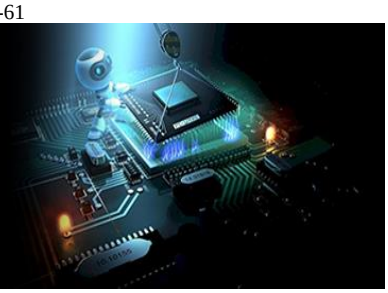
International Journal of Engineering in Computer Science



E-ISSN: 2663-3590
P-ISSN: 2663-3582
www.computersciencejournals.com/ijecs
IJECS 2024; 6(2): 56-61
Received: 16-06-2024
Accepted: 22-07-2024

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E-government in the healthcare and education systems using blockchain

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DOI: https://doi.org/10.33545/26633582.2024.v6.i2a.126

Abstract
The medical field has been a major advocate for blockchain technology in recent years. Electronic medical record systems may find relief from several significant issues if this works. The current literature on blockchain technology and its potential uses in healthcare is thoroughly reviewed in this study. The purpose of this study is to assess the merits and limitations of 144 papers that address the topic of healthcare operations with blockchain technology. Our goal is to showcase the technology's capabilities and draw attention to the challenges and opportunities for future blockchain studies in the healthcare industry. The article begins with a comprehensive examination of the technology and its characteristics. Next, the study delves into a comprehensive literature assessment of the chosen publications to bring attention to the current research issues surrounding healthcare systems that use blockchain technology. Then, the solutions offered by blockchain technology and their primary uses in hospitals are highlighted. The discussion portion concludes by shedding light on the restrictions, difficulties, and potential avenues for further study.

Keywords: E-government, blockchain technology, electronic medical records (EMR)

Introduction
Contemporary healthcare systems confront the critical issue of high administration and maintenance expenses. People from many walks of life—doctors, researchers, nurses, aides, managers, and patients—make up the many facets that make up the healthcare system. Consequently, patient data classification and management becomes an enormous task. Dissimilar data formats and processes in various healthcare fields further worsen this difficulty. Because of these factors, a major obstacle is the inefficient transfer of healthcare-related data between different healthcare domains. It is necessary to create, oversee, and update a system in order to deal with medical records and exchange. Although confidence, privacy, and data security continue to be significant concerns, a third party builds and maintains both electronic medical records and conventional personal health record systems. Existing health recording systems that rely on third parties, however, are unable to meet the privacy requirements of stakeholders. Privacy and data security concerns make the conventional electronic healthcare paradigm opaque. Blockchain technology has great promise for addressing security issues and the massive and diversified data problem plaguing healthcare organizations. Blockchain technology combines elements of a distributed ledger, digital database, and peer-to-peer network. No transactions are needed to construct a new block on the blockchain, which aids in the secure transfer of information between users and links several computers together via nodes. The customer has the ability to access all authorized and verified medical records over a cryptographically protected blockchain. Adding a new chains to the block and selecting transactions are both open to everyone. Blockchains are able to produce unique IDs for cryptocurrencies to add data using their master key, which is a hash function. Stakeholders are wary of collaborating and cooperating for the sharing of health information due to the fact that conventional EHR and PHR-based systems have not adequately addressed privacy and security concerns. This has led to a dramatic rise in healthcare costs, which has an impact on both consumers and doctors. Researchers and governments are increasingly looking to blockchain technology as a solution to these trust-related concerns. According to IBM, several prominent healthcare companies anticipate that blockchain technology will revolutionize healthcare by enhancing

healthcare management platforms and creating a decentralized framework for the exchange of electronic healthcare records. It is projected that the blockchain technology industry would reach over USD 500 million by 2022. While there have been a number of studies looking into blockchain technology in healthcare, the current literature is lacking in painting a full picture of the many potential uses. As a result, investigating blockchain's potential uses in healthcare is an essential matter that must be undertaken. More and more servers are being designed with the intention of serving customers via mobile devices. With today's internet services, it's easy to generate and send a mountain of medical data on a weekly or daily basis using various apps and mobile devices. Cost, tactical, preserving standards, and individual behavioral constraints on services are just a few areas where the existing healthcare system may be able to provide solutions. Nevertheless, healthcare providers aren't always taking use of the supply chain's most cutting-edge technologies. For instance, they aren't making good use of the newly-instituted system for collecting and distributing medical supplies. Unnecessary supplier management and operations cost almost USD 25.7 billion annually, according to a research on Healthcare Finance. Improving the shortcomings and meeting increasing aspirations for improved healthcare requires a tremendous amount of effort focused on an intelligent healthcare system. Smart gadgets, tools, improved facilities, and a modernized healthcare system might form the basis for its design and development efforts. Smart healthcare based on customer-connected applications, biosensors, and state-of-the-art emergency response systems is another potential outcome. If we want to enhance healthcare services via the Internet of Things (IoT), we need to find consensus methods that are compatible with the infrastructure that is currently in place on blockchain networks. Distributed data storage systems are an alternative to blockchain that allows for quicker data exchange and thereby reduces the massive data storage issue (DDSS) In order to maintain track of several documents that have the same name, it employs cached data and file translation. On the other hand, DDSS may split large files into smaller data pieces—256 kb, for instance—and then use Distributed Hash Tables (DHT) to recover the whole file from among these smaller objects. It is possible for some sensors to automatically gather user data and send it to a designated storage location or the cloud, where doctors, nurses, and other medical professionals may analyze it further. To protect the privacy of individual patients, many pieces of legislation have been suggested. In order to monitor, share, and exchange patient health data, these regulations always mandate effective security management. Violations of these rules are severely punished, and electronic health records (EHRs) face harsh prosecution. Healthcare leaders are increasingly turning to blockchain-based medical care management systems for improved security and administration of data at lower costs, as well as for regulatory compliance and the creation of a decentralized framework for expressing electronic health records (EHR). Nearly 70% of healthcare leaders anticipate that blockchain will have a significant impact on these areas, as well as on clinical trial systems, regulatory compliance, and quality of care. The last ten years have seen an explosion in studies investigating healthcare systems that use blockchain technology. A dearth of thorough data collection and documentation of previous efforts in this area hinders the progress of future studies. The most up-to-date review articles summarize key findings and discuss the pros and cons of experts' proposed remedies. However, the research themes being followed, the areas in healthcare where blockchain is mostly used, uses for blockchain in certain areas, and existing a blockchain-based healthcare systems are not thoroughly evaluated in these review papers. A dearth of thorough data collection and documentation of previous efforts in this area hinders the progress of future studies. Short reviews of new research on healthcare systems that use blockchain technology and an analysis of the pros and cons of academic solutions are available in recent review articles. In order to find possible blockchain applications in many areas of healthcare, this project will examine the current literature extensively. A blockchain-based healthcare system is the subject of this study, which also delves into its potential future directions, obstacles, and research courses. The main contribution of this work is a comprehensive literature evaluation that organizes information about blockchain in healthcare into clusters.

Related work

Applying phase-type models to the cost of health, social, and community services for stroke patients

Stroke is a major economic and social burden because of the time and money spent caring for those who have had the condition. Stroke is a complicated illness with a wide range of possible consequences and treatment options. There is already a model in place that categorizes patients according to their LOS (hospital stay duration). Next, the patient flows for every cluster were described using phase-type models. It is also possible to have other outcomes, such as going home, to a nursing home, or passing away. We derive the momentary Generating Function for the overall cost of a system with several absorption states and numerous transient phase-type classes by adding costs to this model. In several states that provide both inpatient and outpatient care, this system stands in for various patient demographics. This study examines potential outcomes by comparing the costs of thrombolysis therapy under different regimes using data from stroke patients at Belfast City Hospital. With an eye toward integrated system-wide planning and budgeting that includes both hospital and community care, the overarching modeling framework describes the behavior of populations of stroke patients. Models that account for patient heterogeneity and numerous therapeutic alternatives have been created within this broad framework. Developing a strong relationship with healthcare providers and supporting the models with comprehensive patient-specific data are essential components of such intricate tactics.

Blockchain-Based Healthcare: A Comprehensive Literature Review on the Subjects of Scientific, Temporary, and Spatial Research Obstacles and Opportunities

With blockchain technology, a decentralized, trustworthy, and intelligent system for making transactions between users may be created. The distributed ledger technology (blockchain) has the ability to revolutionize healthcare systems, just as it has altered several other industries.

Published in 21 conferences, 33 journals, and 10 online sources between 2016 and January 2020, this paper presents a critical evaluation of 64 publications on blockchain-based healthcare systems. The articles were part of a systematic review. This essay seeks to address three primary inquiries. To begin, how can blockchain technology be used to improve healthcare systems? Specifically, how can blockchain be used to a particular healthcare sector, and what are the obstacles and structures that must be overcome? Furthermore, in the several healthcare domains where blockchain applications are now being explored, what are the technological, temporal, and geographical considerations to be considered? Thirdly, where do you see blockchain-based healthcare system design and implementation going in the future? Most of the 64 papers' suggested blockchain-based healthcare systems employ a private blockchain and Bitcoin platforms, according to statistical information about the technical features of these publications. Moreover, the majority of the writers are linked with research institutes in the USA and China. Integration of the blockchain with artificial intelligence cloud-computing-based solutions, and perpendicular blockchain architecture are some of the possible future research paths that we cover.

Classification of Medical Healthcare Big Data using the KNN Algorithm

Medical informatization has progressed toward intelligence thanks to the fast growth of information technology. Big data in healthcare offers a foundational data resource for smart healthcare and medical service intelligence. For smart actions with medical information, the categorization of medical care big data is crucial. The K-Nearest Neighbor (KNN) classification technique has found extensive application across several domains as a result of its ease of use. Nevertheless, the KNN algorithm's classification effectiveness is significantly diminished when dealing with huge feature characteristics and sample sizes. In this study, we compare the classic KNN method with an updated version and suggest several improvements to the latter. Each class is given a weight, and the classification is done in the neighbourhood of the query instance of the traditional KNN classifier. To make sure the provided weight doesn't hurt the outliers, the algorithm looks at the type's distributions around the query instance. This research presents a new KNN technique that uses cluster denoising and dense cropping to address the problems with the original KNN algorithm while dealing with massive data sets. The method increases the sorting efficiency of the algorithm for KNN by speed up the search process for K-nearest neighbors, and it conducts denoising processing via clustering. It maintains the precision of classification of the KNN algorithm. The results of the experiments demonstrate that the suggested approach not only maintains the accuracy of classification of the KNN algorithm well but also significantly improves its classification efficiency while processing huge data sets. It also has high classification performance.

The Biomet Project: A Cutting-Edge Blockchain-Based Smart Contract Serverless computing Network Architecture for the Healthcare Industry

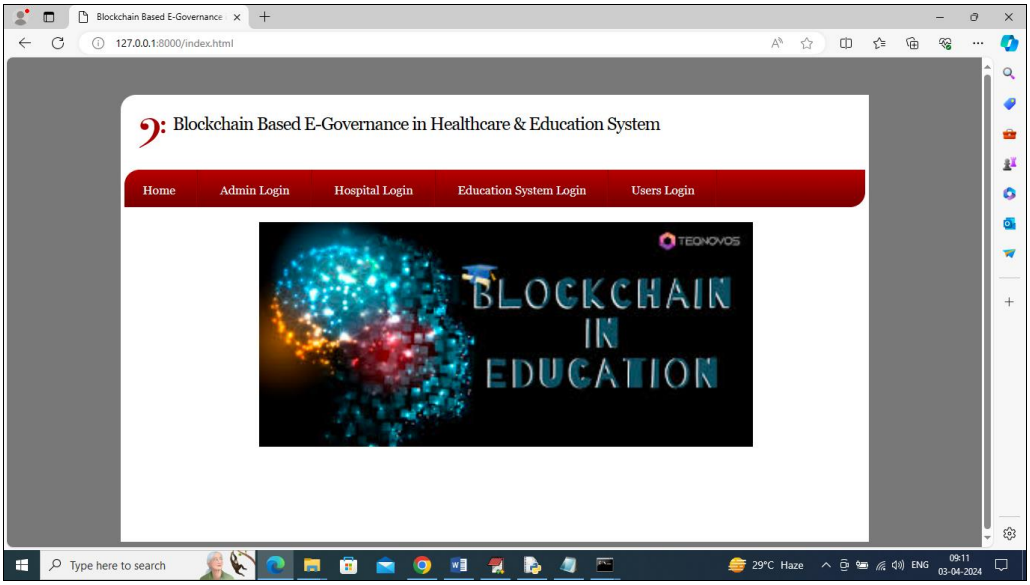
The previously indicated method of transmitting client data to centralized servers poses significant privacy and security risks due to the delicate nature of healthcare data. As an added bonus, blockchain-enabled resources have introduced permanent storage and decentralized management of information capabilities, which, when combined with a serverless network, can manage a large number of dispersed nodes involved in E-Healthcare transactions. Under this situation, the healthcare sector is worried about implementing a new method of preserving patient records and sharing standards for the delivery of services without relying on an unreliable third-party infrastructure. Biomet is a consortium architecture that we proposed in this study. It uses blockchain technology and Hyperledger fabric to ensure the safety of health-related transactions and the secure exchange of sensitive medical data in a serverless P2P network. The World Wide Web of Medical Things, or IoMT for short, is working on a consensus to lessen the impact of blockchain resource restrictions. The Uncyphers Re-Encryption process enhances security and ensures the integrity and transparency of medical ledgers while protecting the confidentiality of people's health transactions prior to sharing. After going through a process of cross-verification and validation, smart contracts are put into place to automate device registering, exchange transactions, and the maintenance of the ledger in immutable storage (file currency). The experimental findings reveal that the suggested Biomet boosts robust medical node creation to 60.37 percent while decreasing the computational expenditure by 26.13 percent. Serverless P2P network utilization is preserved at 74.21% and information pertaining to IoMT at 31.79%.

Methodology

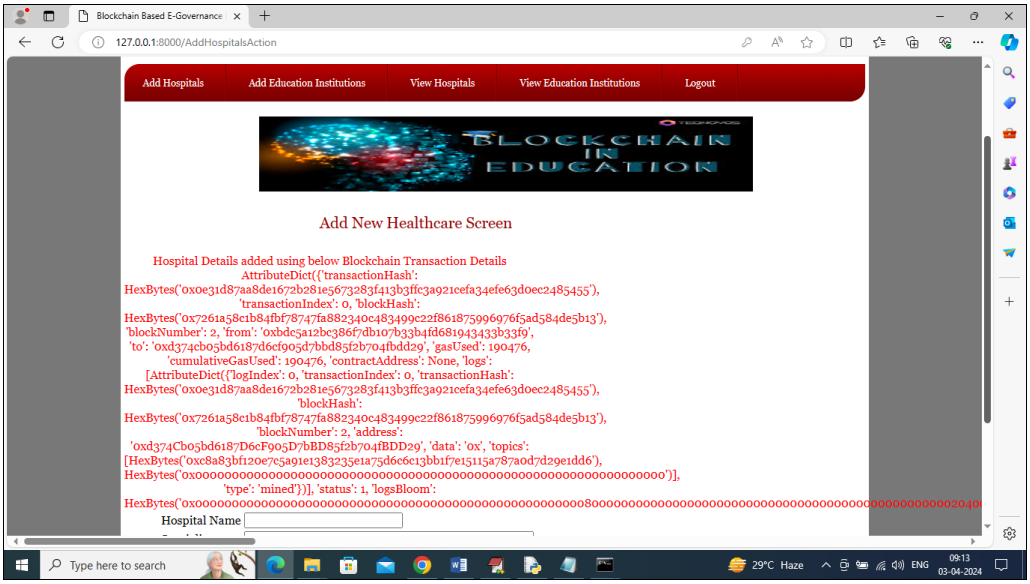
To implement this project, we have designed following modules

1. The Admin module's login credentials are "admin and admin." This allows the admin to access the system. Upon successful login, the administrator will provide access to "educational institutions and hospitals" by assigning them a username and password. All of the healthcare and educational facilities are visible to the admin.
2. Login for the hospital: With the credentials provided by the administrator, the hospital may access the system and enter "new patient details" as well as see existing patient information. We will provide a unique username to every patient so they may access their prescription information in the future.
3. The third feature is the Education Login, which allows any educational institution to access the system and manage student information.
4. User Login: After entering their unique username, users may see their complete medical history and academic records.

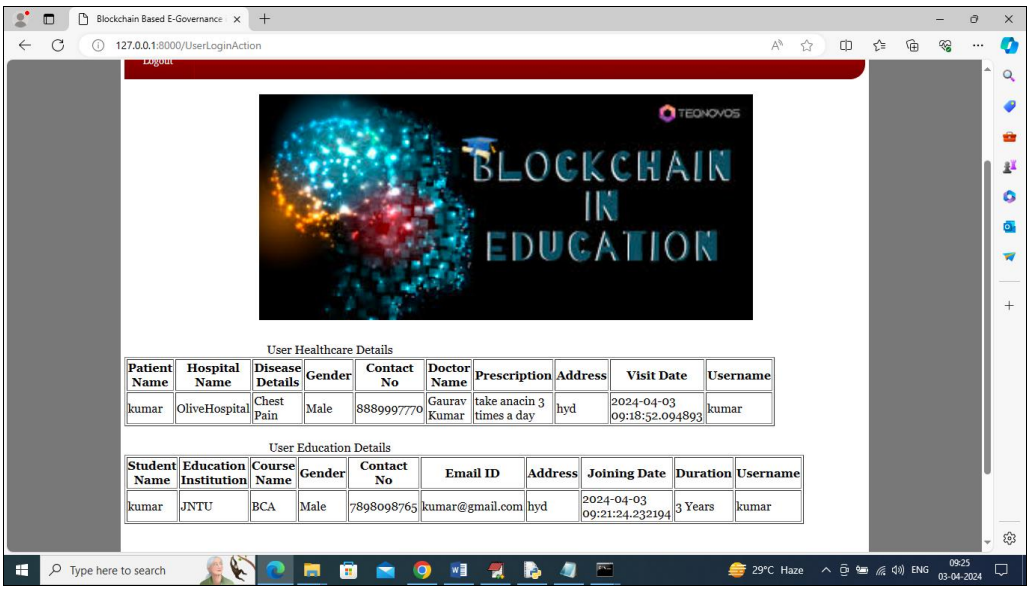
Results and Discussion



In above results click on 'Admin Login' link to login as admin.



In above result in red colour text, I am showing all response returned from Ethereum after storage. Above details showing for you and your guide understanding purpose and in above screen displaying all details like transaction hash code, address etc. Now click on 'Add Education Institution' link to add education centre.



In above result user can view all his healthcare and education details saved in Blockchain and similarly by following above screens you can manage all healthcare and education details in single Blockchain server.

Conclusion

In order to identify specific literary trends, this study set out to do a comprehensive literature evaluation, survey, and classification of pertinent research articles on blockchain technology and its applications in healthcare. In this study, we distributed 144 research articles on blockchain technology in healthcare according to their bibliometric and functional characteristics. We tallied up all the blockchain platforms and methods mentioned or suggested in the articles we looked at. Data movement patterns cannot be controlled by any third party organization thanks to the blockchain technology, which enables the creation of decentralized apps. A decentralized database stores the entities' data transactions in a transparent, secure, immutable, and verifiable manner, together with a date and other relevant information. Health data analytics, remote patient monitoring, biological research and education, medicine, data sharing, and log management are just a few of the many possible uses for blockchain technology in the healthcare industry. Blockchain technology brings several benefits to healthcare applications, but it is not without its limitations. In addition, we examined the evaluated publications' suggested remedies for these issues. Blockchain has garnered a lot of attention, however our research shows that its impact on applications in healthcare is limited to the documentation stage. Research in this field, along with blockchain-based healthcare applications, is still in its infancy.

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