



Medical Applications using Blockchain and Machine Learning

S. Arun Kumar, Agniva Chakraborty

Abstract— Blockchain was particularly used in Cryptocurrency technologies. Prior to 20th century there was no other technologies for determining the health of a person naturally. At the dawn of the 21st Century machine learning played a vital role in determining the health of a person using various algorithms and natural language processing techniques. Now for every machine learning technique to work for it needs data. Data is very important as far as providing information is concerned. Data sharing plays a vital role in improving accuracy of techniques involved. Along the blockchain technology plays a vital role in this aspect. Thus, the merging of these two techniques involve provides highly accurate results in terms of machine learning with privacy and reliability of Blockchain technology. This technique uses natural language processing techniques which focuses basically mainly on healthcare techniques such as cancer detection, prediction of machines used in healthcare etc. Prior to healthcare which is used in blockchain it was used in cryptographic techniques only. Also, this technology can be used to provide medical suggestions to the doctors based on the condition of the patient. The accuracy of this method can be increased more using providing as much data as we can. This combination of Blockchain and machine learning algorithms can be used widely in healthcare, where the data is highly secured and there is no fear of data loss. This paper involves how combining these two technologies can be helpful in healthcare.

Keywords—blockchain, natural language processing, algorithms, cryptocurrency, data, accuracy, prediction

I. INTRODUCTION

The main objective of the whole system is to provide highly accurate results in terms of machine learning and blockchain technology. The blockchain technology uses decentralized storage medium for storing the data, and uses machine learning algorithms for obtaining desired results. This uses a natural language processing technique for detection of various diseases such as cancer, dengue etc. It is also used for providing medical suggestions to doctors. The main objective for using this natural language processing technique is because of seamless communication and sharing of expressions among two entities. Along with the algorithm blockchain is used for storing the data. Blockchain provides security and guarantees prevention of data duplication.

II. PROPOSED SYSTEM

The proposed system is to make an authentication card that is linked to a patient.

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* Correspondence Author

Mr. S. Arun Kumar, Assistant Professor, (Sr. G), Department of CSE, SRM Institute of Science and Technology, Chennai, India

Agniva Chakraborty, Scholar, B Tech, Department of Computer Science and Engineering, SRM Institute of Science and Technology, Chennai, India.

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The card is linked to the patient's directory. When a ledger is created the entire information is transferred to the card using blockchain technique. Also when the patient arrives at the pharmacy to collect medicines, the card is swiped again. In this process the card gets validated. Validation of the blockchain sequence is more important, as it helps in checking the authenticity of the ledger provided. The blockchain is validated using a hash value.

A. Authentication Card

This is the primary module of the blockchain system where all the information and health records based on the patient are saved there. The card is based on blockchain storage technique, which is a decentralized storage system. The authentication card can be updated with new ledgers that the doctor prescribes. The card also is unique to every patient ie no two patients can have the same card. Next we see about the next module ie the swiping machine where the card is swiped.

B. Card Swiping machine

The card swiping machine is the next module after the card. The card that is registered with every patient in the hospital, also has an electronic layer, where the information is stored. When the card is swiped in the machine, the information gets transferred into the blockchain based database. The card swiping machine updates the information and helps the card to access the database. Now we move on to the next module that is the blockchain database module proceedings, and not as an independent document. Please do not revise any of the current designations.

C. Blockchain Database Module

The blockchain database module is a pretty useful way of storing data. It is a decentralized storage medium in which is used to store the information. Due to its decentralized nature it employs a P2P ie a peer to peer networking architecture which embarks in better connectivity and security of data. In blockchain data are more secure than cloud storage systems. Also in blockchain, it is not owned by any private organization. Now we will see how blockchain database validates the data, and how the information is achieved.

D. Validation of Blockchain methods

Blockchain Validation is the procedure in which blockchains are validated and the correct information is judged. Blockchain data is validated using a hash. A hash is a 256 bit code which is used in encryption. A hash encrypts a fixed length of input into encrypted outputs of fixed lengths. There are many hash algorithms such as ("sha256, sha512, etc). Our module is based on sha256 hash algorithm. The hashing algorithm verifies the previous hashing. If both the hash matches, then strings are verified as equal.

E. Importing Python Modules

The various Python modules used in our system includes:- (“import hashlib”) and (“import uuid”). These are modules used in our system. Hashlib is based on an MD5 system which is a message digest algorithm, used hash function which generates 128 bit value. Also UUID is a module abbreviated as Universally Unique Identifier, which is a 128 bit number used to generate random numbers. As hashing is used in our system, random number has to be generated.

III. LITERATURE SURVEY

The concept of blockchain technology was implemented in the late 20th century, but it rose to an importance in the 21st century. With the increasing technology in today’s era, and due to emerging of high demand of security assignments the demand for blockchain technology also rose into prominence. Basically blockchain technology is a decentralized storage area which consists of ledgers and it keeps record of any transaction in the form of a hash value which is a 256 bit encrypted alphanumeric code in mixed cases that is upper case and lower cases in a much secured way than other storage mediums. Blockchain technology has emerged in healthcare in a number of ways ie in Personal Health Data sharing using cloud, wherein EMR method is used to share the personal health data of an individual using cloud storage. The main advantage of this is that the EMR method consists of the static records of a person and also it consumes very less storage space. There are other applications of blockchain which consists of lifetime data of an individual on the blockchain using a pseudo anonymous identifier. Also Storj and IPFS techniques are used. Here embedding helps in distribution of medical records in blockchain. Files can be altered here. Also using some techniques such as Med Rec tech, tree based data processing technique, Intel SGX etc in Secure and Smart Healthcare in Smart Cities Using Blockchain. The peak precision of blockchain can be obtained by Duplicated computing, Grid computing and Leverage technology. Grid computing is a distributed architecture of many computers which solves a tedious problem in a much simple manner.

IV. ARCHITECTURE DIAGRAM

The architecture diagram consists of various modules such as Drug manufacturer, patient, radiologist, lab technician, medical researchers, physician etc. The architecture diagram is a set of various modules that are managed by a blockchain server. The main system denotes that in a medical plant each and every individual patient has a unique authentication card for authentication and validation. In the card, the previous medical records of the patients are stored and the data can be altered and updated. This data is stored in the database using a blockchain wherein when the patient swipes the card using a card swiping machine the system redirects the user ie the patient in this case to his own unique database. Now all the processes occurs internally. Now all the processes occur in the blockchain database system. In here the blockchain framework checks the data and converts it into a hash value containing alphabets and numbers in which the data is encoded. Now there are some hashes, anything can be used correspondingly. The technique of checking of data is pretty simple but the implementation is the complex part. When the doctor adds any record or ledger in the blockchain

database of the patient, a new ledger gets created and then a new hash is created for the new data. The hashing algorithm checks the data in such a way that if the hash does not match the previous hash, then the data will not be verified accordingly.

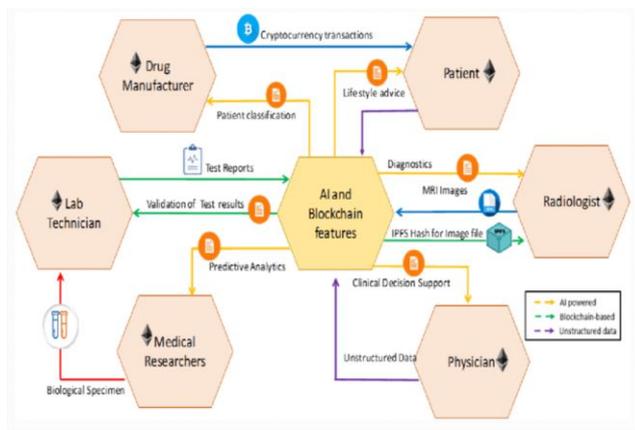


FIG 1

V. CRYPTOCURRENCY TRANSACTIONS

A cryptocurrency transaction is a transaction of digital asset for performing transaction and securing financial transactions. The decentralized control of every digital currency works through appropriated record innovation, ordinarily a blockchain, that fills in as an open budgetary exchange database. The payments of hospitals are huge and thus a secure payment method needs to be established and thus blockchain method are used in transactions purposes. The decentralized method of the blockchain is very useful in such cases where using its P2P configuration and IPFS system it undergoes the transaction process. The cryptocurrency transactions are based on certain digital assets that are used for performing transaction, also bitcoin can be used for cryptocurrency transaction but do not have any such relevance for this system. Thus the cryptocurrency transactions can be used in this system.

VI. PATIENT CLASSIFICATION

The different patients in the total healthcare system can be classified and identified using the blockchain mechanism. As discussed earlier a card is provided to every registered patient by the hospital’s managing authority and the card is authorized for the patient’s classification and redirecting to the database of the hospital that runs on a blockchain manner. Thus the patients are classified based on the different authentication card system. Now this method comes into play when in the pharmacy is flooded by patients and everybody requires the proper medicine for treatment. In such cases the patient classification method comes into play, using the blockchain system we can classify the patients accordingly.

VII. LIFESTYLE ADVICE

The lifestyle advice module present on the architecture diagram is based on artificial intelligence mechanisms, where the program checks,



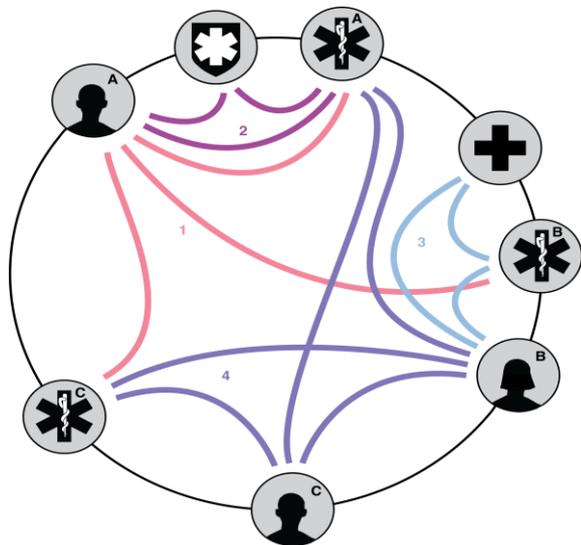


FIG 3

Well MEDREC being the ultimate module in our system embarks the blockchain implementation in it. Well MEDREC doesn't store knowledge physically however it encodes information to assist patients firmly access them. The information contains info concerning possession, permission and therefore the integrity of the info being requested. the primary implementation of MEDREC used the worth of information to insensitive 'mining' of the MEDREC blockchain, that is needed for the system to scale and therefore the chain to advance. The mining method a computationally intensive hashing exercise would be performed by medical researchers, United Nations agency successively would gain access to mixture and anonymised knowledge which may be accustomed additional medical analysis.

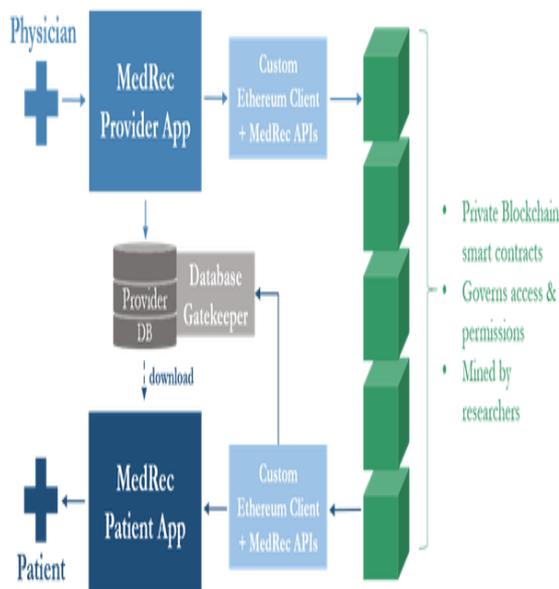


FIG 4

This MEDREC technology is a project for patients welfare. This project is supported by a grant from the Henry Martyn Robert Wood Johnson Foundation, with extra support from the university Media research lab. This concludes MEDREC technology and also the end of our modules and techniques

for this project. The conclusion of our project is present in the next topic.

XII. CONCLUSION

To conclude this project I would like to give a brief on what is covered in this whole paper. As we can know from the paper title Medical Management using blockchain and Machine learning it emphasizes on blockchain technology and Machine learning techniques in medical department for human welfare. To explain the brief working of the system, the system would store all the medical records or data ie lab results, test reports, blood reports, medical history, etc of each patient individually. This data can be accessed only by the individual patient who is authorized by an authentication card that is provided to them at the time of registration. Now when the card is swiped across a machine the electronic material of the card redirects it to the patient's database which is based on blockchain implementation which cannot be duplicated or frauded by anybody as the blockchain uses a hash value for validation. Thus any alterations in the data results in alterations in the hash values and thus the data is blocked and cannot be retrieved. Now there are some techniques involved such as IPFS file hashing system and MEDREC system which stores the patient's data as a digital asset and using a decentralized storage medium of intermediate elements. This is the blockchain mechanism of the system. Now let us talk about the machine learning element in our system. The machine learning algorithm uses training sets of data to undergo prediction and analyses the condition of patient and also checks the medical records of the patient for proper treatment. It provides suggestions to the patients for lifestyle. the such as calorie intake, nutrient intake, exercise etc. This whole system is focused on medical technology for the benefit of human beings, and machine learning and blockchain technology has made it gone further to the next level. I would like to conclude by stating that this system can bring glory and convenience to human kind. But blockchain cannot be minimized, it requires a lot of computing power to operate thus blockchain technology uses excessive energy . Also we cannot rely completely on blockchain as it is not completely indestructible. But despite all blockchain is convenient in medical management..

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AUTHORS PROFILE



Mr. S. Arun Kumar, Assistant Professor (Sr. G), Dept of CSE, SRM Institute of Science and Technology, Chennai, India Holds a post-graduation degree M.Tech (CSE) from SRM Institute Of Science and Technology. Having more than three years of teaching and Industrial. He can be reached at Email: arunatr85@gmail.com



Agniva Chakraborty, UG Scholar, B Tech, Department of Computer Science and Engineering, SRM Institute of Science and Technology, Chennai, India. He can be reached at Email: agnivariju@gmail.com