Next-Generation Smart Healthcare System with Secure Cloud Integration

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Abstract—

This paper proposes a **Next-Generation Smart Healthcare System with Secure Cloud Integration**, incorporating Aadhaar-based authentication to enhance the efficiency, reliability, and security of healthcare services. The system utilizes authentication mechanisms provided by the Unique Identification Authority of India (UIDAI) to uniquely identify patients, thereby eliminating duplication and preventing identity fraud. Upon successful verification, encrypted Electronic Health Records (EHRs) are securely stored and managed on a cloud platform, enabling authorized access for healthcare providers anytime and anywhere.

The proposed architecture supports real-time data updates, seamless interoperability across multiple healthcare institutions, and automated electronic prescription generation, thereby improving clinical decision-making and patient care. Advanced security measures, including role-based access control and end-to-end encryption, ensure data confidentiality, integrity, and privacy. By integrating smart technologies with cloud computing, the system delivers a scalable, cost-effective, and patient-centric digital healthcare ecosystem.

Keywords— Aadhaar Authentication, IoT-based Healthcare, Electronic Health Records (EHR), Cloud Computing, Role-Based Access Control (RBAC), Digital Health Infrastructure, Patient-Centric Healthcare.

I. INTRODUCTION

The rapid digital transformation of healthcare demands secure, scalable, and efficient systems for managing patient data. Traditional record- keeping methods often result in duplication, inefficiencies, and security vulnerabilities. To address these challenges, this paper proposes a secure and scalable cloud healthcare architecture integrated with Aadhaar-based authentication provided by the Unique Identification Authority of India (UIDAI).

The system ensures accurate patient identification, prevents identity fraud, and enables encrypted storage of Electronic Health Records (EHRs) on a cloud platform. By incorporating role-based access control, interoperability, and real-time data updates, the proposed architecture enhances system reliability, data security, and patient-centric healthcare delivery.

II. LITERATURE REVIEW

Recent advancements in healthcare technologies (2024–2026) highlight the growing adoption of digital solutions. Research primarily focuses on secure cloud-based EHR systems to improve scalability, interoperability, and accessibility of medical data. Blockchain technology is being explored to enhance data transparency and prevent tampering.

Artificial Intelligence (AI) plays a significant role in disease prediction, diagnostics, and personalized treatment, while Internet of Things (IoT)-enabled medical devices facilitate real-time patient monitoring. Additionally, advanced cybersecurity techniques, including machine learning-based threat detection and quantum encryption models, are strengthening healthcare data protection. These innovations collectively contribute to the development of secure, efficient, and patient-centric healthcare systems.

III. METHODOLOGY

The proposed system presents a Secure and Scalable Cloud Healthcare Architecture integrated with Aadhaar-based authentication to ensure accurate patient identification and eliminate duplication or fraud. The system leverages UIDAI authentication services before granting access to medical records.

Encrypted Electronic Health Records (EHRs) are stored on a secure cloud platform with role-based access control to ensure authorized usage. The architecture enables interoperability among hospitals, laboratories, and pharmacies, supports real-time data updates, and facilitates electronic prescription generation. Additionally, IoT-based sensors continuously monitor patient health parameters and transmit data to the cloud for analysis.

IV. RESULTS AND DISCUSSION

The proposed smart healthcare system integrating AI and IoT was successfully implemented to monitor vital parameters such as heart rate, temperature, SpO_2, and blood pressure in real time. Sensor data were transmitted to the cloud for continuous monitoring and analysis.

The AI model effectively detected abnormal health conditions and generated timely alerts to caregivers, significantly reducing emergency response time. The system improved monitoring efficiency and reduced manual

intervention. Results demonstrate enhanced early disease detection and improved patient management.

However, challenges such as data security, sensor accuracy, and network reliability must be addressed for large-scale deployment.

V. CONCLUSION

The proposed smart healthcare system integrating Artificial Intelligence (AI) and Internet of Things (IoT) provides an efficient and reliable solution for continuous patient monitoring. By collecting real-time health data through sensors and analyzing it using AI algorithms, the system enables early detection of abnormalities and timely medical intervention.

This approach reduces hospital visits, lowers healthcare costs, and improves patient safety, particularly for elderly and chronic patients. Despite challenges such as data security and network reliability, the system demonstrates strong potential for scalable, cost-effective, and technology-driven healthcare management.

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