International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Predicting Heart Attacks with Machine Learning

Dr. M. Manojprabu[1], Mr. S. Ramprakash[2], Mr. S. Sethuragavan[3], Mr. R. Sathyan[4], Mr. G. Ajith[5]

[1]Associate professor, Department of biomedical engineering, Sri Shakthi Institute of engineering and technology, Coimbatore, Tamil Nadu
[2,3,4,5]UG students, Department of biomedical engineering, Sri Shakthi Institute of engineering and technology, Coimbatore, Tamil Nadu

ABSTRACT:

Predicting heart attacks is an important part of healthcare because it helps prevent and treat cardiovascular diseases. Predicting heart attacks based on various risk factors like age, blood pressure, cholesterol levels, and smoking habits has shown great promise for machine learning. A heart attack risk prediction model based on machine learning is the focus of this research. We trained our model on a dataset of many individuals with various demographic and clinical characteristics using publicly available data. The model's performance was evaluated using a variety of classification algorithms, including Naive bayes and KNN classifier. The proposed model's accuracy of over 90% is demonstrated by our findings, which bodes well for future applications. The model can help doctors who specialize in cardiology and other medical specialties identify patients who have a high risk of having a heart attack, allowing for early treatment and intervention. By using machine learning algorithms, it is more possible to predict the heart attack accurately at the earliest stage. By predicting heart attack at the earlier stage, it is possible to save most of the lives.

Keywords: Heart attack, Machine learning, KNN classifier, cholesterol level

1. Introduction:

Globally, heart disease is the leading cause of death and morbidity. It causes more deaths than any other cause annually. The World Health Organization (WHO) estimates that heart disease was the cause of death for 17.9 million people in 2016, or 31% of all deaths worldwide. Over three quarters of these deaths occurred in countries with low or middle incomes. Of all heart illnesses, coronary illness (also known as cardiovascular failure) is by a long shot the most well-known and the most lethal. For instance, according to the CDC (2019), approximately 805,000 Americans suffer a heart attack each year and that one occurs approximately every 40 seconds in the United States. The good news is that heart attacks can be avoided with simple lifestyle changes like quitting smoking and drinking alcohol, eating well and exercising) and early treatment significantly improve its outlook. However, due to the multifactorial nature of numerous contributory risk factors like diabetes, high blood pressure, and high cholesterol, among others, it is difficult to identify patients at high risk. Machine learning come to the rescue in this situation. Because of their superiority in pattern recognition and classification over other traditional statistical approaches, scientists and doctors alike have turned to machine learning (ML) techniques to develop screening tools. Here we use naïve bayes, KNN classifier for detection of heart attack at the earliest stage. As the existing systems produce values at the lowest rate of accuracy, here we use the machine learning algorithms to get a maximum get a most accurate result. Our objective is to develop a highly accurate predictive model that can be used to aid healthcare professionals in making informed decisions and prevent cardiovascular disease.

2. Methodology:

2.1 Hardware interface:

The temperature sensor DHT11, the heart rate sensor KY039, and the spo2 sensor MAX30100 make up the system. The parameters are measured by these sensors, which are then connected to the node MCU, a software module that connects the sensors to the IOT platform (Thing speak) and machine learning. In machine learning, the system will provide the necessary information in accordance with the datasheet and coding. On the off chance that the individual is at risk for a heart assault then the framework will alarm the specialists and the participants. If not, the system will continue to measure the parameters.

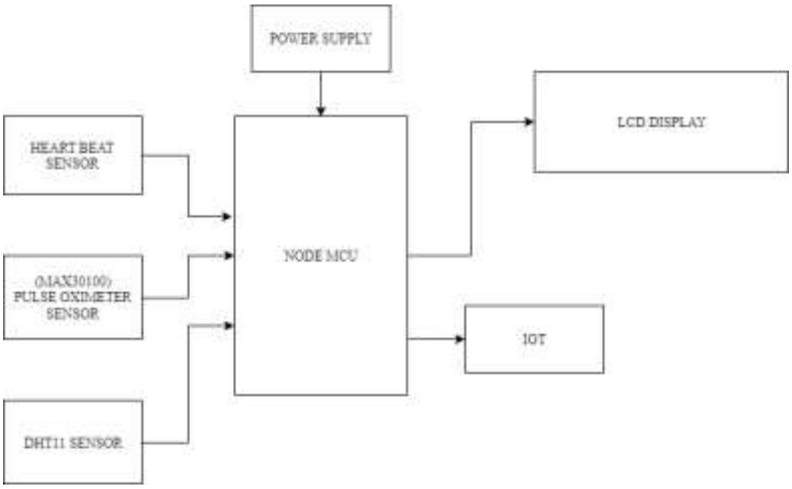


Fig 2.1

2.1.1 DHT11 temperature sensor:

A temperature and humidity sensor complex with a calibrated digital signal output is included in the DHT11 Temperature & Humidity Sensor. It ensures high reliability and excellent long-term stability by utilizing the exclusive digital signal acquisition method and temperature and humidity sensing technology. This sensor has a resistive-type component for measuring humidity and an NTC component for measuring temperature and connects to a high-performance 8-bit microcontroller. It is excellent in quality, responds quickly, can prevent interference, and is affordable. Whenever the person place finger on the sensor it starts to take readings.

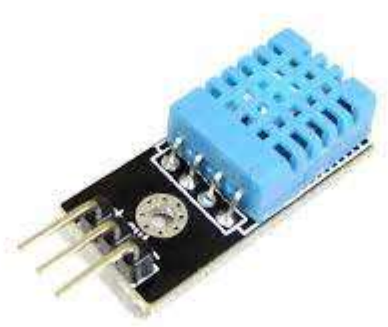


Fig 2.2

2.1.2 MAX30100 pulse oximeter sensor

The MAX30100 is a cutting-edge Analog bias intertwined palpitation oximeter that can be found in the module. To detect blood oxygen signals, it combines two LEDs, a photodetector, improved optics, and analog signal processing with low noise. The MAX30100 has two LEDs, one IR LED and one RED LED, on the right. Additionally, there is a truly sensitive photodetector on the left wing. The idea is that you can measure the position of blood oxygen by shining a single LED at a time and observing the amount of light that returns to the sensor. The sensor is grounded on the hand. The MAX30100 chip requires two distinct force voltages 1.8 V for the IC and3.3 V for the RED and IR LEDs. Therefore, the controllers for the module are 3.3 V and 1.8 V. This enables you to connect the module to any microcontroller with 5V, 3.3V, or even 1.8V position I/O. The MAX30100's low power consumption during dimension is one of its most important characteristics. Additionally, the MAX30100 can be used in standby mode, where it consumes only 0.7 A, making it possible to use it in battery-powered devices like smartwatches, wearables, and smartphones. Palpitation oximetry is based on the idea that the amount of oxygen in your blood affects how much red and infrared light is absorbed.

Fig 2.3

2.1.3 KY032 Heart beat sensor:

The bright infrared (IR) LED and phototransistor in the Finger Detection Heartbeat Measuring Sensor Module KY-039 are used to detect the pulse of the finger; a red LED flash with each. Beat screen fills in as follows: The phototransistor on the opposite side of the finger is used to get the flux emitted when the blood pressure pulses through the finger when the photo transistor's resistance changes slightly. The LED is the light side of the finger. A photo transistor and an IR LED make up this detection module, which produces a varying signal when a finger is placed in its vicinity. A change in this analog signal can be interpreted as a heartbeat.

Fig 2.4

2.1.4 Node MCU:

IoT platform Node MCU is free and open source. The hardware is based on the ESP-12 module, and the firmware runs on the Espressif Systems ESP8266 Wi-Fi SoC. By default, the firmware rather than the development kits is referred to as the "Node MCU." The Lua scripting language is used in the firmware. It is the device which helps hardware to send data to the cloud and machine learning. It works as a WIFI module.

Fig 2.5

2.2 Software interface:

After getting values from all the sensors, the readings are transferred to the cloud (thingspeak) and machine learning with the help of nodemcu.

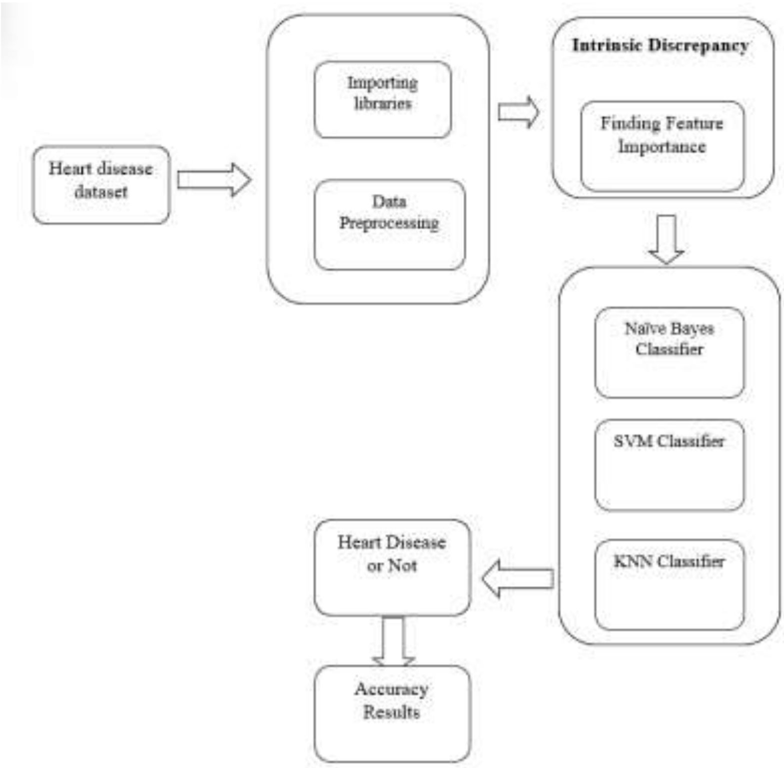


Fig 2.6

2.2.1 Pre-processing:

As per the block diagram, after getting results from the sensors the datas are shared to the pre-processing unit. Here all the datas are shared to the cloud and machine learning.

2.2.3 Get the important features:

After pre-processing the processed value is used to attain the important features which will be used in the machine learning. Important features like readings where the patients are in the danger of Heart attack.

2.2.4 Train the machine learning:

We get data sheets from high reputed scanning centers or hospitals. And using python we can finalize the accurate classifier. After obtain the accurate classifier we load them with the data sheets for the provide training to the machine learning. After some months of training to the machine learning algorithms. We tested the machine learning for the usage. After getting the accurate results we use the machine learning for the predicting purpose.

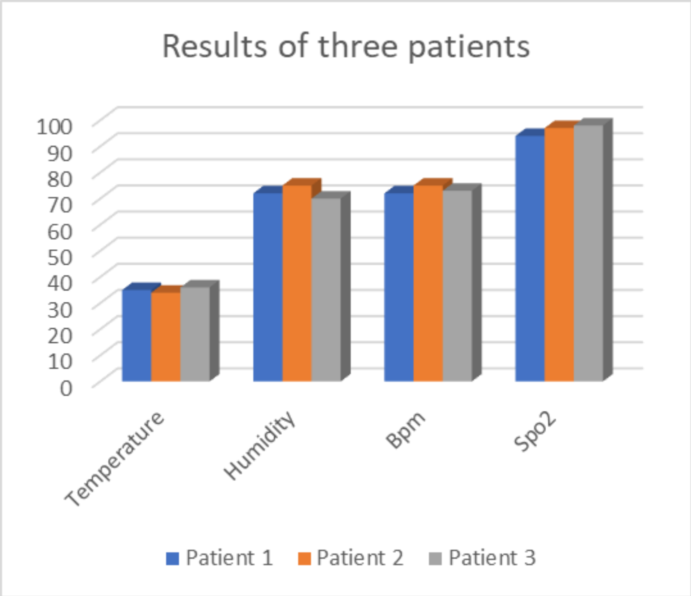
2.2.5 Comparing obtained values with the dataset:

After getting important features those values are sent to the machine learning. As per the coding and dataset on the machine learning classifiers, the total ML will compare the obtained values with the data set. The ML will compare the each and every datas we upload on it and get the accurate matching for our obtained values.

2.2.6 Finalizing the result:

By comparing with the obtained value, if the values matched are abnormal then the machine learning will alert the doctor and attenders of the patients. If the values compared are normal then system will repeat the process again and again until it gets the abnormal value.

3. Result:



As per the results we obtain the patients is normal and they are not in the danger of heart attack. If the readings we acquire exceeds the normal value then the machine learning will alert the doctors and attenders of the patients who is in the danger of heart attack.

Conclusion:

Our prototype will always function properly as long as we obtain accurate results. Because technology has advanced so rapidly, we can now order everything from the comfort of our homes. Similarly, treatment at the earlier stage for heart attacks will be available if our health condition is easily accessible online. Most likely, we will be able to save a life since it is a machine learning process. These issues can almost be resolved when this prototype becomes a device that works. After the ideal values are discovered and entered into the phone, anyone can use it. This will be easy because mobile phones are more widely used and trusted in today's society than any other electronic device. A person's data base-based data analytics will accompany the daily monitoring. A weekly report with precise details about the patient's condition will be generated by the software. These results will show how likely the person is to have a heart attack.

Reference:

1). Meharwar Fatima, Maruf pasha," Survey of Machine Learning Algorithms for Disease Diagnostic", journal of intelligent literacy system and operation, 2017

2). Harshit Jindal, Sarthak Agrawal, Rishabh Khera1, Rachna Jain and PreetiNagrath," Heart complaint vaticination using machine literacy algorithms", transnational journal of material wisdom and engineering, 2021

3). Jaymin Patel, Prof.TejalUpadhyay,Dr. Samir Patel," Heart Disease vaticination using Machine literacy and Data Mining fashion", conference paper 2016

4). Dangare C S & Apte S(2012). Advanced study of heart complaint vaticination system using data mining bracket ways.

5). Soni J, Ansari U, Sharma D & Soni S(2011). Prophetic data mining for medical opinion an overview of heart complaint vaticination.

6). Khourdifi, Y., & Bahaj,M(2019). Heart Disease Prediction and Bracket Using Machine Learning Algorithms Optimized by flyspeck mass Optimization and Ant Colony Optimization.

7). Deekshatulu, B.L., & Chandra,P.(2013). Bracket of heart complaint using k- nearest neighbour and inheritable algorithm.

8). Ramalingam VV, Dandapath A, RajaMK. Heart complaint vaticination using machine literacy ways a check. Int J Eng Technol. 2018.

9). Bouali H, AkaichiJ. relative study different bracket ways heart complaint use case. In 2014 13th transnational conference on machine literacy and operation.

10). Daniel Teichmann, Dennis De Matteis, Marian Walter and Steffen Leonhardt, " Cardiorespiratory Monitoring Device Fusing Two Noncontact Sensor Principles", 11th International Conference on Wearable and Implantable Body Sensor Networks, 2018

11)J.Ojarand,S.Pille,M.Min,R.Land,J.Oleitšuk, " glamorous Induction Detector for the Respiration Monitoring ", Biomedical circuits and system conference, 2017

12) Toshiyo Tamura, Yuka Maeda, Masaki Sekine and Masaki oshida, "Wearable Photoplethysmographic Sensors Past and Present ", Electronics 2014, 3, 282- 302; doi10.3390/ electronics3020282, 2016

13) Madhan Mohan P and Nagarajan V " Spot and nonstop Monitoring of Heart Rate by Combining Time and frequence sphere Analysis of Photoplethysmographic(PPG) Signals at Rest Conditions", IET Signal Processing, Vol. 9,pp.

14) Daniel Teichmann, Jerome Foussier, Jing Jia, Steffen Leonhardt, Marian Walter, "Noncontact Monitoring of Cardiorespiratory exertion by Electromagnetic Coupling", IEEE Deals on Biomedical Engineering, VOL. 60, NO. 8, AUGUST, 2016

15). Bouali H, AkaichiJ. relative study different bracket ways heart complaint use case. In 2014 13th transnational conference on machine literacy and operation.