



Blockchain-Cloud Fusion For Integrated Healthcare

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ABSTRACT

In recent advancements within the realm of IoT-enabled cloud computing and interactive applications, there has been a growing impetus for researchers to reassess the current landscape of healthcare services. IoT-cloud-based systems play a pivotal role in facilitating remote monitoring and extending support to patients. Despite their significance, the existing healthcare systems have not placed sufficient emphasis on addressing security concerns from the outset, thereby leaving vulnerabilities to third-party data spying. This paper proposes a comprehensive framework for healthcare, incorporating Blockchain technology to enhance the security of the system's interactive user interface. Our focus includes ensuring the scalability and optimizing the performance ratio of the system. The designed and developed interface caters to both patients and doctors, enabling patients to transmit their healthcare data through the IoT-enabled Cloud Medium, while doctors receive real-time data in a highly secure manner. To address data identification and analysis, Hybrid Attribute Encryption Algorithms coupled with Blockchain techniques have been implemented. This integration provides a robust solution for enhancing the interactive healthcare experience for both patients and medical professionals, leveraging the capabilities of Cloud and Blockchain technologies.

1. INTRODUCTION

In recent times, there has been a noteworthy surge in research and developmental initiatives focusing on the integration of Blockchain-Cloud platforms to facilitate the provision of healthcare services within the context of smart cities. The persistent migration of individuals towards urban centers, marked by an approximate daily relocation of 1.3 million people, underscores the critical need to tailor healthcare services to the unique demands of urban environments. Projections further illuminate that by the year 2040, an estimated 65% of the global population will call cities their home, underscoring the escalating significance of smart and interconnected urban spaces as burgeoning hubs for

innovation.

The integration of blockchain techniques into the healthcare sector represents a transformative paradigm that holds immense potential for revolutionizing the way healthcare data is managed, shared and secured. In recent years, the intersection of blockchain technology and healthcare has garnered substantial attention due to its promise in addressing critical challenges such as data interoperability, security and privacy concerns. Blockchain's decentralized and tamper-resistant nature offers a novel approach to managing Electronic Health Records (EHRs) and creating a seamless, secure ecosystem for healthcare data exchange.

By leveraging the inherent characteristics of blockchain, including immutability, transparency and cryptographic security, healthcare organizations can establish a trust infrastructure that ensures the integrity and confidentiality of patient information. This paradigm shift not only enhances data accuracy but also empowers patients with greater control over their health data, fostering a patient-centric approach. As blockchain techniques continue to mature and gain acceptance within the healthcare domain, the potential benefits extend to streamlined processes, reduced administrative overhead and enhanced collaboration among diverse stakeholders in the healthcare ecosystem. This comprehensive integration of blockchain techniques in healthcare signifies a pivotal step towards building a more resilient, transparent and patient-centric healthcare system for the future.

2. LITERATURE SURVEY

Title: Digital transformation in the Healthcare Sector through Blockchain Technology, Insights from Academic Research and Business Developments

Author: Maurizio Massaro

Year: 2023

Description: Healthcare research, being a multidisciplinary field encompassing the entire stakeholder ecosystem, explores solutions to challenges in medical practice. The integration of digital transformation introduces novel trends in value creation, with blockchain technology emerging as a potential catalyst to expedite this process by addressing data management issues. However, the true value of blockchain must be substantiated, as expectations often precede concrete evidence in the realm of new technologies. This study conducts a comparative analysis between content from papers and patents, aiming to present insights into expectations surrounding blockchain implementation in the healthcare sector.

While research papers offer the perspectives of scholars, patents reflect the expectations of companies and investors safeguarding their inventions. By juxtaposing data from both sources, this paper seeks to bridge the research-practice gap, shedding light on the evolving expectations for blockchain applications in the healthcare sector.

Title: IoT-Based Healthcare-Monitoring System towards Improving Quality of Life: A Review

Author: Suliman Abdulmalek , Abdul Nasir

Year: 2022

Description: The Internet of Things (IoT) plays a pivotal role in various innovative applications, including smart cities, smart homes, education, healthcare, transportation, and defense operations. Its application in healthcare is particularly impactful, facilitating secure and real-time remote patient monitoring to enhance people's quality of life. This review delves into recent trends in healthcare monitoring systems, focusing on the role of IoT. It discusses the significance and benefits of IoT-based healthcare systems, providing a systematic review through a comprehensive literature analysis. The review compares the effectiveness, efficiency, data protection, privacy, security, and monitoring of various IoT-based healthcare systems. Additionally, it explores wireless- and wearable-sensor-based IoT monitoring, offering a classification of healthcare- monitoring sensors. The paper meticulously details challenges and open issues related to healthcare security, privacy, and Quality of Service (QoS). Concluding with suggestions and recommendations for IoT healthcare applications, the study outlines future directions aligned with recent technology trends.

Title: Optimization of the Medical Service Consultation System Based on the Artificial Intelligence of the Internet of Things

Author: Yi Mao, Lei Zhang

Year: 2021

Description: Although artificial intelligence-assisted diagnosis systems are advancing rapidly, there exists a current lack of awareness among doctors regarding their utilization. Bridging this awareness gap is crucial for the successful implementation of these AI medical assistant diagnosis systems. To address challenges in IoT medical consultation services, this paper proposes a business operation model based on multi-party participation and shared medical consultation resources. The information flow, overall logic, and service implementation process for this model has been meticulously designed, creating a comprehensive artificial intelligence medical service framework. By integrating IoT technology, A vital signs monitoring environment is established and provide clarity on IoT device utilization.

Within the error backpropagation algorithm, no significant variance in the contribution of different samples to weight changes is observed, posing challenges in adapting to difficult medical consultation samples. To mitigate this, a confidence-based classification for training samples is introduced, distinguishing between dangerous and safe samples using a dynamic threshold. This novel learning algorithm penalizes the loss of dangerous samples, prompting the convolutional neural network to prioritize effective information extraction

from challenging cases. Addressing eight physiological data characteristics, the convolutional neural network structure is optimized to enhance adaptability to dynamic data changes over time. The resulting CNN optimization algorithm demonstrates improved prediction effectiveness, achieving a medical consultation accuracy rate of 90.15%, surpassing other machine learning algorithms.

Title: Internet of Things (IoT): A Review of Its Enabling Technologies in Healthcare Applications, Standards Protocols, Security, and Market Opportunities

Author: Mohammad Nuruzzaman Bhuiyan, Md Mahbubur Rahman

Year: 2021

Description: The Internet of Things (IoT) serves as a framework wherein real-world entities interact through network technologies. This article presents a survey on advancements in IoT-based healthcare methods, delving into state-of-the-art technologies and categorizing existing IoT-based healthcare networks. It meticulously examines IoT healthcare protocols, offering a comprehensive discussion. The review encompasses a thorough survey of IoT healthcare applications and services, emphasizing insights into security, requirements, challenges, and privacy issues within the healthcare IoT landscape. Security and privacy features such as data protection, network architecture, Quality of Services (QoS) and continuous healthcare monitoring are scrutinized, revealing challenges faced by many IoT-based healthcare architectures. In response, the article proposes an IoT-based security architectural model. It sheds light on market opportunities to augment IoT healthcare market development. The survey employed specific keywords to search established journal and conference databases, employing a filtering mechanism for relevant papers, analyzing their contributions, and identifying research gaps for sustainable IoT healthcare development.

Title: A Systematic Analysis of Applications of Blockchain in Healthcare

Author: Ambuj Kumar Agarwal, Raj Gaurang Tiwari, Rajesh Kumar Kaushal, Naveen Kumar

Year: 2021

Description: The advent of the internet has significantly impacted the healthcare domain, enabling the storage, access, and updating of medical records from any location and at any time. The term "Electronic Health Record (EHR)" refers to the digital format housing patient information. As these records are patient-centered, authorized users can access them through any device, fostering accessibility and flexibility. In tandem, blockchain technology has emerged as a transformative force across various industries, offering inherent features such as distributed ledger, decentralized storage, authenticity, confidentiality, and immutability. Blockchain applications in healthcare aim to fortify and prevent unauthorized modifications of electronic health records, enhancing the quality of healthcare services for both patients and hospitals. This paper explores existing techniques

within the healthcare blockchain system, specifically focusing on authentication, data integrity, and confidentiality domains.

3. PROPOSED SYSTEM

The proposed system provides secure Healthcare Information (HI) storage ensuring the confidentiality of the cloud service provider and HI against any hacker or third party/malicious outsider. It provides a requirement centric approach against ensuring the confidentiality of HI (i.e., separate classification of security provision based on the sensitivity level of HI).

It combines Advanced Encryption Standard (AES) Algorithm and Interplanetary File System (IPFS) Protocol for enhanced security. It provides full control of the patient to their HI and any unwanted attempt to access the HI would be restricted. Only the patient has full access to his/her data and based on the requirement, it can be shared with others under blockchain i.e., specialists and experts.

MODULES

4.1.1 Authorization

The first module enhances project security by requiring users to move from a login window to a user window, verifying valid user ID and password entries. It prevents unauthorized access, displaying error messages for invalid credentials. Utilizing JSP for design, the server authenticates users, reinforcing network security.

4.1.2 File Upload

Users log in, uploading encrypted files/images stored on the admin side, accessible only after admin approval. Cloud computing raises security concerns, particularly regarding user data stored in the cloud. To safeguard privacy, users verify the cloud server during access, while the server authenticates users' login requests. During registration, users select and submit computations securely to the cloud server, ensuring data privacy.

4.1.3 File Protection

In this segment, administrators manage files, requiring an acknowledgment from other admins within the team before accessing a file. This process aims to enhance file security, ensuring multiple authorizations and maintaining a robust level of control over file access within the administrative team. The primary objective is to establish a secure and collaborative approach to file management among the administrators.

4.1.4 File Monitoring

In this phase, administrators oversee file maintenance and actively monitor files, including text, image, or video formats. When an admin from the team requests a file, the system ensures the request adheres to the required format. This approach streamlines file access, promoting efficient communication within the admin team and facilitating a structured file management process. The module prioritizes systematic file monitoring and standardized request formats for enhanced administrative control and workflow efficiency.

4.1.5 File Access

To access and read any uploaded file, ownership or knowledge of the four distinct keys generated by a random algorithm is mandatory. The file is split into four parts, and reading requires either ownership of the file or possession of the correct set of keys. A security measure is in place to prevent unauthorized access, ensuring that without the correct keys, the file's content cannot be opened. Additionally, the downloaded file is protected by this key-based system, reinforcing security and control over file access and content.

4. CONCLUSION

This project aimed to pioneer the development of a Blockchain-based smart healthcare system, leveraging cloud technology to establish a seamless and interactive healthcare framework accessible to patients, healthcare providers, and practitioners. Emphasis has been placed on ensuring scalability and incorporating components to support the privacy of patient data through the implementation of a robust Blockchain security model. A meticulous analysis, grounded in the security reliability of Blockchain for the devices integral to the proposed system, has been conducted. Moreover, the proposed healthcare system has demonstrated superior performance compared to existing models, showcasing advancements in system architecture, security protocols, data availability, and treatment planning.

5. RESULT



Fig 1: Home Page



Fig 2: Patient Portal



Fig 3: Doctor Portal



Fig 4: Admin Portal



Fig 5: Patient Registration Page

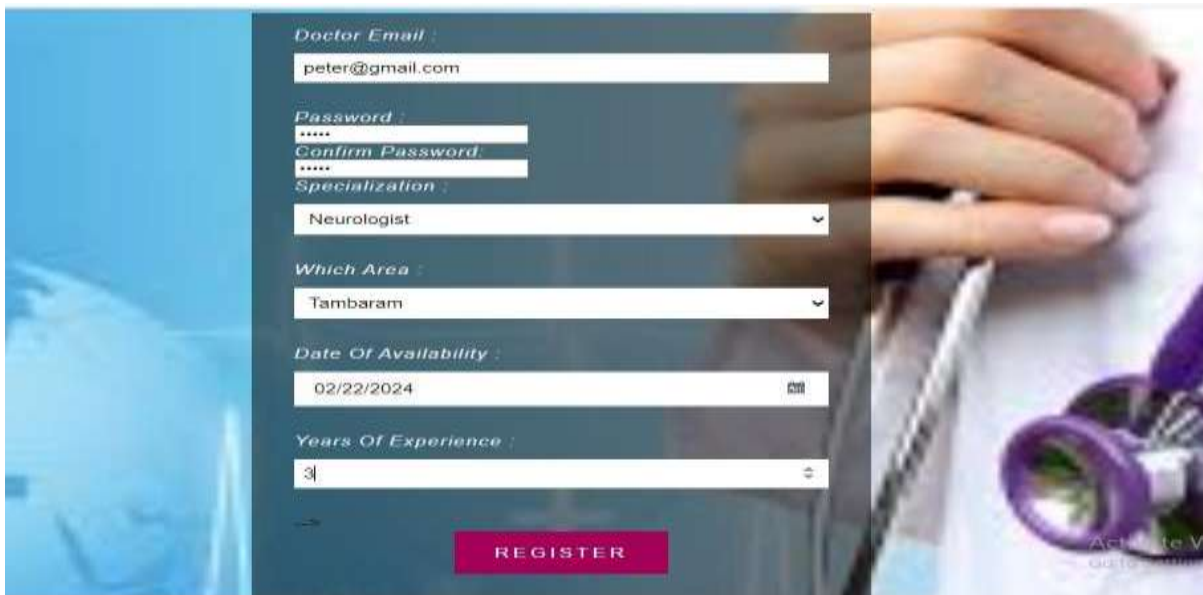


Fig 6: Doctor Registration Page

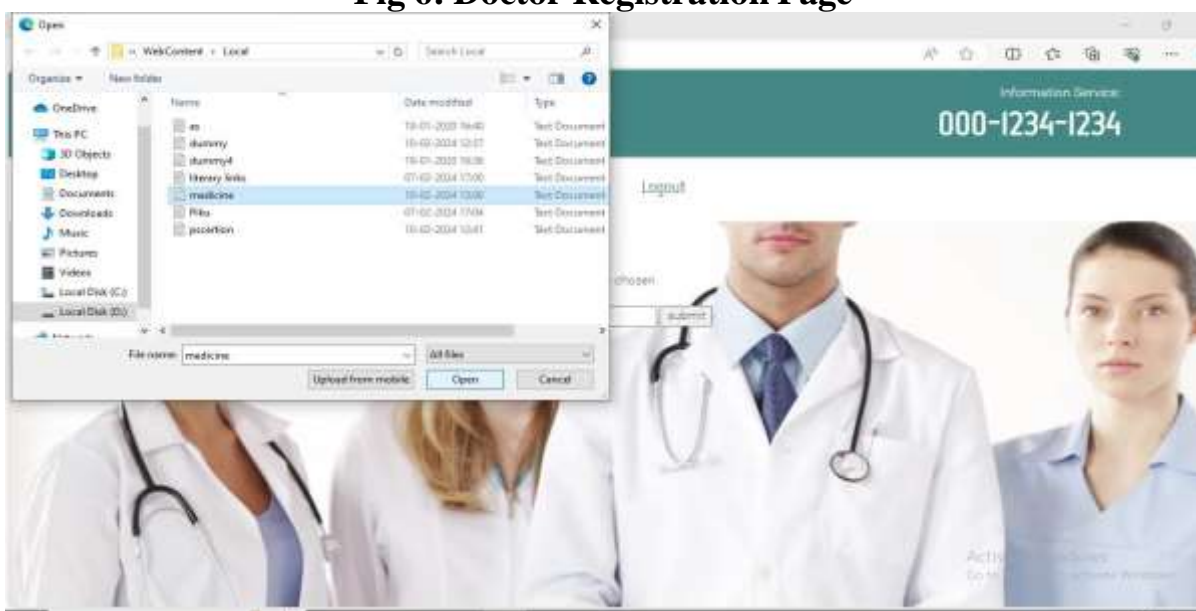


Fig 7: File Upload



Fig 8: File Security

ONLINE HOSPITAL MANAGEMENT

Home Doctors List search Notifications() File Download Logout



Fig 9: File Access

6. FUTURE SCOPE

The incorporation of quantum computing technologies can be explored to enhance processing speed and overall system performance, allowing for more complex computations and data analysis within the Blockchain-based smart healthcare system.

The system's analytical capabilities can also be enhanced by integrating advanced Data Analytics and Artificial Intelligence (AI) algorithms. This can contribute to more accurate diagnostics, personalized treatment plans, and predictive healthcare analytics.

7. REFERENCE

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