

Blockchain Technology in the field of Artificial Intelligence (Key Benefits Vs. Limitation)

Abstract

Blockchain technology has emerged as a groundbreaking innovation with the potential to revolutionize various industries. This paper explores the benefits and limitations of blockchain technology, shedding light on its transformative capabilities and inherent challenges.

The benefits of blockchain are numerous. 1st, its decentralized nature ensures transparency, immutability, and security of transactions. The use of consensus mechanisms, such as proof-of-work or proof-of-stake, enhances trust among participants. Smart contracts, which are self-executing agreements with coded terms, automate processes, reduce the need for intermediaries, and minimize the risk of fraud. Additionally, blockchain facilitates faster and more cost-effective cross-border transactions, opening up new possibilities for global financial inclusion. However, the technology is not without its limitations. The scalability challenge poses a significant hurdle as the current blockchain infrastructure struggles to handle a large number of transactions simultaneously. Energy consumption associated with certain consensus mechanisms, particularly proof-of-work, has raised environmental concerns. Moreover, regulatory uncertainty and the lack of standardized frameworks hinder widespread adoption, preventing the realization of blockchain's full potential. Privacy concerns also arise because the transparency of blockchain can be a double-edged sword, potentially exposing sensitive information.

Introduction

As of today, blockchain technology offers numerous key benefits in terms of decentralized infrastructure and transactions. This paper reviews blockchain technology in terms of its benefits and challenges across various business fields. Additionally, it enhances transparency, security, trust among participants, and the ability to execute smart contracts among multiple parties in an automated way, aiming to reduce reliance on intermediaries. However; alongside these transformative benefits, blockchain technology grapples with several limitations which will be highlighted in this paper.

Keywords

Blockchain, Artificial Intelligence, Cybersecurity, and Artificial Intelligence· blockchains. Method Employed

Objectives

Investigate the advantages of using blockchain technology, evaluate how blockchain enhances security and trust in transactions, and explore how blockchain facilitates transparency and accountability. Additionally, highlight the major challenges associated with blockchain implementation. This analysis is conducted without bias towards any specific research paper used in this study.

Key Finding

In the table below, the researcher selected Key finding Points among 6 studies, to bring reader attention, and simplify Comparison as below:

Title	Author	Key finding results
Accounting and auditing with blockchain technology and artificial Intelligence.	[1]	Addresses integration and optimization of data management in SMEs. Highlights the benefits of adopting digital technology with AI. Proposing process diagram for managing customer relationships. Introduces B-SMEs, a blockchain and AI-enabled distributed framework. Handles automation of SME transactions and resource sharing among participants. Reduces computational resource costs, network bandwidth, and storage. Adopts proof-of-work and proof-of-stake consensus for transaction management.
A critical analysis of the integration of blockchain and artificial intelligence for supply chain	[2]	Integration of blockchain and Artificial Intelligence improves security, efficiency, and productivity. Supply chain benefits from blockchain and Artificial Intelligence in information and process resilience.
The collaborative role of blockchain, artificial intelligence, and industrial internet of things in digitalization of small and medium-size enterprises	[3]	Reduces computational resource costs, network bandwidth, and storage. Deploys three different chain codes for stakeholder registration and information management. Protects individual transactions with NuCypher threshold re-encryption. Adopts proof-of-work and proof-of-stake consensus for transaction management. Identifies open challenges and limitations for future technological developments.
Blockchain for securing Artificial Intelligence applications and open innovations	[4]	
Blockchain for securing Artificial Intelligence applications and open innovations	[5]	Blockchain can mitigate vulnerabilities in Artificial Intelligence applications. AI can improve the performance of Blockchain.
Cybersecurity Challenges in Blockchain Technology		Disclosed severe impact of cyberattacks on companies. 61% of small and medium enterprises have suffered cyberattacks. Digital encoding on blockchain enables easy registering, tracking, and trading. The combination of Artificial Intelligence and blockchain technologies. Explores the applications and platforms of blockchain for AI. Open research challenges of using blockchain for Artificial Intelligence are identified.
Blockchain for Artificial Intelligence Review and open research challenges	[6]	Highlights the need for comprehensive reviews on blockchain and Artificial Intelligence integration.

Method Employed

The paper presents a comparative study related to the search of relevant literature using keywords "Blockchain" and Artificial Intelligence.

What is a Blockchain technology? Why is it important? How does it work?

A blockchain can be referred to as a collection of records or an open record that is shared among Participating parties. Every transaction that is incorporated is first verified by all the participants involved in that transaction. And it is really important in field of transactions, it is crucial to note that once the data is recorded on the blockchain, it can never be rewritten or altered. Thus, the blockchain can be termed as a record book of all the transactions conducted. [7] Siddharth Rajput¹, Archana Singh², Smiti Khurana³, Tushar Bansal⁴, Sanyukta Shreshtha⁵

What is the combination of Blockchain and AI?

In the first study, the author focuses on research about the integration and optimization of data management in SMEs organizations. The text highlights the benefits of adopting digital technology with AI, proposing a process diagram for managing customer relationships. It also handles the automation of transactions and resource sharing among participants in order to reduce computational resource costs, network bandwidth, and storage. [(Han et al., 2023)]

In the 3rd study, the author highlights the benefits of blockchain through the proposed B-SMEs framework. It increases ledger management and optimization by 17.3% and reduces resource consumption by 9.13% in terms of computational power. Additionally, it utilizes 14.11% less network bandwidth and 7.9% less storage compared to the current mechanism. The framework performs better and more efficiently compared to other studies. [(Khan et al., 2023)]

Limitations and Challenges:

Challenges and limitations for both studies (1,3) mainly highlighted the technical aspects (organizational, storage capacity, privacy, scalability, interoperability, cybersecurity challenges) which do not refer to blockchain standardization, as blockchain cannot be considered a one-size-fits-all solution. [NO_PRINTED_FORM] [(Han et al., 2023)], (Khan et al., 2023)

Maintaining the integrity, transparency, reliability, provenance, availability, and trustworthiness of SMEs' operations between two different enterprises is challenging due to the current nature of centralized server-based infrastructure. The issue of interoperability platform is a critical challenge in designing and managing a secure distributed Peer-to-Peer industrial development environment for SMEs. The current mechanism of SMEs consumes more computational resources, network bandwidth, and storage capabilities compared to the proposed framework. [(Khan et al., 2023)].

In the second study, the author highlighted that blockchain technology is emerging as a way to secure crucial applications. There has been significant growth in publications on blockchain since 2019, mostly led by countries such as China and the United States. The number of research publications has been increasing in the last few years. In addition, the author refers to and highlights how the integration of Artificial Intelligence and Blockchain can improve both technologies. Blockchain could make Artificial Intelligence more coherent and trackable, as it allows secure access to heterogeneous data for AI. As conclusion of this research, open innovation and the adoption drive increased production rate. [(Charles et al., 2023)]

Limitations of Research:

1st: Lack of security and trust in Artificial Intelligence systems, 2nd Research work needed for implementing stable Blockchain-based Artificial Intelligence systems. [(Charles et al., 2023)]

Studies 4. Focused on the integration between blockchain and artificial intelligence to mitigate vulnerabilities in artificial intelligence applications and improve the performance of blockchain, addressing the limitations in the study. [(Shinde et al., 2021)].

In addition, the text explores the applications and platforms of blockchain for AI and highlights the need for comprehensive reviews on the integration of blockchain and artificial intelligence. [(Salah et al., 2019a)]

Limitations of Research:

Generally, the research lacks information on the Blockchain platform used, does not mention any security analysis, and fails to specify applications of Blockchain in Artificial Intelligence.

Vulnerabilities and security risks in blockchain systems include issues with contract authentication, the reliability of third-party systems such as oracles in smart contract authentication, and the necessity of employing specific Artificial Intelligence consensus protocols for blockchain transactions. [(Shinde et al., 2021)], [(Salah et al., 2019b)].

Conclusion

According to the resources cited in this research, all indicators show that blockchain technology has been expanding since 2019[4]. It allows for securing applications, making Artificial Intelligence more coherent and trackable, adding efficiency, security, and reliability in transactions and information exchange, and reducing costs. However, blockchain still requires more research focusing on enhancing the trading system and finding solutions. None of the studies refer to using more than one blockchain and how operational procedures will impact the OPEX cost, as well as how it will increase efficiency by segregating services between blockchains.

Summary of references

Study	Author	Research Year	Research design	Research Title		
				Accounting and auditing with blockchain technology and artificial Intelligence.	- Reviewed literature using Nvivo software. - Ranking the articles based on blockchain benefits, prospects, implications. - Bibliometric analysis, Summary statistics.	- Addresses integration and optimization of data management in SMEs. - Highlights the benefits of adopting digital technology with AI. - Proposing process diagram for managing customer relationships. - Introduces B-SMEs, a blockchain and AI-enabled distributed framework. - Handles automation of SME transactions and resource sharing among participants. - Reduces computational resource costs, network bandwidth, and storage. - Adopts proof-of-work and proof-of-stake consensus for transaction management.
Study 1	[1]	2023	Journal	A critical analysis of the integration of blockchain and artificial intelligence for supply chain	- The paper presents a comparative related studies using AI, IoT, and blockchain. - The proposed framework is called "BSMEs" and is designed for distributed SMEs.	- Integration of blockchain and Artificial Intelligence improves security, efficiency, and productivity. - Supply chain benefits from blockchain and Artificial Intelligence in information and process resilience.
Study 2	[2]	2023	Research	The collaborative role of blockchain, artificial intelligence, and industrial internet of things in digitalization of small and medium-size enterprises	- The paper discusses various IoT, blockchain, and AI-enabled techniques for SMEs. - Bibliometric analysis is used to evaluate existing research patterns. - Scopus and Web of Science databases are examined for analysis.	- Reduces computational resource costs, network bandwidth, and storage. - Deploys three different chain codes for stakeholder registration and information management. - Protects individual transactions with NuCypher threshold re-encryption. - Adopts proof-of-work and proof-of-stake consensus for transaction management. - Identifies open challenges and limitations for future technological developments.
Study 3	[3]	2023	Scientific Reports	Blockchain for securing Artificial Intelligence applications and open innovations A critical analysis of the integration of blockchain and artificial intelligence for supply chain	- The paper presents a detailed survey on blockchain applications for AI. - It reviews the literature, tabulates, and summarizes emerging blockchain applications, platforms, and protocols targeting AI. - The paper identifies and discusses open research challenges of utilizing blockchain technologies for AI.	- Blockchain can mitigate vulnerabilities in Artificial Intelligence applications. - AI can improve the performance of Blockchain. - Blockchain records transactions shared among participants, cannot be altered. - Paper covers bitcoin history, literary reviews, blockchain workings, and applications.
Study 4	[4]	2021	Journal	Blockchain for Artificial Intelligence Review and open research challenges	Key finding results	- The combination of Artificial Intelligence and blockchain technologies. - Explores the applications and platforms of blockchain for AI. - Open research challenges of using blockchain for Artificial Intelligence are identified. - Highlights the need for comprehensive reviews on blockchain and Artificial Intelligence integration.
Study 5	[7]	2019	Research	Methodology • Search of relevant literature using keywords. •		
Study 6	[6]	2019	Research	searching and		

References

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Siddharth Rajput¹, Archana Singh², Smriti Khurana³, Tushar Bansal⁴, Sanyukta Shreshtha⁵ Department of Information Technology, ASET, Amity University Uttar Pradesh, NOIDA sidd7399@gmail.com, archana.elina@gmail.com, khuranasmriti700@gmail.com, btushar739@gmail.com sanyuktashreshtha2000@gmail.com.

-Blockchain for AI: Review and Open Research Challenges

KHALED SALAH¹, (Senior Member, IEEE), M. HABIB UR REHMAN², NISHARA NIZAMUDDIN¹, AND ALA AL-FUQAHA³
¹Department of Electrical and Computer Engineering, Khalifa University of Science and Technology, Abu Dhabi 127788, UAE
²Department of Computer Science, National University of Computer and Emerging Sciences, Lahore 54770, Pakistan
³NEST Research Lab, Computer Science Department, College of Engineering and Applied Sciences, Western Michigan University, Kalamazoo, MI 49008, USA Corresponding author: Khaled Salah (khaled.salah@ku.ac.ae)

-Cybersecurity Challenges in Blockchain Technology

Scoping Review

Samreen Mahmood, Mehmood Chadhar, and Selena Firmin
School of Engineering, Information Technology and Physical Sciences, Federation University, Australia
Correspondence should be addressed to Samreen Mahmood; smahmood@students.federation.edu.au Received 4 January 2022; Revised 14 February 2022; Accepted 12 March 2022; Published 5 April 2022 Academic Editor: Brandon T. McDaniel.

-Blockchain for Securing Artificial Intelligence Applications and Open Innovations

Rucha Shinde, Shruti Patil^{2,*}, Ketan Kotecha² and Kirti Ruikar³

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- The collaborative role of blockchain, artificial intelligence, and industrial internet of things in digitalization of small and medium-size enterprises

Department of Computer Science, Sindh Madressatul Islam University, Karachi 74000, Pakistan. 2Department of Computer Science and Information Technology, Benazir Bhutto Shaheed University Lyari, Karachi 75660, Pakistan. 3Software Collage, Shenyang Normal University, Shenyang, China. 4School of Software Technology, Dalian University of Technology, Dalian 116620, China. 5Research & Development Institute of Northwestern Polytechnical University in Shenzhen, Shenzhen 518057, China.
Email: lipeng2015@mail.dlut.edu.cn.

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Accounting and auditing with blockchain technology and artificial Intelligence: A literature review
Hongdan Han*, Radha K. Shiwakoti, Robin Jarvis, Chima Mordi, David Botchie Brunel Business School,
Brunel University London, UB8 3PH, United Kingdom.