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A Survey On BLOCKCHAIN IN HEALTHCARE

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ABSTRACT

Blockchain technology is one of the most significant discoveries and inventive advances that is currently playing a crucial part in the professional world. The trajectory of blockchain technology is toward constant revolution and development. No matter how far apart two people are from one another, this chain of blocks protects their information and upholds their mutual confidence. The growth of blockchain technology over the past several years has compelled academics and industry experts to consider novel ways to integrate blockchain technology into a variety of fields. The exponential growth of blockchain technology has opened up a wide range of new application possibilities, including those in the field of healthcare. An in-depth analysis of developing blockchain-based healthcare technology and related applications is provided by this survey. In this investigation, we draw attention to the unresolved issues in this rapidly expanding sector by briefly outlining them. We also demonstrate how blockchain technology has the potential to revolutionize the healthcare sector.

1. INTRODUCTION

Blockchain technology[1] has become increasingly popular within the healthcare industry in recent years. The technology offers an array of advantages to the healthcare system, from ensuring data security to reducing costs. Blockchain is a distributed ledger technology that works by securely storing data across a network of computers. The data stored on the Blockchain is secure, immutable, and easily verifiable. The benefits of using Blockchain in healthcare are numerous. The technology can be used to securely store patient data, ensuring that it is kept confidential and safe from unauthorized access. Additionally, the technology can streamline the process of sharing data between healthcare professionals, making it easier and faster to access and share important medical information. Furthermore, Blockchain technology can help reduce costs associated with data management, as it is inherently more secure and efficient than traditional methods. Another key benefit of Blockchain technology is its ability to improve the quality of care. By securely storing patient data, Blockchain can help healthcare professionals make better and more informed decisions. Additionally, Blockchain can be used to create smart contracts, which can be used to automate various healthcare processes, such as claims processing and payments. In short, Blockchain technology has the potential to revolutionize the healthcare industry. By providing secure data storage, and streamlining data.

Blockchain technology has huge potential to revolutionize the healthcare sector. It is a distributed database that stores an unchangeable and secure digital ledger of transactions. This technology could enable healthcare providers and patients to access a single decentralized source of data, allowing for faster speed of care, better transparency, and improved security. Blockchain technology can be used to store patient data securely and accurately. By using blockchain, healthcare organizations can ensure that the data is not edited or tampered with, ensuring that it remains secure and private. Additionally, Blockchain makes it easier for medical organizations to securely store patient records, allowing them to access and share this data quickly and securely. This could potentially lead to improved patient outcomes. Furthermore, Blockchain technology can be utilized to facilitate secure payments between healthcare providers and patients. By using Blockchain, healthcare organizations can securely store and transfer payments between patients and providers, eliminating the need for third-party intermediaries. This could potentially lead to reduced costs for both patients and providers. Overall, Blockchain has the potential to significantly improve the healthcare sector.

Patients can benefit from medical information. The majority of this information, however, cannot be used interchangeably in the various institutions' present medical systems, necessitating new medical care for every patient in order to capture their medical data. Often, the only source of data is a hazy memory. Although paper medical records are still used by the majority of hospitals, they are easily lost or damaged, making them a particularly unreliable means for storing medical information. On the other hand, using conventional databases to share medical information frequently results in leaks because some dishonest staff members resell the information, further harming patients. Therefore, medical staff and patients urgently need a way to achieve medical information sharing between hospitals and to ensure a system where patient information will not be leaked, and Blockchain is currently a great way to implement this system. This study is planned to review the implemented approaches for Blockchain in the healthcare sector and analyze the work to direct future researchers of the area for more development to minimize the risky challenges for data exchange and dissemination service providers and subjects are needed to have combined secured data exchange technologies to create enlightened clinical decisions. The rest of the paper is organized into different but interrelated sub-sections. These are the paper we have thoroughly studied.

PAPER NAME	AUTHOR	YEAR OF PUBLICATION	MERITS	DEMERITS	METHODS / TOOLS
Research on medical system based on Blockchain technology[2]	Jia Qu EngD*	2021	PBFT implementation to achieve more efficiency in consensus algorithm	Theoritical model expected better working	PBFT DPOS

Research paper on the application of blockchain in smart healthcare constructing a hirerarchical framework[3]	Xiaomin Du Beibei Chen Ming ma Yanyiao zhang	2021	Intelligent medical development system based on blockchain and build a hierarchical model to overcome single information technic in IOT	This cant contain all the possible attributes	Fuzzy set Theory DEMATEL IoT
Using blockchain and semantic web technologies for the impletation of smart contracts between individuals and health insurance organizations.[4]	Efthymios Chondrogiannis Vassilki Andronikou Efstathios Karanastasis Antonis Litike Theodora Varvarigou	2022	The storing of data for a separated blockchain to enhance security	The smart contract based on time of last accepted block, which can be influenced by potential intruders	Etherium Virtual Machine Smart contract OWL XML METAMASK
Smart Healthcare System using Blockchain Technology[5]	Hammad raza Muhammad Amjad Salman Muneer	2022	Improves the healthcare of patients using IoT		IoT
Blockchain Technology for improving clinical quality[6]	Mehai Benchoufi Philippe Ravaud	2017	Preventing posteriors reconstruction through Smart contract	Lack of Transparency	Smart Contract

1.1 PBFT

The PBFT[7] algorithm is a consistency algorithm based on state machine replication. The service replicates in various nodes of a distributed system and functions as a state machine. The state of the service and the operations carried out are saved in each copy of the state machine. When the percentage of error-containing nodes does not exceed one-third of all nodes, this technique can guarantee the system will operate normally. The idea is to let every node that receives a message ask about the content of the message received by other nodes.

1.2 DPOS

Users in a DPOS[8] consensus can choose to cast their votes themselves or delegate their right to vote to another party. Blocks are built by selected witnesses by validating transactions. They are rewarded for validating and signing every transaction in a block, and this compensation is often distributed among those who voted for witness. A block is missed, all transactions are left unverified, and no reward is paid to that witness if they are unable to verify all of the transactions in the allotted period. The next witness who validates that block earns a bonus prize in addition to their own. The next witness collects these transactions, and the block is referred to as stolen.

1.3 DEMATEL

The decision-making trial and evaluation laboratory (DEMATEL) is regarded as an efficient technique for locating the causal links in a complex system. It focuses on assessing the interdependencies between elements and identifying the crucial ones using a visual structural model.[9]

1.4 FUZZY SET THEORY

A study strategy known as fuzzy set theory can address issues with ambiguous, subjective, and imprecise assessments and quantify the language component of accessible data and preferences for either individual or group decision-making.[10]

1.5 SMART CONTRACT

A smart contract[11] is a self-executing contract with embedded lines of code that define the parameters of the agreement between the contract's counterparties. A smart contract is essentially a digital rendition of the traditional paper contract that automatically enforces and carries out its conditions.

The smart contract is executed over a Blockchain network, and the network's numerous computers each contain a copy of the contract's code. This guarantees a more secure and transparent facilitation and execution of the contractual conditions.

1.6 OWL

Web Ontology Language abbreviated as OWL[12] is a Semantic Web language that is intended to process and integrate information on the web in a way that is analogous to how people reason. By using terminology and style that support automatic machine processing, it aims to make web material more comprehensible.[13]

1.7 XML

XML (Extensible Markup Language) is a markup language that is similar to HTML but does not have built-in tags. Instead, you create your own tags that are tailored to your requirements. In a format that can be kept, searched, and shared, this is a potent way to store data. Most crucially, because the basic structure of XML is standardized,[14] the recipient can still parse the data if you publish or transmit XML across systems or platforms, whether locally or via the internet. This is because XML syntax is standardized.

1.8 METAMASK

MetaMask[15] is a software cryptocurrency wallet used to interact with the Ethereum Blockchain. Users can utilize a browser extension or mobile app to access their Ethereum wallet, which can then be used to connect with decentralized applications. With MetaMask, users may send and receive Ethereum-based cryptocurrencies and tokens, broadcast transactions, store and manage account keys, and securely connect to decentralized applications using a suitable web browser. A user's MetaMask wallet (and any other similar blockchain wallet browser extensions) can be connected to, authenticated, and/or integrated with other smart contract functionality by websites or other decentralized applications using JavaScript code. This enables the website to send action prompts, signature requests, or transaction requests to the user through MetaMask as an intermediary.

1.9 IoT

The internet of things IoT defines as tangible objects with sensors convert capability software and different technologies that link and exchange info with different devices and systems over the internet or additional media networks. Internet of Things has been considered a misnomer cause devices do not need to be linked to all computer networks.[16] They only need to be linked to a network and be separately addressable.

1.10 EVM

EVM that stands for Ethereum virtual machine [17]in essence virtual machines serve as a coating of pensiveness betwixt two together the law being performed and bureaucracy on that it is being performed software flexibility is reinforced as uses are preserved despite everything each one and from their hosts by this coating of pensiveness the EVM is a tool used to predict the common state of Ethereum for each block on the Blockchain as it is amounted to the chain as accompanying other Bockchain-based networks Ethereum engages a delivered ledger to hold a record of transactions while imposing rules for by what method users can communicate on the network it further has its own native token in contrast Ethereums smart contract skills supply an extra coating of performance this second coating is as known or named at another time or place the delivered state structure Ethereums state can be delimited as a large table containing all of the ETH [18]reports and their associated balances with each block Ethereum state can be refurbished in accordance with the set of settled rules that can run some programming language this is a singular feature of Ethereum when a new block is added the Ethereum virtual machine EVM defines by what method the appliance will shift state essentially it executes tasks by executing particular instructions these are referred to as opcodes every opcode is one byte in size and is converted to bytecode before being used when you do a given task it is broken-down into its constituent bytes the Ethereum virtual computer is turing-complete as a result of a set of 140 opcodes in other words it should be able to solve nearly all computing issue EVM is isolated cause the code executing on it has no access to any additional processes running on your computer allowing it to perform deficient segregation to completely comprehend this you must first discover by virtue of what smart contracts work.

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2. RELATED WORK

Several surveys have provided overviews of Blockchain implementation in the healthcare area. They simply put the Blockchain technology advantages over any other technology in regards to security and trustworthiness. In contrast, our survey goes deeper into the implemented application using Blockchain and other technology required to support the technology to give the desired output in the healthcare sector and review models that have interpretable functions.

3. CONCLUSION

The Blockchain has to turn into an important technological movement for its application design it is thus of paramount task to landscape information for advancing understanding so that design practices may be enhanced in healthcare. there are risky challenges for data exchange and dissemination service providers and subjects needed to have connected secured data exchange technologies to create enlightened clinical decisions in this paper we discovered visions of Blockchain-based technologies and their potential uses for healthcare areas. The frontier of research as described in this review show that Blockchain-based solutions now are being researched in a few clinical trial structure use cases several additional health information structure domains are under-examined as we raise few if any publications that addressed several ways of implementing Blockchain technology in healthcare field along with PBFT, DPOS, DEMATEL, EVM, OWL, XML, META MASK, MACHINE LEARNING, IoT AND CLOUD
COMPUTING to make the healthcare sector more secured transparent and trustworthy by diminishing threats from within also from outside the healthcare sector

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