HEART RATE MONITORING, HEART ATTACK DETECTION AND PREDICTION

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Abstract -- One of the most vital organs in the human body is the heart. It works as a pump to circulate oxygen and blood throughout the body, ensuring that the body's functioning is maintained. A heartbeat is a two-part pumping motion of the heart that lasts approximately a second. It is formed as a result of the heart's contractions. The SA(Sino Atrial) node gives out an electrical signal when blood gathers in the upper chambers, causing the atria to constrict. The blood is subsequently pushed through the tricuspid and mitral valves by this contraction; this phase of the pumping mechanism is known as diastole.When the ventricles are entirely filled with blood, the following phase begins. Electrical impulses from the SA node reach the ventricles, causing them to contract. Heart-related health issues are increasingly widespread in today's world.One of the leading causes of mortality in both men and women is heart disease. Every year, it takes the lives of around 1 million people. Heart rate is an important factor in how well the heart works. Heart rate monitoring is therefore essential in the research of heart performance and, as a result, in preserving heart health.Using IoT and machine learning, this research presents a heart rate monitoring detection system. The treatment of most heart-related disorders nowadays necessitates long-term monitoring as well as ongoing monitoring.In this sense, IoT is highly valuable since it replaces traditional monitoring systems with a more efficient method by giving important information about the patient's status to the doctor. Machine learning, on the other hand, is the idea that a computer programme can learn and adapt to new data without the need for human intervention. Machine learning is a branch of artificial intelligence (AI) .that maintains a computer's built-in algorithms up to date despite global economic fluctuations.Furthermore, the user or doctor present at the hospital can utilize the real-time monitoring system to check the patient's heart rate in the serial monitor.

Keywords- Graphical user interface (DUI), Saturation level of Oxygen (SpO2),Heart Rate(HR), Sinoatrial Node(SA).

I. INTRODUCTION

We now have a higher prevalence of cardiac problems, including a higher risk of heart attacks. Our suggested method makes use of sensors that can detect a person's heartbeat ,SpO2,and Temperature sensing even if they are at home. The sensor is then connected to a microcontroller, which allows the heart rate values,Spo2 and temperature to be checked and transmitted over the internet. The maximum and minimum heart rate limitations can be adjusted by the user or doctor based on the patients' age. After setting these restrictions, the system begins monitoring, and when the patient's heart rate exceeds a specific threshold, the system sends an alarm to the controller, who then sends it via the internet to physicians and other interested parties.Lower heartbeats are also signaled by the system. The device also displays the patient's live heart rate whenever the user signs in for monitoring. Thus, concerned individuals may monitor heart rate and get an alarm of a heart attack to the patient from anywhere, allowing the person to be saved in a timely manner.It is mostly utilized at the homes of patients and by those who care for them when they are away from them. It is convenient, low-cost, and easy to monitor by both patients' guardians and doctors, depending on the number of users.

II. RELATED WORK

1. Real Time Heart Beat Monitoring Using Computer Vision Abstract: Among the different biological parameters, **heart rate (HR)** plays a very significant part in the disease diagnosis. It confirms the state of living of a person. Heart rate gives an idea about the person's health and hence it should be observed.[1]

2. The **Heart Rate Monitoring system** is developed using IOT technology with an objective of detecting the heart beat of the patient in order to monitor the risk of heart attack and also the regular checkup. Body health monitoring is very important to us to make sure our health is in excellent condition. [2]

3. Smart heart rate monitoring system Abstract: **Heart rate that is given by the number of times heart beats per minute** is a crucial health parameter that indicates the soundness of the human health. [3]

4. An alternative designed architecture of a **microcontroller based heartbeat and body temperature monitoring system using fingertip and temperature sensor** is presented as a solution to some of the identified challenges of existing technology that uses network between the patient and doctor to enable remote monitoring of aged patient for medical attention.[4]

III. SYSTEM DESIGN

HARDWARE ARCHITECTURE OF THE SYSTEM

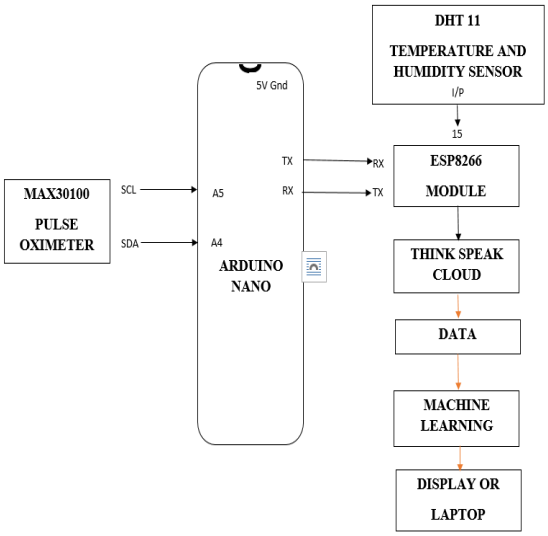

FIGURE. 1. BLOCK DIAGRAM OF THE HARDWARE

The suggested system's Block Diagram [Fig. 1] is shown below, with brief component explanations discreetly about the working of the device.The sensed data from the sensor will be send to the microcontroller and then the data will be send to WiFi Module.By using the WiFi module data will be uploaded in the cloud the data can be used for prediction purpose.

SOFTWARE ARCHITECTURE OF THE SYSTEM

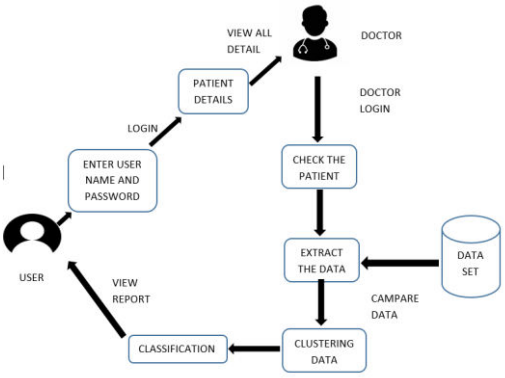

FIGURE. 2. BLOCK DIAGRAM OF THE SOFTWARE

The suggested system's Block Diagram [Fig. 1] is shown below, with brief component explanations discreetly about User and Doctor modules.The User will upload all the details about the patients post record.After in Doctor module ,the doctor will able to analyze the sensed data and record of the patients.And the doctor will send a report to the patient health status.

IV. ALGORITHM

Agglomerative hierarchical algorithms

Hierarchical clustering (also known as hierarchical cluster analysis or HCA) is a cluster analysis approach that aims to create a hierarchy of clusters in data mining and statistics.

Here initially each data point is considered as an individual cluster. At each iteration, the similar clusters merge with other clusters until one cluster or K clusters are formed.

Agglomerative hierarchical methods are used here, and each data point is originally treated as a separate cluster. Similar clusters merge with other clusters in each iteration until one cluster or K clusters are produced.

TREE STRUCTURE(DENDROGRAM)

The dendrogram is **a visual representation of the compound correlation data**. The individual compounds are arranged along the bottom of the dendrogram and referred to as leaf nodes. Compound clusters are formed by joining individual compounds or existing compound clusters with the join point referred to as a node.

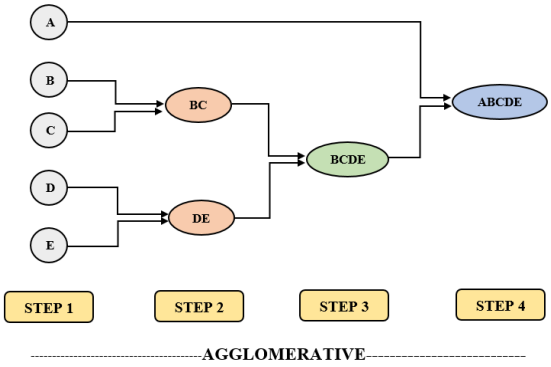

FIGURE. 3. TREE DIAGRAM OF THE DENDROGRAM

V. PROPOSED SYSTEM

The proposed system provides a platform to view all the data senses from MAX30100 sensor and DHT11 Temperature and Humidity sensor to Arduino nano and it sends the data to ESP8266 WiFi. With the help of Think Speak Cloud we can store the data from the sensor and analysis ,plot the chart to view the patients records.After some time the data from the cloud is used to analyze the probability of heart attack and it alarms the certain number of users. The proposed system is GUI-based, user-friendly, scalable, reliable and an expandable system. The proposed working model can also help in reducing treatment costs by providing Initial diagnostics in time.General physicians can utilize this tool for initial diagnosis of cardiac-patients.There are many possible improvements that could be explored to improve the scalability and accuracy of this prediction system.As we have developed a generalized system, in future we can use this system for the analysis of different data sets. The performance of the health's diagnosis can be improved significantly by handling numerous class labels in the prediction process, and it can be another positive direction of research.

VI. OUTPUT OF THE PROJECT

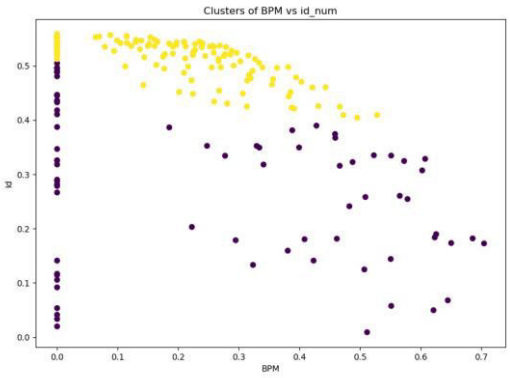

FIGURE. 4. CLUSTER OF THE BPM

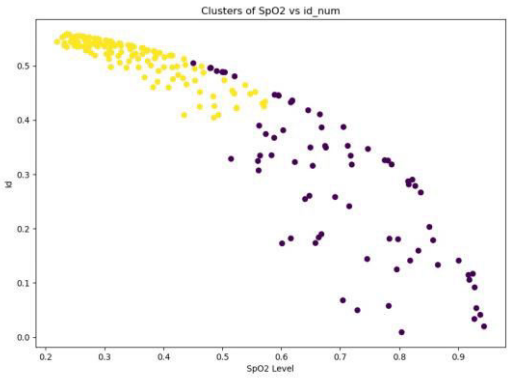

FIGURE. 5. CLUSTER OF THE SPO2

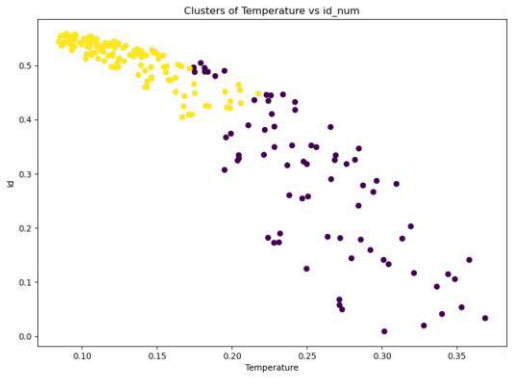

FIGURE. 6.CLUSTER OF THE TEMPERATURE

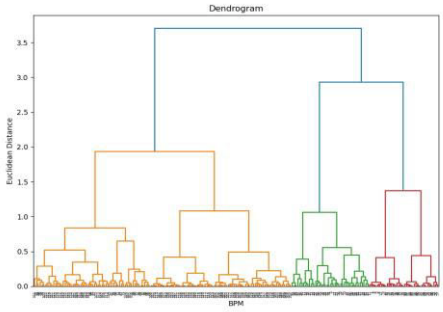

FIGURE. 7. DENDROGRAM OF THE BPM

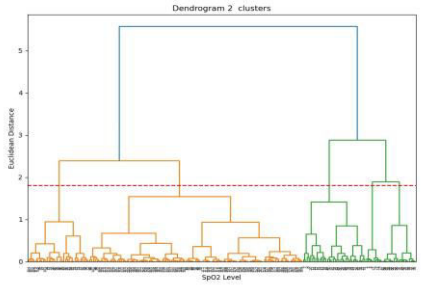

FIGURE. 8. DENDROGRAM OF THE SPO2

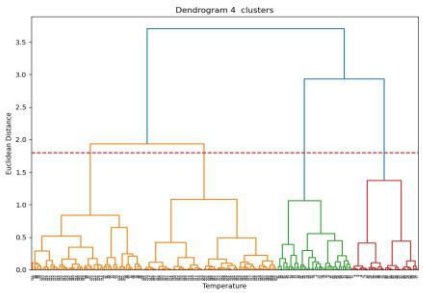

FIGURE. 9. DENDROGRAM OF THE TEMPERATURE

VII. CONCLUSION

In this study, we proposed and implemented a portable wearable ECG system for real-time heart beat monitoring ,heart attack detection and prediction using both IOT and Machine Learning.we implemented both hardware and software successfully.The device alerts the user whenever the abnormal heartbeat arrives.The sensors and microcontroller are successfully interfaced with the cloud. The data is stored successfully and can be accessed remotely. All observations and experimental set up proves that this is a complete solution to monitor the heart of the patient. Users can have access to the data and can know if there are any deviations with respect to heart beat,SpO2,temperature, humidity. Implementing this system will allow users like users to monitor from anywhere in the world.In the future, we would like to fabricate all the sensors and microcontroller into simple devices to make it more feasible to the user .

VII. FUTURE WORK

The future scope includes supplying a casing to the sensors in order to create a crash-proof system. Example Titanium or stainless steel can be used. Additionally, additional sensors can be used to assess fuel capacity and tyre pressure. In real-time, these controller level sensors communicate with the appropriate channel sensors to provide the same suitable output.

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