Analysis of Human Diseases using Artificial Neural Network and Blockchain Technology

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ABSTRACT

With the development of engineering technology and artificial neural network which mimic human brain neural networks, are being using in medical diagnosis for various human diseases. The purpose of this paper is to investigate and study various diseases using neural network and blockchain technology used in medical diagnosis. Emerging technologies like artificial Neural Network and Blockchain Technology are revolutionizing the existing healthcare infrastructure, which is a difficult task to securely and accurately forecast different diseases in Human being. Blockchain and ML are providing the best solutions to gather information while predicting and securing human disease. This study provides comprehensive reviews on different Artificial Neural Network techniques, Radial Basis Function (RBF), Generalized Regression Neural Network (GRNN), Support Vector Machine (SVM), Feedforward Backprogation Neural Network (FFBP), Convolutional Neural Network (CNN), in order to predict various human diseases. Artificial Neural Network, in addition to its strengths, may assist in overcoming many of the restrictions that Blockchain Technology base systems used in medical diagnosis of various diseases. These two technologies when combined can produce high performing and valuable solutions. In this manuscript, Blockchain Technology and how machine learning skills can be combined with a blockchain based systems are studied.

Keywords : Blockchain Technolom.gy, Neural Network, Heart Disease, Brain Tumor, Data mining

I. INTRODUCTION

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. [1-3].

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.

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 [4-5].

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 [6-7].

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 [8-10].

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 [11-14].

II. RELATED WORK

Blockchain, originally developed to support the cryptocurrency ecosystem, has recently been used in various other fields to achieve extraordinary levels of

security [15-16]. Similarly, the healthcare sector has started integrating blockchain into various aspects of this digital age. Its features such as micro-transactions, decentralized exchanges, consensus mechanisms, and smart contracts allow for securing the privacy of the health data of patients who are key stakeholders in the healthcare domain. These data include patient clinical and trial results, billing information, medical reports, etc.[17-18].

Up to now, various classification algorithms have been employed on Turkoglu's valvular heart disease data set and high classification accuracies have been reported in the last decade [19]. Turkoglu's valvular heart disease data set was obtained from Firat Medical Center. A detailed description for the data set will be given in the next section. The valvular heart disease data set was firstly utilized in [20] where Turkoglu et al. fulfilled an expert diagnosis system which uses backpropagation artificial neural networks (BPANN) classifier. The performance evaluation of the realized system was evaluated by classification accuracy and the correct classification rate was about 94% for normal subjects and 95.9% for abnormal subjects. Later, Turkoglu et al. suggested an intelligent system for detection of heart valve disease based on wavelet packet neural networks (WPNN). The reported correct classification rate was about 94% for abnormal and normal subjects. Recently, Comak et al. investigated the use of least-square support vector machines (LS-SVM) classifier for improving the performance of the Turkoglu's proposal [21-27].

Support vector machine (SVM) is a novel learning machine introduced first by Vapnik [28]. It is based on the Structural Risk Minimization principle from computational learning theory. Hearst et al. [29] positioned the SVM algorithm at the intersection of learning theory and practice: "it contains a large class of neural nets, radial basis function (RBF) nets, and polynomial classifiers as special cases. Yet it is simple enough to be analyzed mathematically, because it can be shown to correspond to a linear method in a high dimensional feature space nonlinearly related to input

space." In this sense, support vector machines can be a good candidate for combining the strengths of more theory-driven and easy to be analyzed conventional statistical methods and more data driven, distribution free and robust machine learning methods [30].

A GRNN is a variation of the radial basis neural networks, which is based on kernel regression networks. A GRNN does not require an iterative training procedure as back propagation networks. It approximates any arbitrary function between input and output vectors, drawing the function estimate directly from the training data. In addition, it is consistent that as the training set size becomes large, the estimation error approaches zero, with only mild restrictions on the function [31-37].

CNN is a feed-forward neural network-based calculation generally used to analyze PC vision-related issues. A shift-invariant complex perceptron is utilized to demonstrate architecture. interconnection of many structural layers based on the human visual cortex. CNN architecture is made out of three essential layers: input layer, stowed away layer, and result layer [38-39]. Numerous artificial neuronal layers that closely resemble the neurons in the human brain make up deep learning (also known as DNN). Similar to linear regression, back propagation using the gradient descent algorithm updates each neuron's weight value to reduce the overall loss function. It was feasible to extricate additional theoretical numerical connections from the information to move to the result by applying nonlinearity using initiation capabilities, for example, sigmoid, tanh, or relu, to the various layers of every neuron. Consequently, new unlabeled information can be anticipated utilizing a thoroughly prepared model. Since deep learning is a subfield of Deep learning, it acquires a portion of the central ideas from Deep learning, like essential measurements and likelihood, the misfortune/cost capability, etc, yet it likewise has greater adaptability and can be created to have more complicated layers and various neurons in each layer for worked on prescient capacity. Completely associated NN (or just NN) for organized information,

convolutional NN (CNN) for picture information, and repetitive NN (RNN) for text and grouping information are the three kinds of NN that are most often utilized in clinical exploration [40-43].

Pre-Diabetes :- A condition in which blood sugar levels are higher than the normal blood sugar level but not high enough to be Type 2 diabetes (Type 2 because of the lifestyle of people, they are much likely to suffer from Type 2) and by precautions and medications can be normalized is known as pre-diabetes . Sugar plays an important role of fueling up of the body cells. When it fails to do so, it automatically, instead of fueling up, builds up in the bloodstream. These are the steps of occurrence of pre-diabetes. Type 1. When a person's body fails to produce insulin, the state is known as Type 1 diabetes. Insulin helps the glucose to pass from blood to the cells of the body. Type 2. When the sugar level or glucose in the blood is higher than normal, it is known as Type 2 diabetes. Type 2 diabetes is also known as hyperglycemia. Mostly people suffer from Type 2 diabetes . Gestational diabetes. If a woman suffers from high blood sugar levels during pregnancy, then it is known as gestational diabetes [44-51].

Knowledge discovery in databases is well-defined process consisting of several distinct steps. Data mining is the core step, which results in the discovery of hidden but useful knowledge from massive databases. A formal definition of Knowledge discovery in databases is given as follows: "Data mining is the non trivial extraction of implicit previously unknown and potentially useful information about data". Data mining technology provides a user-oriented approach to novel and hidden patterns in the data. The discovered knowledge can be used by the healthcare administrators to improve the quality of service. The discovered knowledge can also be used by the medical practitioners to reduce the number of adverse drug effect, to suggest less expensive therapeutically equivalent alternatives. Anticipating patient's future behavior on the given history is one of the important applications of data mining techniques that can be used in health care management[52-57].

Several numbers of papers appeared in connection with HRV related cardio coherent issues. HRV is defined as fluctuation in the length of adjacent R-to-R (RR) waves-intervals. The importance in the analysis of HRV (i.e., the fluctuations of the heart beating in time,) The system operates on R-R interval data (intervals between successive R-waves of an ECG) Tulen and Man in have found that, HR, diastolic blood pressure (BP), mid-frequency band power of HR and systolic BP, and plasma adrenaline concentrations showed significant increase when changed from supine to sitting to standing posture. Viktor et al. have studied the variation of HR spectrogram and breathing rates in lateral and supine body positions. Recently, new dynamic methods of HRV quantification have been used to uncover nonlinear fluctuations in HR that are not otherwise apparent. Hear Rate Variability (HRV) is one such parameter that has been found to be associated with a wide variety of disorders as it is one of vital component of the physiology. Heart rate variability (HRV), the variation over time of the period between consecutive heartbeats, is predominantly dependent on the extrinsic regulation of the heart rate (HR).HRV refers to the variations in the beat intervals or correspondingly in the instantaneous HR. [58-67].

III. COMPARATIVE RESULTS DISCUSSION

In 2017, Zeinab Arabasadi et al[68]., proposed a hybrid diagnosis model for coronary artery disease using machine learning algorithm namely Artificial neural network (ANN) and genetic algorithm. In this research Z-Alizadeh Sani dataset is used consists of 303 patient records with 54 attributes (only 22 essential attributes were used in experiment), among them 216 patients suffered from coronary artery disease (CAD). First weights to artificial neural network were identified by genetic algorithm then ANN model was trained by using training data. In this experiment ANN with one input and output layer also consists of one hidden layer having five neurons employ feed forward approach. 10-fold cross validation technique is used for system

evaluation in this experiment. From the results we observe that our proposed model performed high in accuracy as compared to existing simple ANN model. We also test our model in other four world famous heart disease data sets with comparative results. Our proposed model also provides high accuracy as compared to existing ANN model[69].

	Data sets (with No. of Attributes)	Proposed Model (Genetic ANN)	Accuracy Existing Model (ANN) Accuracy
1	Z-Alizadeh Sani dataset (22)	93.85 %	84.62 %
2	Hungarian dataset (14)	87.1	82.9
3	Cleveland dataset (14)	89.4	84.8
4	long-beach-va dataset	78.0	74.0
5	Switzerland dataset	76.4	71.5

IV. CONCLUSION

Artificial intelligence and blockchain technology is more useful in the field of medical diagnosis in healthcare system. In Medical diagnosis healthcare system the information of the patients are first verified by the system, especially with the help of Blockchain Technology and services that are personalized using artificial neural network services can be used in real time. This study showed how to verify it using accurate medical parameters and image data extraction with the help of blockchain technology based on data from healthcare systems by using a wide range of etched artificial intelligence and blockchain technologies.

Thus, this review study went through the method of verifying the neural network techniques for human diseases such as Heart Disease, Brain Tumor, Diabetes, Kidney disease, Lung cancer, etc and Blockchain Technology used in healthcare system. It is found from the above review study that the blockchain technology can be useful for the medical records to secure in Healthcare system. In Future artificial intelligence, big data, and blockchains are useful for the medical records to secure in healthcare system.

V. REFERENCES

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