intermediary, there is no subject to censorship.

Second, the irreversibility of records means ensuring the safety of information. Once data (information) is contained in the Blockchain, forgery is virtually impossible.

Third, transparency means that tracking is possible because all transaction details are open and shared. Let’s summarize a brief look at Blockchain technology.

The essence of the Blockchain is decentralization, and decentralization has censorship resistance, irreversibility, and transparency [37].

What if we demonstrate journalistic imagination through the above Blockchain technology? The discussion can begin by substituting the three characteristics of decentralization into journalism. In journalism, ‘censorship resistance’ is an important condition. Currently, several factors act as censorship in media activities. It is multi-layered, including market power, political power, and media owners represented by advertisers. IT platform operators such as portals and Facebook, which hold the distribution network of news content, are also third parties that exist between reporters and readers. It is a necessary condition for journalism that reporting and reporting activities are resistant to censorship from them. Let’s look at the combination of information irreversibility transparency and journalism.

It is not as good as the combination of censorship resistance. Rather, it can be a very dangerous combination. Irreversibility only guarantees the ‘truthfulness’ of data and

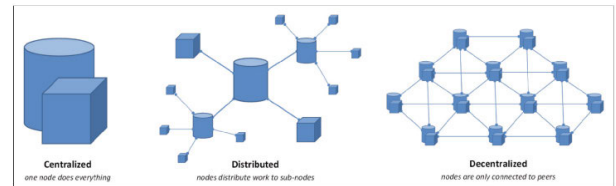


FIGURE 3. Blockchain architecture.

the truth is a completely different issue. Let’s imagine a situation in which the information recorded on the Blockchain is wrong in the first place. This cannot be modified (modulated), and situations that everyone can look into can cause problems. It is also likely to lead to a fatal situation in media activities, such as news content. When recording on the Blockchain, irreversibility, and transparency are problematic, as shown in Figure 3.

1) CIVIL

Civil is a Blockchain project that declared ‘Our mission is journalism.’ It started in the U.S. at the end of 2016 and launched two newsrooms on June 11, 2018, including “SLUDGE” and “DOCUMENTED” on Ethereum. Civil aims to eliminate a third party called “advertisement” [38] from the existing news content ecosystem. It aims at a news ecosystem where news producers and consumers meet in person. The revenue model is inevitably subscription and funding. The plan is to enable independent and sustainable media activities as a model where reporters and readers meet in the open news market.

The news market in Sibil takes on a ‘Token economy’. News market participants can subscribe to and fund news with the CIVIL Project’s own cryptocurrency CVL token. In addition, rewards for various activities are given in CVL.

The token economy also decentralizes the news production structure. Individual newsgroups operating in the Civil are called “Newsrooms,” and CVL token holders decide which newsrooms can operate in the Civil community. Specifically, it is a method in which token holders decide to launch a newsroom through voting by borrowing the “Token Curated Registry”.

This method has two implications. It is a device for “quality journalism” and a decentralized method [39] in which network participants are involved from the stage of deciding whether to launch a newsroom, Figure 4.

2) DNN

DNN is also a project that started in the United States. The DNN team told Reddit that during the U.S. presidential election, they felt problematic about [40] fake news and biased reports led by huge media power and started the project.

Therefore, DNN aims to produce fact-based, unbiased news by focusing on political news. DNN’s goal is to collapse the widespread filter bubble on SNS. DNN also pays attention to the ‘compensation system’ based on the token economy. Unlike Civil, where news content can be produced only when

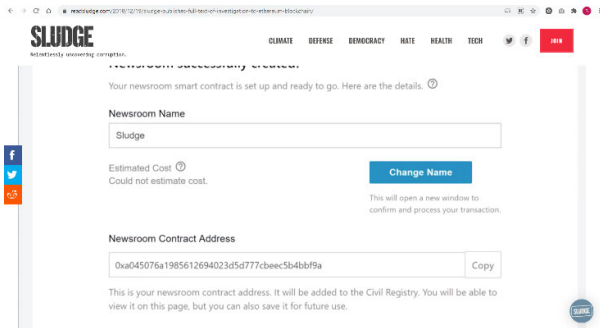


FIGURE 4. Civil blockchain news.

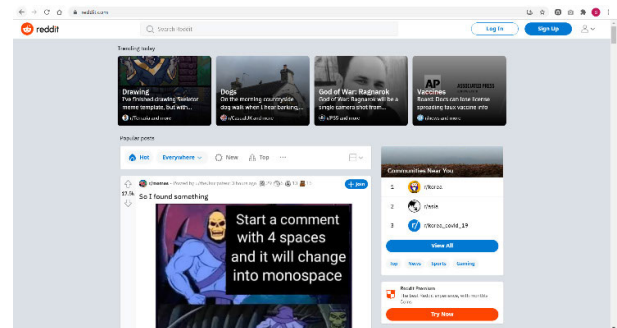


FIGURE 5. Reddit blockchain news.

the newsroom is passed, everyone in DNN has a series where you can post the news through the process. A series of processes refers to the process by which news is released. There are four types of participants in DNN: reporters, reviewers, readers, and publishers. Anyone can write an article as a reporter.

However, not all content will be released. When a shipment request is made, a majority of the “approval of shipment” must be secured after reviewing seven arbitrarily designated anonymous reviewers.

The reviewer is selected as a token economy model [41]. They cannot modify the article and can only submit the pros-cons of shipment. Reviewers cannot collude because they don’t know each other. What’s interesting about DNN is that it decentralized the way articles are released. The desk serves as a reviewer in existing media companies. The desk has a long experience.

Insight gives good instructions to reporters, but it can also give unfair instructions for various interests or emotional reasons or prevent the release of articles in the worst case. It is noteworthy that DNN is an attempt to decentralize the release authority. In addition, there are “Multra” projects that provide rewards with tokens when users consume news content [42], and “Trive” that offer to create a compensation structure according to Nash’s equilibrium theory.

The above projects are projects that are currently being launched or have just begun. Therefore, it remains to be seen whether the blueprint presented in the white paper will be printed in reality. Judging from the contents described in the white paper, most of the above projects face the following problems. First, in the case of Civil, we face the question of the possibility of journalism business.

In other words, it is a question of whether the paid news content model can succeed. There are many skeptical views in the Korean media industry. Even if it is a position that predicts success, it is possible under the premise of “quality journalism”. Quality journalism also partially conflicts with ‘expandability’.

To pursue quality journalism, a hurdle is prepared in some way to participate as a news producer. It is pointed out that such a method eventually hinders scalability. In the case of DNN, some parts do not match the physiology of

news-seeking breaking news and independence. From the standpoint of a reporter who wrote a major exclusive article [43], it is a Blockchain that entrusts an unknown reviewer to release his article, Figure 5.

III. FAKE NEWS VERIFICATION ARTIFICIAL INTELLIGENCE BLOCKCHAIN RESEARCH METHODOLOGY

A. ISSUE RAISING

Blockchain news media is still in its infancy. However, high attention is focused on how to use Blockchain technology in the journalism industry. Blockchain technology is mentioned as a way to overcome the crisis in news media [44], and there is an opinion that the utilization of Blockchain technology is expected to expand further, especially to reduce dependence on fake news and traditional profit models. There are currently about 15 Blockchain-based news media, but information is being presented that services aimed at Blockchain-based news media are continuing to enter the development stage in the future. As Blockchain news media platforms have been actively developed and serviced so far, you can see Civil and DNN (Decentralized News Networks).

Civil advocates for an open market-concept journalistic media that allows reporters and readers to trade news directly using Blockchain technology. It was first developed in early 2018 with the schedule of releasing a white paper in June 2017, officially launching its coin and platform called CVL and starting the service in earnest, but the actual service was released in 2019. This has suffered ups and downs in initial investments because market expectations for the Blockchain news media platform have not yet been high. Civil’s principle is that professional journalists in various fields, including videos, write articles, and the first curator consists of about 200 professional journalists [45], [46], [47]. The news they produce requires objectivity and integrity to be verified by a committee and fact checker that thoroughly complies with the guidelines. This is to secure the reliability of articles by systematizing them so that fact-checking can be done as strictly as reporters because fact-checking is also given appropriate compensation.

Therefore, verification and prediction algorithms that secure these Blockchain and artificial intelligence technologies are needed.

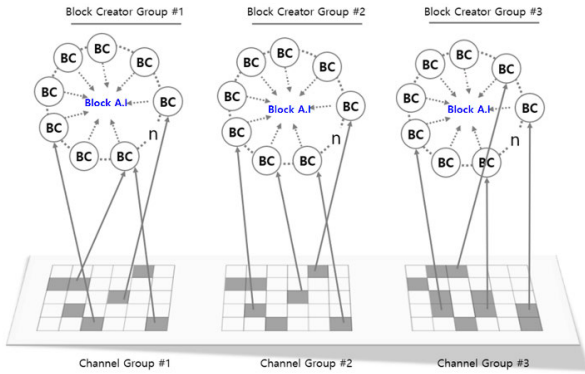


FIGURE 6. Block creator group architecture.

B. FAKE NEWS BLOCKCHAIN VERIFICATION ARCHITECTURE

To verify fake news, this study aims to develop a dynamic multi-channel technology that supports inter-channel communication (ICC) to overcome the limitations of existing Blockchain methods that maintain independent Blockchains from channel to channel, while allowing transactions to be evenly distributed by channel and to create or eliminate channels depending on the situation. State sharding is an account-based model [46], which is restricted from performing cross-division transactions, although certain shards maintain only a portion of the state in the specified Blockchain.

Therefore, understanding the dependence between states to minimize cross-division transactions acts as a major factor in performance. In addition, event-driven state management is characterized by designing functions in response to changes in state, and the areas of affected data are clearly distinguished. In this design, the horizontal scalability of the distributed computing model is simplified and the resilience to failure is improved. By converting each variable declared in a smart contract into a database record to determine whether it is dependent in detail, it is possible to parallelize not only the information specified in the transaction but also smart contracts by designing a structure to determine whether it is dependent in detail.

This is an AutoDL that performs verification work with state sharding technology and randomly generates results from each deep learning model (DNN, CNN, RNN, CRNN) to perform artificial intelligence text classification, while repeatedly performing and recommending optimal models in each model or ensemble model. It also creates algorithms to predict fake news using random multi-model deep learning (RMDL) algorithms, as in Figure 6.

We would like to select the proposed model to use media company data as method 1 as an additional independent variable to the basic model. Then, to find out how well the proposed model to be selected performs, other settings changed the machine learning technique ANN, CBR, and MDA in the same situation and experimented with comparative analysis. In addition, the 5-fold cross-validation was used as a comparative method as described above to more closely

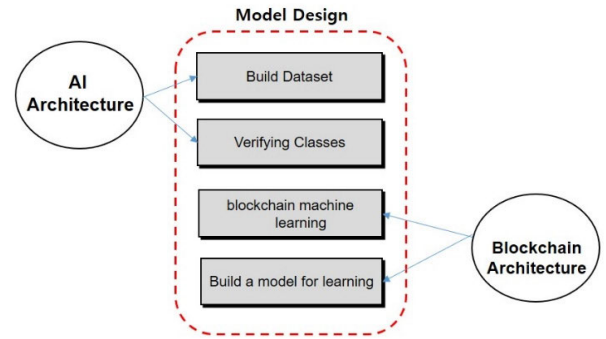


FIGURE 7. Blockchain AI architecture channel service.

examine the possibility of its usefulness even in general situations. Experiments on the prediction accuracy according to the 5-fold cross-validation are summarized and shown, and the optimal setting values for each mold are presented, so the order of the average prediction accuracy of the dataset was SVM > CBR > MDA > ANN as in Figure 7.

1) PARALLEL TRANSACTION PROCESSING

Algorithms are developed for graph profiling and speculative optimization of dependence on transaction parallel processing. In addition, when processing transactions in each block, creating a dependence graph for transactions and scheduling them in parallel can increase the processing performance of transactions. Additionally, if transactions are speculatively processed in parallel without creating a dependence graph by profiling data on the dependence graph, they can be processed more aggressively. Also, since the profile information is to estimate future data based on past data, the situation may change or a special situation may occur and be wrong.

$$\begin{aligned} &\nabla_{\phi} E_q [\log p_{\theta}(\mathbf{x} | \mathbf{z})] \\ &= \nabla_{\phi} \int q_{\phi}(\mathbf{z} | \mathbf{x}) \log p_{\theta}(\mathbf{x} | \mathbf{z}) d\mathbf{z} \\ &= \int \log p_{\theta}(\mathbf{x} | \mathbf{z}) \nabla_{\phi} q_{\phi}(\mathbf{z} | \mathbf{x}) \frac{q_{\phi}(\mathbf{z} | \mathbf{x})}{q_{\phi}(\mathbf{z} | \mathbf{x})} d\mathbf{z} \\ &= \int q_{\phi}(\mathbf{z} | \mathbf{x}) \log p_{\theta}(\mathbf{x} | \mathbf{z}) \nabla_{\phi} \log q_{\phi}(\mathbf{z} | \mathbf{x}) d\mathbf{z} \\ &= \mathbb{E}_q [\log p_{\theta}(\mathbf{x} | \mathbf{z}) \nabla_{\phi} \log q_{\phi}(\mathbf{z} | \mathbf{x})] \end{aligned}$$

If a conflict occurs due to incorrect parallel processing scheduling, speculative execution should be stopped through exception processing, dependence graphs should be created, and parallel processing should be performed as originally. If an exception continues to occur, it is possible to cope with rapidly changing situations and continue to optimize by discarding previous profile information, generating new profile information, and performing parallel processing.

$$\begin{aligned} H(x) &= Wx + b \\ cost(W, b) &= \frac{1}{m} \sum_{i=1}^m (H(x^{(i)}) - y^{(i)})^2 \end{aligned}$$

Hypothesis equations and cost function. H(x) means a Model based on the data we have. The cost function is

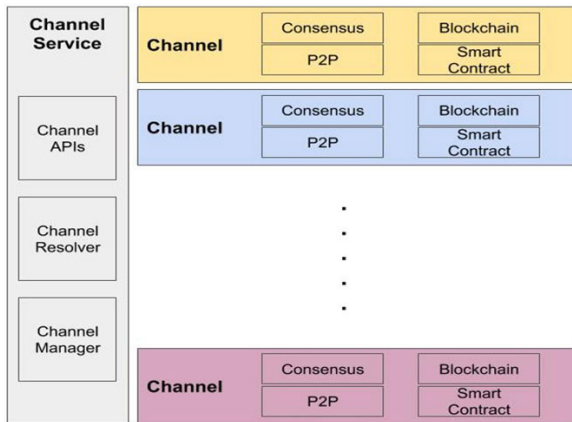


FIGURE 8. Blockchain AI channel service mechanism.

a function that finds the optimal $H(x)$ by calculating the distances between the data and $H(x)$. The smaller the cost function, the better $H(x)$ (hypothesis). Now we show $H(x)$

$$H(x) = Wx$$

$$cost(W) = \frac{1}{m} \sum_{i=1}^m (Wx^{(i)} - y^{(i)})^2$$

to minimize the cost function.

2) SEPARATE AND MERGE DYNAMIC CHANNELS

The concept of dynamic channel separation and merging is that efficient channel allocation is important to improve the performance of distributed systems. There is a need for a channel allocation algorithm that can be applied quickly according to the demand for channels and can be stably expanded without a deadlock. In addition, as a limitation of existing technologies, channel allocation is static according to a specific transaction type or application scenario in an existing Blockchain, so a performance bottleneck may occur frequently as the amount of transactions is concentrated in a specific channel. However, the excellence of development technology aggressively processing transactions in parallel can improve simultaneous throughput by allowing transactions that form multiple dependence graphs to exist independently and separate channels when speculative parallel processing always succeeds.

Conversely, when it is determined that interdependence is strong, it is possible to reduce the overhead from communication between channels by merging channels. By improving Blockchain processing time, procedures, and security, the introduction of scalability technology can eliminate the hassle of existing systems that brokerage agencies use to guarantee trust in transactions, such as remittances and payments, and improve the system to enable fast and simplified financial services under mutual trust. As high fees and performance constraints are resolved, Blockchain can be applied to most financial services such as signing contracts, joint management of customer information, remittance and payment, bond issuance, and stock trading Figure 8.

To provide channel services for dynamic channel separation and merging, it must be possible to interwork with existing software through the Channel API. In addition, the consensus process of the Blockchain is used by using the characteristics of the channel using Channel Resolver. Through Channel Manager, we are creating a service and management system for Smart Contract and Channel Service.

3) ZK ROLLUP ALGORITHM

Plasma has a problem in that the main chain cannot provide availability for each transaction by processing transactions in the commit chain and registering only the commit chain block header corresponding to the result in the main chain. Commit chain users must manage their related transaction history to raise objections. Unlike plasma, ZK roll-up commits all transactions to the main chain as they are. Since hundreds of internal transactions exclude signatures, they are only about 10 bytes per unit. The validity of the transaction is proven to be approximately 100 to 300 bytes of zero-knowledge proof (SNARKs). These transactions and proof of zero knowledge are referred to as packages.

Through ZK roll-up, it is possible to achieve ‘multiple separations of the ledger’, one of the concepts of this task. Freedom is being an application or being able to bind frequently related users. In this study, transactions are parallelized in several chains, just like the ZK roll-up. ZK roll-up is difficult to be called complete parallel processing because it requires verification of transactions and status inside an independent Blockchain on the mainchain. Since the criteria for ‘grouping of nodes’ are not set, additional design is required for the application. ZK roll-up is also not a structure designed to assume a ‘small node’ environment, so it cannot optimally utilize the computing resources of nodes. Even in a small environment, the number of transactions occurring internally is not large, so compression efficiency through proof of zero-knowledge is reduced. Therefore, the TPS is lower than expected. In addition, there is no explicit way to communicate between different chains that may occasionally occur. Cross-chain communication may be a bottleneck for scalability. In this study, it is possible to minimize bottlenecks, even when communication between channels is required through dependence graphs and speculative transaction execution.

The development of Web 3, along with the growing popularity of dApps, is putting pressure on existing networks and calling for the development of scaling solutions. Among the latter zero-knowledge rollups (ZK-Rollups), it is evaluated as the most promising.

Scaling solutions known as layer 2 chains (L2) are designed to solve the scalability problems of layer 1 (L1) networks like Ethereum by processing transactions on the mainnet. It aims to provide users with higher throughput, lower gas fees, and higher transaction speeds while relying on L1 for the final transaction. Rollups rely on batching multiple transactions in the L2 and then publishing them to the main network. There are two common types of rollups: These are Optimist Rollup and ZK-Rollup. Examples of parent

optimist rollups include Optimist and Arbitrator. Speaking of ZK-Rollup, zkSync Era is currently one of the leading projects. Other notable players include Polygon's ZK Rollup and Starknet.

Both Optimist and ZK-Rollups share the transaction processing principles of L2. Meanwhile, the latter offers several additional benefits to users through its approach to the validation process. Optimal rollup verification approach and its limitations.

Optimistic rollups rely on proof of fraud based on the assumption that all transactions submitted to L1 are legitimate. Therefore, they are "optimistic." After a user submits a withdrawal request, the validator must check the state of the chain to provide proof of fraud. To detect miscalculated transactions, proof-of-fraud uses a binary search between two parties to find the exact location in the block where they disagree. The entire process can take several days and can lead to long withdrawal times.

In contrast, ZK-Rollups use Zero-Knowledge Proof (ZKP), a computationally intensive and promising transaction verification approach. L2 transactions are batched with proofs, a cryptographic mechanism to automatically provide L1 proof that the computations in L2 were done correctly. This algorithm is based on the principle of encrypting and verifying the results of calculations without being able to "unroll" them to reveal the original data. Therefore, there is no need to verify every transaction because the encryption algorithm has already provided the final correct result with verification.

The generated proof is then submitted to the main chain and validated by the L1 network's nodes. This approach offers both enhanced security and instant withdrawal time since it optimizes the data shared between layers and allows for faster verification and higher throughput.

C. ARTIFICIAL INTELLIGENCE BLOCKCHAIN DESIGN FOR VERIFICATION OF FAKE NEWS

The fake news verification artificial intelligence Blockchain research methodology can be divided into Node1 and Node2 as shown in Figure 9.

To design an artificial intelligence Blockchain for fake news amnesia, a Blockchain artificial intelligence-based design was conducted by dividing it into Node1 and Node2. First, an algorithm was installed to partition the Web Application for each node. In addition, the architecture was constructed to verify using Linux systems for each cache container in memory.

A cache container is cache storage used in a subsystem. The Red Hat Infinispan default cache container is defined in the configuration of an XML file (standalone-ha.xml, standalone-full-ha.xml, domain.xml). One cache is defined as the default cache, which is the cache to be used for clustering. Write the default cache defined in each cache container. In this example, a replica cache is defined as a default value in a web cache container. Therefore, the replica cache is used to cluster web sessions. The cache container and cache

attributes can be configured using the management console or CLI command, but it is not desirable to rename the cache container or cache. In addition, it communicates with Node2 through eth0 through connection with docker0 and flannel0. In addition, IPIP Encapsulated is used for communication, and network areas of 192.168.0.100 classes are used using MAC addresses, Outer IP, UDP, and Inner IP.

1) DESIGN OF DISTRIBUTED TRANSACTION PROPOSAL ALIGNER (TPA) COMMUNICATION STRUCTURE

The information exchange communication structure of distributed TPA is designed to efficiently manage the parallel processing of multi-channels by assigning Tx received as normal news and fake news for each node group.

In addition, to reflect the decentralized structure, a protocol is designed for real-time synchronization of real-time change information of the R/W Variable Set, which is basic information for efficient allocation and exchange of Tx between distributed TPA. In addition, the existing A&S-based time-slot-based simulation uses Single TPA, but the Blockchain adopts a distributed structure because the mutual monitoring function by decentralization is important.

In addition, if a collision occurs during the exchange of real-time R/W Variable Set information, a fast negation protocol and a pre-avoidance negation algorithm must be developed to resolve the conflict. R/W variable set information-based transaction type classification and model development and simulation are required for parallel processing. It is necessary to develop a transaction-type classification model based on R/W Variable set information. The A&S algorithm dynamically determines and classifies the Tx type based on the R/W variable set information added to Tx. Developing a dynamic allocation algorithm based on R/W Variable set information for TPA and TPA determines whether the received Tx is of a positive type or should be processed in series with the Tx batch of TPA.

These are matters for the development of Aggregate & Serialize Tx launchers for Blockchain for fake news verification.

- Development of Tx Batch-based Serialized Tx Executor.
- Development of technology for caching reference and change variable values for Tx Executor.
- Catching reference and changing variable values for Tx Validator.
- Development of serialized Tx block recording method to minimize block recording structure change.

2) A CHAIN MAPPING MODEL BETWEEN PHYSICAL CHANNELS

Develop chain mapping and multiplex chain accessors between physical channels and design technology to search for chains to which specific variables are mapped on physical channels. Development technology adds blocks of irrelevant variables to each physical channel but does not guarantee that the latest values of certain variables are written to fixed physical channels. As a result, it is necessary to access all

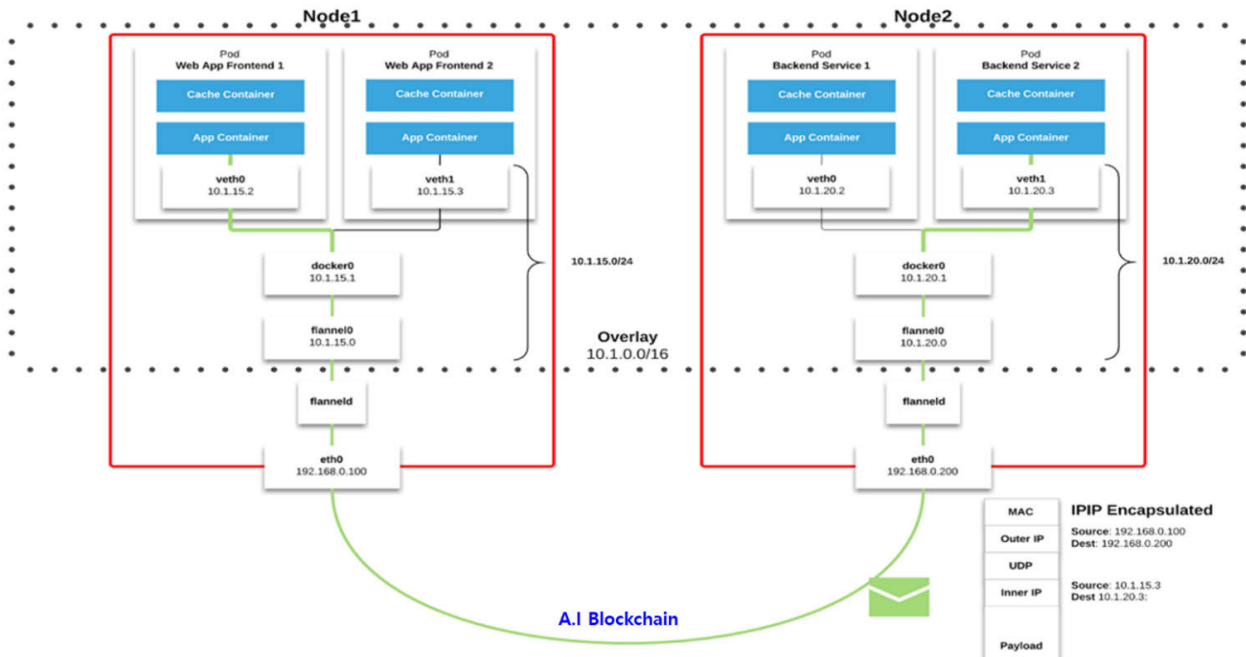


FIGURE 9. AI blockchain node configuration.

the channels’ chains to find the latest variables, but it speeds up a reference by parallelizing the latest value search by allocating separate storage devices for each channel. Since the record on the block of development technology is the same as that of existing Blockchain technology, if there are N multi-channels, the latest location (depth) is 1/N in probability, so access speed can be improved N times compared to existing Blockchain technology Figure 10.

To model the chain mapping between physical channels, Step 1 generates a chain and a user. It also refers to the step linked to verification. Step 2 establishes a policy for physical mapping.

policies to establish a Blockchain consensus algorithm policy are very important. Step 3 worked on binding for the Blockchain policy. In Step 4, or Option A, we split into user groups that are managed by each person. Administrators can also use it through this account. Option B allows you to log in with an administrator account. In addition, you can log in with your private key and access it.

3) A MODEL FOR MAPPING BLOCK DATA BY LOGICAL CHANNEL

It designs logical channel structures for smart contracts independent of physical channels and designs data access rights structures for smart contracts on logical channels. In addition, it creates a block generation cycle synchronization technology design and simulation on the same instance and creates a synchronization technology of the block generation cycle of the entire physical channel on one logical channel. However, there is also a limitation of R/W set verification in the smart contract of the multi-channel Hyperledger Fabric.

- Multi-channel data access control cannot be strictly designed.
- Provides more access to data than necessary.
- JN: The restrictions of channels that can be changed.

However, by adding blocks of all physical channels belonging to one logical channel at synchronized timing, the development technology can refer and change the entire physical channel (full variable) in one logical channel as if dealing with a single channel, and inter-chain Tx design without R/W set verification failure. Platform development that ported a multi-channel communication framework to Blockchain technology is used to verify fake news.

4) DEC LEARNING NODE PREDICTION ALGORITHM

In both the pre-learning stage of DEC’s autoencoder and the clustering performance stage, a backpropagation algorithm based on the gradient descent method, a learning algorithm of deep learning, is used. In the pre-learning stage of the autoencoder, the difference between the input data and the output data is defined as a loss function for feature vector extraction and is learned in the direction of minimizing it. In the clustering performance stage, the similarity between the feature vector extracted from the autoencoder and the center of the cluster is used.

It defines an auxiliary distribution that allocates clusters and allows data to be allocated more purely to clusters.

Then, the difference between similarity and auxiliary distribution is defined as a loss function and learned for the direction of minimizing it. DEC requires a normalized similarity measurement function because data generates a probability distribution to be assigned to each cluster through similarity and defines an auxiliary distribution so that it can

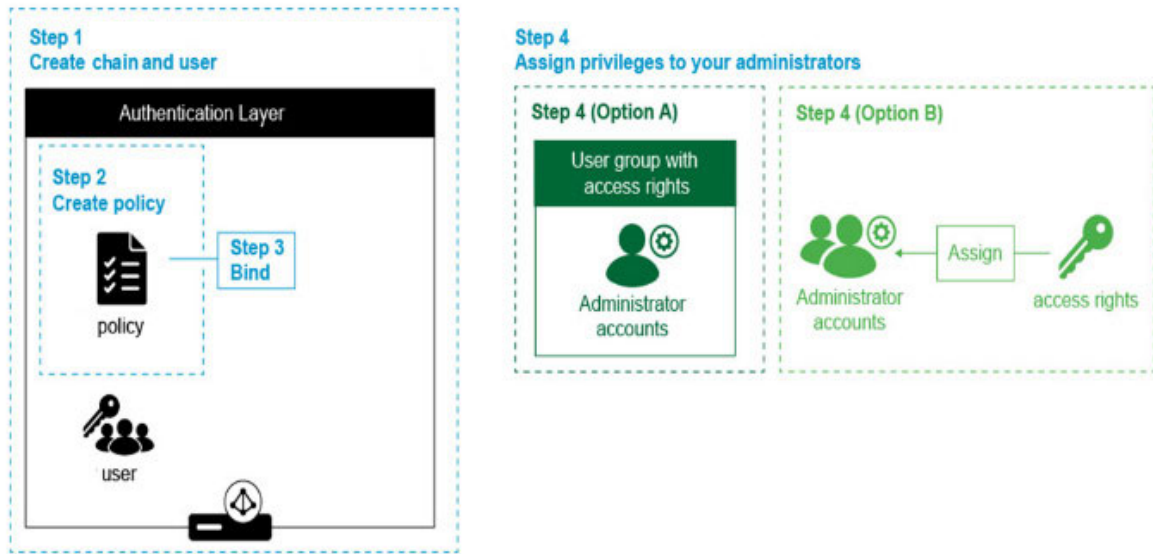


FIGURE 10. A chain mapping model between physical channels.

be assigned to a more similar cluster than in the generated probability distribution. The similarity measurement function has a student distribution, and the sum term of the denominator normalizes the equation so that the sum of the similarities for all clusters is 1. Therefore, it means the probability that data will be allocated to the cluster. Since both the autoencoder pre-learning stage and the clustering performance stage of DEC are learned through the learning algorithm of deep learning, a loss function that defines the difference between the target variable and the output value must be defined.

D. VERIFICATION UML AND SOURCE CODE DESIGN

1) FAKE NEWS VERIFICATION UML DESIGN

To design a fake news verification Unified Modeling Language (UML), we draw the process of delivering blockchain.register and Create a return ‘message’, as shown in Figure 11.

Verification should be done on a Fake News Document. In addition, this artificial intelligence-based transmission with Blockchain Artificial Intelligence was designed as UML.

1. Register as blockchain.register.
2. Register the ID with blockchain.register.add.
3. Create a return ‘message’ that is recorded and the transmitted message is registered.
4. Call import URL parse.
5. It transmits self-current_transactions transaction data.
6. Register the register’s new full-node blockchain full node.
7. Register the results for the Blockchain registration results blockchain.
8. Forward registered blockchain indexes as a result of registration and return result values.

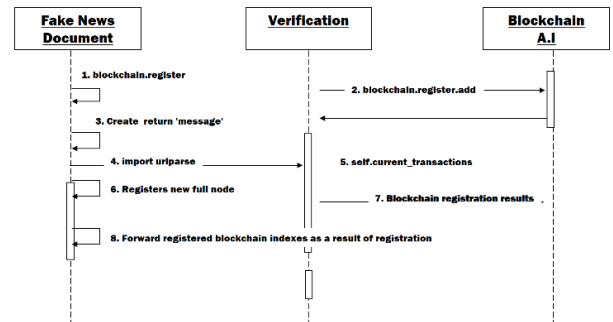


FIGURE 11. Fake news verification UML design.

2) DESIGN OF SOURCE CODE FOR VERIFICATION OF FAKE NEWS

The fake news verification source code design was designed as Node.js, and Java’s Jason code was used to estimate. In addition, software was designed using the Egyle methodology.

A source code was designed to verify fake news. In addition, the pseudo-code was partially opened. For the first time, a variable of the new node fake news Blockchain was registered. In addition, ‘300,’ which is the number of nodes verified based on the clonal variable, was returned. In each node, uuid1 to 5 were verified and uuid5 was returned to verify the block of ew_block (self, nonce, prevhash), it can be seen that the nipple file of min-blockchain/blockchain is returned. In this way, part of the source code was disclosed.

IV. EXPERIMENTS AND RESULTS

A. EXPERIMENT ENVIRONMENT AND DATA SET

We trained in advance before experimenting. We used the most necessary experimental tools to conduct the most stable experiment and to conduct the most objective experiment. For the field of artificial intelligence and the field of blockchain,

```

#define Fakenews Verification Solve
Add new node fakenews Blockchain
"""
if not request.is_json:
    return Response("", 300)
node_id = uuid5()
blockchain.register_node(node_id)
node_id = blockchain.register_node
(request.host)
return {
    'message': 'New node have been added.',
    -42,6 +37,9 def get(self):
class Mine(Resource):
    def post(self):
        if not request.is_json:
            return Response("", 400)
        req = request.get_json()
        node_id = req.get('node_id')
        16 min-blockchain/blockchain/blockchain.py
from hashlib import sha256
from time import time
from urllib.parse import urlparse
from uuid import uuid4
class Blockchain:
    -14,7 +15,7 def __init__(self):
        """
        self.current_transactions = []
        self.chain = []
        self.nodes = set()
        self.nodes = dict()
        # Create genesis block
        self.new_block(100, '1')
        -23,12 +24,15 def register_node(self,
address):
        """
Registers new full node
:param address: Hosts's address
:param address: Host's address
:return: None
:rtype: None
:return: Node's ID
:rtype: str
"""
        self.nodes.add(urlparse(address).netloc)
        node_id = str(uuid4()).replace('-', '')
        self.nodes[node_id] =
urlparse(address).netloc
        return node_id
def new_block(self, nonce, prevhash):
    """
    -132,4 +136,4 def is_valid_nonce(prev_nonce,
nonce):
        guess = '{0}{1}'.format(prev_nonce,
nonce).encode()
        guess_hash = sha256(guess).hexdigest()
        return guess_hash[:4] == '0000'
        return guess_hash[:5] == '00000' }
    
```

FIGURE 12. Example of fake news dataset.

we also referred to existing studies and divided the objectivity of the experiment in detail.

Analysis was conducted with the data of this study. About 2,000 pieces of data were analyzed. The data on the news confirms the data on the existing news and the fact-checking news. If you look at sites such as those, you can see fact-check articles and articles that are not. Among these data sets, analysis was performed based on about 2,000 data sets, and analysis and prediction were experimented with using LSTM-based artificial intelligence techniques.

Fake news data was primarily verified using the Blockchain authentication function, and artificial intelligence LSTM was used to predict how fake news comes out or how it is determined, see Figure 12.

In this way, data that was crawled by visiting various sites were stored in .csv. Fake news and fact news based on Blockchain were separated and crawled. Data was collected for about six months from January 2021 to July 2021 and classified into a class. The class had important distinctions between False, True, and divided the data into Misleading, Mostly False, Mixture, Unlikely, No Evidence, Half True, pants-fire, and barrier-true.

B. EXPERIMENTAL ENVIRONMENT

The test was attempted by verifying fake news with a Blockchain server and establishing a verification experimental environment for how much fake news verification performance is achieved. To predict Blockchain and artificial intelligence LSTM, an experimental environment in which CPU and GPGPU were verified was established, and the experiment was conducted.

- A server for blockchain nodes.
- Xeon CPU 20 core / 256 RAM.
- A laptop for blockchain development.
- Intel I7 or higher.
- Monitor for blockchain development.
- LCD/LED.
- network switch 24 ports.
- A server for blockchain nodes.
- Xeon CPU 20 core / 256 RAM.
- Personal PC.
- Intel I5 or higher.

C. EXPERIMENTAL CONDITIONS

The conditions for experimenting were verified to measure the performance of about 2,000 pieces of data processing

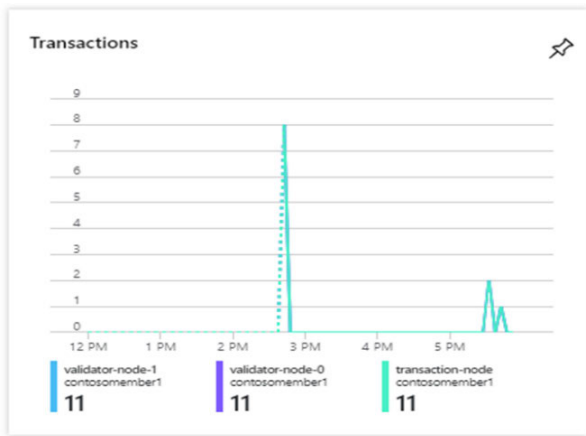


FIGURE 13. CC request max data.

actual news data and fake news data. In addition, these datasets were classified according to the importance of data. The actual process of spreading fake news proceeds in a wide variety of procedures and stages. Experiments are being conducted through various conditions and on these conditions.

D. PERFORMANCE ANALYSIS

To maximize performance and minimize the cost of expanding nodes in Blockchain AI to verify fake news, not only technology to expand multi-channel but also to maximize channel performance and divide chains, which are upper layers of channels, is needed.

Many multi-channels perform in the entire chain by summing up the performance of each channel, so it is essential not only to increase the number of channels through multi-channels but also to open the channel’s performance itself. In addition, if the chain is separated through virtualization technology, more chains can be constructed with the same resource, which improves the ability to utilize server resources, reducing server resource costs. When a channel is multi-separated, the TPS of the sum increases, but the TPS of each channel cannot exceed the channel TPS before multi-separation. Multi-channelization by improving the speed of the channel itself can significantly improve the overall TPS speed.

Long-term throughput alone seems to have achieved high TPS, but in fact, it has significantly lower performance problems in terms of one user or one application.

If there are no transaction requests other than transactions for one application at a specific time zone (low load situation), the Blockchain framework is showing the lowest performance, not the best performance. Figure 13 shows CC request max data.

As a result of verifying the transaction of the artificial intelligence Blockchain node, the number of nodes for the validator-node-1 control member 1 was set to 11. In addition, time series analysis was performed by time zone. It showed the highest peak of 8 at 3 pm. This figure is very important and stores data and even at 5 pm, it shows some 1 transaction.

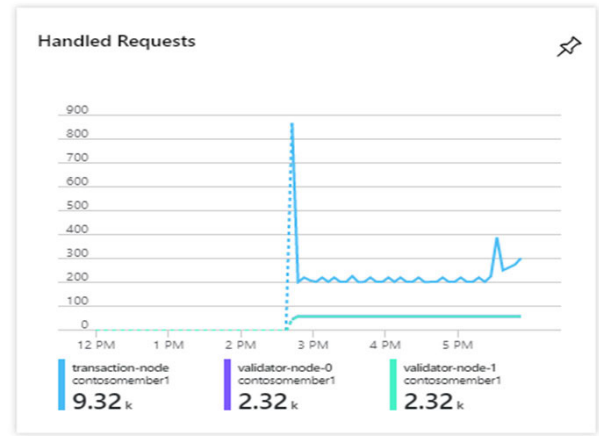


FIGURE 14. CC request max data and average.

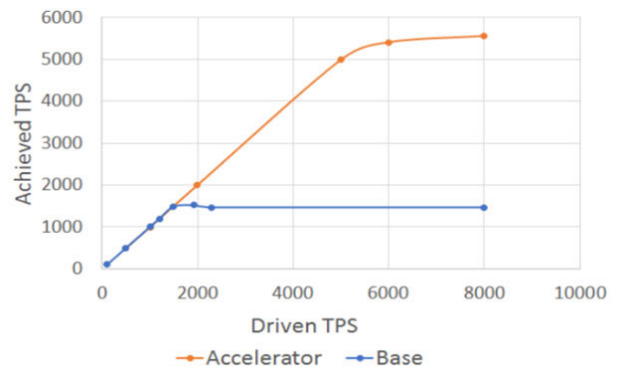


FIGURE 15. Performance operation (First Set).

Also, there is a difference between 10 simulations and 1,000 simulations, in Figure 14.

This experiment is an experiment to show Handled Requests. Values of the validator-node-1 component 1 and the validator-node-0 component 1 are compared. In addition, in the validator-node-0 control member 1, the return value is about 890. This figure is mostly done at 3 pm. In the validator-node-1 control member1, the return value is about 400. It is showing a speed of 2.32k and it can be seen that this performance increases.

Data was verified once. An experiment was conducted based on the algorithm by mounting an artificial intelligence algorithm. It can be seen that the Achieved TPS shows an average of 1,500 TPS. And it can be seen that the Driver TPS is constant from 2,000 to about 8,000. The average value shows that it is between 2,000 and 8,000.

The real TPS is 3000, not 5000, and up to 500 TPS in the event of a variable collision, but it has not solved the problem of the 90% drop in maximum performance, in Figure 15.

In addition, a second experiment was conducted. Performance verification was performed by adding a total of two tests. It can be seen that the Achieved TPS shows an average of 1,500 TPS. In addition, the maximum speed is up to 3,500 TPS and it can be seen that the Driver TPS is constant from 500 to about 5,000. The average value is between 500 and 5,000. In addition, it can be seen that the Accelerator and

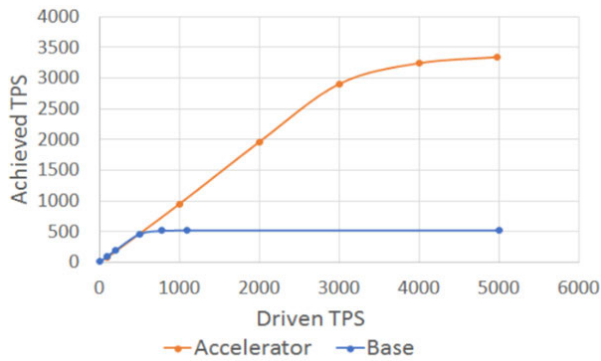


FIGURE 16. Performance operation (Second Set).

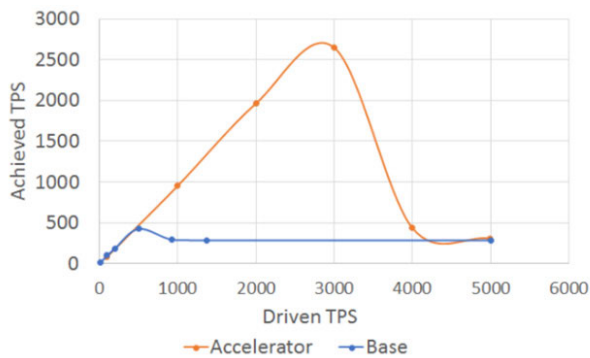


FIGURE 17. Performance operation (Third Set).

base values maintain a constant driving TPS at 500, shown in Figure 16.

In addition, a tertiary experiment was conducted. Performance verification was performed by adding a total of three tests. It can be seen that the Achieved TPS shows an average of 1,500 TPS. In addition, the maximum speed is up to 2,500 TPS and it can be seen that the Driver TPS is constant from 500 to about 5,000. The average value shows that it comes out to be about 500. Finally, it can be seen that the Accelerator and base values remain constant at 500 or less, in Figure 17.

According to similar experimental results, the maximum number of topics was set to 10. If so, in this situation, experiments were conducted with ANN, CBR, and MDA to find out whether SVM is a machine learning technique that shows the highest prediction accuracy, and comparative analysis was conducted. Below, experimental results for prediction accuracy according to machine learning techniques are shown. According to the experimental results, the prediction accuracy of the verification dataset is 51.11% when SVM is used, which is about 7% higher than the lowest 44.40% when CBR is used, and when MDA is used, it is relatively superior by producing a result about 2% higher than 48.90%, which is the second highest after SVM. Therefore, this study shows a slightly higher number.

V. CONCLUSION

Journalistic imagination through Blockchain technology can be done in two main ways. First, it is a method of creating Blockchain-based news media. In this case, there is a limit

to the scalability of participants as content producers, and the problem that the paid news content market is poor is raised. However, considering that these attempts are still meaningful and are currently in the beginning stage, it is necessary to keep an eye on them. Second, it is a structure that imagines news content as a type of content distributed in Blockchain-based media. In this case, the question remains as to whether the profits from the token economy model can replace the existing news revenue structure. It is also necessary to predict the possibility through practical attempts.

In this paper, a plan to reduce fake news by verifying the reliability of authorized news articles by applying the Blockchain was proposed, and based on the proposed contents, it was implemented and confirmed that the experiment results operate normally. In this paper, subscribers described a system that can distinguish between authorized news articles and news articles that are not, but further research is needed on a system that can discriminate between fake news and misinformation occurring within authorized news.

In addition, among online media, news is the area where Blockchain technology can have the greatest influence. The characteristics of the Blockchain of irreversibility and decentralization that cannot be deleted are the same as the basic principles of journalism, such as objectivity and fairness. In particular, news media is no longer able to gain consumer trust at a time when advanced graphic technology and various forms of news media coexist, causing social confusion through “fake news.” Blockchain is often referred to as a ‘technology of trust’. It is a system in which anyone participates in the network, trades between individuals, and verifies and records the information together. It would not be an exaggeration to say that until the advent of Blockchain technology, we did not find a way to trust another person when dealing with or communicating with someone on an online network.

Blockchain technology is emerging as the most notable technology along with hyperconnected society and IoT in the era of the 4th industrial revolution. In particular, it is designed so that all participants in the network can reliably and safely store and record data through decentralization, a technical characteristic of the Blockchain. Although various industries are currently making great efforts to apply Blockchain technology, it is still difficult to find practical useful examples of Blockchain technology being applied in the media content industry. In particular, if it is a transparent and reliable technology through decentralization, journalism is the area where such technology can see the greatest light.

In other words, we think it is news media. Currently, various attempts at news media platforms based on Blockchain technology can be seen overseas. However, the Blockchain news media platform is still not as responsive in the market as we expect. It is questionable whether it takes a long time to gain trust from consumers because it is simply a new technology, whether consumers are not expecting an innovative news media platform yet, or whether the explosive growth of the Blockchain news media platform is difficult for other

reasons. Research to answer this or direct research between Blockchain and media platforms is still insufficient.

It is in one state and through various artificial intelligence fields and Blockchain, Blockchain verification work was performed, and fake news prediction was made using artificial intelligence. Various experiments were conducted and performance tests were conducted, and the third experiment was conducted to record the performance of about 5,000 TTPS. In addition, we think it is necessary to combine artificial intelligence and Blockchain technology in the future. In addition, a second experiment was conducted. Performance verification was performed by adding a total of two tests. It can be seen that the Achieved TPS shows an average of 1,500 TPS. In addition, the maximum speed is up to 3,500 TPS and it can be seen that the Driver TPS is constant from 500 to about 5,000. The average value is between 500 and 5,000. In addition, it can be seen that the Accelerator and base values maintain a constant driving TPS at 500.

This study provides the following implications to fake news researchers and media experts. Combining different characteristics in deep learning does not always lead to the improvement of the model's performance, and performance may be maintained or vice versa depending on the reciprocity between characteristics. On the other hand, it was confirmed that the emotional change pattern improves the performance by combining it with the content characteristics. In the actual application of the proposed model, there is no need to take the risk of possible performance degradation even if the model based on the content characteristics is already in operation

It means that. The limitations of this study are as follows. Training and verification data are limited in preserving the form and meaning of the original fake news. Fact-checking includes the subject of the speech, specific remarks, and contextual information that can grasp the context of the relevant speech in the SNU sentence, so it is possible to extract characteristics close to the original text. In addition, many media companies participate in cross-validation and are objective. However, there is a possibility of characteristic loss in the process of organizing the original text of fake news in the media and transferring it to the form suggested by fact-checking. Lack of data required for training and testing is also a constraint to be resolved. Although fake news data is accumulated through continuous research and voluntary participation of media companies, efforts to secure a large amount of fake news data that is sufficiently credible should be continued. In addition, follow-up studies are also needed to utilize unsupervised learning and reinforcement learning, an algorithmic approach relatively free from data shortages and imbalance problems, to detect fake news.

For such big data, parallel computing or parallel computation is a method of computation that performs a lot of calculations at the same time. It is mainly used to solve large and complex problems in parallel at the same time by dividing them into small pieces, and there are many methods and types of parallel computing. Examples include bit level, command level, data, and work parallel processing method. Parallel

computing has long been mainly used for high-performance computations, and it attracted more attention after increasing awareness of the problem as it approached the physical limitations of processor frequencies. In addition to the recent increase in interest in heat generation and power consumption in computer use, it has attracted attention as a strong paradigm in computer structure with a multi-core processor as its core. As such, to obtain various big data in the future, research should be continuously conducted using parallel computing.

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