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The Heart Disease and COVID disease Prediction using supervised classification Techniques

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Abstract: Heart disease is a common problem that can be very serious in the elderly and also in individuals who do not have a healthy lifestyle. In addition to maintaining a decent eating habit, it can prevent it to some extent with periodic check-up and diagnosis. Hospitals produce a large amount of patient data, such as heart pain results, chest pain results, personal health records (PHRs), etc. Based on the symptoms, which are explicitly the attributes needed for prediction, the decision tree classifier is implemented. Using the decision tree algorithm, we will be able to classify certain attributes which are the best ones that will lead us to a better prediction of the datasets. The data that is generated from the hospitals are not used effectively. Some of these tools are used to extract data from the heart disease detection database, and other functions are not accepted. Various optimization algorithms such as (Fuzzy Logic, Random Forests, and Q-Learning) and health care data are used in this report to identify patients whether or not they have heart diseases according to the details in the record. The system is able to predict the heart disease as well as COVID-19 disease possibility in a detailed report. Try to use the data as a model that tells the patient whether or not they have heart disease.

Keywords: Heart disease prediction, machine learning, supervised learning, classification, cardiac disease, prediction system

I. INTRODUCTION

Recent studies show that the mortality rate is increasing in vast amounts because of heart disease. So to minimize the mortality rate intelligent heart disease prediction systems are required. There are various reasons for heart disease like changing lifestyle, more stress and so on. So heart disease prediction is a very important need of life. As we have studied in literature various data mining techniques have been used for the prediction of heart disease. Parameters considered for the experiment are blood pressure, heart rate, cholesterol, pulse rate, and so on. Each day in large quantities medical data is generated so important knowledge extraction from this big data is a challenging task. Heart is the main part of human life, if the heart is working properly then human health is good. The input to the system contains 7 parameters. The output generated by the system will be one of the two classes as Normal and Critical. It is limited to only heart disease prediction. Due to the depth and breadth of research, BSN technology is slowly maturing and is being widely used in many fields including medicine, social welfare, sports, etc. To proposed work is to develop and introduce a framework that provides the patient with health by analyzing any disease's recommendations using the classification method of machine learning.

II. LITERATURE SURVEY

Mosenia A, Sur-Kolay S, Raghunathan A, Jha N.[1] Wearable Medical Sensor based System Design IEEE Transactions on Multi-Scale Computing Systems.This proposed Wearable Medical Sensor-based System Design. This system discusses various services, applications, and systems that have been developed based on WMSs and sheds light on their design goals and challenges. We first provide a brief history of WMSs and discuss how their market is growing. We then discuss the scope of applications of WMS-based systems. Next, we describe the architecture of a typical WMS-based system and the components that constitute such a system, and their limitations. Thereafter, we suggest a list of desirable design goals that WMS-based systems should satisfy. Finally, we discuss various research directions related to WMSs and how previous research studies have attempted to address the limitations of the components used in WMS-based systems and satisfy the desirable design goals.

Patil, Prakash Goud, and Samina Mohsin.[2] "Fuzzy logic based health care system using wireless body area network." International Journal of Computer Applications 80.12 (2013).This proposed system designed for measuring health parameters of patient body in which it consists of temperature and pulse sensor, this sensor is connected to Base Station through a microcontroller and that device has the ability to be controlled and monitored by remote computer. Wireless Sensor Network system continuously monitoring the pulse and temperature of patients at remote or in hospital. These systems have the main purpose: to provide or transmit the health information to the patient, to the medical staff or for both at the same time. This paper demonstrates the use of wearable Wireless Body Sensor Network and ambulatory

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health monitoring. If there is any change in the patient body that physiological parameter information is transferred through the sensor, if there is any emergency then this message is transferred to the doctor or relative or emergency unit. After receiving the information from the patient, the doctor can control the patient via remote. This application's main aim is to provide a quick facility for hospitals. This paper proves wireless sensor networks can be widely used in healthcare applications.

Madhyan, Ekta, and Mahesh Kadam2014.[3] "A unique health care monitoring system using sensors and zigbee technology." International Journal of Advanced Research in Computer Science and Software Engineering 4.6 (2014): 183- 189 .This proposed A Unique Health Care Monitoring System Using Sensors and ZigBee Technology.The proposed system can monitor the different aspect of the human body such as Blood Pressure, Electrocardiogram (ECG), Electroencephalogram (EEG), Temperature, glucose, respiratory (spirometer). The proposed system in which it gathered the information from patient through different aspect of body function and these information is transmitted to zigbee and from that zigbee it sends data from one zigbee to another zigbee, after receiving the information it display on the display module such as mobile of doctor or family or emergence unit. We can also say that intelligent healthcare and monitoring systems that include body sensor networks (BSN) and local sensor networks have been presented. The wireless biosignal acquisition SystemonChip for BSN application is applied to capture the real human body temperature, heart rate and ECG signal via IEEE 802.15.4 zigbee. According to the real measurement results, health care can be acquired by the proposed WBSA-soc[3].

Kim Y, Lee S, Lee S.[4] Coexistence of ZigBee-based WBAN and WiFi for health tele monitoring systems. IEEE journal of biomedical and health informatics. 2016 Jan;20(1):222- 30 .This proposed Coexistence of zigbee-based WBAN and wifi for Health Tele monitoring Systems Contribution: The tele monitoring concept can be used concept can be used via Wireless Body Area Network (WBAN) that provide the home based mobile health monitoring. A wireless Body Area network (WBAN) in which having small sensor, this medical sensor is very intelligent that is collect the physiological parameter i.e. EKG (electrocardiogram), EEG (electroencephalography and the last one blood pressure can be monitored in this healthcare application. These sensors are wearable on the patient body that sensor collects the patient body that sensor collect the physiological parameter from patient and send to the coordinator is small mobile devices after that the coordinator sends this data through wireless network this can be send to the doctor clinic. Ingole, Abhilasha, Shrikant Ambatkar, and Sandeep Kakde [5]. "Implementation of healthcare monitoring system using Raspberry Pi." Communications and Signal Processing (ICCSP), 2015 International Conference on. IEEE, 2015.Devotion towards own body is one of the important factor considered in this era. The equipments which provide results at run time and also accuracy maintained are provided by the electronic engineers. With the help of new technology of Raspberry Pi, health care system can be monitored. In this type of technology same area network is shared by multiple users which helps in monitoring. Wireless communication is done through Wi-Fi which provides flexibility and extendibility. In this paper basic parameters like body temperature is monitored and is transferred on webpage to make it locally visible for users.

In Fahd Saleh Alotaibi [6] researchers used Rapid miner tool and various ML approaches to improve the previous accuracy score and to predict the heart disease. UCI heart disease dataset was tested. The proposed work improved the previous accuracy score. In Lewlyn L. R. Rodrigues [7] proposed the Structural Equation Modeling using Partial Least Square method for the analysis of data. They studied the association of body mass index, age, systolic blood pressure, diastolic blood pressure, cigarettes smoked per day, alcohol consumed per week on hypertension and coronary heart disease to use machine learning. They discovered that except for age, SBP and BMI, the rest of the features had a significant positive association with CHD (coronary heart disease) and hypertension. These results contributed for researchers and medical practitioners in ML which make an effort to look for these variables relationships.

In Mohd Ashraf et. al. [8] researchers proposed Deep Neural Network technique to create an automated system for heart attack prediction. ML techniques were tested on multiple datasets for certain accuracy. Proposed method introduced automated preprocessing approach in data and removed the anomalies from system.

In Sumit Sharma, Mahesh Parmar [9] researchers proposed Talos Hyper parameter optimization model for prediction of cardiac and heart disease. Heart disease is a key area to use Deep Neural Network which boost overall heart classification consistency Disease. Classification performed differently using SVM, Na¨ıve Bayes, Random Forest. UCI heart attack Dataset to display the Talos Hyper-parameter Optimization performed better than other classification algorithms mentioned.

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III.PROPOSED SYSTEM DESIGN

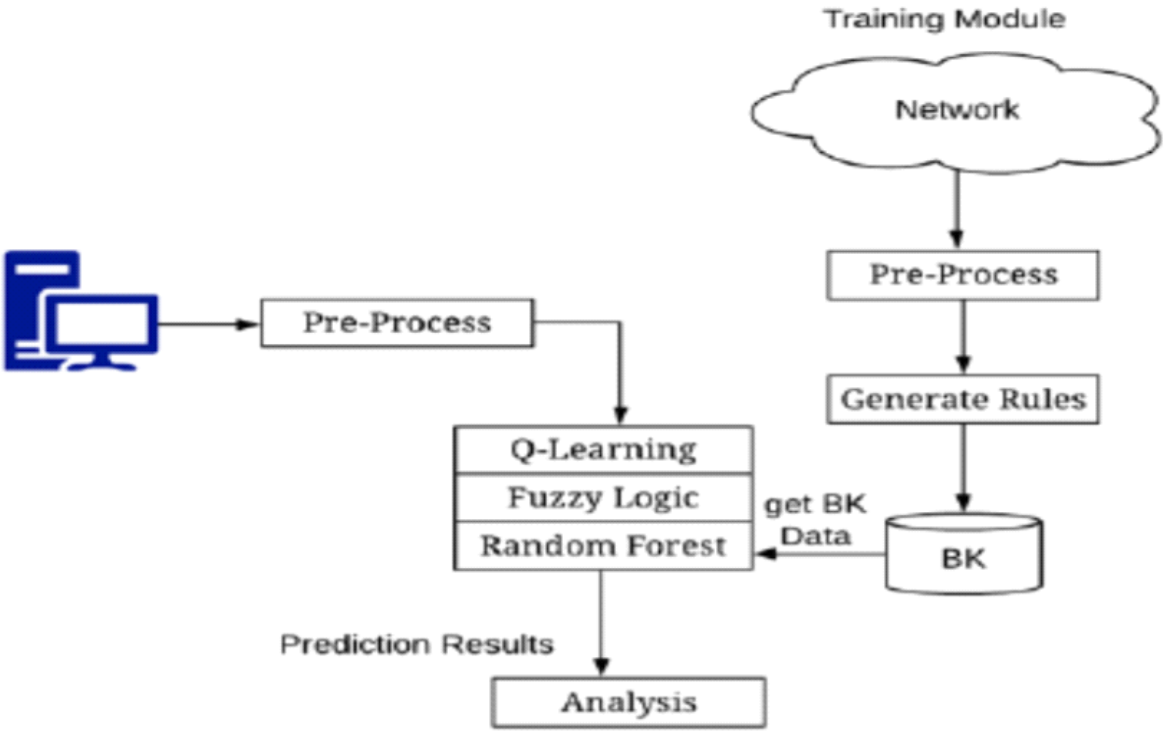

Fig. 1 : Proposed system architecture

III.1 Training:

- Collect data from various online as well as offline sources
- Apply data mining approaches.
- Data is saved into the database called background knowledge, which is used at the time of testing.
-

III.2 Testing:

- System works with synthetic as well as real time input patients data over the internet and predicts the disease possibility based on a trained module.
- Using a link-oriented architecture, all collected data is stored in a global database.
- In testing, all testing and training data are read simultaneously.
- Apply the classification of the machine and foresee the future application of the decision-making method.
- Finally, provide the consistency of the study with the system's real (positive) and false (negative)
-

III.3 Algoritms:

Algorithm 1 : Proposed HDP Algorithm

Input: Input values for all parameters HashMap <Double Value, String class> which contains the all attributes values like {BP, Heart_Rate, Cholesterol, Stress, Sugar, ECG, Oxygen_saturation, Hemoglobin, CI} etc. Policy patterns {P1,P2,Pn}

Output: Generate sample report for individual patient.

Step 1 : for each read Hashmap

Step 2: if [j] similar to P[1]
NormalPos = +1
MasterLits1. Add (NormalPos)

Step 3 : if [j] similar to P[2]
AbnPos = +1
MasterLits2. Add (AbnPos)

Step 4 : if [j] similar to P[n]
DenPos = +1
MasterLits3. Add (DenPos)

Step 5: end for

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Step 6 : calculate the fitness factor for all classes using below formula for all class list
Step 7: Weight _CurrentList[w] = *100
Step 8 : Sort _CurrentList[w] using desc order
Step 9 : Recommend _CurrentList[0] for final class for patient profile.
Step 10 : end procedure
Algorithm 2 : Naive Bayes
Input: User input file data record which contains all body parameters sensor values, Patient id Pid, Timestamp T.
Output: Classified label
Step 1: Read R {All attributes} from current parameters.
Step 2: Map with train features with each sample.
Step 3 : calculate average weight of train DB with same evidences
Step 4 : evaluate AvgTScore > threshold
Step 5: ReturnAvgTScore

Algorithm 3 : Q- Learning Algorithm
Input: inp[1…..n] all input parameters which are generated by sensors, Threshold group TMin[1…n] and TMax[1…n] for all sensors , Desired Threshold Th.
Output: Trigger executed for output device as label.
Step 1 : Read all records from database (R into DB)
Step 2: Parts [] Split(R)

$$\text{CVal} = \sum_{k=0}^{n} \mathbf{Parts[k]}$$

Step 3:
Step 4: check (Cval with Respective threshold of TMin[1…n] and TMax[1…n] **)**
Step 5: T get current state with timestamp
Step 6 : if(T.time > Defined Time)
Read all measure of for penalty TP and reward FN
Else continue. Tot++
Step 7: calculate penalty score = (TP *100 / Tot)
Step 8 : if (score >= Th)
Generate event
end for

IV. RESULTS AND DISCUSSION

The result section is the final stage of research that includes experimentation, the data confirmed, and the evaluation and discussions to be concluded. The research is conducted by conducting various experiments to check the efficiency of the proposed algorithm in terms of various parameters such as computation time, dataset type, and distinct algorithm input. A consternation matrix is a simple production analysis tool used in classification problems. Used to depict a prediction model's test result. Each matrix column represents instances in a projected class, while each row represents instances in an actual class.

Table 1: Confusion Matrix Analysis (Exp. 1)

Confusion matrix		Predicted	
		Negative	**Positive**
Actual	**Negative**	124	2
	Positive	5	122

The entries in the confusion matrix have the following meaning in the context of a data mining problem. The multiclass classification matrix defines some basic terms. Accuracy is the percentage of accurate predictions overall. Calculated by using the equation:

Accuracy = a+d / a+b+c+d

The proposed accuracy is calculated using the below formula and it achieves around 97.23% correctly prediction is better than all the existing approaches.

97.23 = 124+122 / 124+113+9+7

The figure 2 illustrate the multiple experiment analysis with various data size or records, the average accuracy is around acceptance level, even data size has changed as well as some algorithm parameters has tunes.

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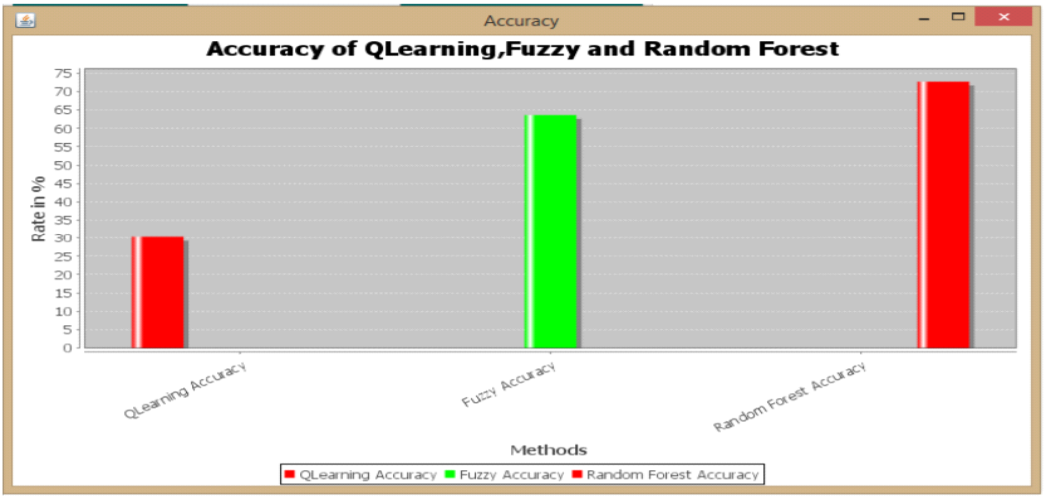

Fig. 2: Classification accuracy of proposed system

V.CONCLUSION

The Internet of Things Architecture is basically a well-functioning technology because it provides the average man with the common platform who can afford it in many of the refinery areas at affordable costs. The research field referred to as healthcare is an important and inevitable part of our everyday lives in this above mentioned area. IoT offers a better forum for assembling sensory data under this medical domain and bringing them into smart devices. Super brilliance provides the poor with the best supervision. This is the central level of the android devices' intellectual thinking or could be called smart gadgets. Most of the tests are intrusive in the conventional approach, which gives patients discomfort and induces dissatisfaction or carelessness towards their wellbeing. It's very tough for them to be able to cope with those circumstances. Therefore, the goal of this study is to provide them with a forum where each needy patient with a suggested non-invasive approach can get their vitals. In this case, in emergency cases, patients will contact the 24X7 doctor with internet technology and be notified. We can control cholesterol, blood pressure, stress indicators and many other such parameters by the proposed system, which are essential to my exact heart health, including vascular age and cardiac index for the same. It is possible to expand the dissertation to incorporate a more precise Heart Disease Prediction Method. The algorithm can be checked using different numbers of parameters and check the accuracy. The concept component analysis algorithm can be used for attribute reduction.

VI. REFERENCES

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