International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 04 Issue: 04 | April -2020 ISSN: 2582-3930

Heart Disease Diagnosis using Machine Learning and IOT

Shubhangi Dilip Channagire
Department of Information Technology
VPKBIET , Baramati

Pratiksha Tanaji Patil
Department of Information Technology
VPKBIET , Baramati

Komal Vitthal Deshmukh
Department of Information Technology
VPKBIET , Baramati

Abstract—Machine learning has empowered smart health ap-plications specially health care sector. Heart diseases are rapidly growing issue in recent years. Heart diseases are chronic diseases were diagnosis is necessary. With the rising availability of personal health care devices, Internet of things can be applied to develop health monitoring systems.

This paper proposed an heart disease diagnosis model. The heart disease diagnosis model refer standard dataset available on UCI machine learninig repository. The model uses machine learning algorithms, support vector machine and artificial neural network. The real data taken from sensors to predict the heart disease. The heart disease diagnosis model classify dataset into two classes i.e. 0 represents the absence of disease and 1 represnts the presence of disease.

Keywords - Machine Learning, Internet of Things, Heart Disease

I. Introduction

Heart Disease Diagnosis is one of the important tasks which can improve the healthcare field and save millions of patients life worldwide. Now a day heart disease, become the leading cause of killing people around the world according to the World Health Organization (WHO). Therefore, residents need to pay The considerable amount of attention to individual wellness as a methodology for preventing heart diseases. We will develop an android application for heart disease diagnosis. This project predicts heart disease on real time data with the help of body sensor. Heart disease diagnosis model classify dataset into two classes i.e 0 represents the absence of heart disease and 1 represents the presence of heart disease. We will compare Heart Disease prediction accuracy of SVM model and ANN model. To perform real time heart disease prediction, AD8232 chip is used to measure the electric activity of the heart which connects to the Arduino. This pulse rate is given as input to heart disease model for prediction. The HM-10 is a Bluetooth low energy receiver which is used to receive the raw analog data signal from microcontroller. Then displays this data in Electrocardiographs. The HM-10 device is used to send data to the android application.

II. Literature Survey

1) G. M, W. K and D. S, et.al[1], focuses on support vector machine and artificial neural network that can predict the accuracy of the heart disease. The Support Vector Machine and Artificial Neural Network both are comparatively study perform on classifiers to measure the good performance on an accurate rate. From this experiment, SVM gives the highest accuracy rate. During which the physician induces the Diagnosis of a new and unaware case from an available set of historical data and from clinical experience. A support vector machine is an algorithm It uses a nonlinear mapping to transform the primary training data into higher dimension. It searches for the optimal linear separating hyperplane that is a decision separating boundary separating the tuples of one class from another.

2) S. Seema et.al[2], focuses on techniques that can predict chronic disease by mining the data containing in historical health records using Nave Bayes, Decision tree, Support Vectors and Artificial Neural Network. A comparative study is performed on classifiers to measure the good performance on an accurate rate. From this experiment, SVM gives the highest accuracy, whereas for Diabetes Nave Bayes gives the highest accuracy rate. Naive Bayes classifier have worked quite well in many real-world situations, famously document classification and spam filtering. They require a small amount of training data to estimate the necessary attributes. Naive Bayes classifiers can be extremely fast compared to more sophisticated methods.

3) S.Jeong and C.-H. Youn et.al[3], recommended the Integrated Healthcare System for home-Hospital environments. That is used for real time monitoring, and classification of Patients diagnostic information. Facing the increasing challenges and demands in the area of the chronic disease care, various studies on the healthcare system can, whenever and wherever, process and extract patient data have been conducted. Chronic diseases are the long-term diseases and require the processes of the real time monitoring, multidimensional quantitative analysis, and the classification of patients' diagnostic information. This Services basically aim to provide patients with accurate diagnosis of disease. This system is used to the outside of hospital.

4) Noura Ajam et.al[4] recommended artificial neural

network for Heart disease diagnosis. Based on their ability, Feed forward Back propagation learning algorithms have used to test the model. By considering appropriate function, classification accuracy reached to 80 percent and 20 percent neurons in the hidden layer. ANN shows significantly results for the heart disease prediction. The network exists in the values of the weights between neurons,it needs a method of adjusting the weights to solve a problem. For this type of network, the most common learning algorithm is used called Back Propagation (BP). In back propagation connection between input and hidden layers and connection between hidden and output layers is present. The nodes at the output layers they find out the error signals for a given input. Find out at every node for that given input what is actual output error and we can try to change the weights so that errors becomes small.

5) B. Nidhi and J. Kiran et.al[5], Proposed a novel approach for heart disease diagnosis using data mining techniques. A clinical uses several sources of data and test to make a diagnostic impression but it is not necessary that all the test are useful for the diagnosis of heart disease. The objective of the work is to reduce the number of attribute used in heart disease diagnosis that will automatically decrease the number of test which are required to be taken by a patient. This work also aims at increasing the efficiency of the proposed system. The observations illustrated that Naive Bayes and decision tree using fuzzy logic has outplayed over the other data mining techniques.

III. Proposed System

The overall architecture of the Heart Diseases Diagnosis system is shown below in figure 3. The entire Heart Diseases Diagnosis system consists of following steps:

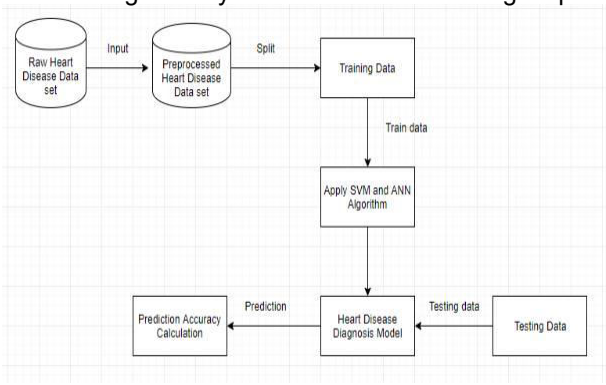
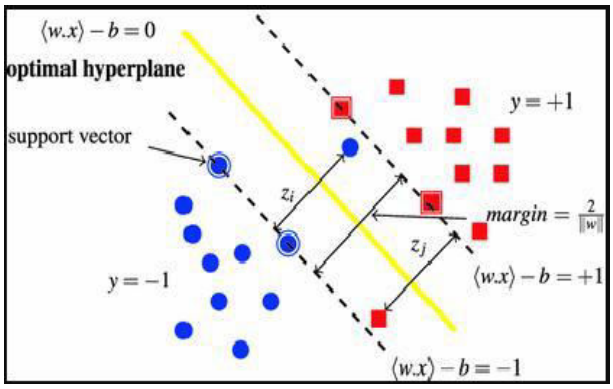


Fig. 1. System Archietecture

1) Obtain dataset from UCI repository.
The UCI is a collection of databases, domain theo-ries, and data generators that are used by the machine learning for the empirical analysis of machine learning algorithms. We are taking dataset from UCI machine learning repository. Which contains multivariate data set characteristics. It contains 303 instances and its area is related to Life. There are three attribute characteristics which contains categorical, integer and real types of attributes. The databases have 76 raw attributes, only 14 of them are actually used. The Attribute analysis the higher accuracy of the disease.
2) Extract feature of preprocessed data.
Data preprocessing is a data mining technique that involves transforming raw data into an understandable format. Real-world data is often incomplete, inconsistent and is likely to contain many errors. Data preprocessing is a proven method of resolving such errors and issues. This module is used to extract features which are predict high accuracy.
3) Apply SVM and ANN algorithm on dataset.
Prediction is the most important part in machine learning. It is used to predict the absence or presence of heart disease. The prediction is based on algorithms which shows the accuracy of the disease. This module shows that which module gives the highest accuracy of system.

IV. Methodology

1) Support Vector Machine:



A Support Vector Machine algorithm is an algorithm

Fig. 2. Support Vector Machine

it uses a non-linear mapping to transform original training data into higher dimensions. It searches for the linear optimal separating hyperplane that is a decision boundary separating the tuples of one class from another.
Data from two classes can always separated by a hyperplane. The Support Vector machine finds this hyperplane using support vectors and margins.
The distance from closest negative point and closest positive point is called as a margin. The points lies on the margins are called as supporting vectors. The closest positive points and closest negative points from decision surface are supporting vectors.

The closest negative points and closest positive points are linearly separable by a linear separable hyperplane that is decision boundary, If we maximize the Margin the distance from the closest negative point and closest positive point is same. Margin is twice larger.

Let the training samples having dataset Data = yi , xi ; i = 1, 2, . . . , n where xi Rn represent the ith vector and yi Rn represent the target item. The linear SVM finds the optimal hyper plane of the form f(x) = wT x + b where w is a dimensional coefficient vector and b is a offset. This is done by solving the subsequent optimization problem.

2) Artificial Neural Network:

Artificial neural networks (ANN) are software implementations of the neural structure of our brains. The brain contains neuron, which are kind of like organic switches. These can change their output state depending on strength of their electrical or chemical input. The neural network in a person's brain is a hugely inter-connected network of neurons. Where the output of any given neuron may be the input to thousands of neurons. The network exists in the values of the weights between neurons, we need a method of adjusting the weights to solve a particular problem. For this type of network, the most common learning algorithm is used called Back Propagation (BP). In back propagation connection between input and hidden layers and connection between hidden and output layers is present. The nodes at the output layers we find out the error signals for a given input. So we can find out at every node for that given input what is actual output error and we can try to change the weights so that errors becomes small. But error can be find out only in output. so error we find out in output layer we are going to back propagate the error and estimate the error at the inside hidden layer. Take the error which we observe in output layer back propagate error to the previous layer. The error in output layer is in hidden layer partially depends on back propagate to other nodes. So weight will be updated to previous layer.

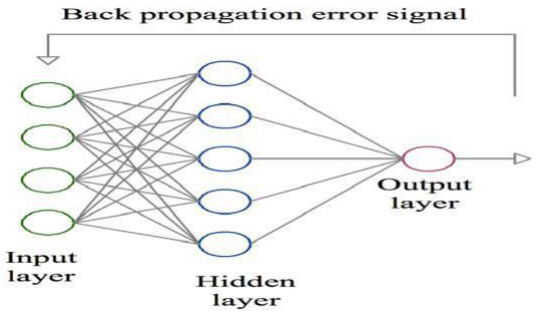


Fig. 3. Artificial Neural Network

V. Important Data

1) Bluetooth Low Energy Protocol

Fig. 4. Bluetooth Low Energy Protocol

HM-10 is a Bluetooth 4.0 Module. This is the bluetooth low energy protocol. The module is designed by using the Texas Instruments CC2540 or CC2541 Bluetooth low energy (BLE) System on Chip. This module is used for establishing wireless data communication. This device is used to send health data to android application. Bluetooth low energy receives raw analog data from microcontroller which is connects to the android mobile application. The data displays through the serial port in Electrocardiograph (ECG).

2) AD8232 chip

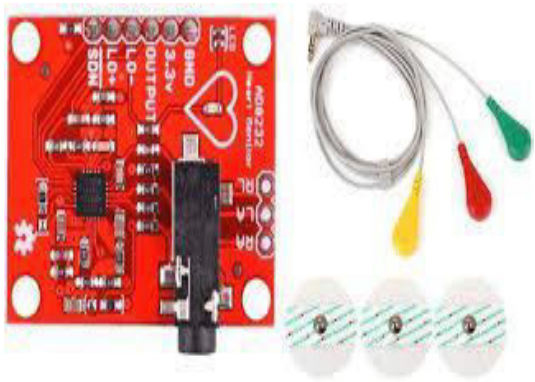


Fig. 5. ECG chip

The AD8232 chip is used to measure the electrical activity of the heart. The electrical activity displays through the elctrocardiograph (ECG). ECG uses to record patients heart electrical activity by using electrodes. The electrodes are attached to the skin capture the small electrical changes on the skin when arise from each heartbeat. AD8232 chip uses three electrodes to capture skins electrical changes arise because of the hearts electrical activity while heartbeat.

AD8232 chip connects to the microcontroller and it sends raw ECG data to the microcontroller.

VI. Conclusion

The heart disease diagnosis based on two areas. Machine learning and internet of things to identify absence or presence of heart disease. This paper present that machine learning classifiers, SVM and ANN provide the accuracy. In this system the ECG electrodes are connected to the human body which gives the raw ECG signal using the bluetooth low energy protocol. This study aims to use machine learning for improve the accuracy of identifying heart disease.

References

[1] G. M, W. K and D. S, "Decision support system for heart disease based on support vector machine and artificial neural network," Computer and Communication Technology(ICCCT), p. 741-745, 2010.
[2] Dr.S.Seema Shedole, Kumari Deepika, Predictive analytics to prevent and control chronic disease, https://www.researchgate.net/punlication/316530782, January 2016.
[3] S. Jeong, C.-H. Youn, E. B. Shim, M. Kim, Y. M. Cho and L. Peng, "An Integrated Healthcare System for Personalized Chronic Disease Care in HomeHospital Environments," IEEE Transactions on Information Technology in Biomedicine, vol. 16, no. 4, pp. 572-585, 14 03 2012.
[4] Noura Ajam, Heart Disease Diagnoses using Artificial Neural Network, The International Insitute of Science, Technology and Education, vol.5, No.4, 2015, pp.7-11.
[5] B. Nidhi and J. Kiran, "A Novel Approach for Heart disease Diagnosis using Data Mining and Fuzzy Logic," International Journal of computer Applications, vol. 54, 2012.
[6] Ms. Shinde Swati B. Prof. Amrit Priyadarshi, Decision Support System on Prediction of Heart Disease Using Data Mining Techniques, Interna-tional Journal of Engineering Research and General Science Volume 3, Issue 2, March-April, 2015 ISSN 2091-2730.
[7] UCI Machine Learning Repository: Heart Disease Data Set. http://archive.ics.uci.edu/ml/datasets/Heart+Disease
[8] P. S and A. R, "Intelligent heart disease prediction system using data mining techniques," in IEEE/ACS International Con- ference on Computer Systems and Applications, 2008.
[9] Niti Guru, Anil Dahiya, Navin Rajpal, "Decision Support System for Heart Disease Diagnosis Using Neural Network", Delhi Business Review, Vol. 8, No. 1, January - June 2007.