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Challenges of Blockchain Technology using Artificial Intelligence in Healthcare System

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ABSTRACT: The world is facing many types of multiple healthcare challenges in various diseases. Blockchain is promising and secured technology being applied for creating new innovative ideas as well as solutions in various fields such as banking, supply chain, agriculture including healthcare system but it is not the resolution for all problems. A Blockchain Technology networking is used in the healthcare system to maintain and replace patient data through hospitals, diagnostic laboratories, pharmacy firms, and physicians. Blockchain Technology applications can accurately identify severe wrong mistakes and even dangerous ones in the field of medical diagnosis. Thus, blockchain technology can improve the performance, security, and transparency of sharing medical data in the health care system. This article has shown the challenges and multiple possibilities how anyone can reliable on Blockchain Technology using artificial intelligence models, which is an open network for the sharing and authorization of information. Healthcare professionals will have way to access to the blockchain to display the medical data records of the patient, and Artificial Intelligence uses a variety of proposed techniques and decision-making capability, as well as large quantities of data. The objective of this article is to discuss various challenges and proposed framework of Blockchain Technology and Artificial Intelligence with healthcare system.

KEYWORDS: Blockchain Technology, Artificial Intelligence, Healthcare, Smart Contract, Medical Records.

I. INTRODUCTION

The Healthcare field is an fundamental and basic concern for all the developing as well as developed cities as well as countries because this field is directly concerned with the social welfare and lives of citizens. Each and every day research and different technologies in the Healthcare sector always increasing and every day something new technology declaring something new ideas and is ongoing process, as it will help to improve the quality and understanding of living by taking care and diagnosing various health issues and diseases. With the innovation and recent developments in technology, the improvement in the Healthcare sector can be seen easily understand and diagnose. The existing development of the Healthcare and Medical field can be further improved by using the Blockchain technology with artificial intelligence in the field of healthcare system. The introduction of the latest and innovative computer technologies in the Healthcare field can assist medical doctors and medical practitioners in the early diagnosis of various diseases. The accuracy of detecting and diagnosing diseases in the early stages can also be improved considerably using these advanced computer technologies.

Blockchain is a decentralized and public digital ledger that records transactions on many computers so that no record involved can be altered retroactively without altering any blocks afterwards. Blockchain is verified and linked to the preceding 'block,' forming a long chain. After all, Blockchain is the name of the record. As any transaction is registered and checked publicly, Blockchain provides a good deal of accountability. When entered, no one can modify all the information written in the Blockchain. It serves to demonstrate that the data is actual and unchanged. In Blockchain, data are maintained on networks instead of a central database, improving stability and showing its proneness to be hacked. Blockchain offers a fantastic forum to develop and compete with traditional companies for modern and creative business models [1–3]. Blockchain technology is presently generating approximately energetic enthusiasm amongst banks, enterprises and public bodies. Blockchain technology is currently generating a lot of buzz among banks, businesses, and government agencies. Nearly every day, new initiatives and various collaboration agreements on blockchain applications are announced in the economic press. This includes projects run by governments and central banks as well as banks and private enterprises [4-5].

Blockchain helps marketers to maintain an overview of the products used in medicine. Health and pharmaceuticals will get clear of counterfeit medications using Blockchain technologies, enabling tracing of all these medicines. It helps discover the cause of falsification. Blockchain can guarantee the confidentiality of patient records; when medical history is developed, Blockchain can also store it, and this record cannot be modified. This decentralized network is

used with all commodity hardware in the hospital. Researchers allow computing estimates for therapies, medicines, and remedies of diverse illnesses and disorders using the resources saved by these devices [6,5].

This paper describes the following points

1. The study of a Blockchain technology in Artificial Intelligence and its important requirements in healthcare system;
2. To understand of Blockchain technology to support the healthcare culture worldwide
3. To identify and discuss enablers of Blockchain technology for reviving healthcare services using artificial intelligence;
4. To collect medical records for Blockchain technology in providing healthcare services;
5. To discuss significant challenges of Blockchain Technology with AI for healthcare.

Need of Blockchain Technology in Healthcare other fields

Blockchain Technology can be used increasingly in the field of industry as well as in medical field in various ways, leading to decrease the cost of new innovative ideas to access the healthcare system.

Blockchain Technology is nowadays famous the field of secure data, a distributed system for recording and maintaining transaction data. Blockchain is a distributed, decentralised, immutable record of peer-to-peer transactions that are created from connected transaction blocks and kept in a digital ledger of blocks.

As far as healthcare is concerned, the urgency of development increases to more incredible speeds. Today the need is for quality health facilities supported by advanced and newer technologies. Here, Blockchain would play a critical role in transforming the healthcare sector. In addition, the landscape of the health system is moving towards a patient centred approach focusing on two main aspects: accessible services and appropriate healthcare resources at all times. The Blockchain enhances healthcare organisations to provide adequate patient care and high quality health facilities. Health Information Exchange is another time consuming and repetitive process that leads to high health industry costs, quickly sorted out using this technology. Using Blockchain technology, citizens may take part in health study programs. In addition, better research and shared data on public wellbeing will enhance treatment for different communities. A centralized database is used to manage the entire healthcare system and organisations [8-10].

II. RELATED WORK

The blockchain is a distributed database using state machine replication, with atomic changes to the database referred to as transactions grouped into blocks, with the integrity and tamper-resistance of the transaction log assured via hash links among blocks. The blockchain concept was introduced for Bitcoin in the context of decentralized electronic currency. The recognition of Bitcoin allows blockchain that can use without depending on any established third party to enable trustworthy and safe transactions through an untrusted network. There have been many information and reports on basic building blocks in the blockchain technology[11].

A sequential series of blocks containing a list of complete and correct transaction records is blockchain. The blocks are connected by a relation (hash value) to the previous block, thereby creating a chain [12]. The block that precedes a given block is recognized as its block header, and the very first block is recognized as the block of genesis [13-14].

With a growing interest in many applications, spanning from data storage, financial markets, computer protection, IoT, and nutritional science to the healthcare sector and brain studies, blockchain technology has gained tremendous popularity and progress to distribute safe and stable monitoring of healthcare records. It may be a tool in the future that could theoretically assist in customized, credible, and safe healthcare by combining and displaying the whole real-time clinical records of a patient's wellbeing in an up-to-date, secure healthcare setup [15].

Blockchain platform to determine the health care status of patient illnesses, focused on concurrent execution and artificial intelligence healthcare networks and the proposed approach analyses of the patient's overall state, diagnosis, and recovery system, and investigates the relevant surgical interventions by simultaneous operations and clinical decision making computational studies to assess the quality of care for patients and the feasibility of diagnosis, the proposed method has been evaluated in actual, as well as simulated, Healthcare systems.

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Blockchain technology is also used to Secure but high-profit gain-based investment is a common desire of all people to achieve financial goals. In order to meet these requirements, investment in the stock market is one of the most effective

and legally correct options. However, as the stock market works with multiple factional information and data, stock market prediction is highly essential before investing in any stock [19-20].

Blockchain technology can also be used in Big data that has the capability to manage a huge volume of disparate data, at the right speed, and within the right time frame to allow real-time analysis and reaction. Big data is an evolving term that describes any amount of structured, semi-structured and unstructured data that has the potential to be mined for information [21].

Learning is no longer an activity that is performed during an initial period of formal mode, and which is enriched by experience in professional and vital practice. Life-long learning has become a labor necessity [22], according to the mode of human learning [23] a requirement of the twenty-first century citizenship[24], which affects both the social framework in which we move, and biographical social learning [25]. Robots have entered into many aspects of human life, including medical science. The impact of robotics on medicine is undeniable. Robots can be defined as "automatically controlled multitask manipulators, which are freely programmable in three or more axes." The success of robots is based on their precision, lack of fatigue, and speed of action. Medical robotics is a promising field that really took off in the 1990s. Since then, a wide variety of medical applications have emerged: laboratory robots, surgical training, remote surgery, telemedicine and teleconsultation, rehabilitation and hospital robots[26]. The Women warrior is a user friendly App that helps women to get out from trouble. Our intention is to provide user with fastest and simplest way to contact nearest help. This Women warrior application also having videos that women must know about *safety* and first aid hacks[27].

Blockchain Technology can also be used in higher education and technical research are done parallel in the same premises. The data generated there is of high utility and worth of being intellectually protected. The data generated at these research facilities and high education centers must be protected diligently. Blockchain is a very reliable technology to protect digital data [28].

The main important risks and critical issues in a conventional healthcare system include a single point of failure, data modification, high chances of different malicious cyber attacks, centralized authority, high data management keeping storage as well as cost, and databases that are not transparent. To address these issues, researchers have proposed numerous blockchain-based solutions. The authors of [29] addressed the security and privacy concerns by using a blockchain-based server–client architecture network to store the hashed patients' data. However, these server–client architectures are prone to a single-point failure. Thus, a blockchain-based distributed mechanism for data accessibility between patients and doctors in a healthcare system is presented in [30]. The authors of [31] designed a smart contract-based, real-time patient monitoring system to record wearable device data as events and share that information with healthcare professionals. The primary goal of this system is to eliminate third parties and resolve the vulnerability issues in remote monitoring. In other studies [32- 33], researchers created a secure and trusted digital environment using a smart contract-based healthcare system to prevent data breaches in electronic health records (EHRs). To attain decentralized data management in healthcare, the authors of [34] proposed a framework to store patient EHRs in a decentralized, patient-centric framework that allows patients to control their data using a rule-based smart contract. On the other hand, healthcare systems based on AI [35] require more computational power due to the exponentially increased parameter numbers, complex architectures, and sufficient data to achieve accurate deep learning solutions. Meanwhile, the data are accumulated from different sources and stored on the central server to find a global model. Therefore, researchers have proposed distributed AI approaches based on blockchain that leverages parallel computing power, as well as focuses on distributed data storage. One such effective distributed learning solution is federated learning that trains locally stored data with local computational power while protecting privacy [36].

In analysis of images, deep models that have been broadly used to observe and solve the many several difficulties in medical treatments. When deep learning model is trained on a large amount of data, it may give the output more effectively and accurate result. Hospitals, medical diagnostic laboratories, lab research organizations, institutions, and patients may exchange valuable findings and work together to improve the AI model. However, they face challenges in sharing important data with third parties due to privacy and security concerns. Hence, secure data sharing becomes an obstacle in improving the quality of AI-based healthcare systems. Disease diagnosis is one of the applications where data mining tools are proving successful results. This research paper proposed to find out the heart diseases through data mining, Support Vector Machine (SVM), Genetic Algorithm, rough set theory, association rules and Neural Networks. [37]

Kumar et al. [38] have proposed an approach that involves sharing local models via the blockchain network, leveraged to collectively develop a global model for improved prediction of lung cancer using CT scan images. As a result, the collectively updated model helps in accurately identifying the patients' disease, resulting in improved therapy. This will avoid actual sharing of data and hence maintains privacy. Through smart contracts, organizations will upload their data over IPFS (Interplanetary File System) and share local gradients. Delegated Proof-of-Stake consensus algorithm is used to train the global model. The trust in data is built over a smart contract, and the hash of the local gradient is maintained

in the blockchain. Kim et al. [39] have presented a blockchain algorithm that checks the data that has been refined. The agreement algorithm on the blockchain is HyperPOR. The HyperPOR algorithm functions by confirming the business partner's identity. Then the generation block validates and accomplishes distributed computing, adds sharding technology for protecting PHR(Patient Health Records). Nguyen et al. [40] have proposed an intrusion detection system to protect data transmission in the cyber-physical system of healthcare.

Technological advances, such as distributed learning, provide a road ahead, but they are plagued by a lack of openness, reducing trust in the data utilized for analysis. To solve these challenges, Zerka et al.[41] has projected that Chained Distributed Machine Learning C-DistriM, a novel distributed learning that blends sequential distributed learning with a blockchain-based framework, would be developed in medical imaging. Blockchain is used to record the immutable history of computation and protect from model poisoning. After training, it encrypted the local models and uploaded them on the cloud simultaneously, removing all local copies of the model. Access to the cloud is then restricted through the smart contract for unauthorized users. Kuo et al. [42] have proposed the ExplorerChain framework, which combines two important technologies, online machine learning and a blockchain without a centralized authority, to learn a predictive model across institutions in a distributed architecture, i.e., without the need for patient-level data sharing or a central coordinating node.

An Expert System is a problem solving and decision making system based on knowledge of its task and logical rules or procedures for using knowledge. Both the knowledge and the logic are obtained from the experience of a specialist in the area. In the field of medicine, heart diseases have caused turbulence all over the world[43]. Many published deep learning systems lack clarity about model validation and testing outcomes. Blockchain technology might be a viable answer to these challenges, operating as a decentralized, secure, and trustworthy shared ledger for data management and offering tracking and accountability for testing results reporting. Schmetterer et al. [44] deployed a blockchain-based AI platform to establish data transmission, model transfer, and model testing in the real world across three sites in Singapore and China as a proof of concept. Using retinal images taken from distinct multiethnic populations from different countries, researchers set out to create and test deep learning algorithms to identify myopic macular degeneration and extreme myopia. They leveraged a blockchain-enabled AI infrastructure that helps secure, persistent, and verifiable data transmission, model transfer, and transparency in the diagnostic performance of deep learning algorithms. However, it does not maintain the privacy of data.

Khan et al. [45] explored a wireless capsule endoscopy frame-based automated method for detecting stomach infections. A blockchain-based technique is used in a convolutional neural network model to secure the network for precise identification of stomach ailments such as ulcers and bleeding. Each layer comprises an additional block that keeps certain information to resist any tempering and modification attacks. Pilozi et al. [46] states that artificial intelligence (AI) technologies, particularly natural language processing (NLP), have shown to be an effective tool for classifying the emotion and tonality of texts, like those of social media posts. These approaches could be used to investigate the public perception of Alzheimer's disease. Incorporating secure and decentralized data transfer and storage methods like blockchain will give patients greater control over their data. It will help relieve most of the insecurities of unknowingly disclosing personal information to an entity that may discriminate against the patient.

In this paper, [47] the growth of expert systems is expected to continue for several years. In the last two decades, the use of Neural Network in medical analysis is increasing. This is mainly because the classification and detection system have improved a great deal to help the medical experts in diagnosing. Heart disease affects millions of people every year. As clinical decision making inherently requires reasoning under uncertainty, expert system and Neural Network technique are suitable for dealing with partial evidence. Medical trainee doctors other than specialist may not have enough expertise or experience to deal with certain high risk diseases. With this system the patients with high risk factors can recover. In this paper, the detail about patient data collection procedure, coding, normalization and tabulation is given.

Electronic Medical Records

To transform healthcare, the focus should be attributed to the management of health data that could be improved from the potential to connect heterogeneous systems and increase Electronic Health Records (EHRs) accuracy. While Electronic

medical records (EMRs) and EHRs are used interchangeably, there is a difference between the two terms. EMRs term came along first, which is a digital version of the paper charts in the clinician's office. An EMR contains the medical and treatment history of the patients in one practice. However, EHRs focus on the total health of the patient-going beyond standard clinical data collected in the provider's office and inclusive of a broader view on a patient's care [48-49]. From the mapping study, blockchain technology supports the management of EHRs. In this context, Ekblaw et al. present [50] MedRec, an EHR-related implementation that proposes a decentralized approach to manage authorization,

permissions, and data sharing between healthcare stakeholders. MedRec uses ethereum platform to enable patients to have knowledge and information on who can get to their healthcare information.

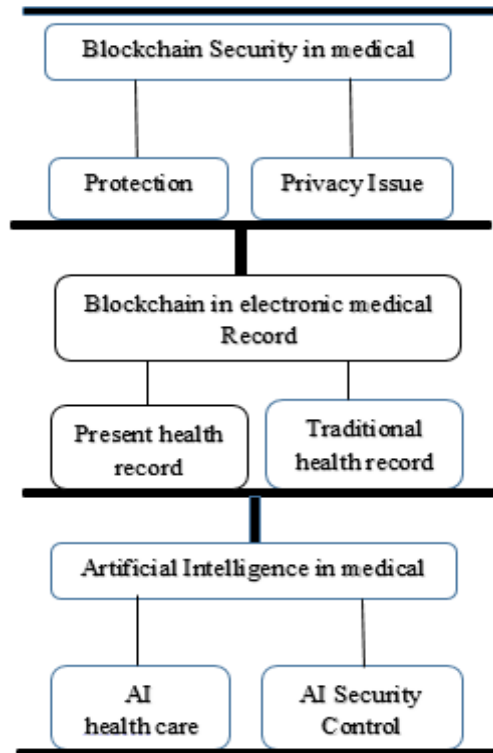


Fig 1. Block chain and artificial intelligence security in Healthcare asystem

III . CHALLENGES OF BLOCKCHAIN WITH AI

In this section, we discuss and highlight to-date challenges for combining AI and blockchain technologies. Some of the foreseeable challenges related to the unification and integration of both technologies are listed below:

- **Privacy.** Data is more important factor in the field of medicine. Publically this data should not be available. Public blockchain ledgers enable secure and authentic data processing, however, collected data are publically accessible and available for all readers. This can be a point of privacy evasion and concern. In addition, pervasive sensing systems in IoT continuously collect consumers’ personal and sensitive data and putting this data on open ledgers could lead towards privacy issues. Using private blockchain ledgers, the data privacy could be ensured by enabling encryption and allowing controlled access of the ledgers. However, such private blockchain platforms will limit the access and exposure of the large amount of data that can be necessary for AI to process and perform accurate and correct decision making and analytics.

- **Scalability and Side Chains.** Scalability is one of the main property that can handle a growing amount of work by adding resources to the models. concerns for today’s blockchain platform. For cryptocurrency blockchain platforms, bitcoin blockchain can perform an average of 4 transactions per seconds, while Ethereum can perform an average of 12 transactions per second. Such performance is really unacceptable when compared with Facebook which handles millions of transactions every second including likes, posts, and comments. Side chains (known also as side channels) are used to accelerate the performance of blockchains, in which transactions are settled between parties in a quick manner outside the main chain, and settled only once per day on the main chain [51]. Many new emerging types of blockchains improve significantly the consensus algorithms of mining nodes.

For example, platforms like Algorand and IoTA can provide substantially better performance than that of Ethereum and Hyperledger blockchains [52-53]. However, more work is still needed to improve the scalability to be comparable to that of Facebook and its likes.

- **Blockchain Security.** The decentralized power found in blockchain can suffer from abuses and misuses. Though blockchain provides robust schemes for securing IoT and predictive analysis, the blockchain systems are vulnerable to cyber-attacks as that of 51% attack [54]. The consensus mechanism depending upon the hashing power of the miner can be compromised, in which the decentralized platform becomes centralized around a few mining farms that control



consensus and settlement finality. This security problem is more evident in public blockchains such as Ethereum and bitcoin. Private blockchain platforms suffer less from this problem, as consensus protocols are predefined among parties. Furthermore, the execution environment of the mining nodes is not protected, especially for private blockchain platforms with a few mining nodes as that of Hyperledger, in which the execution outcomes can be tampered with. To solve this problem, newly emerging blockchain platforms are equipped with hardware to offer execution in a Trusted Execution Environments (TEEs), such as Intel SGX [55-58].

- **Smart Contracts** is actually a computer program where vulnerabilities and Deterministic Execution. It is crucial to ensure that the implementation of a smart contract is free of bugs and vulnerabilities and secure against attacks. It is important to safeguard the code and the information on the network, as they may be vulnerable to attacks. For example, the smart contract for the DAO which was built on the Ethereum platform had serious code vulnerability and was hacked in 2016 for which make the of loss of 3.6 million Ethers. There is a definite need for blockchain engineering, addressing this issue posed by smart contract programming and other applications running on blockchain [59]. The vulnerability issues are due to poor and negligent programming practices in the languages used to write the smart contracts code (as that of Solidity and Chaincode). Testing smart contracts for vulnerabilities has become of a critical importance, and some tools have been developed to assess the security state of a smart contract code [60-62]. Furthermore, as of today, the execution outcomes of smart contracts are all deterministic and cannot be probabilistic. This can pose a key challenge for decentralized AI in which AI and machine learning based decision making algorithms get executed as smart contracts by the mining nodes, in which the execution outcome are not usually deterministic, but rather random, unpredictable and most often approximate. This entails a novel solution to deal with approximate computation and to devise consensus protocols for mining nodes for agreeing on results with a particular degree of certainty, accuracy, or precision, and with data input that might be highly fluctuating as that of IoT and sensory readings.

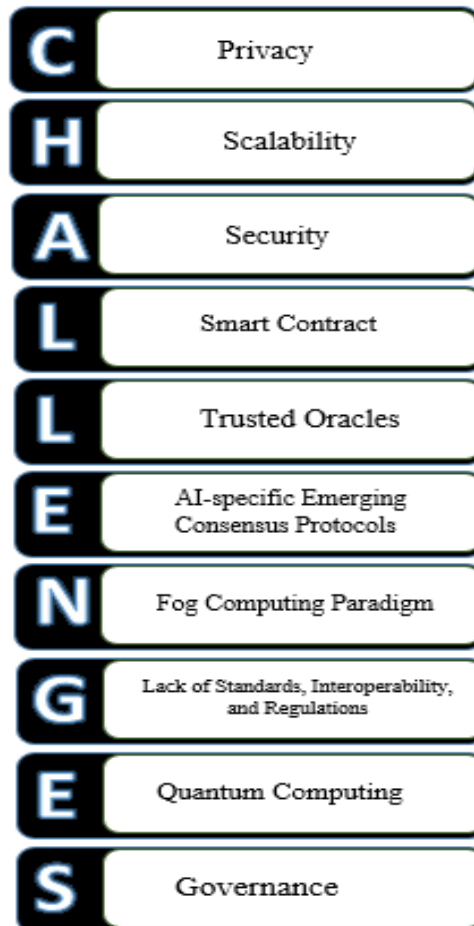


Fig. 2 Challenges of Blockchain Technology with AI

• **Trusted Oracles** that feeds form external system, Smart contracts are designed to be invoked by external events or outside functions invoked by blockchain participants. Smart contracts are not designed to automatically trigger events, or initiate retrieval of data on their own. In other words, the contracts cannot pull data from the outside world. Data and events have to be pushed to the contracts. To remedy such shortcomings, trusted oracles (which are basically trusted external parties or nodes) are being proposed as alternatives, and used to push events and data to the smart contracts. Oracles add a level of complexity and insecurity for ensuring and managing trust, in which a completely decentralized system becomes centralized around a group of oracles that must be trusted. Voting among trusted oracles is typically employed to reach consensus [63-64].

AI-specific Emerging Consensus Protocols. Existing consensus protocols considers network and middleware layers of blockchain systems by enabling different proof of X protocols. A large plethora of research opportunities are available for future researchers to explore if the application level consensus protocols could be designed considering proofs based on quality of learning models, efficient search strategies, quality and provenance of data, and quality of optimization.

• **Fog Computing Paradigm. Fog computing**, also called fog networking or fogging, describes a decentralized computing structure located between the cloud and devices that produce data. Fog computing is a newly emerging computing paradigm that allows for localized computing and storage close to the source of data being generated by customers or IoT devices. Fog nodes are typically used to augment the long delay incurred by computing and storage at the cloud environment. Fog nodes can be thought of as a local small-scale cloud. In the context of AI and blockchain, future fog nodes have to be equipped with AI and machine learning capabilities as well as enabled with blockchain interface, whereby localized management, access, and control of data are performed by the fog nodes.

• **Lack of Standards, Interoperability, and Regulations.** To date, blockchain technology standards are yet to be devised. Work is in progress by IEEE, NIST, ITU, and many standards bodies to put forward standards for blockchain interoperability, governance, integration, and architecture [65-66]. Moreover, at local and global level, governmental and institutional guidelines, rules, laws, regulations, and policies need to put in place for blockchain deployment, arbitration, and dispute handling, in the context of AI applications and especially for public blockchain transactions involving financing and automated payments using cryptocurrencies. This entails research directed at devising models and proof of concepts that can play a key role in defining the right set of technical standards for blockchain architectural models, services, deployment and interoperability.

Quantum Computing. It is an area of computer science that uses the principles of quantum theory. It is envisaged that future quantum computing will have the ability to break public key encryption in which private keys can be determined. Current blockchain relies on digital signatures which use public key encryption. Many experts believe that quantum computing may render the underlying security of blockchain breakable by the year 2027 [67-68]. This entails serious research on quantum-safe and secure blockchain that withstand such breakability, and still guarantees high performance and scalability. Also this entails sound migration plans and interoperability with quantum-resilient blockchain platforms.

• **Governance. Governance** is the procedure of associations through the rules, laws, conditions, power or language of an organized society over a social system Deploying, constructing, and managing a blockchain platform among different participants and stakeholders is a tedious task. Even with a private of consortium blockchain, serious issues arise related to the type of blockchain to deploy (e.g., Hyperledger or Ethereum), who administers and troubleshoots the blockchain, the deployment location of the blockchain nodes, who writes the smart contracts, settlement of disputes, selection of trusted oracles, mechanisms for off-chain activities, deployment of side channels, regulations and standards to comply with, and many others. This entails research targeted at devising sound governance models [69].

IV. PROPOSED REPRESENTATION

Proposed representation of medical data using Blockchain Technology and AI in healthcare system : In the following figure which shows the proposed representation of medical data using Blockchain Technology and AI in healthcare system. The framework is generally categorized into four layers: Healthcare participants, blockchain layer, AI layers, and decentralized storage layers. These four layers are integrated with the smart contract or is also called as crypto contract to make decisions and maintain accessibility within the medical records for healthcare ecosystem.

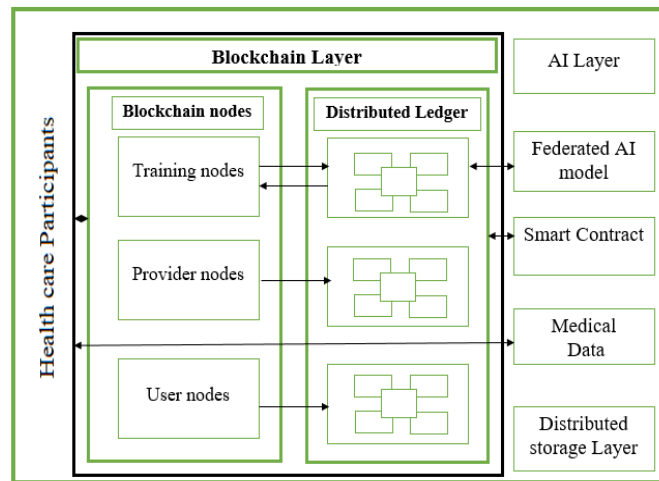


Fig 3. Representation of the Medical data using Blockchain and AI

V. DISCUSSION

With the help of Blockchain technology that brings integrity and outcome and findings to clinical records. Those data or records can be stored in the digital format as artificial intelligent contracts on the Blockchain platform. This blockchain technology and network infrastructure security at all levels, identifies the confirmation and validation of all records, and uniform patterns of authorization to access electronic health information are only a few of the benefits of Blockchain Technologies in Healthcare. A Blockchain technology is used to maintain the monitoring of the pharmaceutical supply chain and tracking of medication responsibilities. This blockchain technology is used to store the data and related information of even single individual patient and, therefore, helps to check and analyse the effects of a particular procedure. Blockchain Technology is used to store the data in block format and is used keep the medical patients data for keep track of records, clinical trial, patient observing monitoring, improves safety, display information and transparency of records. It also maintains the payment records in hospitals and minimizes the data transformation time and cost. Blockchain technology will generate a hash key for individual blocks of patient health records. Blockchain system would also encourage patients to show their required data to third parties while keeping their identity confidential. More records of data sets is required to analyze a medical clinical records. The researchers concentrate on these medical data sets and analyse routine implementation to provide analyses, and efficiency ratios under various conditions. The data are analysed, and more decisions are made based on these findings. However, many scientists can manipulate the data and evidence gathered to alter the result. Further, many drug makers want to record the findings that will provide their businesses with such advantages. Thus, researchers use Blockchain technology to make clinical studies fairer and more straightforward.

VI. CONCLUSION

There are more new innovative applications of Blockchain Technology in healthcare due to encryption and decentralization factor. This improves the main factor that is security of all patients' electronic medical records improves interoperability among healthcare organisations. This blockchain technology offers more reliable, shows potential security, availability, privacy, and trust in AI-based healthcare applications. In this article, an attempt was made to enumerate different possible ways with which the Blockchain technology along with Artificial intelligence can be integrated into the Healthcare system to improve the overall performance and to strengthen the current Healthcare sector. Also, various possible challenges and related work in the deployment of these two different and most useful technologies, i.e., Blockchain and Artificial Intelligence, in the Healthcare system were explored and discussed in detail. Even though, blockchain technology with artificial intelligence offers various features, there is still a need for more research to better understand, efficiently and securely develop and evaluate this technology because this technology have less experts. Future, in future this research work can be extended using patient's electronic medical records by implementing with various techniques available in artificial intelligence.

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