Chapter 8

Integration of Artificial Intelligence and Blockchain Technology:
A Review

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ABSTRACT

This chapter comprehensively reviews the integration of artificial intelligence (AI) and blockchain technology. AI is a machine simulation of human intelligence to create systems that can perform tasks that typically require humans to recognize patterns and solve problems. It has been successfully applied across various sectors such as healthcare, finance, transportation, education, etc. Blockchain technology is a decentralized distributed ledger system that records transactions across networks. Although it gained popularity when Bitcoin was introduced, it can be applied to various sectors such as decentralized finance (DeFi), healthcare, supply chain management, etc. An extensive review of journal articles was conducted to explore the synergies, challenges, and potential research directions of AI and blockchain convergence, especially in the financial sector. The contents of the selected articles were summarized to evaluate the current applications and future research directions were outlined.

BACKGROUND

Artificial intelligence (AI) has become increasingly popular in various sectors due to its reputation for improving efficiency and decision-making. AI algorithms enable

machines to emulate human behavior for enhanced problem-solving capabilities (Agarwal et al., 2020). Various sectors such as healthcare, finance, management, manufacturing, and education successfully implemented AI to improve their performance (Agarwal et al., 2020; Nurwulan, 2021; Siemens et al., 2012; Tao et al., 2018). The capabilities of AI in analyzing and predicting in a short period of time are notable across industries (Agarwal et al., 2020). In the financial sector, AI has notably improved the performance of credit risk assessment and portfolio optimization (Thomas, 2000), algorithmic trading (Hendershott & Riordan, 2013), fraud detection (Roszkowska, 2020), market trend prediction (Kumar et al., 2021), and customer service interactions (Sulaiman, 2022).

The applications of AI in the financial sector evidently have improved efficiency, precision, and innovation remarkably. For instance, the proficiency of AI in analyzing vast datasets speeds up credit risk assessment and portfolio optimization to improve financial decisions (Thomas, 2000). AI can analyze large datasets to predict trends from historical data, enhancing the accuracy of forecasting. This ability improved the performance of decision-making in algorithmic trading where real-time decision-making is needed (Arifovic et al., 2022). Similarly, pattern recognition can also be used for fraud prevention. AI algorithms can detect anomalies and irregularities by comparing the current activities to historical datasets. As a result, security risk management is improved for both financial institutions and customers (Phua et al., 2005). In addition, the development of virtual assistants and chatbots using AI algorithms enhances customer service interaction by providing instantaneous responses to customers' queries (Sulaiman, 2022). Although the virtual assistant might not be able to answer all kinds of questions, it can reduce the waiting time of the customers than if all queries are directed to human customer service. On top of that, the customer might get an answer right away if the question is frequently asked by the customers.

AI is indeed a disruptive technology in the financial sector. Likewise, blockchain technology has also become popular in reshaping financial transactions. Blockchain is a decentralized and distributed digital finance technology that enables a secure and transparent ledger across networks (Swan, 2015; Zetzsche et al., 2020). The introduction of Bitcoin in 2008 was the catalyst of blockchain's popularity (Nakamoto, 2008). Since then, blockchain has been applied to many sectors although initially it was introduced as the framework of cryptocurrencies. With blockchain, the transactions are organized and linked chronologically to enhance security (Narayanan et al., 2016), making it possible for the participants to engage in peer-to-peer transactions without intermediaries since there is no central (Nakamoto, 2008). By removing the intermediaries, financial transactions can be done faster and cheaper.

As blockchain technology continues to evolve, its influence is expanding beyond its origins in cryptocurrencies. The financial sector has been significantly impacted

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