Converging Blockchain And Machine Learning for Healthcare

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Abstract **- Machine learning is immensely used to interpret design in data, analyzing and making decisions. Its significance is presented in various sectors. Data sharing and data reliability are two major components in machine learning. So, in order to improve its accuracy decent amount of data is required. In this project to overcome the issue of data sharing and data reliability, the decentralized database in Blockchain Technology is implemented. The consent in Blockchain Technology assures to be legitimate and secured. The potential of Blockchain Technology is it uses the current healthcare Data into peer to peer and interoperable manner eliminating the third party. So as to achieve machine learning emphasizing on security and Blockchain Technology emphasizing on reliability, converging both these technologies can give highly accurate results. Also using these technologies, application can form transparent and immutable record of data with reduced systematic fraud. This project gives an overview of how integrating these two technologies make an improvement in healthcare sectors.**

Keywords: Machine Learning, Blockchain Technology, Healthcare, Decentralized.

I. INTRODUCTION

Machine learning is nothing but scientific study of various algorithms and statistical models used in computer systems that rely on patterns and inference to perform a particular task effectively instead of using explicit instruction. In machine learning, data is very crucial asset. The importance of machine learning models has shown their eminence in various sectors such as healthcare, transportation, marketing and e- commerce. In case of healthcare it can be used for prediction and detection of diseases like cancer, heatstroke's, etc. With increasing needs, the data is also increasing and so data is stored in centralized servers. The data available in these centralized servers can be used with a fee. And thus, becomes a disadvantage i.e. it limits the quality of research. Another disadvantage is that due to failure issues in centralized server the reliability reliability of data also suffers. And then comes Blockchain with decentralized database which solves the issue of data reliability. So, users can directly access the data in decentralized database. Blockchain is a fixed time-stamped series record of data that distributed and linked using cryptography. In short Blockchain technology distributed network of interconnected nodes in which everyone has the copy of distributed log which has details of each and every transaction that takes place in Blockchain network. Machine learning models can be directly fed by data. The adaptability and capability of Blockchain technology is increasing rapidly. Treatment is predicted on the basis of symptoms given by patients by using machine learning. It is also used to give advice as per medical situation.

II. AIMS AND OBJECTIVE

a) Aim

The aim of the project is to give clinical suggestions to doctors on the basis of patient's symptoms. This system helps to analyze the disease based on patient's symptoms and accordingly gives treatment suggestions. It can be used for prediction and detection of diseases.

b) Objective

The objective of the project to detect correct disease and give treatment suggestion accordingly. It will provide data reliability. It will manage database size and transaction record alteration.

III. LITERATURE SURVEY

Paper 1: E-Voting with blockchain: An E-voter privacy:

Blockchain technology supports inter-connected nodes of distributed network consisting of large number. Lack of interest in voting is a potential solution to E-Voting. Each

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node has their own copy of the distributed ledger that contains full history of transactions. It can be views as special cases of secure multi-party computation. Blind signatures and blockchain introduces a lot of desirable properties.

Paper 2: How blockchain-timestamped protocols could improve the trustworthiness of medical science:

Blockchain is a distributed, tamper proof public ledger of timestamped protocols. It allows the exact wording and existence of a protocol at a given point in time to verified. In this system once a block of data is recorded on a ledger of blockchain and once it is reached to do required changing on thousands of computers worldwide. It increases the trust of patients.

Paper 3: Survey of e-Health Status and Services in Eastern India:

E-Health services programmers in eastern India offered as challenges faces and nature of their abstracting had brought so many e-health programs being offered today as saw treatments compliances data collection and disease surveillance and other medical evaluation. Its unusually recorded it is extremely difficult to change. If the changes are done, then the user had that e-health will have sustainable impact on all the social involvement in all areas. [10]

IV. EXISTING SYSTEM

The existing system focus on detecting diseases and giving treatment suggestions on patient's symptoms. But they neither focus on their accuracy and efficiency. This project handles these issues. The existing system contributes on prediction and detection of diseases based on patient's symptoms. And also resolves the data acquisition problem since every authenticated user will have a shared ledger. The authorization and authentication

Authorization and Authentication: Blockchain network will provide an authorized certificate from Certificate Authority to every user. This digital certificate will be used for transaction process.

Prediction and detection of diseases: When patient enters their symptoms, it analyses the disease and suggests the treatment related to that particular disease. And the patient's report can be accessed by that patient itself and also by doctors.

V. COMPARATIVE STUDY

Table 1: Comparative Analysis

SR NO.	PAPER TITLE	AUTHOR NAME	METHOD	ADVANTAGE	DISADVANTAGE
1.	E-Voting with Blockchain: An E-Voting Protocol with Decentralization and Voter Privacy	Freya Sheer Hardwick, Apostolos Gioulis, Raja Naeem Akram, and Konstantinos Markantonakis, ISG-SCC May 25 2018	Based on blockchain technology.	Greater transparency.	It does not fix internet voting security.
2.	How blockchain-timestamped protocols could improve the trustworthiness of medical science	Kan Yang, Xiaohua Jia, Kui Ren, Bo Zhang, Ruitao Xie, Institute of Public Health, University of Cambridge, 26 Feb 2016	Based on timestamped protocol using SHA256.	Extremely robust verification.	Difficult to modify the data.
3.	Survey of e-Health Status and Services in Eastern India", Far East Journal of Electronics and Communication	Subhranil Som, Rajashree Roy Som and Renuka Mahajan, Far East Journal of electronics and telecommunication, Nov 2016	Based on telemedicine software.	Easiest method for respondent.	Slow speed, cost can be very high.
4	A Peer-to-Peer Electronic Cash System	Satoshi Nakamoto, IEEE, 2008	Based on digital signature and cryptography.	Easy to manage on small scale.	Files and folders cannot be backed up.

VI. PROBLEM STATEMENT

These method goes through by the transparency between medical facilities, insurance providers, and patients. Doctors, insurance providers and medical facilities come across many medical data of patient. Today, it's a sort of puzzle of patient's medical history and records. This jumbling of data is the cause loss of integrity and accuracy. Diagnostics, health recipes and drugs prescriptions are also concern by this. All of these factors impact proper treatment. Sometime it can be the mean difference between death and life if the proper information of patient is not gathered.

VII. PROPOSED SYSTEM

Blockchain stores the record of digital medical records and help healthcare sector parties to put health data puzzle

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together in the specimen. Thus, on each patient's record, the data will be up-to-date and can be understandable by anyone who is involved in the process. Accurate medical data management becomes the advantage of healthcare. Data entered into Blockchain should be immutable. The development of Machine Learning and the popularity of Machine Learning devices, people are gradually getting accustomed to a new era. Machine learning is nothing but scientific study of various algorithms and statistical models used in computer systems. Blockchain is a fixed time-stamped series record of data that is distributed and linked using cryptography. Doctors can be trained to predict future outcomes. Since data files are sensitive, data privacy is big challenge manage by transaction manager.

The framework is an overview of how combining these two technologies can help in healthcare sectors. (1) Doctor (2) Patients

(3) Transaction Manager (4) Blockchain

(5) Machine Learning.

VIII. ALGORITHM

The general idea of working of proposed system algorithm is given as follow:

Naive Bayes Classification
Step 1: Start
Step 2: Input parameter = symptoms.
Step 3: Initialize s, sum
Step 4: Accuracy = Naive Bayes
Step 5: While within bound.
Step 6: Predict diseases.
Step 7: Transaction
if transaction <ledbalance then
transaction=sum-ledbalance
Step 8: Update Blockchain
Step 9: Update Node
Step 10: Update Ledger
Step 11: Transaction successful
Step 12: End.

SVM classification
Step 1: Start
Step 2: Sample data= Medical data
Step 3: Input parameter= Symptoms
Step 4: Initialize s
Step 5: Analyze = SVM (Trained data)
Step 6: Identify the disease
Step 7: Update Admin
Step 8: Prediction successful
Step 9: End.

IX. MATHEMATICAL MODEL

1. Naive Bayes algorithm:

Naive Bayes are simple and easy to build. Naive Bayes has strong, independent assumptions features. They are known even to perform highly sophisticated model classification.

$$P(c|x) = \frac{P(x|c)P(c)}{P(x)}$$

Here,

- P(c|x): posterior probability of class (c, target) given predictor (x, attributes). This represents the probability of c being true, provided x is true.
- P(c): is the prior probability of class. This is the observed probability of class out of all the observations.
- P(x|c): is the likelihood which is the probability of predictor-given class. This represents the probability of x being true, provided x is true.
- P(x): is the prior probability of predictor. This is the observed probability of predictor out of all the observations.

2. SVM Classification:

$$y=\text{sign}(\sum_{i=1}^{m} K(x,x_i))$$

Here,

- K: Is a kernel function which measures the similarity between two diseases x and x_i.
- x: Predict the disease by symptoms.
- y = identification of disease.

3. Decision Trees:

Decision Trees are the natural result of a "divide-and-conquer" approach to the problem of learning from a set of independent instances. Each node in a decision tree involves testing a particular attribute, while leaf nodes give a classification to all instances that reach the leaf. Attributes represent the columns while instances the lines of the data set.

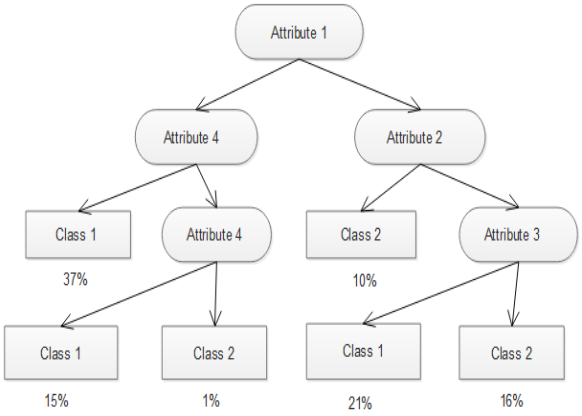

Fig.1: Planned Decision Tree

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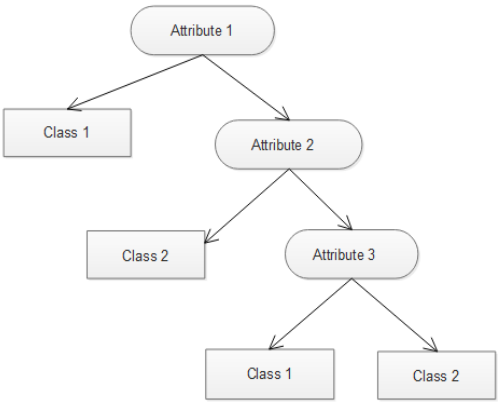

Fig.2: Unplanned Decision Tree

X. SYSTEM ARCHITECTURE

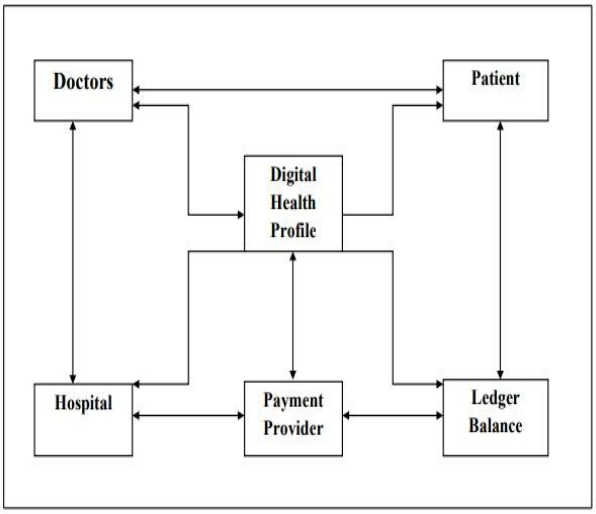

Fig.2: System Architecture

Description:

Doctor: On the basis of symptoms and other laboratory reports, the train model can predict the outbreak and the diseases related to it.

Patient: On the basis of patient's symptoms/problems it can give suggestions and lifestyle advices. And since the trained model deals with real data, this increases the accuracy and efficiency.

Hospital: Expert doctors from different hospitals will login and help the patients on the basis of symptoms and reports. And thus, doctors will suggest the medicines.

Payment Provider: After diagnosis process of the patient then the hospital will provide a payment slip online and the patient will further pay it by online transaction.

Ledger Balance: Ledger report shows the history of patient services, service charges and descriptions, applied payments and adjustments and also shows remaining balances. Undisbursed patient payments also appear on this report.

XI. ADVANATGES

- Secure storage and integrity protection.
- Privacy and ownership of data.
- It increases accuracy and efficiency.
- It provides data reliability and data sharing.
- It provides transparency .and accountability of data.

XII. DESIGN DETAILS

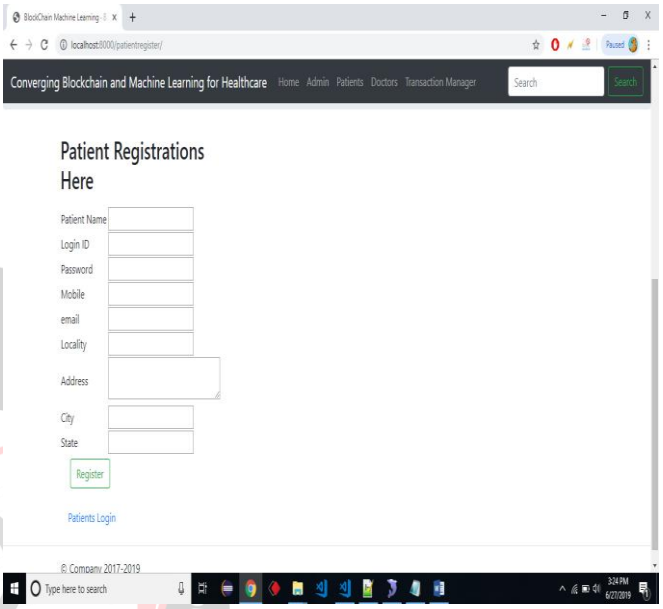

Fig.3: Patient Registration

XIII. CONCLUSION

Thus, we have tried to implement the paper

"Moises Diaz, Andreas Fischer, Miguel A. Ferrer, and Réjean Plamondon, Fellow", "*Dynamic Signature Verification System Based on One Real Signature*", IEEE 2016 and according to the implementation the conclusion is for the verification of the signature. System has performed verification of the signature whether the user signature is genuine or forged. systems also calculated the accuracy of the signatures. The method of signature verification, preprocessing, and future extraction benefits the advantage of being exceptionally satisfactory by potential clients when appeared differently in relation to the rest of biometric courses of action. Hence the above project implemented is basically for the verification of the user signatures.

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