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Survey for the Prediction of Chronic Kidney Disease using Machine Learning

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ABSTRACT

According the 2010 global burden of disease study, Chronic Kidney Diseases (CKD) was ranked 18th in the list of causes of total no. of deaths worldwide. 10% of the population worldwide is affected by CKD. The prediction of CKD can become a boon for the population to predict the health. Various method and techniques are undergoing the research phase for developing the most accurate CKD prediction system. Using Machine Learning techniques is the most promising one in this area due to its computing function and Machine Learning rules. Existing Systems are working well in predicting the accurate result but still more attributes of data and complicity of health parameter make the root layer for the innovation of new approaches. This study focuses on a novel approach for improving the prediction of CKD. In recent time Neural network system has discovered its use in disease diagnoses, which is depended upon prediction from symptoms data set. Chronic kidney disease detection system using neural network is shown here. This system of neural network accepts disease-symptoms as input and it is trained according to various training algorithms. After neural network is trained using back propagation algorithms, this trained neural network system is used for detection of kidney disease in the human body.

Keywords : Chronic Kidney Diseases prediction, Artificial Neural Network, Back Propagation

I. INTRODUCTION

Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves.

The process of learning begins with observations or data, such as examples, direct experience or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide.

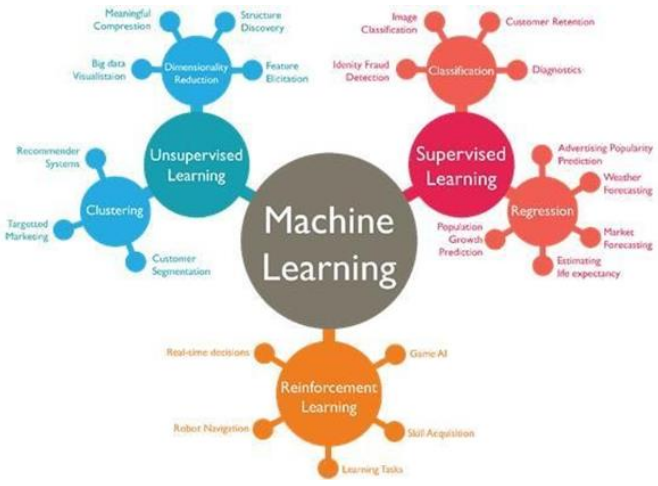

Figure 1. Machine learning methods[2]

Some machine learning methods:

Supervised learning

An algorithm uses training data and feedback from humans to learn the relationship of given inputs to a given output. For instance, a practitioner can use marketing expense and weather forecast as input data to predict the sales of cans.

You can use supervised learning when the output data is known. The algorithm will predict new data.

Unsupervised learning

In unsupervised learning, an algorithm explores input data without being given an explicit output variable (e.g., explores customer demographic data to identify patterns).

You can use it when you do not know how to classify the data, and you want the algorithm to find patterns and classify the data for you.

Reinforcement learning

It is about taking suitable action to maximize reward in a particular situation. It is employed by various software and machines to find the best possible behavior or path it should take in a specific situation.

Application of Machine Learning are in every field, few of them are here listed below.

ARTIFICIAL NEURAL NETWORK

Prediction of Chronic Kidney disease is called supervised learning problem. As the output variables are in category type, the prediction of Chronic Kidney disease is “classification type of supervised learning”. An artificial neural network (ANN) learning algorithm, usually called "neural network" (NN), is a learning algorithm that is vaguely inspired by biological neural network. Computations are structured in terms of an interconnected group of artificial neurons, processing information using a connectionist approach to computation.

ANN is an interconnected group of nodes. Here, each circular node represents an artificial neuron.The arrow represents a connection from the output of one artificial neuron to the input of another.

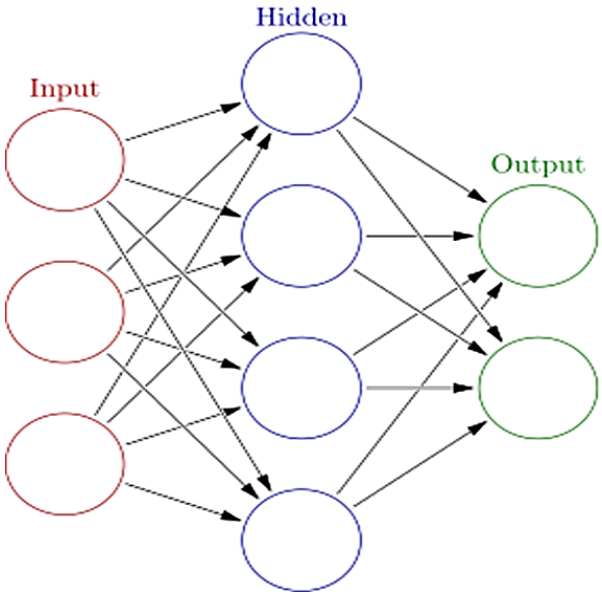

Figure 2: Artificial Neural Network[3]

Artificial neural networks are relatively crude electronic networks of neurons based on the neural structure of the brain. They process records one at a time, and learn by comparing their prediction of the record (largely arbitrary) with the known actual record. The errors from the initial prediction of the first record is feedback to the network and used to modify the network's algorithm for the second iteration. These steps are repeated multiple times.

II. LITERATURE REVIEW

To manage the high-risk condition of CKD affecting millions of people around the world. This paper tried to analyze chronic kidney disease dataset using two important types of data analytics, statistical and predictive analytics in order to create a 100% accurate model based on machine learning algorithm. The

results obtained can be a key for gaining insights from the dataset, forecasting the CKD status of the new patients and adopting good strategies for improving the safety, efficiency, and quality of the care processes toward CKD disease. [4]

This paper has presented an IoT with Cloud based CDSS framework and implemented for the prediction of CKD with its level of severity. This paper provides a systematic scheme for the CKD, and the relevant healthcare data is created by the use of UCI Repository dataset. In addition to that, the medical sensors are utilized to gather data from the CKD affected patients and maintained as the patient records. We employed an ML algorithm using DNN to carry out the learning tasks of mapping data into two classes like 'Normal' and the 'Abnormal'. The use of PSO based feature selection significantly enhances the classifier results with the classification accuracy of 98.25 whereas the accuracy is only 99.25 prior to the feature selection process. The experimental results validate the performance of the proposed model in terms of different classification measures over other classifier models. [5].

Chronic Kidney Disease (CKD) detection system using neural network is successfully implemented here. This prediction system has found high accuracy and can be alternative method for doctors, it can also be used by normal people to find probability of having CKD. This prediction system is capable of detecting chronic kidney disease with new set of inputs. Earlier Rough dataset is converted into highly preprocessed data by filling most probable values for all missing values. All four learning algorithms are tested on same dataset and all learning algorithms are giving good performance in case of highly preprocessed data. Levenberg Marquardt is found best algorithms for kidney dataset based on prediction accuracy. Based on training time, scaled conjugate gradient and resilient back propagation are found more efficient than Levenberg and Bayesian regularization. This research work gives an efficient and economical solution to CKD detection problem by using neural network. [6].

In this paper, three algorithms are used, namely, Artificial Neural Network along with Gravitational Search Algorithm (GSA+ANN), Genetic Algorithm along with ANN (GA+ANN), and K-Nearest Neighbor (KNN). They are used to assess the training performance of classification accuracy. The Gravitational Search Algorithm enhances the classification accuracy of neural networks by skipping the local minima and converging to global minima. The main goal to estimate the performance of the algorithm over kidney disease dataset is Accuracy. Comparing these three algorithms, (GSA+ANN) gives better accuracy, sensitivity, and with equal specificity which are very important metrics in a medical report. [7]

In this article, a genetic algorithm trained neural network has been proposed to efficiently detect chronic kidney disease (CKD) at an earlier stage. The local search-based learning algorithms may be trapped in local optima, the problem has been overcome using GA to train the neural network which actually tries to minimize the root-mean-squared error involved during the training phase. The performance of NN-GA-based model has been compared with NN, MLP-FFN, and Random Forest classifiers in terms of accuracy, precision, recall, and F-Measure. The results have suggested that NN-GA has outperformed other existing classifiers and is able to detect CKD with more efficiency. The future research may be focused on studying other such optimization techniques to train NNs to effectively improve the performance of NNs in real-life applications[8]

III. PROPOSED SYSTEM

Following are the stages of the above proposed System: Stage 1: Dataset.

Dataset is taken form UCI Repository.

Stage 2: Optimization.

Here the profiling is done by optimizing the dataset by reducing the noise and normalizing the values to reduce over fitting of data.

Stage 3: Training of Neural Network.

Training data will be feeded to multilayer perceptron neural network. Back propagation will be used for error reduction training. The prediction output and error will then be matched with target outcome. If it's not matched the multilayer feed forward neural network will be used for further prediction, which will be taking output of previous neural network as input.

Stage 4: Prediction.

The chronic kidney disease will be predicted on the basis of its absence or presence.

IV.CONCLUSION

The proposed system will definitely help in improving the prediction of Chronic Kidney disease system by increasing its accuracy and prediction capability by reducing the error. The existing systems are focused on using single neural network. The mean square error will be reduced in subsequent neural training iterations.

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