IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, February 2024

Healthcare and Management using Blockchain and AI Technologies

Manasa Umesh[1], Bhavana H[2], Nirmala H[3]
Undergraduate Students, Department of Information Science and Engineering[1,2]
Professor, Department of Information Science and Engineering[3]
Global Academy of Technology, Bangalore, India

Abstract: *Blockchain technology, a transformative force in today's business realm, operates as a digital ledger securing transactions through cryptographic references. Its application in healthcare responds to the imperative of safeguarding sensitive medical data, given the industry's vulnerability to breaches. Between 2009 and 2017, over 176 million patient records fell victim to data breaches, highlighting the urgency for robust security measures. Blockchain's appeal lies in its capacity to provide an unalterable, decentralized, and transparent record of patient information, ensuring privacy through complex codes. This decentralized approach fosters quick and secure data sharing among patients, doctors, and healthcare providers. Additionally, the integration of machine learning enhances blockchain's efficiency, allowing for the extraction of pertinent information from healthcare data. This synergy holds promise for addressing security concerns and optimizing data management in healthcare.*

Keywords: digital ledger, cryptographic references, data breaches, patient records, security measures, unalterable record, decentralized, transparent, privacy, machine learning, efficiency, pertinent information

I. INTRODUCTION

In a distributed ledger system like Blockchain, individual transactions undergo encryption, forming blocks that are permanently added to the ledger without the possibility of deletion. The information in Blockchain relies on a verified linked list of encoded transactions, utilizing a hash generated by a hash function. This hash function encrypts the data fed into Blockchain, serving as the foundation for a decentralized healthcare platform shared by patients and providers, functioning as an interface to the patient's record.

Blockchain is characterized by its cryptographically secured, immutable, write-once-read-anywhere data structure. Comprising blocks linked through an unmodifiable key referencing mechanism, the Blockchain data structure includes key components:

A Blockchain network with a secure list of blocks containing essential information.
A peer-to-peer network housing identical instance of the Blockchain data structure.
A consensus mechanism ensuring synchronized growth of the Blockchain.
A security mechanism guaranteeing the immutability of data stored in Blockchain network.

II. LITERATURE SURVEY

2.1: Blockchain technology applications in healthcare: An overview [1]

Blockchain, an emerging technology, is making significant strides in various sectors, including healthcare, by fostering innovative solutions. Within the healthcare systemBlockchain networks make it easier for doctors, hospitals, diagnostic labs, and pharmacy companies to communicate and preserve patient data. This technology proves invaluable in identifying critical errors in the medical field, enhancing performance, security, and transparency in sharing medical data. Medical institutions benefit from Blockchain's ability to provide insights and improve the analysis of medical records. The paper delves into the capabilities, enablers, and the unified workflow process of Blockchain technology, diagrammatically presenting its support for global healthcare. Additionally, examines fourteen noteworthy uses of blockchain technology in the healthcare industry, emphasizing how important it is to tackling issues like clinical trial fraud. Blockchain's potential lies in enhancing data efficiency, preventing manipulation, and ensuring the highest level

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, February 2024

of security in healthcare data storage. The technology offers versatility, interconnection, accountability, and authentication for data access, contributing to decentralized data protection and mitigating specific threats. The pros and cons are:Facilitates understanding of treatment outcomes and progress.Promises improvements in patient record management, infringement prevention, interoperability, procedure rationalization, and monitoring of medication, prescriptions, and medical supply chains. Lack of conversation around machine learning methods.

2.2 Blockchain applications in health care for COVID-19 and beyond: a systematic review [2]

This study aims to identify trends and areas with potential for practical use by providing an extensive analysis of recent blockchain research in healthcare. Emphasizing COVID-19-specific applications as catalysts for blockchain adoption in healthcare, the study covers both pandemic-related and general healthcare uses notable applications are anticipated to persist after the epidemic, like telemedicine recording and vaccination supply chain management. The study acknowledges limitations, including the limited availability of clinical implementation studies and time constraints preventing exhaustive database searches. Despite notwithstanding these limitations, the review presents blockchain as a solid platform for a wide range of healthcare uses, both inside and outside of the COVID-19 pandemic. The highlights of this paper are a solid basis for blockchain as an enabling platform for a wide range of health-care applications is represented by this systematic review, We were unable to carry out an additional thorough search through other bibliographical databases that would have offered more insightful data.

2.3 Is blockchain for Internet of Medical Things a panacea for COVID-19 pandemic?[3]

The COVID-19 epidemic has had a profound effect on public health and lifestyle. The use of the Internet of Medical Things (IoMT) in healthcare facilities presents a promising solution to the problems caused by infectious diseases such as COVID-19. It has the potential to reduce diagnosis times and improve the efficiency of medical resources.However, the privacy and security issues surrounding IoMT provide challenges to its wider implementation. To overcome these challenges, it proposes a framework integrating blockchain with IoMT systems. This paper reviews the advantages of this architecture, highlighting opportunities presented by blockchain-enabled IoMT. Additionally, we provide use scenarios that highlight how blockchain-enabled IoMT may effectively address the COVID-19 pandemic in areas including injectable medication supply chain management, location sharing, contact tracing, and infectious disease prevention.The highlights of this paper are: Investigation into the use of blockchain-enabled IoMT (BCeMT) in the fight against the COVID-19 outbreak.IoMT and blockchain technical overview, including a summary of the privacy, security, and interoperability issues of current IoMT systems.The lack of conversation around machine learning methods.

2.4 Blockchain technologies to mitigate COVID-19 challenges: A scoping review[4]

Blockchain technology has emerged as a flexible resource with a wide range of possible applications as public health specialists and politicians look for solutions to lessen the impact of COVID-19. Despite numerous proposals and implementations during the pandemic, a comprehensive review summarizing these technologies is lacking. Exploring blockchain technology to address COVID-19 problems as documented in the literature is the goal of this project.Following PRISMA-ScR guidelines, We carried out a scoping review, identifying 19 eligible studies out of 225 retrieved. These studies reported 10 use cases, with notable applications in contact tracing and immunity passports. Nine studies only postulated blockchain technology, whereas ten studies developed it. Ethereum in particular, a public blockchain, was widely utilized. The most popular programming language was Solidity.Transaction costs were reported in 4 studies, but expected latency and scalability were not identified.Until a vaccine is created, blockchain technologies should let individuals resume their regular lifestyles that were unaffected by the epidemic and stop COVID-19 from spreading.There no discuss about machine learning techniques.

2.5 Integration of Machine Learning and Blockchain Technology in the Healthcare Field: A Literature Review and Implications for Cancer Care

With an emphasis on their integration in cancer survivorship care, this succinct paper seeks to give a narrative review of the application of blockchain technology (BCT) and machine learning (ML) techniques in the healthcare industry.Six

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, February 2024

relevant papers were included in the review, highlighting the growing interest in combining these data-driven technologies for clinical data management and analysis in healthcare. The results imply that ML and BCT integration is both practical and efficient.The highlights of this paper areBeneficial for clinical data management and analysis in healthcare, Specific suitability limited to cancer care.

2.6 Blockchain Assisted Data Edge Verification with Consensus Algorithm for Machine Learning Assisted IoT

Devices connected to the Internet of Things (IoT) are becoming more and more common in a number of industries, including manufacturing, transportation, and healthcare.Despite their widespread use, challenges like potential faults and reliability concerns persist. Uploading unprocessed data to a central server for model training in typical IoT failure detection presents security and privacy concerns. In order to overcome these obstacles, this paper presents a brand-new method for IoT fault detection called the Blockchain Assisted Data Edge Verification with Consensus Algorithm for Machine Learning (BDEV-CAML). BDEV-CAML combines the strengths of blockchain, IoT, and machine learning (ML) models to enhance trustworthiness, efficacy, and security in the IoT network. In the BDEV-CAML technique, blockchain technology allows IoT devices with decentralized decision-making capabilities to achieve consensus on intrablock transactions' efficiency. For fault detection, the deep directional gated recurrent unit (DBiGRU) model is employed, and the African vulture optimization algorithm (AVOA) fine-tunes hyperparameters to improve fault detection rates. At a maximum accuracy of 79.6%, experimental results show how well the BDEV-CAML algorithm performs. Effective identification of faults in the IoT environment.Integration of blockchain, IoT, and ML for enhanced trustworthiness, efficacy, and security in IoT network.Accuracy falls below 80%.

2.7 Confluence of Blockchain and Artificial Intelligence Technologies for Secure and Scalable Healthcare Solutions: A Review[7]

Artificial intelligence (AI) and blockchain (BC) technologies have separate uses in a variety of sectors, including manufacturing, insurance, banking, finance, healthcare, construction, transportation, and hospitality. Furthermore, because of these two technologies' complimentary and supporting characteristics, they can be combined with ease. By using their processing algorithms, AI algorithms can improve the efficiency of medical BC storage while also acting as informed gatekeepers. BC can support AI models by providing secure, sizeable, traceable, diverse, and immutable healthcare data for the training purpose. There are several applications for combining AI and BC in the healthcare sector, from pandemic control to illness prediction. Previously, researchers have reviewed the applications of each of these technologies in healthcare independently. To the best of our knowledge, although the combination of AI and BC has proven successful, no prior research has examined how these two technologies intersect in the healthcare industry. Two distinct categorization techniques have been used by us to categorize the works: 1) application-based classification and 2) AI-training paradigm-based classification. A list of instruments utilized in the BC and AI integrated healthcare systems is also available from us. We discovered that the use of BC and AI technologies had been used in a variety of healthcare domains, from pandemic management to biological research. It is also mentioned that the integration frequently makes use of the federated learning paradigm and supervised learning algorithms for safe, decentralized AI model training. Our findings reveal that majority of the reviewed works use BC as a secure database for AI models. Furthermore, we also have pointed out the potential applications of these two technologies in healthcare.This survey will act as a guide to the researchers who are working to develop AI and BC integrated solutions in the healthcare sector. Accuracy is less then 82%.

2.8 Blockchain Meets Federated Learning in Healthcare: A Systematic Review With Challenges and Opportunities

The Author is entering an era of smart healthcare because to recent developments in machine learning (ML), information and communication technologies, and the Internet of Medical Things (IoMT).However, centralizing medical data for robust ML model training raises concerns regarding privacy, ownership, and regulatory compliance. A common global model and a centralized aggregator server help Federated Learning , which takes a decentralized approach to address these issues, provide a solution. Nevertheless, FL faces challenges such as motivating member contributions and ensuring accurate model aggregation. In order to solve these problems, this paper suggests integrating

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, February 2024

blockchain technology with Federated Learning (FL). The study shows how blockchain-based FL improves competent healthcare by using edge nodes to maintain the blockchain and prevent a single point of failure, and how FL is used by IoMT devices to efficiently use distributed clinical data. Using a content analysis technique, the study emphasizes the advantages and drawbacks of integrating various technologies, concentrating on three primary research streams: 1) Internet of Medical Things (IoMT); 2) Management of Electronic Medical Records (EMRs) and Health Records (EHRs);and 3) digital healthcare systems (internal consortium/secure alerting). Lastly, the difficulties and potential paths for using FL and blockchain together in healthcare applications are explored. maximizes utility and minimizes the loss function in order to solve an optimization challenge for developing effective models on distributed healthcare data using a blockchain-based architecture. Discrepancies in storage, computing, and communication capacities among devices in a federated network may pose challenges.

2.9 A Blockchain and Machine Learning-Based Drug Supply Chain Management and Recommendation System for Smart Pharmaceutical Industry[9]

Over the past ten years, pharmaceutical businesses have encountered difficulties in monitoring their products across the supply chain, which has resulted in the introduction of fake medications into the market.This global issue results in substantial annual losses, estimated at $200 billion for US pharmaceutical companies. To combat this, a robust system is needed to trace and track drug delivery at every phase of supply chain. This study presents a new approach called the Drug Supply Chain Management and Recommendation System (DSCMR), which is based on machine learning and blockchain technology. The system consists of two primary modules: a machine learning-driven drug recommendation engine for customers and a blockchain-based Hyperledger Fabric drug supply chain management system. The suggested method combines blockchain technology and machine learning algorithms to stop fake medications from getting into the supply chain. Although tests confirm its efficiency and usability, the system's accuracy falls below 90%.Ensures a secure supply chain, preventing the infiltration of counterfeit drugs.shows promise in integrating blockchain technology and machine learning in the healthcare industry.Accurary is below 90%.

2.10 Smart Health Care System using Blockchain and Machine Learning

Blockchain and Machine Learning together can be beneficial on a large scale. Combining several jobs into one intelligent healthcare system yields the best solutions for carrying them out. Whenever we enter any hospital, document verification is the first thing which a patient has to go through. However, because it is a laborious and time-consuming procedure, it becomes extremely dangerous in an emergency. When it comes to data breaches during the last 20 years, the health care sector has been among the most often targeted. Blockchain technology's consensus can guarantee the authenticity of the data and the security of the transactions. Machine learning can be used to identify or diagnose health issues in real time. This capability makes it useful in the healthcare system.This capability makes it useful in the healthcare system.Accuracy is less than 85%.

III. ANALYSIS TABLE

Sl. No	Paper Title	Discussion	Remarks
1	Blockchain-Based Medical Records Secure Storage and Medical Service Framework	Based on blockchain technology and cloud storage, we create a storage system to handle individual medical data. Moreover, a description of a service framework for medical record exchange is provided. Furthermore, a comparison with conventional systems is used to demonstrate and examine the features of the medical blockchain. No third party is required for the suggested storage and sharing plan, and no one party has complete control over how the processing is carried out.	It requires large amount of resources.
2	Blockchain: Solving the privacy and	We describe how the blockchain technology can assist in resolving the issue of simultaneously guaranteeing data	It requires large amount of the

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, February 2024

	research availability tradeoff for EHR data: A new disruptive technology in health data management	availability and safe data storage. The American HIPAA law, which establishes the requirements for health data public availability, serves as our main guideline; nevertheless, local rules may vary greatly.	resources.
3	The biggest medical data breaches in history	The effects of medical insurance fraud on victims include large financial losses, poor credit rating, and limited access to urgent healthcare. Furthermore, financial and personal data, such as Social Security numbers (SSNs), are frequently included with medical data.	We have studied about the data theft in the recent years.
4	Healthcare Data Breach Statistics.	Hackers gained access to parts of its network that contained the protected health information of 2.4 million individuals.The second largest data breach was reported by Practice first, a New York business associate of multiple HIPAA-covered entities.	We have studied about the data theft in the recent years.
5	Health department of northernstate exposed data of 12.5 million pregnant women	Assistance for the HIV component of the survey was provided by the National AIDS Control Organization (NACO) and the National AIDS Research Institute (NARI), Pune. NFHS-4 fieldwork was conducted by 14 Field Agencies (FAs), and 7 laboratories conducted the HIV testing.	We have studied about the health care secret data.
6	A huge trove of medical records and prescriptions found exposed	Meditab, a little-known software firm situated in California, describes itself as one of the top providers of electronic medical records software for healthcare facilities, including hospitals and pharmacies. The business handles electronic faxes for healthcare professionals, which are still the main way that pharmacies and other providers receive patient files.	We have studied about data leakage. There is no prevention method.
7	A review of security of electronic health records. Electronic Health Records: security, safety and archiving	The primary objective of this project is to provide an answer to the research question, "Are current information security technologies adequate for electronic health records (EHRs)?" To that end, the following concerns have been covered in this essay: (i) What does information security mean in relation to EHRs? (ii) Why is electronic health records data security so important? and (iii) Which EHRs can currently access information security technologies?	We have researched the electronic health report in this.
8	Supervised Machine Learning: A Review of Classification Techniques	Several supervised machine learning classification methods are described in this study. Of fact, it is impossible to evaluate every supervised machine learning classification technique in a single article.	In this we have studied about machine learning concepts.
9	Health Analysis System using Machine Learning	This work proposes effective machine learning methods and techniques for extracting sentences relevant to diseases and treatments from brief medical paper content. This work's primary goal is to demonstrate the machine learning and natural language processing (NLP) methods used to represent information and the classification algorithms that are most suited for finding and categorizing pertinent medical information in brief texts.	This is insufficient to ensure data security.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, February 2024

IV. CONCLUSION

In the context of securing patient healthcare data, a Blockchain network is employed to facilitate transactions between patients and authorized doctors. The use of Blockchain ensures a secure and transparent framework for managing healthcare information. Patients can interact with their designated doctors, and the transactions related to healthcare data are recorded in a tamper-resistant and decentralized ledger.Once a new set of patient healthcare data is generated, it undergoes a process facilitated by a trained model. This model acts as a filter, carefully eliminating any identifiable information or personal details from the medical data. This step is crucial for preserving patient privacy and adhering to data protection regulations. By eliminating sensitive information, the model safeguards the confidentiality of patients' personal details.

Following the data filtering step, the model classifies the medical data according to illnesses. The orderly structure of information made possible by this category facilitates data analysis and comprehension for medical experts. Disease-specific categorization enhances the efficiency of healthcare management, aiding doctors in making informed decisions and providing targeted medical interventions.In summary, the integration of Blockchain for secure transactions and a trained model for data filtering and categorization establishes a robust system for managing patient healthcare data. The approach prioritizes patient privacy, ensures data security, and enhances the utility of healthcare information for medical professionals.

REFERENCES

[1]. Chen, Y.; Ding, S.; Xu, Z.; Zheng, H.; Yang, S. "Blockchain-Based Medical Records Secure Storage and Medical Service Framework", Journal of Medical Systems, vol.43, no. 5, 2018.

[2]. G.Magyar,Blockchain: Solving the privacy and research availability tradeoff for EHR data: A new disruptive technology in health data management, Budapest, Hungary,24-25 Nov. 2017.

[3]. Aimee O'Driscoll (2019, July), "The biggest medical data breaches in history", a. [Online].Available: https://www.comparitech.com/blog/vpnprivacy/biggest-medical-data-breaches/

[4]. HIPAA JOURNAL (2018,March) , "Healthcare Data Breach Statistics.", a. [Online]. Available: b. "https://www.hipaajournal.com/healthcare-data-breachstatistics/

[5]. Zaheer Merchant (2019, April) , "Health department of northern state exposed data of 12.5 million pregnant women.", a. [Online].Available: https://www.medianama.com/2019/04/223- health-department-indian-state-pregnant-women-data-leak/

[6]. "Medicalchain Whitepaper - 2.1" a. [Online].Available: https://medicalchain.com/en/whitepaper/

[7]. Zack Whittaker (2019, March), "A huge trove of medical records and prescriptions found exposed.", a. [Online]. Available: b. https://techcrunch.com/2019/03/17/medical-health-data-leak/

[8]. Centres for Medicare & Medicaid Services," Electronic Health Records", a. [Online]. Available: b. https://www.cms.gov › Medicare › E-Health › EHealthRecords

[9]. K.T. Win. A review of security of electronic health records. Electronic Health Records: security, safety and archiving, 34, 2005

[10]. S. B. Kotsiantis,Supervised Machine Learning: A Review of Classification Techniques, Department of Computer Science and Technology University of Peloponnese, Greece. [11] P. Shinde,S.Madhav,Health Analysis System using Machine Learning

[11]. F. Jiang et al., "Artificial intelligence in healthcare: Past, present and future," Stroke Vasc. Neurol., vol. 2, no. 4, pp. 230–243, 2017.

[12]. K.-H. Yu, A. L. Beam, and I. S. Kohane, "Artificial intelligence in healthcare," Nat. Biomed. Eng., vol. 2, no. 10, pp. 719–731, 2018.

[13]. M. Hölbl, M. Kompara, A. Kamišalic, and L. N. Zlatolas, "A systematic ´ review of the use of blockchain in healthcare," Symmetry, vol. 10, no. 10, p. 470, 2018.

[14]. T. Davenport and R. Kalakota, "The potential for artificial intelligence in healthcare," Future Healthcare J., vol. 6, no. 2, p. 94, 2019.

[15]. C. C. Agbo, Q. H. Mahmoud, and J. M. Eklund, "Blockchain technology in healthcare: A systematic review," Healthcare, vol. 7, no. 2, p. 56, 2019.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, February 2024

[16]. T. McGhin, K.-K. R. Choo, C. Z. Liu, and D. He, "Blockchain in healthcare applications: Research challenges and opportunities," J. Netw. Comput. Appl., vol. 135, pp. 62–75, Jun. 2019. [7] E. Chukwu and L. Garg, "A systematic review of blockchain in healthcare: Frameworks, prototypes, and implementations," IEEE Access, vol. 8, pp. 21196–21214, 2020.

[17]. A. Tandon, A. Dhir, A. K. M. N. Islam, and M. Mäntymäki, "Blockchain in healthcare: A systematic literature review, synthesizing framework and future research agenda," Comput. Ind., vol. 122, Nov. 2020, Art. no. 103290.

[18]. S. Cheng, Q. Guan, Y. Su, P. Zhou, and Y. Zeng, "Integration of machine learning and blockchain technology in the healthcare field: A literature review and implications for cancer care," Asia–Pacific J. Oncol. Nursing, vol. 8, no. 6, pp. 720–724, 2021.

[19]. Krittanawong et al., "Artificial intelligence–powered Blockchains for cardiovascular medicine," Can. J. Cardiol., vol. 38, no. 2, pp. 185–195, 2021.

[20]. M. Sarrouti and S. O. El Alaoui, "A machine learning-based method for question type classification in biomedical question answering," Methods Inf. Med., vol. 56, no. 3, pp. 209–216, 2017.

[21]. G. Handelman, H. Kok, R. Chandra, A. Razavi, M. Lee, and H. Asadi, "eDoctor: Machine learning and the future of medicine," J. Internal Med., vol. 284, no. 6, pp. 603–619, 2018.

[22]. T. Bocek, B. B. Rodrigues, T. Strasser, and B. Stiller, "Blockchains everywhere—A use-case of blockchains in the pharma supply-chain," in Proc. IFIP/IEEE Symp. Integr. Netw. Service Manag. (IM), 2017, pp. 772–777.

[23]. M. Benchoufi and P. Ravaud, "Blockchain technology for improving clinical research quality," Trials, vol. 18, no. 1, pp. 1–5, 2017.

[24]. L. Zhou, L. Wang, and Y. Sun, "MIStore: A blockchain-based medical insurance storage system," J. Med. Syst., vol. 42, no. 8, pp. 1–17, 2018.

[25]. M. A. Engelhardt, "Hitching healthcare to the chain: An introduction to blockchain technology in the healthcare sector," Technol. Innov. Manag. Rev., vol. 7, no. 10, pp. 22–34.