

Machine Learning and Blockchain Techniques Used in Healthcare System

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Abstract—Information systems and computerization nowadays need very faster, secure & easier data analysis techniques. It is also required to maintain efficiency and accuracy in data analysis. So machine learning & Blockchain techniques have been continuously used in the data analysis & security in various fields from medicine to organization and education to energy applications. This study applies classification of machine learning & Blockchain techniques to process the data and survey of selection methods, query strategies, applications and security. In highly secure data, Security issues are solved by using Blockchain Technology.

Blockchain technology is rapidly gaining attention towards the Security of confidential data. The healthcare industry is one of the fields of organization where high risk involves & its attracted attention of many technological organizations so this field required the security for securing their data. The Blockchain is generally used for providing the security to secure the high sensitive data. By using the Blockchain technology there are numerous opportunities for healthcare industry to achieve & gain. Such as reduced transaction costs, increased transparency for regulatory reporting, efficient healthcare data management and healthcare records universality as well as able to access data from any location. In the context of smart healthcare system blockchain may provide distinct benefits, particularly from a context-aware perspective where efficient and personalized solutions may be provided to citizens and the society. This paper provides a comprehensive survey of relationship between Machine learning and blockchain techniques related to smart healthcare system. In addition, we are going to discussed several challenges can comes for actually implementing machine learning secure healthcare system using blockchain based Technology.

Keyword: Machine Learning, Blockchain, Security.

I. INTRODUCTION:

In this era of computerization of business, organizations focus is mainly on future predication by considering the historical data. Machine Learning is an approach or subset of Artificial Intelligence that is based on the idea that machines can be given access to data along with the ability to learn from it. It learns from examples and experience, without being explicitly programmed. Instead of writing code, you feed data to the generic algorithm, and it builds logic based on the data given. In a general manner, Machine Learning is a system that works and gives output on the basis of histological data without any interaction of human on the basis of data analysis. This can be happened by storing the histological collected data

and applying the different algorithm and method for predicting the expected output. The choice of method and algorithms are depends on what type of data do we have and what kind of task we are trying to automate. The paper organized as follows.

Section II focus on need of machine learning and blockchain techniques, section III explain about application of technology given in section II ,section IV gives the idea about supervised and unsupervised methods and finally section V gives the conclusion[1].

II. NEED OF MACHINE LEARNING:

Machine Learning is a field which came from AI. By using AI we need to work on better Machine which can predict the decision. But AI is not only finding the shortest path between the system it's a system where we can work on other work which predict the future on basis of Histological data[3][5].

Its can be archive by using the Machine Learning it can be use to predict the decision on basis of Histological data. This sounds similar to a child learning from its self. So machine learning was used as a new technology for computer society And now machine learning is present in so many segments of technology, that we don't even realize it while using it. Finding the patter of earth through which its gives it output only possible by human brain. The data being very massive, the time required to complete it takes a more time and at that time to reduce the time and gives the expected output we used Machine Learning, which help people to handle large data in minimum time.



Fig. 1. Machine Learning Process

If big data and cloud computing are gaining importance for their contributions & data sharing and available any where any time, machine learning as technology helps to process a large amount of data, easing the task of data scientists in an automated process and gaining equal importance and recognition. The techniques we use for data mining was from last many years, but they were not efficient to get perfect output as they are not able to used algorithm which gives efficient output[13]. If you run deep learning with access to better data, the output we get will lead to dramatic breakthroughs which is machine learning.

Blockchain Technology:

Blockchain Technology is very useful system which attracts the attention of my user and technical person in recent years. It is a transparent, distributed, in general it used for providing the security to secure the high sensitive data. By using the this technology there are numerous opportunities in many industry to achieve & gain. Such as reduced transaction costs, increased transparency. This system generally used distributed ledger database which is decentralized in network which is connected through peer to peer network. The system is used by different network but connected through node to node. Blockchain is one form of DLT. The blockchain is continues link of number of block in one sequence in the form of one continuous connected structure which link one block to another block in the form of chain. The continues connected chain based block structure is the most popular data structure of DLT, but it is not the only one. There are also different data structure uses by them[14]. All of those data structure work on same logic but have some different methods. But by using those systems we are able to get good performance in less time period.

Blockchain is the most widely used scattered data that can store anywhere on virtual network, so in this paper, we mainly focus on blockchain technology. Blockchain technologies have different type mainly they focus on three constraints: public blockchain, consortium blockchain and private blockchain. The public blockchain is non trusted technology this system shares the data publically and access by anyone, while both other blockchain technology can able to provide the security and required authentication while accessing the data. In the public blockchain, anyone can able to access data and share data from any location and able to do transaction due its unsecure nature have some issue to loss of data. Those system don't need security and open access to all user uses the Public Blockchain method because it has less cost and don't need to buy it. The crypto currencies are the main example of public Blockchain technology that are generally used. Bitcoin is the most famous crypto currency that is created by Satoshi Nakamoto in 2008. Ethereum is another representative public blockchain those can be used by different system and use to access by different user. Its uses the decentralized data by using public blockchain system and Crypto currency is best example of it.

Need of Blockchain:

The blockchain mainly used for Security purpose for securing the data. The data sent to each block in distributed share network on those every one can able to access the data

with proper authentication; due to this process able to reduce the error in system in another word we are able to secure the system. While we are accessing data or use the data on network any inaccessible thing happened on network which is not store on system treated as unauthorized and immediately marks it as error to protect the system. This secure nature of decentralized blockchain technology means that is protecting the total blockchain shared database store on network and able to remove/reduce the attack attempted by unauthorized person. Due to this secure nature blockchain mainly used where more protection is needed in distributed database.

Categories of BlockChain:

Blockchain structures fall into three categories:

Public blockchain Architecture

An open blockchain engineering implies information stockpiling on cloud or virtual system can be access by any individual whenever from anyplace (for example Bitcoin, Ethereum, and Litecoin blockchain frameworks are open).

Private blockchain Architecture

Instead of open blockchain engineering, the private framework is controlled distinctly by clients from a particular association or approved clients who have a greeting for investment[13].

Consortium blockchain design

This blockchain structure can comprise of a couple of associations. In a consortium, methods are set up and constrained by the starter appointed clients.

The Three Pillars of Blockchain Technology:

The three primary properties of Blockchain Technology which has helped it increase far reaching praise are as per the following:

1. Decentralization
2. Transparency
3. Immutability

Key Characteristics of Blockchain Architecture

Blockchain engineering has a great deal of advantages for organizations. Here are a few implanted attributes:

Cryptography - blockchain exchanges are approved and dependable because of the mind boggling calculations and cryptographic evidence among included gatherings

Immutability - any records made in a blockchain can't be changed or erased.

Provenance - alludes to the way that it is conceivable to follow the source of each exchange inside the blockchain record

Decentralization - every individual from the blockchain structure approaches the entire circulated database. Instead of the focal based framework, agreement calculation considers control of the system

Anonymity-each blockchain organize member has a created location, not client character. This keeps clients' obscurity, particularly in an open blockchain structure

Transparency - the blockchain framework can't be ruined. This is probably not going to occur, as it requires tremendous figuring capacity to overwrite the blockchain organize totally.

III. HEALTHCARE SYSTEM

Currently, there are several disadvantages in the area medical care industry of organization related to health system, records store on cloud, mainly on how medical or healthcare related data from different sources is accessed, processed, and analyzed from different database those are store on cloud and able to access from anywhere. Currently there is no system which store all medical or healthcare related data on cloud like lab tests, imaging, or a patient's medications between visits which can be access from anywhere with secure system[14]. Now a day's many medical related department used computer system and software to store the data on system instate of manual system that reduces the human effort to access data manual and reduce the time & effort to access those data. But still customer not able to access data online from their own place they need to visit the place manually it required more time.

This can be challenging task as there is no single source where total medical/health related data store and customer can access those data from any point or place so can reduce the effort and time of customer. Interoperability and different data standards or format are significant challenging task to merge the data. From many year many people working on that system to store all medical related data store centralized or decentralized and can access from anywhere but due to security issue not able to implement those system. In addition, there is possibility of multiple storage of data on cloud so its increase the duplication of records and increase the confusion and time. These unnecessary and expensive tests are unused, while simultaneously put the patient at risk. Prescription fraud also faces a similar problem. From this point of another challenging task to keep data secure from unauthorized person. The past few years many organization works on security of data so that data store on system can protected from unauthorized person with no effect from theft. Consequently, health care providers are looking for more effective ways to secure the personal health information which store decentralized on system or network. Supervised learning begins with the objective of anticipating a known yield or target. In AI rivalries, where individual members are made a decision on their exhibition on normal informational indexes, intermittent administered learning issues incorporate penmanship acknowledgment, (for example, perceiving written by hand digits), arranging pictures of articles (for example is this a feline or a canine?), and report order (for example is this a clinical preliminary about cardiovascular breakdown or a budgetary report?). Remarkably, these are generally undertakings that a prepared individual can progress admirably thus the PC is regularly attempting to rough human execution. Where as in unaided learning, there are no yields to foresee. Rather, we are attempting to discover normally

happening examples or groupings inside the information. This is innately an all the more provoking undertaking to pass judgment and regularly the estimation of such gatherings learned through group learning is assessed by its presentation in resulting supervised learning assignments.

Generally, there are different fundamental challenges in the field of healthcare system for working with them. Some of its fundamental challenges related to managing EHRs is as follow,

- 1) it's very hard to share the medical or healthcare data with customer with proper protection.
- 2) Patients are limited access to their own data and their management due to security reason.
- 3) All data not available on any decentralized system for accessing.
- 4) Patient Not able to get time to time updation related to health.

IV. SUPERVISED & UNSUPERVISED METHOD IN MEDICAL FIELD FOR TRAINING THE DATA

Supervised learning:

Supervised learning begins with the objective of foreseeing a known yield or target. In AI rivalries, where individual members are made a decision on their exhibition on normal informational indexes, intermittent directed learning issues incorporate penmanship acknowledgment, (for example, perceiving manually written digits), grouping pictures of items (for example is this a feline or a canine?), and record grouping (for example is this a clinical preliminary about cardiovascular breakdown or a budgetary report?). Notably, these are all work and task can be perfectly performed well by using computer so its gives better performance. Supervised learning work on the bases of well trained system those can perform task by trained person and predict the output by using this method we are able to produce good output with proper predication and gives good performance. So able to get proper thing with less time period as its uses the trained data.(such as the temperature in San Francisco tomorrow afternoon).

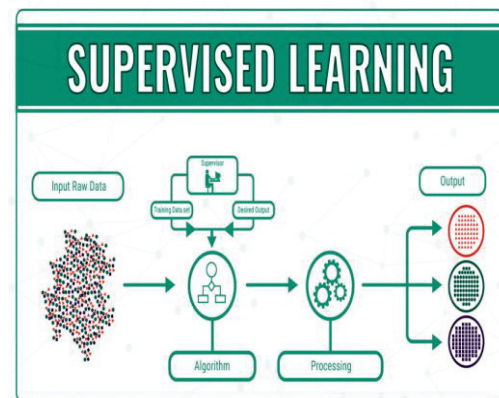


Fig. 2. Supervised learning Process

What may be a few instances of supervised learning in medication? Maybe the most widely recognized model seen by a cardiologist is the computerized translation of the EKG, where example acknowledgment is performed to choose from a constrained arrangement of analyses (for example a characterization task)[14]. In radiology, mechanized location of a lung knob from a chest X-beam would likewise speak to administered learning. In both these cases, the PC is approximating what a prepared doctor is as of now equipped for doing with high precision. Supervised learning is frequently used to gauge chance. The Framingham Risk Score for coronary heart disease (CHD) may in certainty be the most usually utilized example of directed learning in medication. Such hazard models 9 exist crosswise over medication, and incorporate directing antithrombotic treatment in atrial fibrillation and implantation of robotized implantable defibrillators in hypertrophic cardiomyopathy. In demonstrating hazard, the PC is accomplishing more than only approximating doctor abilities however discovering novel connections not promptly obvious to people.

Unsupervised learning

In contrast, in unsupervised learning, there are no outputs to predict. Rather, we are attempting to discover normally happening examples or groupings inside the information. This is naturally an all the more provoking errand to pass judgment and regularly the estimation of such gatherings learned through solo learning is assessed by its exhibition in resulting supervised learning undertakings.

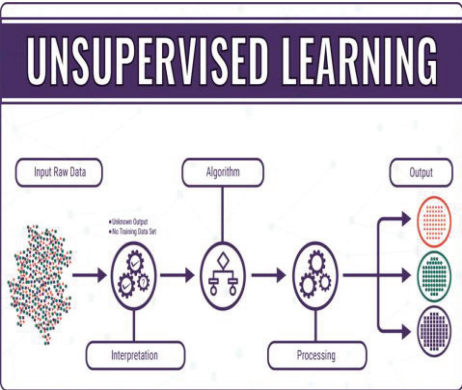


Fig. 3. Unsupervised learning Process

Disappointed by the inborn heterogeneity in most regular illnesses, there is a developing exertion to reclassify ailment as per pathophysiologic components, which could, thusly, give new ways to treatment. Be that as it may, distinguishing such components for complex multifactorial ailments won't be simple. One can begin with a huge gathering of evidently comparable people with unexplained intense systolic cardiovascular breakdown. One would then be able to perform myocardial biopsies on them, and portray the cell creation of each example with a procedure, for example, immunostaining. For instance, one would have a count of T lymphocytes, neutrophils, macrophages, eosinophils, and so forth, at that point check whether there are repeating examples of cell structure, which, thus, may recommend system and guide treatments to investigate. A comparative approach, but

centered around genomics, prompted distinguishing an eosinophilic subtype of asthma, which interestingly reacts to a novel treatment focusing on the eosinophil-discharged cytokine IL-13 [13]. With administered learning – there is no anticipated result – we are just keen on distinguishing designs in the information. Actually, regarding this as a managed learning issue –, for example, building up a model of mortality in myocarditis and ordering patients by chance – might miss such subgroups totally, along these lines losing an opportunity to distinguish novel illness components.

Data Science of healthcare data analytics:

There has been information explosion of big data in the healthcare field. Traditional technologies adopted earlier to analyze genomics, DNA, and cancer with trial and methods through Human Genome Project have taken more than a decade to understand and analyze the composition of DNA and the patterns of the data. Big Data Analytics introduced revolutionary tools and techniques to analyze the chronic diseases for prevention and cure. Genome sequencing has been used to understand the potential root causes of tumor growth causing cancer. The data has grown exponentially from terabytes to exabytes. The healthcare data from X-Rays, CT scan and MRI has increased by leaps and bounds concerning the volume of the big data. The advanced technologies of medicine through big data analytics allowed to diagnose the patients records and perform a comparison to a global population to separate the noises from the signal to understand the trends of the tumor growth which was not possible earlier and speed up the diagnosis and treatment. Though there are several theories and techniques that can be applied for the diagnosis of the illnesses, this paper briefly reviews some of the key techniques.

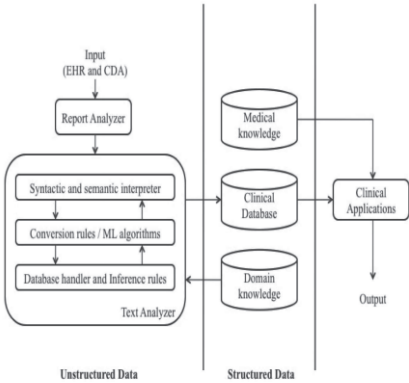


Fig. 4. How Healthcare related data Process

One of the most important to combine the healthcare with machine learning or data processing it get train data in less time period. Unsupervised learning is main thing to gain thing goal from trained data, because unsupervised learning do not need a trained data. The data used by unsupervised learning is not properly structured and storage anywhere in system. By using the different method we are able to work on healthcare data and provide the security[13]. Mostly we work on gathered data by forming the cluster of data and analyzing those data

properly. Those data we are going to store on cloud so we are able access those data in anytime and anywhere. Some of the objective that can be achieve by working on healthcare data is as follows,

- To enhance the interoperability by handling and maintaining distributed data on cloud.
- To design efficient method for data validation and prevents it from the threat of hacking.
- To save the time and money of patient.
- To develop an efficient mechanism to manage access to Electronic health records stored on cloud.
- To provide home health care services that promotes the patients value of life:
- Minimizing patient illness, disability and diseases.
- Maximizing patient's potential level of independence.
- To improve quality, safety, performance and accountability.

V. CONCLUSION:

Today, it is not possible to use or considers Machine Learning as a secure data store method as number of data store on different places and we are accessing those data and analyzed it in parallel manner. But by using the Machine learning and blockchain technology it is possible to make accurate estimations or predictions about future results. Also we have discussed how the medical or healthcare related data can be secured. This study has used various classification techniques and Blockchain technology to a group or individuals who are in the process for accessing the Data. Since using machine learning techniques and blockchain method in classification studies results in accurate outcomes accompanied with significant saving in terms of time, cost and security, it is highly recommended to make use of machine learning techniques and blockchain method in Data Processing and for providing the security to access those data. This study will be useful for organizations and individuals operating in all areas, here we mainly focus on medical field that have gone for computerization of their business processes and patient can able to access the data from any place. Due to Blockchain method no one can directly access data without proper authentication. In future we are going to discuss how to access healthcare related decentralized data stored on cloud by

providing the security using Blockchain technology. Due to it patient can able to access data from anywhere with proper authorization which may save the time, effort & cost of patient.

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