Health Monitoring System using IoT and Machine Learning

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Abstract - *With the prevailing rise in the number of people developing health issues due to the covid 19 pandemic, there is an urgent need to check on the health of the people on a daily basis. This project focuses on calculating the temperature and pulse rate of people by making use of the ESP 8266 Node MCU to collect the data of people of different age-groups and making a data set out of it with the help of ThingSpeak. Then by using Linear Regression Machine algorithm we check for the Normal and Abnormal characteristics of people of different age-groups and finally, a comparison between two age groups using different types of graphs is demonstrated.*

***Key Words*: ESP 8266 node MCU, Temperature, Pulse rate, Monitoring, ThingSpeak and Linear Regression Algorithm**

1.INTRODUCTION

In today's era, health issues have become an major hurdle. To take care of these things, people need to be more cautious about their hygiene as well as try to maintain a daily checkup. For instance, they should check their blood pressure, temperature, pulse rate, etc. on a daily basis. But in doing so, they need to go to doctors or nurses, which will be way too much costly. To make it cost efficient as well as portable, we have designed a model which is quite easy to use and also it will help a lot of people staying in remote areas since reaching out to hospital from such areas is a very difficult job for them.

In this project, we are using ESP 8266 node MCU to collect data from individuals of different age groups and making a dataset out of it using ThingSpeak. The dataset thus formed is then further used in machine learning, where we make use of the linear regression algorithm to check the Normal as well as abnormal conditions of different individuals.

2. LITERATURE SURVEY

Dr. Suvarna Nandyal, Roopini U Kulkarni, Rooprani P Metre, Old Age People Health Monitoring System using IoT and ML, in this project, author has collected the data from the sensor after that using supervised machine leaning to detect whether it is normal or abnormal condition.

Warsuzarina Mat Jubadi, Siti Faridatul Aisyah Mohd Sahak,[2]" Heartbeat Monitoring Alert via SMS", in this paper, author used PPG techniques to monitor heartbeat. This system monitors the patient heartbeat if abnormal behavior is found, it sends SMS to doctor or family members.

Ms. Neha Mandelkar, Dr. Jatin Desai, Dr. Milind Shah [3]Arduino based Patient Monitoring System" in this paper, researchers are making use of the Arduino in order to create a small prototype which will help them monitor the pulse-rate as well as the temperate of any patient in hour of need by connecting pulse rate sensor as well as temperature sensor to Arduino. Also, the data collected from the patients will be displayed on an LCD screen and web page as well, which will also be very helpful for maintaining records.

S. M. Mahalle, P. V. Ingole,[4]"Design and Implementation of Wireless Body Area Sensor Network Based Health Monitoring System", in this project, author developed wireless body sensor network where patient data are extracted using sensor and sends to doctor by using GSM technology.

3. METHODOLOGY

The proposed methodology consists of input unit, processing unit and output unit.

In input unit consists of sensors viz. pulse rate and temperature sensor. The pulse rate sensor senses the pulse rate of human body whereas temperature sensors sense temperature of the body.

Pulse rate and temperature sensors uses analog pin for sensor data so they are connected to ESP 8266 NODE MCU. The positive terminal (Vcc) of the pulse rate sensor is connected to the 3v3 pin of node MCU, the ground pin of pulse rate sensor is connected to the ground pin of node MCU while the A0 pin is connected to the A0 pin of node MCU. Again, the positive terminal (Vcc) of the temperature sensor is connected to the 3v3, ground to ground and the output terminal of the sensor is connected to the D1 pin of the ESP 8266 node MCU. All the pins are connected with the help of breadboard and jumper wires.

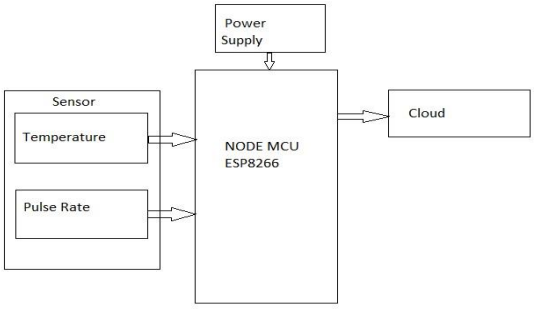

Fig -1: Block Diagram

Processing unit consists of ESP 8266 NODE MCU used for processing the data extracted from the sensors. Then those data are send to ThingSpeak Platform where we can collect the data in csv file and thus we obtained our required graph.

- ESP 8266 node MCU: It is a basically a single board microcontroller which can connect to objects and helps in transferring data through WIFI-protocol. In this project, we will be connecting the pulse rate as well the temperature sensors to node MCU with the help of jumper wires and breadboard while the power is directly supplied through USB. It uses Arduino IDE or IUA languages. It has 30 pins where 16 of them are GPIO and one analog input pin, and 10 GPIO are used for digital input and output operations
- Pulse rate Sensor: It is well-designed, easy to use heart rate sensor used in Arduino and other Arduino based microcontroller chips like ESP 8266 node MCU[3]. It has three connecting pins. Here, pin-1 is GND, pin-2 is VCC while pin-3 is analog input (A0)
- Temperature Sensor: LM35 temperature sensor is used in our project for measuring the temperature of any individual. It is measured in Celsius. Here, pin-1 is GND, pin-2 is Output while pin-3 is VCC. It operates from 0-30 V.

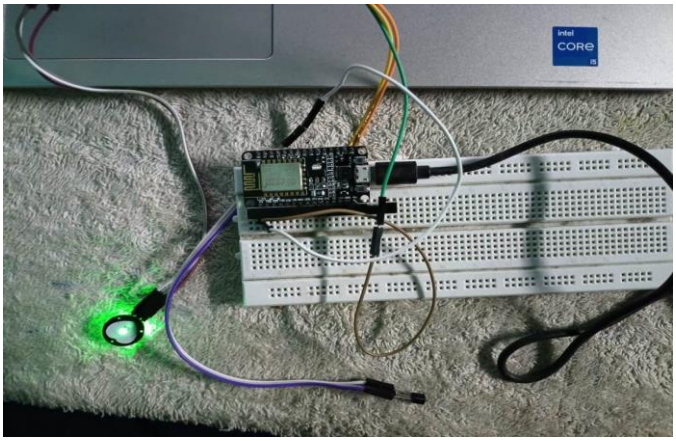

Fig -2: Monitoring System

4. RESULTS

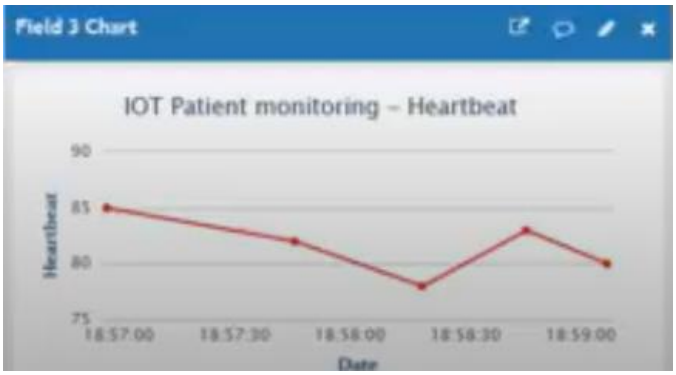

Fig -3: ThingSpeak Output of Pulse Rate

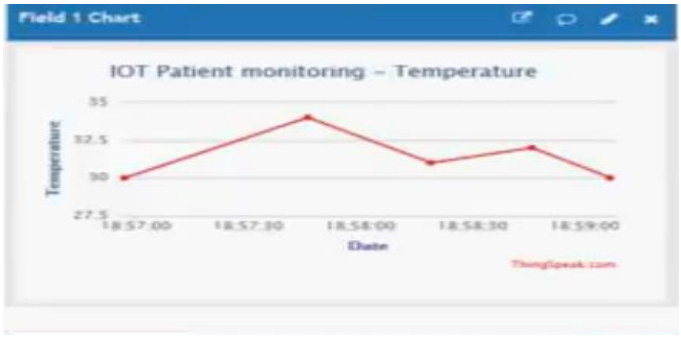

Fig -4: ThingSpeak Output of Temperature

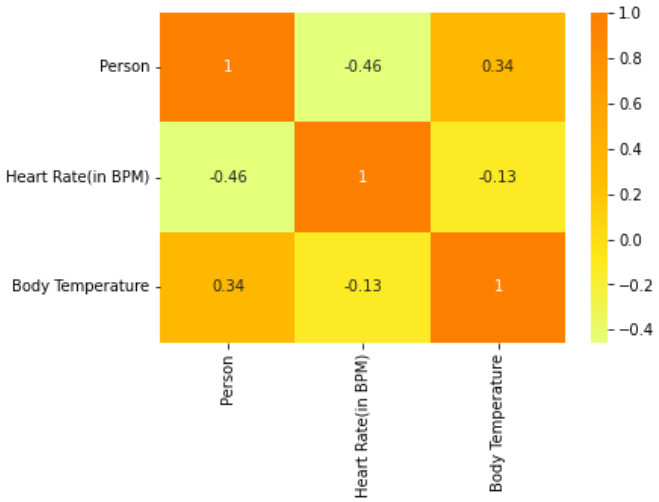

Fig -5: Correlation matrix of datasets

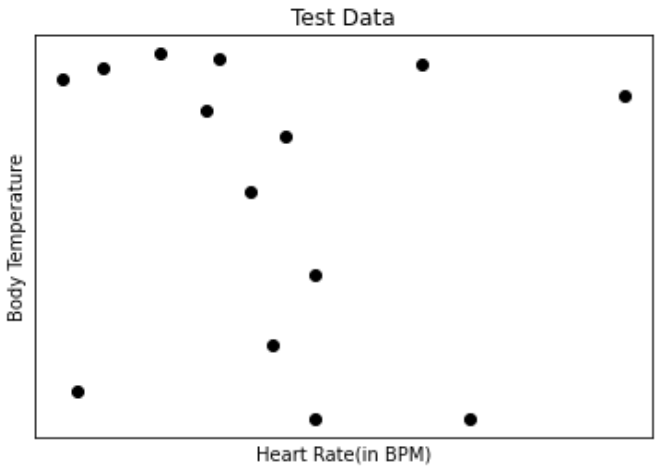

Fig -3: Scatter Plot of Body Temperature and Heart rate

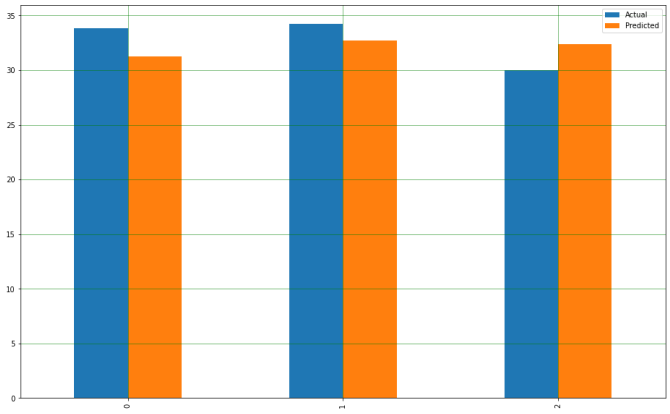

Fig -7: Prediction graph

By using linear regression in the following dataset, we get an accuracy of approximately 90.1%, where we have taken 80% of the dataset for training while 20% is used for testing purpose from a certain area. Afterwards, we have taken another dataset for comparing it with former dataset where for training; we have taken the former dataset while the new dataset is taken for testing purpose

5. CONCLUSION

Thus, from the above discussion, it can be concluded that we have obtained a co-relation matrix as well as scatter plot of the dataset and further, we have a obtained prediction graph of body temperature and pulse rate with the help of linear regression algorithm of machine learning.

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