IOT AND WEB BASED REAL TIME ASSISTING SYSTEM FOR DETECTING CARDIAC ARRHYTHMIA

Mahammed Jameer Ghori
Department of CSE
Alva's Institute of engineering and technology
Moodbidri,India
0009-0003-4345-5523

Prashanth K
Department of CSE
Alva's Institute of engineering and technology
Moodbidri,India
0009-0007-8696-1863

Yeshaswini R
Department of CSE
Alva's Institute of engineering and technology
Moodbidri,India
0009-0005-1159-8807

Nandini Madne K
Department of CSE
Alva's Institute of engineering and technology
Moodbidri,India
0009-0002-1658-3290

Prashanth Kumar
Department of CSE
Alva's Institute of engineering and technology
Moodbidri,India
0009-0003-7610-5466

Abstract

Cardiac arrhythmias are a major health concern, requiring prompt detection for effective intervention and improved outcomes. Traditional methods often lack efficiency and real-time capabilities. This paper proposes an IoT and web-based real-time assisting system for detecting cardiac arrhythmia. The system leverages IoT technology to continuously acquire physiological data, specifically focusing on electrocardiogram (ECG) signals. A web-based platform facilitates data transmission, analysis, and visualization**.**

Keywords— Data mining, cardiovascular, Heart Rate, cholesterol, ventricle, electrode,

I. INTRODUCTION

Heart disease is common among people most common ailments. This is a very common sickness these days. To provide an improved method for anticipating, We used a number of characteristics that may be Additionally, it is extensively linked to heart conditions. algorithms. The main focus is on Using machine learning methods to solve problems detection. These days, a lot of business applications, including e-commerce, use machine learning. Prediction is one use of machine learning; in this case, we analyze patient datasets and patient data for which a forecast of the illness's risk is required in order to estimate the likelihood of heart disease. The objective of the work is to discover the great classifier by means of calculating accuracy of different classifiers Information mining is a frequently employed approach. Globally, heart disease is its fundamental cause of mortality. This system forecasts the potential development of Cardiovascular disease. The outcomes of this system give the % likelihood of developing heart disease. The datasets are categorized using medical parameters. To analyze such factors, our system employs a data mining classification method. The Process of Decision Tree technique and the Naive Bayes algorithm are the two The main diodes machine learning algorithms utilized are: handle the datasets in Python programming. The findings show which method For coronary artery disease. works the best In the context of correctness. The process of collecting incorrect knowledge from vast amounts The information is known as The practice of data mining crucial step in learning from data sets is the application of data mining. There are number Databases, data marts, and information buildings. all over the world. Data mining is mainly used to extract the hidden information from A tremendous abundance of database. Data mining is also called as Knowledge Discovery Database (KDD). the prediction accuracy of weak classifiers, You perform satisfactorily while determining Risk of cardiovascular illness

II. LITERATURE SURVEY

Many investigations on sickness Systems were officially established at medical facilities Nous utilised totally different machine learning algorithms. and data mining techniques. One useful technique The danger of heart attack could possibly predicted with multiple linear regression., as demonstrated by K.

Polaraju et al.'s suggested A Multivariate Regression Algorithm for Cardiac. Disease Prediction. The training collection of information provides 3000 instances with the 13 previously specified properties, is paid to complete the assignment.

The study by S. Seema et al. focuses on Data mining is one of the approaches that depend on Artificial Neural Networks (ANN), Decision tree models and support vector machines (SVM) are similar, Utilize Naïve Bayes for projections. chronic illness using historical medical information. A comparison analysis is carried out to ascertain whether classifiers perform better at An precisely rate. In this study, SVM produces the highest accuracy rate; nevertheless once it arrives diabetes, Naïve Bayes produces Enables the best accurateness. Ashok Kumar Dwivedi promoted a number of algorithms, including Naive Bayes, Classification Tree, KNN, Logistic Regression, SVM, and ANN. The rightness of the Logistic Regression method is greater than that of Other approaches. Megha Shahi et al. suggested a Cardiac Disease Forecasting System Using Information Mining Technologies. We employ WEKA software to rate Optimize the level of service and diagnose bugs efficiently. of ailments.

The suggestion made by Chala Beyene et al. was to analyze and forecast the onset Data mining may enhance the knowledge concerning cardiac arrest techniques. The main objective is to anticipate the arrival of cardiac arrest in order to facilitate early, automated identification of the ailment with quick outcomes. The technique that was suggested holds particular significance for healthcare organizations whereby experts are aging out. It looks at many medical factors, Factors to keep in mind including age, gender, levels of sugar in the blood, and the rhythm of the heart to evaluate discover whether a person has coronary artery disease. Dataset analyses WEKA software was utilized to compute the aforementioned outcomes. R. Sharmila et al. [13] proposed the utilization of a non-linear classification approach For a forecast of heart illness. To anticipate heart disease utilizing an optimised attribute set, SVM Utilize to go along with big data approaches such as MapReduce and The distributed file system of Hadoop (HDFS). There are numerous data mining strategies for the prediction of cardiac illnesses was investigated in this paper. It suggests using HDFS to perform the SVM prediction algorithm concurrently over multiple nodes and store vast Masses of records across numerous nodes. The utilization of parallel SVM resulted in faster computation speeds when compared to Asynchronous SVM. Jayami Patel et al. advocated using data mining and machine learning techniques to detect heart disease. This project desires to utilize methods related to data mining to uncover hidden patterns.

In accordance with UCI. data, the ideal algorithm J48 Offers an outstanding rate of precision when in comparison with LMT. An extremely successful data-mining-based The cardiovascular disease prediction algorithm was presented by Purushottam et al. Based on predetermined criteria, this approach helps medical practitioners make well-informed decisions. By testing and training a certain parameter, it achieves 86.3% correctness all through the evaluation period and 87.3% exactitude in exercising phase. K. Gomathi et al. Potential data extraction methodologies for The projection of various diseases. These days, predicting various diseases demands for the utilization of data mining. By leveraging mining of information techniques, An excessive amount of assessments can be mitigated. Making forecasts regarding Cardiovascular diseases, insulin resistance, and carcinoma of the breast, etc. is the main subject of this essay. P. Sai Chandrasekhar Reddy et al. proposed utilizing ANN To anticipate cardiac events. The necessity to Construct a new technology that can forecast heart disease arose from the rising costs associated with diagnosing the condition. After the patient has been evaluated, a model for predicting outcomes serves to forecast their status based on a number of indicators, including blood pressure,

cholesterol, and heart rate. Java provides proof of the system's correctness. The development of a prediction algorithm that diagnoses Coronary artery disease making use of patient medical data was advised by Ashwini Shetty et al. [18]. In building the system, 13 factors of risk for intake character traits were taken into consideration. by Jaymin Patel et al. [19] to forecast heart disease.

S. Prabhavathi et al. [23] presented the Neural Fuzzy System (DNFS), a decision tree-based Framework for the investigation and prognosis of various cardiac conditions. This publication breaks down the investigation on cardiac illness being detected. DNFS stands for Making choices Tree-Based Neural Fuzzy System.. The reason for the completion of this research investigation is to both develop a smart and economical system and enhance the functionality of the one that already exists. This paper talks about data mining methodologies specifically applied enhance the projected outcome of cardiac disease. The study's findings indicate that SVM and neural networks perform exceptionally well in heart disease prediction. However, The use of data mining tactics do not appear to be promising For the estimation of cardiopulmonary disease.

Sairabi H. Mujawar et al. [24] used naïve bayes and K-means to predict heart illness. The undertaking entails build An apparatus that exploits an antique cardiovascular index to deliver diagnostics. Thirteen ingredients have been investigated to take into account when developing the system. Knowledge can be extracted from databases using data mining techniques like clustering and classification procedures. The Cleveland area Heart Database had 300 records in total, each of which related to 13 factors.

Carlos Ortiz evaluated the issue in 2004 to be adept at identify and predict the association rule for heart disease. He had access to a dataset that included heart perfusion and constricted artery and cardiac history parameters of patients with heart disease along with risk variables.

Boleslaw Szymanski et al. conducted an experiment in 2006 to assess the capacity for calculation sparse kernels in SUPANOVA. The measurement of heart activity and prediction of heart illness, which were measured with utilizing support vector machines and kernel equivalents, were found to be 83.7% right when the author applied this technique to a standard dataset from the Boston housing market. Heon Gyu Lee et al. worked for the arithmetic and cataloguing operations systems in 2007 to include incorporate multi-parametric characteristics using both direct and non-linear heart rate variability (HRV) features.

Using a data mining method, Sellappanpalaniappam et al. (2008) created the HDPS-Intelligent Coronary artery disease forecasting the likelihood system. 2008 saw the establishment of CANFIS (Co-active neuro-fuzzy implication approach) by Lathaparthilan et al. as a means of diagnosing heart disease. Fuzzy logic and neural network technology techniques were integrated to establish the sickness in the CANFIS model. For the purpose to create a heart illness prediction system, Australian S. Dangare and Sindhu S. Apte (2012) utilizing computer equipment strategies for learning, included as decision trees, naive bayes, and neural networks, on datasets related to heart disease. Two data sets were used in this. There are 303 records in the developed heart disease dataset and 270 records in the statlog heart disease dataset. Two additional episodes parameters were recently established. to the generally used 13 attributes list for a determination of myocardial disease: smoking and obesity.

B. Venkatalakhshmi and M. V. Shivasankar created a prediction algorithm for diagnosing cardiac disease in 2014. The UCI machine learning repository's 13 characteristics structured clinical dataset, consisting of just 294 entries, was chosen as the data source for this research study. The algorithm implementation tool is WEKA.

.

III. HARDWARE ARCHITECHURE

Enabling connections between objects at Any time frame and location, with anything and anybody ideally utilising any path/network and any service is the aim of the Internet of Things. More advancements in a number of fields, such as applications and communication, are needed to achieve this goal. Many research and development organizations conduct development activities. Stated differently, the Internet of Everything (IoE) can be defined as a network of interconnected, communicative, information-sharing devices and computers of all sizes and forms.

. Cisco describes the Internet of Everything (IoE) as connectivity of people, data, things, and processes in networks of connections. By 2020, 50 billion devices will be linked to the Internet, predicts Cisco. One way to think of IoT is as a network within network.

HARDWARE USED

The hardware that Is implemented in this detection is shown bellow:

- ARDUINO.
- HEARTBEAT SENSOR.
- TEMPERATURE SENSOR.
- ACCELEROMETER SENSOR.

ARDUINO.

The open-source electronics platform Arduino is built on user-friendly Materials and computer software. Boards that use Arduino may receive inputs, Like say a light from A sensing device, a user's Position your thumb on the trigger, or a message from Twitter, and convert them into outputs, such as starting a motor or Flipping on an LED.

, distributing things online. By providing Procedure for the board's CPU, you can tell it what needs to do. To do this, you use the Processing-based Arduino Software (IDE) and the Wiring-based Arduino programming language.

Fig: 1. Arduino kit.

Microcontroller	ATmega328P -8-bit AVR relatives controller.
Operating Volt	5V
suggested Input volts:	7-12V
Input Voltage Limits	6-20V
Analog Input Pins	6 (A0 – A5)
Digital I/O Pins	14 (Out of which 6 provide PWM output)
DC Current on I/O Pins	40 mA
DC Current on 3.3V Pin	50 mA
Flash Memory	32 KB (0.5 KB is used for Bootloader)
SRAM	2 KB
EEPROM	1 KB
Frequency (Clock Speed)	16 MHz

Table: 1. Arduino Uno Technical Specifications.

IV. TEMPERATURE SENSOR

Generally speaking, a temperature sensor is an apparatus made expressly to gauge an object's heat or coldness. The temperature (in degrees Celsius) is proportional to the output of the precision integrated circuit (IC) temperature sensor LM35. The LM35 provides more precise temperature reading than a thermistor. It will only work raise the temperature in still air by 0.1 °C and has a low capacity for self-heating. The operational temperature range is -55°C to 150°C.The LM35's ability to interface with readout or control circuitry is facilitated by Its final susceptibility is low and consistent.output, and perfect intrinsic calibration. It Has been put to use in appliances, power supplies, battery management, and other areas.

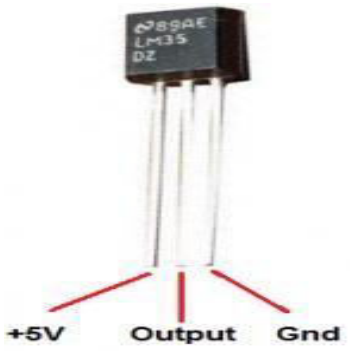

Fig 2. The LM35 chip temperature gauge Pinout.

With an electrical output proportionate to the temperature (in degrees Celsius), the LM35 integrated circuit sensor is a significant means of temperature measurement. Compared to utilising a thermistor, it is more accurate at measuring temperature. Since the sensor circuitry is sealed, oxidation cannot affect it. Compared to thermocouples, the LM35 produces a larger output voltage, hence the output voltage may not need to be amplified. The output voltage of the LM35 is proportional to the temperature in Celsius. There is a.01V/°C scale factor.

LM35 AND ARDUINO INTERFACE

Connect LM35 to Arduino uno as shown in circuit diagram. The +5v for could possibly be adopted from the +5v out pin of Arduino uno. Also, the ground pin of LM35 able to connect to GND pin of Arduino uno. Connect Vout (the analog out of LM35) to any of the Analytic opinions bit.Arduino uno. The aforementioned circuit diagram represents the Vout of the LM35 subsequently has been connected to Arduino's A1 of Arduino.

LM35 The software is attainable in the market in 3 series variations – LM35A, LM35C and LM35D series. The main difference between these 3 versions of LM35 IC are in their range of temperature measurements.

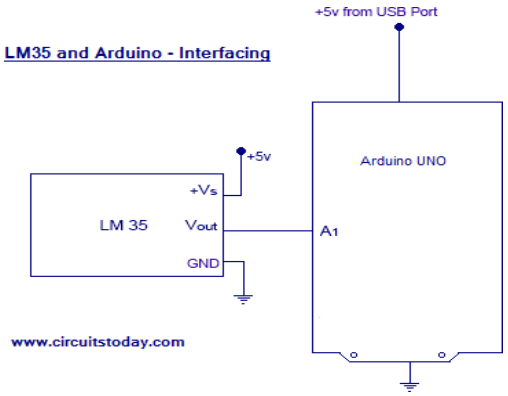

Fig 3. LM35 and Arduino Circuit Diagram.

The LM35D series is designed to measure from 0 degree Celsius to 100 degree Celsius, where as the LM35A series is designed to measure a wider range of -55 degree Celsius to 155 degree Celsius. The LM35C series is designed to measure from -40 degree Celsius to 110 degree Celsius. In our LM35 Arduino example, we are using the LM35Dz sensor- which falls under LM35D series. So, our min-max range of temperature measurement is 0 degreeCelsius to 100 degree Celsius.

V. HEARTBEAT SENSOR

Modern systems monitor heart rate by optics, which involves passing light from an LED through the skin and observing how it reflects off blood vessels. Some gadgets that make Make use of this.technology can track heart rate in addition to blood oxygen saturation (SpO2).

As previously indicated, some modern optical sensors can also send data. Modern gadgets like watches or cell phones can be utilised to show and/or gather the data. Certain devices have the capability to concurrently track heart rate, oxygen saturation, and more variables. These might include gadgets to take measurements. distance, speed, and location, such GPS, gyroscopes, and accelerometers. Rhythm monitors have become available.a standard feature of smartwatches The past few decades have seen important shifts. raised their appeal. PPG sensors are frequently used in some smart watches, smart bands, and cell phones.

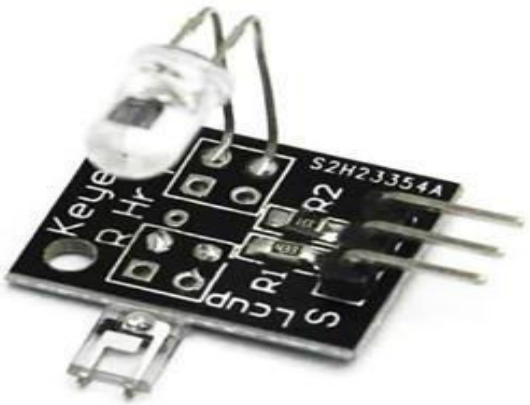

Fig 4. Heart beat sensor circuit

ECG Sensor :

A little, handy chip called the AD8232 is used to gauge the heart's electrical activity .This electrical activity can be converted into an electrocardiogram, or ECG. Electrocardiographs: A diagnostic tool for a variety of heart conditions. Electrocardiography (ECG) sensors, which are commonly found in medical devices, assess the bio-potential produced by electrical signals that regulate the expansion and contraction of the heart chambers.

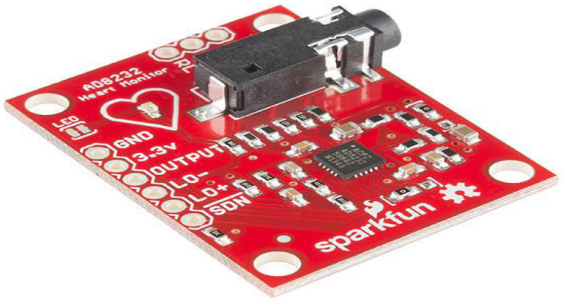

Fig 5. ECG sensor circuit

VI. NODEMCU

The wifi-enabled ESP8266 chip is what makes up the NodeMCUDev Kit/board. Espressif Systems created the low-cost Wi-Fi chip ESP8266, which uses the TCP/IP protocol. To gain additional knowledge about ESP8266, please refer to ESP8266 WiFi Module

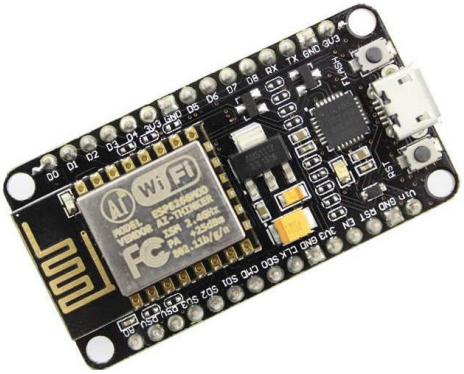

Fig 6. ESP8266 PCB

The Node MCUDev Kit, sometimes referred to as the Node MCU Development Board v1.0 (Version2), is offered in Version 2 (V2) and sometimes appears as a black printed circuit board.

.

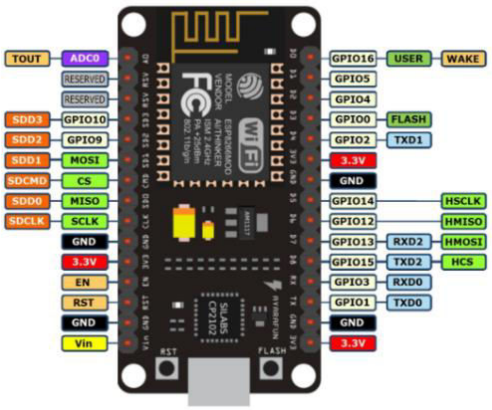

Fig 7. ESP8266 Pin Config

CONCLUSION

A smart IoT gadget Which may have been utilized as forecast and monitor cardiac problems in patients. Additionally, we succeeded in creating a low-power communication link between the smartphone app and the intelligent IoT device. The non-invasive technology being developed This investigation is going to help prospects. have A more thoroughly recognize of their heart health. Results from A wide range of datasets are also provided, demonstrating the high classification accuracy of this method in differentiating between cardiac vital patterns that are normal and abnormal. We intend to test The system we were using gathers data from patients with heart problems in the future to assess the temporal consistency and long-term viability of our approach. To assist us in sifting through pertinent data, we intend to obtain hospital statistics and collaborate with leading cardiologists. In an initial test, Nous love too. assess the power consumption rate Around the span of time during device's lifetime. We also want to track the users' physiological markers while they go about their regular lives. We have developed an application that allows patients and healthcare professionals to communicate, capture data from a heart monitor over Wi-Fi, and have access to these records for the physician when paired with the blood oxygen meter along with your pulse monitor.

VII. REFFERENCES

[1] E. Perrier, positive disruption: healthcare, ageing & participation The year of birth od technology. Australia: the MCkell institute, 2015.

[2] P. Gope and T. Chung. “bsn-care: a secure IoT based modern healthcare system using body sensor network Alcatel Electronics Newspaper, Vol. 16, Jun. a five p. 1. 1368–1376, 2016.

[3] N. Zhu, T. Diethe, M. Camplani, L. Tao as well as D. Burrows, 2006 N. The researcher. D. Kaleshi, M. Mirmehdi, P. Flach, and I. Craddock, “bridging e-health and the internet of things: the sphere project,” IEEE intelligent systems, vol. 30, no. 4, pp. 39-46, 2015.

[4] S. H. Chang, R. D. Chiang, S. J. Wu, and W. T. Chang, “a context-aware, interactive m health system for diabetics,” it professional, vol. 18, no. 3, pp. 14–22, 2016.

[5] C. F. Pasluosta, H. Gassner, J. Winkler, J. Klucken, and B. M. Escoffier, “an emerging era in the management of Parkinson’s disease: wearable technologies and the internet of things,”ieee Bulletin of The biomedical field and Health Computer .19,no.6, pp.1873–1881,2015.

[6] Y. J. Fan, Y. H. Yin, L. D. Xu, Y. Zeng, and F. Wu, “IoT based smart rehabilitation system,” The Transactions of the IEEE on Occupational vol.10, no. 2, pp. 1568–1577, 2014.

[7] S. Sarkar and S. Misra, “from micro to nano: the evolution of wireless sensor-based health care,” IEEE pulse, vol.7, no.1, pp.21–25, 2016.

[8] Y. Yin, Y. Zeng, X. Chen, and Y. Fan, “the internet of things in health care: an overview,” journal of industrial information integration, vol. 1, pp. 3–13, 3 2016.

[9] S. M. R. Islam, D. Kwak was, H. Kabir, the character M.3 the authors, Hos and K. S. Kwak, “the internet of things for health care: a comprehensive survey " Access to the IEEE", Vol. 3, p. 688. – 708, 2015.

[10] D. V. Dimitrov, “medical internet of things and big data in healthcare,” healthcare informatics research, vol. 22, no. 3, pp. 156-163,72016.

[11] z.wei,w.chaowei,and Y. Nakahira, "medical application on internet of things," in communication technology and application, ietinter national conference on,2011,pp.660-665,