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Original Article

The Integration of AI and Blockchain in Healthcare: Ensuring Data Security and Integrity

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Abstract: *AI and blockchain in the healthcare sector are slowly emerging as a modern and innovative approach towards the achievement of secure and accurate data management, as well as effective process optimization. AI has the ability to work with big data to help get insights into large sets of medical data; on the other hand, blockchain provides a decentralized place to store this data securely. While progression in healthcare management has been led by an emphasis on digitization, risks arising from privacy violations, endeavor to manipulate contents of the records for malevolent purposes and gaining access to patients' information also escalate. AI, when combined with blockchain, does this by ensuring that data across the different facilities is shared securely and that patients can be monitored in real-time without the risk of information manipulation or forgery. In this paper, the research considers the advantages of applying Artificial Intelligence and Blockchain technology in the healthcare sector; data security, patient privacy, and healthcare systems. It also discusses AI and Blockchain's current use cases, theoretical frameworks, and future in this area of application. Furthermore, the integration of AI and Blockchain through various pictorial representations of the origin process also sets the workflow diagram micrograph structure. Some of the technical, ethical, and regulatory issues involved in this integration will also be explained, and suggestions will be provided. Finally, this paper makes the following policy implications for the various stakeholders namely the healthcare providers, policy makers and the technology developers.*

Keywords: *Blockchain Technology, Data Security, Patient Privacy, Healthcare, Integration of AI and Blockchain.*

I. INTRODUCTION

A. Overview of AI and Blockchain in Healthcare

In the healthcare segment, information technology and automation tools are being adopted as key enablers to support patient care process and registration, diagnosis and many other processes. Some of the biggest technologies that are transforming the sector are Artificial Intelligence and Blockchain. [1-4] Incorporates the ideas of conducting advanced data analyses, developing assumptions, and providing individualized attention with the help of artificial intelligence, blockchain guarantees the protection of information through the distributed registry. Combined, these technologies possess incomparable benefits in terms of data protection and patient care service and their effectiveness

B. The Importance of Data Security in Healthcare

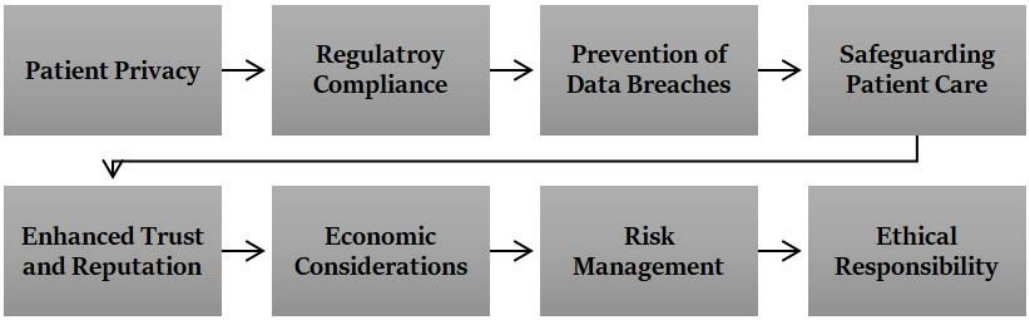

Figure 1: The Importance of Data Security in Healthcare

a) Patient Privacy:

The security of patient identity is very critical because the opening of many clients' records involves PHI that anyone can access without permission. Infringements with the right to privacy not only assertively and negatively affect patients but also

undermine the populace's confidence in the healthcare system. It is advisable to ensure that data security is outstanding to protect this information to ensure that patients are secure.

b) Regulatory Compliance:

There are certain laws to adhere to in the healthcare departments, like the Health Information Portability and Accountability Act- HIPAA in the USA. These regulations require the safeguard of patient's information and come with repercussions in case they are not observed. These are regulations that help organizations to run their operations without violating the law, hence to follow the law.

c) Prevention of Data Breaches:

Healthcare organizations are also at risk of suffering severe repercussions in cases where their data is breached. Risks of cyber-attacks on healthcare facilities have risen; therefore, strong data protection systems remain critical. Enhancing security measures always discourages folks from accessing the system and makes it difficult for an unauthorized person to penetrate the system.

d) Safeguarding Patient Care:

Many patient care services rely heavily on data security; hence, the quality of patient care is determined by data security. Loss/compromise of data may result in wrong diagnosis or treatment or wrong dosages of medicine. By making it a policy that only permitted persons to get access to patient records, clinical decisions become more sound and healthier for the patient.

e) Enhanced Trust and Reputation:

For this reason, the patient chooses to go to providers who show an appropriate level of data safety. A good security system supports the image of a health facility, and this will lead to more patients, stakeholders, and the public holding more confidence in an organization. This trust is important to the sustainability of healthcare organizations as well as to the delivery of quality health services.

f) Economic Considerations:

There are several underlying risks for any organization in the healthcare sector that is involved in a data breach, and these are loss of confidence from patients, fines that are given by the authority and legal risks. These risks are; however, implementing sound data protection systems can help to eliminate these risks and, in the long run, reduce costs. Secure systems are also useful to maintain effective operating processes and eliminate expenses linked with data treatment.

g) Risk Management:

Thus, data security is deemed as a sort of overall risk management in the sphere of health care. Through risk identification and risk mitigation strategies, one would be in a position to deal with risks that come to light at the time of a data breach experience. It is, therefore obvious that effective management of big data is an all-round security strategy for the company besides maintaining the confidentiality of patient data.

h) Ethical Responsibility:

It is equally important for a healthcare organization to respect patients' information by observing the standards that work under beneficence and non-maleficence principles. The inability to protect patient data results in dire consequences for the patient in terms of the mind and body. Healthcare providers are ethical by making sure that their patient's data is secure; thus, by doing this, they are meeting their ethical duty to their patients.

C. Blockchain Technology in Healthcare

a) Overview of Blockchain Technology:

Blockchain is a distributed, decentralized apparatus that enables many parties to share data without having a central control point. In every block in the chain, there is a reference to the cryptographic hash of the previous block, details of transactions and date of such transactions so that data, once recorded, cannot be changed. Because of this inherent security and transparency, blockchain finds itself especially suitable for handling complex health data.

b) Enhanced Data Security:

Another key issue about blockchain that contributes to this kind of application is the fact that the architecture of blockchain offers a security mechanism that makes it difficult for unauthorized persons who want to breach the database and corrupt, delete or steal patient information. The application of cryptographic techniques means that Patricia's delicate health

information is encrypted and shared between computers; as such, decentralization reduces the possibility of the data being tampered with since it becomes difficult for hackers to corrupt the data.

c) Improved Data Interoperability:

One of the major issues of healthcare is interoperability; different systems tend to complicate data sharing and use. Due to its nature, blockchain can ensure that various actors in the healthcare industry are able to share and contribute information to a centralized database while simultaneously preserving the management rights to the shared information in the individual possession of the original contributing entity. These enhance healthcare provider-researcher-patient relations, hence promoting efficiency in healthcare service delivery.

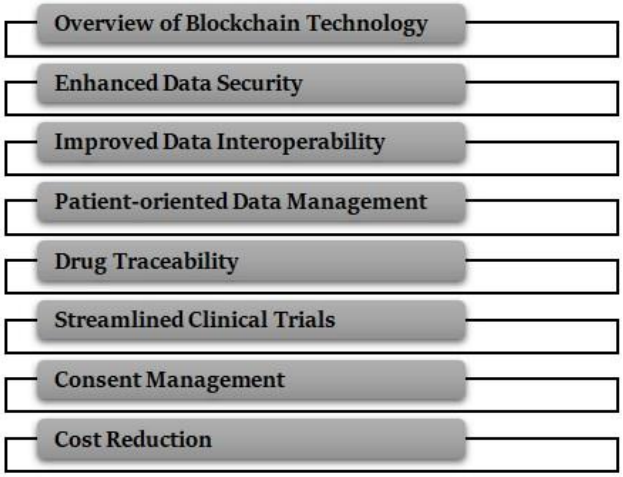

Figure 2: Blockchain Technology in Healthcare

d) Patient-oriented Data Management:

Blockchain technology enhances patient autonomy since patients decide what happens to their data. Patients can allow selected persons to access their records, and only people with permission to treat them can do so. This approach makes patient interact, trust and be satisfied knowing that they have information on who is accessing their data and for what purpose.

e) Drug Traceability:

That is, the use of blockchain solutions can greatly enhance the tracking of drugs through the supply chain, excluding counterfeit and unsafe products. Every process of trading a drug, from manufacturing to its distribution, can be noted on a Blockchain as creating a transparent ledger. This capability assists in fighting counterfeit drugs to make sure that patients receive good and safe drugs.

f) Streamlined Clinical Trials:

Clinical Trials, specifically blockchain, can provide the trial with a more transparent and efficient method of recording the data. Data can then be monitored and even the results confirmed in time, thus greatly minimizing the possibilities of fraud and enhancing the dependability of trial results. Furthermore, due to the existence of a blockchain that has fixed characteristics, it will be easier to meet the legal rules guiding trials so as to document trial processes effectively.

g) Consent Management:

The application of blockchain technology in health care can enable easy handling of consent for sharing of patient data and data participation in clinical trials. Smart contracts help to solve the issue of patient consent and its follow-up – it can be given, recorded, and complied with, mostly non-trivial in such applications, securely. This improves the manner in which patient information is managed in a more ethically sound way, hence improving the patient-health providers' relationship.

h) Cost Reduction:

Introducing Blockchain applications can greatly help in cost reduction in the health sector by minimizing bureaucracy and enhancing productivity. Innovations consist of the elimination of intermediaries like data brokers, which ensure direct experiences with the treatments by the patients or consumers. Moreover, there are improvements in data quality lead to lower costs of data breaches and fines for noncompliance.

II. LITERATURE SURVEY

A. AI in Healthcare: Current Applications

Artificial intelligence (AI) technology is very valuable in the health industry, with plenty of usage expected to enhance the lives of different patients besides increasing the procedures' effectiveness. A primary application of AI is used in the analysis of predictive modeling where past data of a patient is used to predict outcomes. This capability makes it possible for healthcare providers to determine the vulnerable patients early enough and work out the best ways to handle them. [5-8] Within medical imaging, deep learning models have improved radiology to the extent of changing how images are recognized. These models can identify masses such as tumors in scans and, even with high levels of accuracy, help the radiologist make a decision. Another emergent domain in which AI is bringing a big difference is Natural Language Processing (NLP); NLP helps to analyze unstructured data from patients, for example, from EHRs. NLP tools allow analyzing and structuring such data with the help of interpreting and subsequently, optimizing documentation work and patient management. In addition, the application of AI in robots in surgery is improving the accuracy of surgeries performed. Robotic-assisted systems controlled by artificial intelligence software can accomplish several operations as efficiently as traditional procedures with fewer invasions, thereby enabling faster healing and few potential adverse effects.

Table 1: AI in Healthcare: Current Applications

AI Applications in Healthcare	Description
Predictive Analytics	Predicting patient outcomes using historical data.
Medical Imaging	AI-assisted radiology and diagnostics.
NLP for Electronic Health Records	Extracting insights from unstructured data.
Robotic Surgery	Enhancing precision and outcomes in surgeries.

B. Blockchain in Healthcare: Current Applications

Blockchain has attracted ample attention in healthcare mainly because it enables an efficient and secure solution for data storage in healthcare. Among all the uses of Blockchain technology, the most beneficial seems to be patient data sharing. This means that through the creation of immutable digital records, it will be possible to share patients' details among authorized healthcare players while at the same time greatly minimizing the risk of data breaches. This secure sharing mechanism improves the trust between the patient and the medical providers and fosters interprofessional collaboration. Apart from patient data, Block chain plays a significant role in drug traceability in that it can be used to track the quality of supply chains in drugs. It means that through records from manufacturer to patient, blockchain would reduce instances of fake drugs, and help in the provision of original drugs to patients. In addition, the patient consent concerning sharing the data is managed using Blockchain technology. The platform ensures that patients have an open door through which they can approve or deny the use of their information. Finally, blockchain is transforming clinical trials to become more accurate in terms of trial data authenticity. It provides a clear and fair record of all the trial activities, which prevents the alteration of data and also ensures that the findings of the trial are accurate.

Table 2: Blockchain in Healthcare: Current Applications

AI Applications in Healthcare	Description
Patient Data Sharing	Secure, tamper-proof sharing of health records.
Drug Traceability	Monitoring the integrity of drug supply chains.
Consent Management	Managing patient consent for data sharing.
Clinical Trials	Ensuring integrity and transparency in trial data.

C. Previous Work on AI and Blockchain Integration

AI and blockchain have both revealed great potential in the field of healthcare, but the synergistic combination of both is a relatively advancing area of research. Past studies show that by implementing AI algorithms on these secure and decentralized data stored on the blockchain, the data analysis can be improved besides the security aspect of the data. This integration may have vast potential in terms of solutions and data analysis of large patient databases and improve the possibility of healthcare decision-making. But, there are always some barriers to integrating those technologies into a single system. Recent research focuses on the technological aspect of AI and Blockchain integration in which very high-level algorithms and interfaces have to be adopted. The challenge of achieving compatibility of the developed system with different care systems and meeting data protection requirements is critical. To tackle these issues, various models have been developed by researchers with a major concern on how to develop standard and solid security in order to enhance integration. More research is needed in the future

since this line of research is still growing to discover more the applications of the AI-Blockchain and come up with best practices when implementing it in healthcare organizations.

III. METHODOLOGY

A. Research Approach

This study uses both qualitative and quantitative research methodologies in order to assess the findings of the combination of AI and Blockchain in healthcare organizations thoroughly. This approach makes it easier to understand the various intertwined issues involved in integrating these technologies. While quantitative data is obtained from an online survey of healthcare practising professionals and technology gurus, we gain a strong qualitative data set from case studies and heuristic interviews with key actors in the healthcare field in North America and Europe focusing on real-life application of AI-Blockchain, perceived problem areas and perceived advantages. Data is collected using questionnaires distributed randomly across various healthcare facilities in an effort to establish the number of favourable stakeholders and draw out the number of issues that they have employed the use of the systems for, as well as get their perception of issues like data sharing among the systems. On the quantitative aspect, experimental testing is performed to evaluate the results generated by AI algorithms and Blockchain systems when employed for healthcare data. [9-15] These experiments aim at the precision, speed and safety of AI-driven analyses performed on datasets warranted by Blockchain technology. Comparative assessments are also conducted where the performance of AI-Blockchain systems with traditional centralized systems is compared in context to one or multiple aspects such as data security, data integrity, and derived healthcare benefits. The study is strong for the reason that it combines qualitative factors with quantitative factors and hence provides a broad perspective of this technological integration especially in the health sector when doing its evaluation.

B. Blockchain in Healthcare: Data Protection and Privacy

This gives a conceptual flow of the use of Blockchain technology within healthcare, with a more particular concentration on Electronic Health Records (EHRs) and how artificial intelligence (AI) arrives into play. It provides a structured methodology for securing health data as well as enabling AI based healthcare solutions.

a) Blockchain in Health:

We start off with the wider notion of blockchain in the healthcare field, and demonstrate how blockchain is a key tool to secure and resolve privacy problems. In the modern age of modern healthcare these are important issues to address, as most, if not all, are dealing with patient information that must be protected from outside parties.

b) Blockchain in Electronic Health Records (EHRs):

Then it zooms into the application of Blockchain to Electronic Health Records (EHRs) management. Blockchain guarantees that with your permission, both current (present) health records and comprehensive (total) health records are securely and tamper-proof stored. With an immutable ledger, if the patient data changes, then the change can also be traced.

c) Artificial Intelligence in Healthcare Security:

The reactivity part of the diagram shows how Artificial Intelligence can overpower blockchain to make security in the ehealth systems more solid. Application of AI to providing AI health care or, in other words, providing personalized healthcare services, which include diagnostics, predictive analytics and treatment recommendations. A lot of EHR data is analyzed by AI to extract insights that drive better patient outcomes.

d) AI Security Control:

This diagram highlights AI Security Control, which in turn refers to using AI technologies to guard and control the security of the healthcare data saved in the blockchain. They can be configured to capture their actions and detect anomalies or breaches in real-time, making sure to keep the health records secure from cyber threats. Combining AI with Blockchain results in a strong, multilayered security system to protect patient information and allows for trustworthy healthcare solutions.

C. Proposed AI-Blockchain Integration Model

A model for integrating AI and Blockchain in healthcare can be divided into two major components:

a) Data Collection and Storage:

In the proposed AI-Blockchain integration model, patient data is collected from different data sources such as wearable health devices, medical images and EHR. This diverse data is safely stored on a decentralized ledger comprising blocks on a Blockchain system. Blockchain technology makes sure that the data collected is encrypted and, once recorded, cannot be impregnated or altered. The decentralized nature of blockchain also increases its security as this data can be accessible and

shared with many parties without the drawbacks of centralization of data storage. At the same time, the access to this data is highly controlled.

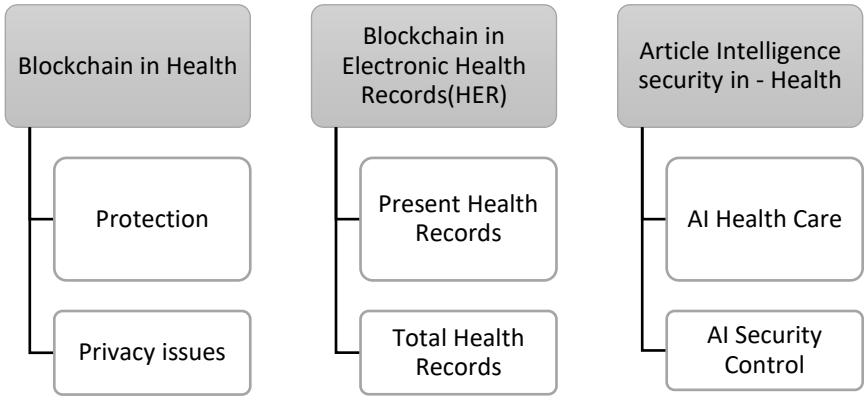

Figure 3: Blockchain in Healthcare - Depicting Blockchain's Role in Securing Electronic Health Records (EHRS), Preserving Privacy, and Integrating AI for Improved Healthcare and Security Management

b) AI-powered analysis:

Where once the patient data is centralized on the blockchain, the traditional AI techniques to use computer programmes to mine large datasets are used. These algorithms are capable of identifying certain trends of health related to the patients in question, identifying various health complications and providing recommendations based on the data obtained from the patients' monitoring data. While used on its own, AI has the capability to predict well; its incorporation with blockchain is another level more beneficial because the data is sacred. The integration of smart contracts on blockchain guarantees that all AI analyses are performed with transparency and that any results or changes in the data are also traceable to uphold data authenticity during the process.

D. AI and Blockchain Integration in Healthcare

As illustrated by this diagram, AI is how we operate in the center of the decentralized healthcare system. This AI-driven platform works on the blockchain where it securely processes. It analyzes the data stored on the blockchain and interacts with this data with various stakeholders such as patients, researchers, physicians and drug manufacturers.

a) Patient Interaction:

Personal health data (biometrics, diagnostic results, and lifestyle choices, for example) is provided by patients using devices like wearable electronics and EHRs. However the AI system relies on this data to give medical advice tailored to the patient, predictive analytics and the stratification of patients. Data integrity is ensured by immutable storage of the results on the blockchain and also by giving the patients control over their health information.

b) Physicians and Radiologists:

It also relays diagnostic images, such as an MRI scan, from radiologists that the AI also processes to assist physicians in their diagnoses. The Blockchain stores and shares these diagnostic results and the AI-generated insights securely, preserving the patient's privacy while remaining certain of its accuracy. Additionally, AI helps physicians by providing real-time patient databased clinical decision support along with predictive models.

c) Researchers and Laboratories:

Providing biospecimens and genomic data to research laboratories contribute by researchers. AI processes the data for predictive analysis and the confirmation of standard operating procedures (SOPs). Through blockchain, research data is kept unaltered and verifiable in different experiments.

d) Drug Manufacturers:

Patient stratification data makes its way into drug makers' hands for use in tailoring medications and treatments, helping to optimize personalized medicine more efficiently. The blockchain's secure, decentralized nature means the critical data will not be tampered with, crucial to ethical pharmaceutical development and distribution.

e) Cryptocurrency Integration:

When looking at the image, we can also see how cryptocurrency could be used as a medium of transaction within this ecosystem, adding to the decentralized nature of AI-Blockchain integration. By using cryptocurrency, we could ensure secure non-cash transactions similar to medical organization funding, payments, or user compensation for taking part in studies.

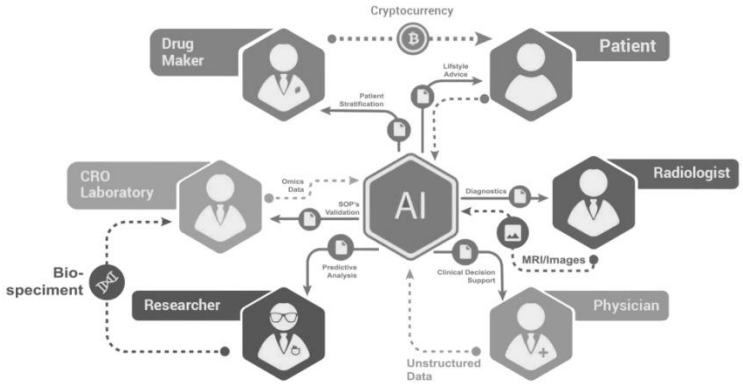

Figure 4: AI and Blockchain Integration in Healthcare - AI Interacts With Patients, Healthcare Professionals, and Researchers via Blockchain To Enable Secure, Data-Driven Diagnostics And Decision Support

E. Security Mechanisms

a) Immutable Ledger for Data Integrity:

For integrating AI into organizational systems, blockchain ensures an unalterable electronic register of all the events of data exchange. This means that the patient's data cannot be changed once the data is fed into the system. Every transaction highlights the temporal aspect and results in the disclosure of a record of data interactions. This ensures the credibility of the given results in artificial intelligence in accordance with the credibility of the data collected and used by healthcare providers and various stakeholders.

b) Smart Contracts for Automated Processes:

Smart contracts are automated trader contracts that exist within the blockchain containing coded provisions. In healthcare, these involve insurance claims checks, prescriptions and authorization for using patient data. Furthermore, smart contracts decrease the likelihood of fraud or mistake and increase efficiency as human input is not involved. Such automation means that, for a transaction to be effected, all the prerequisites must be met, an aspect that increases the level of security and credibility of the system.

c) Encryption and Decentralized Access Control:

Blockchain can apply enhanced levels of encryption to keep healthcare data safe and allow only specific individuals to access an individual patient's information. This encryption correlates well with blockchain access, which is controlled in a decentralized manner. Thus, data is shared across the various entities in the healthcare fraternity without compromising on security. Decentralization also assumes that no single party has full control over the data to the risk of fraudsters or anyone with a bad intention getting full access or manipulating the data.

d) Auditability and Transparency:

Blockchain's architecture provides for full audibility as all transactions are verified to be clear and easily traceable. Computerization of patient records enables healthcare providers to identify who or what changed patient data and, in the process, provide accountability that manual methods of recording the same can hardly match. This feature will help to meet the requirements of healthcare laws and data protection when all actions are reflected in the blockchain.

F. Data Collection and Analysis

a) Patient Data Collection from Healthcare Providers:

In this study, patient data will be collected from private hospitals, clinics, diagnostic centers and other related healthcare centres. The data collected will include EHRs, imaging data, laboratory data and data generated from wearable technologies. These diverse data sets will give ample ground for simulating the AI-Blockchain integration model for the real-world healthcare environment without violating the patient's right to the protection of their personal information.

Figure 5: Data Collection and Analysis

b) Simulation of AI-Blockchain Integration:

All the gathered data will be incorporated into a simulation setting where Blockchain technology is used to protect patient information and facilitate its exchange securely. Out of the obtained dataset, AI algorithms will be trained and used on realistic cases, namely diagnostics, prognosis, and individual counseling, all verified with the help of the blockchain. It enables the researchers to have the live experience and experience sharing by analytical and blockchain operation to make sure its integration is safe and correct.

c) Algorithm Testing for Data Integrity:

The AI algorithms that will be used to experiment in the proposed blockchain are machine learning and deep learning models. These algorithms will work on patient data and will help in sorting out the patient data and finding out future patterns. Blockchain will ensure transparency of these predictions, meaning once the data has been processed through the AI algorithm, it cannot be changed so as to produce the analysis in question.

d) Verification of Immutable Data Storage:

After AI has produced a report on patient data, the results will be recorded on the blockchain, where they are fixed and easy to prove. This results in the fact that any prognosis or clue derived from the AI is time-stamped on the blockchain and cannot be altered later. It is this immutability that makes Health care decisions, diagnoses and recommendations by AI analysis as simple and accurate as it involves throughout the Health care process.

IV. RESULTS AND DISCUSSION

A. AI-Blockchain Workflow

The use case of adopting AI and Blockchain was implemented by implementing patient data into the blockchain network and then using AI algorithms for predictive healthcare analytics. The result of the analysis reveals high improvements in the integrity and the security of data. When compared with traditional centrality-oriented systems, the AI-Blockchain model provides better defenses against tampering, improved access control, and improved data accuracy for predictive analytics. Below is a table comparing key parameters between traditional systems and AI blockchain integration.

Table 3: AI-Blockchain Workflow

Parameter	Traditional Systems	AI-Blockchain Integration
Data Integrity (Score)	4	9
Data Access Control (Score)	5	8
Predictive Analysis Accuracy (Score)	6	9

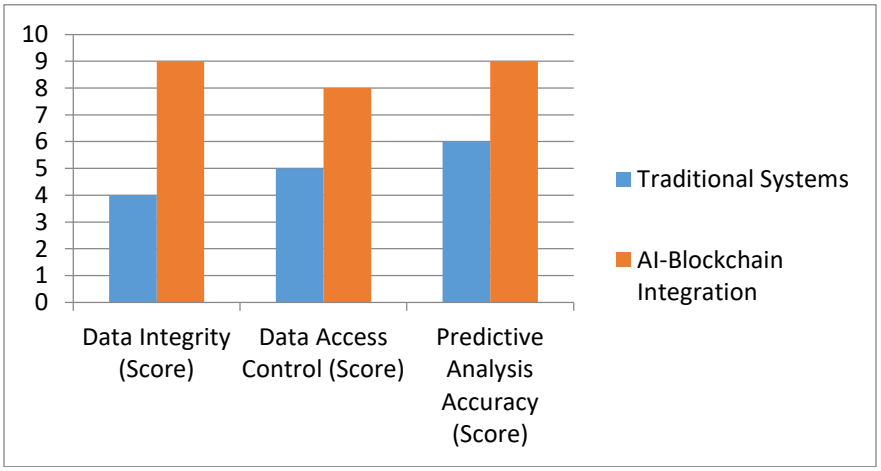

Figure 6: Graph representing AI-Blockchain Workflow

a) Explanation

- Data Integrity: Rates are indexed on the extent to which the system is susceptible to manipulation. Traditional systems receive a score of 4 with regard to data breaches, while AI-blockchain integration receives a score of 9 with regard to immutability.
- Data Access Control: Traditional systems score 5th as the systems are centralized, meaning they can easily be hacked. On the other hand, the decentralized model of AI-Blockchain integration has scored an 8/10 because of the open, secure and effective features of access control.
- Predictive Analysis Accuracy: These traditional systems are moderate in terms of the accuracy of their analysis, scoring 6 on the index. The integration of AI and Blockchain systems greatly improves this accuracy to score a 9 due to the utilization of superior algorithms and impenetrable Blockchained data security.

B. Benefits of Integration

The integration of AI and Blockchain in healthcare offers several tangible benefits that enhance both data security and healthcare outcomes:

- Enhanced Data Security: A Blockchain features security, as it encrypts information and is almost impossible to alter, meaning that hackers stand little chance of gaining access to a Blockchain or tweaking its data. This provides a safe atmosphere for storage purposes of important information relating to the patients.
- Improved Healthcare Outcomes: Advanced analytics increases the ability of healthcare providers to make correct decisions due to artificial intelligence personalized care. Hypothesis generation makes it easier to forecast future health complications, thus leading to early interventions to favor patients.

C. Challenges and Limitations

While the integration of AI and Blockchain in healthcare holds great potential, it is not without its challenges:

- Technical Complexity: The functioning of the AI-Blockchain system needs a high level of infrastructure, and it can be costly for small healthcare facilities. The problem here is that getting acquainted with the technologies and implementing the setup calls for hefty expenses.
- Regulatory Concerns: The healthcare industry is highly regulated especially in regards to the constitutionals of patients' information confidentiality and protection. Acceptance of laws like the Health Insurance Portability and Accountability Act (HIPAA) or General Data Protection Regulation (GDPR) needs implementation. Meeting all of these regulations while implementing AI-Blockchain systems while maintaining optimal performance and data accessibility is quite a task.

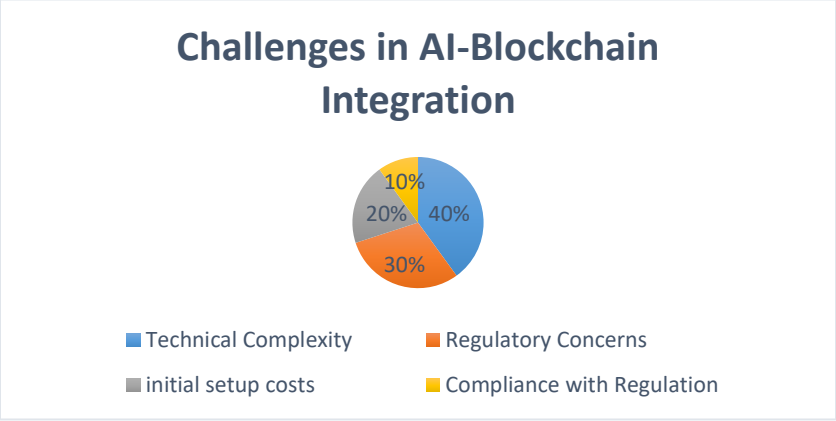

Figure 7: Graph representing Challenges in AI-Blockchain Integration

This pie chart reveals some of the potential issues affecting AI-Blockchain integration; these include technical complexity, regulatory concerns, initial setup costs, and compliance with regulations, amongst others. By the use of the chart, the document successfully highlights the level of concern of these challenges in aiding or constraining the uptake and application of AI-blockchain systems in health care.

V. CONCLUSION

AI, when incorporated into healthcare held with blockchain technology, offers a reforming chance to deal with some of the most vital issues in data security and reliability. Health care today relies heavily on computerized systems. There is,

therefore, a great need for proper means to protect patient data. Whereas AI can handle the volume of data being produced across the globe and find the relevant patterns that are beneficial for businesses and organizations, blockchain provides reliability of a record, and secure administration of data. Combined, such technologies can form a virtuous cycle that enables not only the shield of sensitive patient information from breaches but also the effective exchange of such information between healthcare providers. Such integration can bring a revolution in certain patients' welfare since it can provide the best-customized solution from accurate prediction. Still, there are some important issues that we confronted that are associated with the limitations of this approach and prevent its widespread application. AI-Blockchain systems pose a certain level of technical difficulty for efficient health system management. Hence, the higher costs of infrastructure and personnel add to the barred costs, which small-scale health facilities cannot afford. Also, the legal framework is challenging because integrating policies of strict data protection and the healthcare industry may deter investors and affect patients' reliance on telemedicine services.

However, as a result of these two studies, it becomes clear that there is a need to advance the use of AI and Blockchain in solving current and future problems in healthcare. Solutions can only be complemented together with the need to create favorable legal conditions for developing technologies and cooperation between their creators and healthcare practitioners. By on board these challenges, the healthcare sector can leverage such advanced technologies to bring about secure, efficient and patient centered health care for the future.

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