

# Health Monitoring System Using IOT and Machine Learning

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**Abstract** - Health is one of the very basic needs to any individual. As per WHO statistics, 24% of deaths in India and one-third of all global deaths due to heart diseases. Around 17 million people die due to cardiovascular disease every year. Heart Disease is one of the most effective diseases in the world today. For physical consultant, it is complicated to predict chronic disease on right time. The diagnosis of disease through traditional medical history has been considered as been as not reliable in many aspects. To predict the disease, non-invasive based methods based on machine learning techniques are reliable and efficient. A secure IoT based healthcare system using BSN (Body Sensor Network). The components of IoT and BSN have the ability to collect and transfer data over network with requiring any assistance. BSN-Care addresses the security concerns associated with transmission of sensitive (life-critical) data over the network. This work also provide analysis as well as disease recommendation of patient data. In our system we are measuring patient's parameters (ECG, temperature and heart rate etc) different available sensors data. The current survey shows that mortality rate increasing in vast amounts because of heart disease. So, to minimize the mortality rate intelligent heart disease prediction system is required. There are various reasons for heart disease like changing lifestyle, more stress and so on. So, heart disease prediction very important needs of life. As we have studied in literature various data mining techniques have been used for the prediction of heart disease. Parameters considered for experiment are heart rate, ECG and temperature so on. Each day in large quantity medical data is generated so important knowledge extraction from this big data is challenging

task. Heart is the main part of human life, if heart is working properly then human health is good.

**Keywords**- - Real Time Data, IoT, Machine Learning, Wearable Sensors, Remote Patient Monitoring, Anomaly Detection, Predictive Modeling, Data Analysis, Health Monitoring

## INTRODUCTION

Most humans live a busy life in which going to a doctor for weekly or even monthly checkup is an impossible task. Without monitoring your health it is not possible to whether you are a healthy or sick person. This problem leads to the design of a product which monitors your health every day without going to a doctor. ECG is the most broadly used cardiovascular disease monitoring technique that measures the electrical activities of the heart. An ECG system is a non-invasive monitor for evaluating the heart electrical activity, for measuring the regularity/rate of heartbeats, and for identifying any damage to the heart. In this paper, a system is designed as a prototype for monitoring alerting based on the health of a person. This system is fully automated little or no human help is needed. Any doctor can monitor this person from anywhere through the internet. Health is always a major concern in every growth the human race is advancing in terms of technology.

Like the recent corona virus attack that has ruined the economy of China to an extent is an example how health care has become of major importance. In such areas where the epidemic is spread, it is always a better idea to monitor these patients using remote health monitoring technology. So Internet of Things (IoT)

based health monitoring system is the current solution for it. Health is characterized as a full state of physical, mental, and social well-being and not merely a lack of illness. Health is a fundamental element of people's need for a better life. Unfortunately, the global health problem has created a dilemma because of certain factors, such as poor health services, the presence of large gaps between rural and urban areas, physicians, and nurses unavailability during the hardest time.

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IoT is making any objects internally connected in the recent decade and it has been considered as the next technological revolution. Smart health monitoring mechanism, smart parking, smart home, smart city, smart climate, industrial sites, and agricultural fields are some of the applications of IoT. The most tremendous use of IoT is in healthcare management which provides health and environment condition tracking facilities. IoT is nothing but linking computers to the internet utilizing sensors and networks. These connected components can be used on devices for health monitoring. The used sensors then forward the information to distant locations like M2M, which are machinery for computers, machines for people, handheld devices, or smartphones. It is a simple, energy-efficient, much smarter, scalable, and interoperable way of tracking and optimizing care to any health problem. Nowadays, modern systems are providing a flexible interface, assistant devices, and mental health management to lead a smart life for the human being.

## SYSTEM DESIGN

The system design of the project can be divided into two parts namely, hardware part which includes interfacing of temperature, ECG and other sensor with Node MCU12E ESP8266 and software part which includes coding which has to be done in Python, Java. The heartbeat sensor or ECG sensor and temperature sensor is connected to the NodeMCU-12E Esp8266.

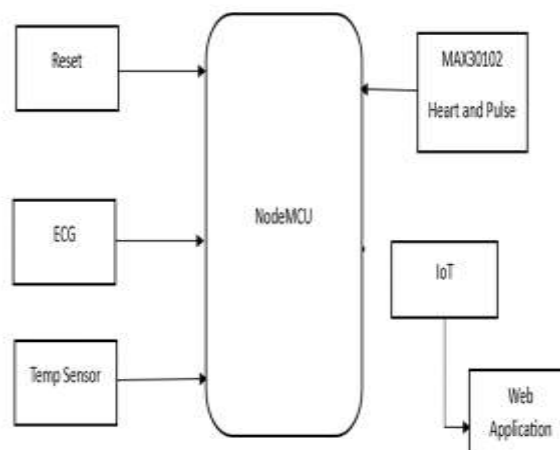


Figure 1 System Design

The Integrated TCP/IP protocol stack, utilised for the display purpose, is then connected to the Node MCU-12E Esp8266.

## OBJECTIVES

- To do analysis of existing wearable devices to measure heart affecting parameters like ECG, temperature and heart rate etc.
- To study and analyze Heart disease prediction in the primary stage through the data mining techniques which gives the methodology useful for decision making.
- To develop a prototype heart disease prediction system using machine learning algorithms.
- To explore and validate the proposed system results with various existing systems and show the system's effectiveness.

## BLOCK DIAGRAM

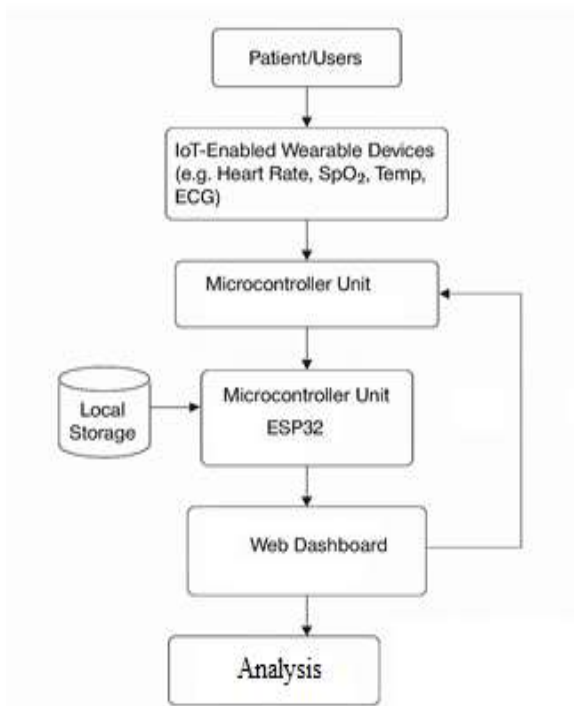


Fig2:- Block Diagram of System.

TABLE:-1

HARDWARE REQUIREMENT FOR THE DEVELOPMENT OF THE PROJECT

Hardware specification	Quantity
ESP32	1
MAX 30100	1
ECG 8232	1
Pulse Rate Sensor	1
Temperature Sensor	1

TABLE:-2

SOFTWARE REQUIREMENT FOR THE DEVELOPMENT OF THE PROJECT

Software Specification	Software Name
Programming Language	JAVA /J2EE/PYTHON

Tools	Eclipse or Higher, Heidi SQL, JDK 1.7 or Higher, Python 3.6
Database	SQL 5.1

## CIRCUIT DIAGRAM

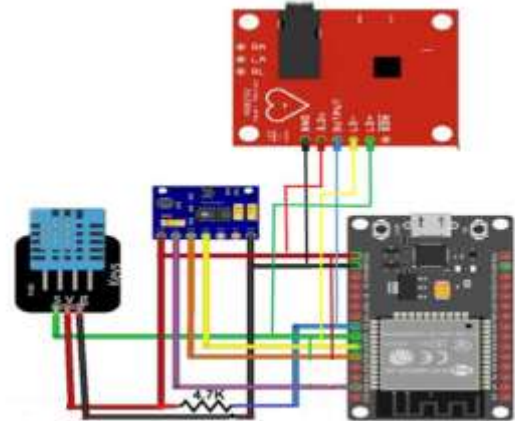


Fig3:- Circuit Diagram of System

## SYSTEM WORKFLOW AND DETAIL OPERATION

In the next part, we provide a comprehensive description of each module.

### 1) Training:

- Collect data from doctors and Internet of Things (IoT) devices, including synthetic and real-time patient data.
- Utilize data mining techniques on patient data, including pre-processing, cleaning, and categorizing.
- Data is stored in a background knowledge database utilized during testing.

### 2) Testing:

- The system operates using synthetic and real-time input patient data transmitted over the internet and predicts the likelihood of disease based on a trained module.
- Collected data is stored in a global database using a link-oriented design.
- In the testing phase, both the testing and training data are read concurrently.
- Apply machine classification and anticipate future implementation of the decision-making process.
- Finally, ensure that the study aligns consistently

with the system's true positive and false adverse outcomes

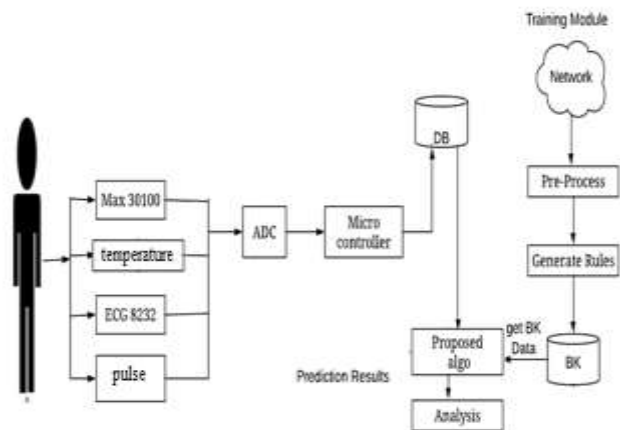


Fig 4:- Complete System Diagram

## ALGORITHM/ FLOWCHART

### Q- Learning Algorithm

**Input:**  $inp[1...n]$  all input parameters which is generated by sensors, Threshold group  $TMin[1...n]$  and  $TMax[1...n]$  for all sensor, Desired Threshold  $Th$ .

**Output:** Trigger executed for output device as lable.

**Step 1 :** Read all records from database (R into DB)

**Step 2:**  $Parts[] \leftarrow Split(R)$

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

**Step 3:**

**Step 4:** check (Cval with Respective threshold of  $TMin[1...n]$  and  $TMax[1...n]$  )

**Step 5:** if (Cval > Threshold)

Read all measure of for penalty TP and reward FN

Else continue. Tot++

**Step 6:** calculate penalty score =  $(TP * 100 / Tot)$

**Step 7:** if (score >= Th)

Generate event

End for

## FLOWCHART

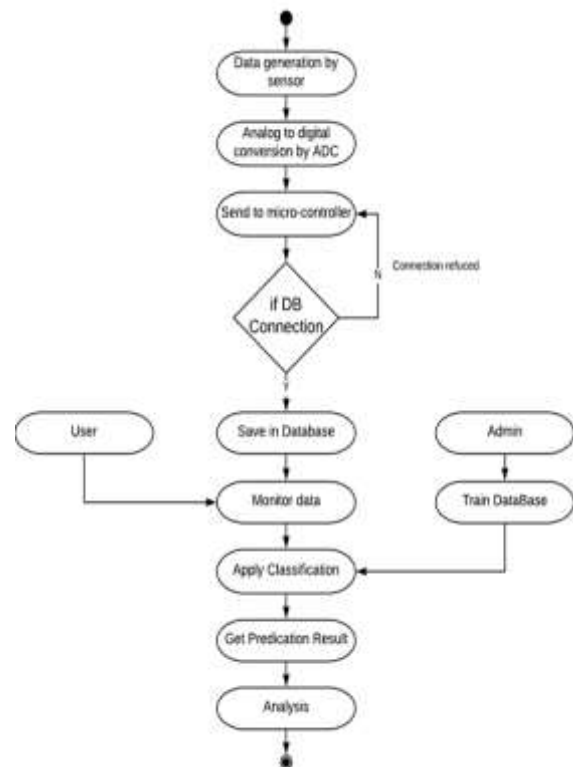


Fig5 :- Flowchart Diagram

## RESULT

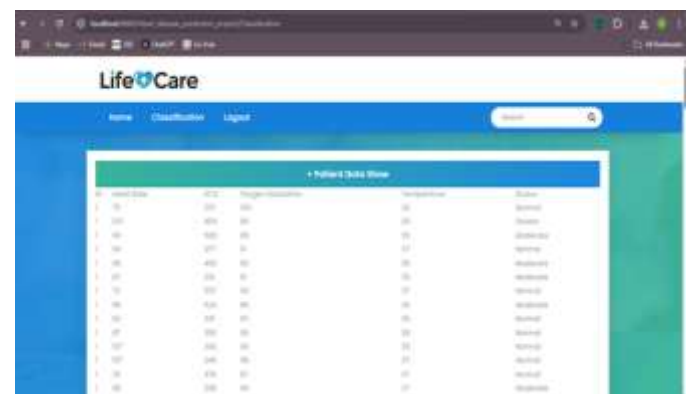


Fig5:- Result

## CONCLUSION

The Internet of Things is considered now as one of the feasible solutions for any remote value tracking especially in the field of health monitoring. It facilitates that the individual prosperity parameter data is secured inside the cloud, stays in the hospital are reduced for conventional routine examinations and most important that the health can be monitored and disease diagnosed by any doctor at any distance. In this system, an IoT

based health monitoring system can be developed. The system monitored body temperature, pulse rate and room humidity and temperature using sensors.

The Internet of Things Architecture is a well-functioning technology because it gives the regular person with a common platform that they can purchase in a variety of different areas. In the aforementioned domain, the study field known as healthcare is an essential and unavoidable component of our daily life. The Internet of Things (IoT) provides a better platform for aggregating sensory data in the medical area and integrating it into smart devices. Super brilliance gives the finest supervision for the underprivileged. This is the most fundamental level of intellectual thinking in android devices, which may also be referred to as smart gadgets. In the traditional method, most examinations are invasive, causing patients pain and causing discontent or carelessness with their health. It's really difficult for them to manage with such situations. As a result, the purpose of this research is to supply them with a forum where each necessary patient may receive their vitals using a proposed non-invasive way. In this instance, patients will use internet technology to contact the doctor 24 hours a day, seven days a week, and will be alerted. The suggested system can regulate cholesterol, blood pressure, stress indicators, and a variety of other measures that are critical to my heart health, including vascular age and cardiac index

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