

Health Disease Prediction Using Deep Learning And Patient Health Monitoring Wearable Device Using Sensors And IOT

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Abstract: In spite of several emerging medical technologies and innovations, many countries are facing difficulties in creating the proper health infrastructure which can handle pandemic and emergency situations. So, it is essential to have a smart and virtual health infrastructure to track, test and treat the patients. The proposed model adopts IOT based wearable device which includes multiple sensors to observe the health condition of the patient. The sensors data obtained from the wearable device will be periodically uploaded to cloud user account. Additional access will be given to doctor/care takers to load the test results and medications. So we have used HTTP protocol over internet or LAN (local area network). We have implemented wearable device where it reads pulse rate and temperature every 8 sec and upload the data in Things speak which is an IOT platform where doctor's, patient care taker and nurse can monitor patients health by sitting any corner of this world and Now-a-days, People nowadays suffer from a variety of diseases as a result of the climate and their lifestyle choices. As a result, predicting illness at an earlier stage becomes a critical challenge. However, doctors find it difficult to make precise predictions based on symptoms. The most difficult challenge is correctly predicting disease. To solve this issue, a computer was developed. Training is crucial in predicting the future. We proposed general disease prediction based on symptoms of the patient.

Keywords: Machine learning, IOT, disease prediction, health monitoring, pulse sensor, temperature

1. Introduction

There are many scientists, researchers who are working on this project where they are coming out with many methods where some of the methods are its own problems like there is no accuracy while predicting disease, there is no proper monitoring done, it is not affordable, there is no safety of data, it was not fast, there was no emergency button for help etc. so to overcome all these problems we have used machine learning for disease prediction as it is more accurate and it can take wild datasets and we are using IOT for uploading the data where it is faster and data is safely used for further purpose.

Doctors plays an important role in checking up patient health and in this covid situation it is difficult for doctors, nurse and care takers to monitor patient every hour so we have created an wearable device where it takes patients basic readings and automatically it gets updated in things speak where it can be observed and monitored through online sitting anywhere in the world. Not only doctors patients care taker can also access through internet observe the patient's health status and if the patients feel uneasy or if they feel it is an emergency we have an emergency red button in that wearable device where doctors and patient's care taker can get to know and take to the hospital by notification to nearby hospitals. Since people can spot irregular body practices, this contribution to society would be very valuable.until being afflicted with a serious illness. Nowadays taking care of health is more important Developing a model that can predict diseases based on consumer symptoms is extremely beneficial in providing patients with fast and effective medical care. Many lives can be saved by timely data collection and accurate disease prediction based on symptoms.if disease can be predicted than early treatment can be given to the patients which can reduce the risk of life and save life of patients and cost to get treatment of diseases can be reduced up to some extent by early recognition. The rapid adoption of electronic health records has created a wealth of new data about patients, which is a goldmine for improving the understanding of human health.

2. Literature survey

- The These days moving medical care frameworks building up countless new advances like wearable gadgets or haze of things. It gives adaptability as far as recording patients checked the information and send it distantly through IoT. At cloud workers, Every understanding is characterizing by remarkable location. Thus,

information at the cloud can confirm the correct patient and give the necessary solicitation. The proposed framework presents the security of medical services and the haze of things.

- Shivakumar et al, Akshata Anigolkar, Prof. Shraddha proposes IOT based patient wellbeing observing utilizing ESP8266. They have utilized IOT on the foundation of things talk which is a use of IoT and Programming interface to store and recover information from things over the LAN, proposed the wellbeing observing system[1]
- B. Thaduangta et al., proposed Shrewd Medical care Fundamental Wellbeing registration and observing framework for old. The specific medical services checking framework for older individuals could likewise be a developing need inside the maturing populace world. This strategy performs fundamental wellbeing exams by estimating the body boundaries routinely and report the information to the doctors[3]
- Bansal et al., centers around the advancement of a framework that is fit for recognizing basic heart occasions. Utilizing a high-level distant checking framework to identify side effects which lead to lethal cardiovascular occasions [4]
- Kunjir et al., [5] proposed the clinical dynamic framework that predicts the sickness of the patients. In this anticipated different sicknesses and inconspicuous example of patient condition. Planned a clinical dynamic framework used for the specific infection forecast on the empirical information. Additionally decides various illnesses idea and inconspicuous example. For the perception reason in this utilized 2D/3D diagram and pie Charts. And 2D/3D diagrams and pie graphs intended for representation reason.
- "Heart Diseases Detection Using Naive Bayes Algorithm"[6] this paper explains a portion of the AI calculations like the Naive Bayes classifier. It is used to break the different information mining ideas that can be used for medical care administrations. The creator has examined the different sorts of datasets that can be used in various fields of clinical and medical care administrations. The strategies for probability and preprocessing information used in the calculation are clarified without any mistake. The boundaries of coronary illness are indicated and perception of datasets has appeared. The limitation is that the greatest exactness isn't accomplished in the forecast.
- "Savvy Health Prediction utilizing Machine Learning"[7] this paper includes the methods like affiliation rule mining, order calculation, and grouping, for example, choice trees are used for various heart-based issues. The K-implies bunching methods can be used to see an improvement in the exactness of the infections forecast. The required undertaking for performing the task is selecting the correct area. The objective information ought to be selected carefully and preprocessing of information ought to be completed. The nitty-gritty clarification of how to perform a calculation is given, where the information is spitted as target set and preparing sets. The plan of Naive Bayes calculation and its working is clarified plainly.

Problem definition

The expert a good ways off can screen the human ailment so they can save the life. The framework is to be accessible at the sensible costs. Implanted framework will be utilized for observing the human ailment without any problem. To reclassify the ICU idea by incredibly lessening the expense by making an ICU climate at each home.

Forecast utilizing conventional sickness hazard model typically implies an AI and managed learning calculation which uses preparing information with the names for the preparation of the models. High-hazard and Okay tolerant order is done in bunches test sets. However, these models are just important in clinical circumstances and are broadly contemplated. A framework for manageable wellbeing observing utilizing shrewd apparel by Chen et.al. He completely considered heterogeneous frameworks and had the option to accomplish the best outcomes for cost minimization on the tree and straightforward way cases for heterogeneous frameworks.

Existing system

In nursing home, the patients have to be taken care individually by atleast one nurse or any medical staff physically present with them so that they can check the patients variation and also they have to keep continuously monitoring them and maintain a proper record data which is quite difficult at some time even for

the medical staffs.

So, If in case of any emergency, the patient can not press any emergency button so we make use of technologies where screening is done, wherein if any absence of the medical staff it monitors certain basic details like temperature, pulse rate, blood pressure etc.....and immediately transfer the patients data through the Hyper Text Transfer Protocol (http) which collects the patient's data and with the help of IP address it is send through internet to the required medical representative so that immediate actions can be taken without any further delay.

Proposed system

Heart diseases are becoming a big issue since the last few decades and many people die because of certain health problems. Therefore, heart disease cannot be taken lightly. By analyzing or monitoring the ECG signal at the initial stage this disease can be prevented.

Basically our project is divided into three domains:

- Sensor Technology
- Communication
- Wireless Sensor Networks Technology (WSNs)

The system architecture of the hardware setup of the health monitoring system.

- Collect the data from the human through three sensors.
- Administer these real time values into the cloud database.
- Perform analysis on the values of the sensors.
- If any abnormality is noticed then notify the doctor or patient peer using cloud and initiate immediate relief.
- In this project we have planned IoT Based Patient Health Monitoring System utilizing ESP8266 and Arduino.
 - The Arduino Sketch running over the gadget executes the different functionalities of the venture like perusing sensor information, changing over them into strings, passing them to the IoT stage and showing estimated beat rate and temperature on character LCD. The IoT stage utilized in this undertaking is ThingSpeak.
 - ThingSpeak is an open source Internet of Things (IoT) application and API to store and recover information from things utilizing the HyperTextTransferProtocol convention over the Internet or by means of a LAN. You would then be able to design activities and cautions dependent on your continuous information and open the estimation of your information through visual tools. This IoT gadget could peruse heart beat rate and measure encompassing temperature. It persistently screens the heart beat rate and encompassing temperature and updates them to an IoT platform. You can interface AD8232 ECG Sensor with NodeMCU ESP8266 Board and screen the ECG Waveform on Think Speak.
 - We will produce an ECG signal by associating ECG prompts chest or hand. Utilizing Think talk boundaries like API Key or Token we will send the ECG chart to cloud utilizing Wifi interfacing with cloud. The AD8232 is an incorporated sign molding block for ECG and other biopotential estimation applications. It is intended to remove, intensify, and channel little biopotential signals within the sight of uproarious conditions, for example, those made by movement or distant cathode position. This plan considers a ultralow-power simple to-advanced converter (ADC) or an installed microcontroller to get the yield signal easily. The AD8232 can execute a two-post high-pass channel for killing movement ancient rarities and the cathode half-cell potential. This channel is firmly combined with the instrumentation engineering of the speaker to permit both huge increase and high-pass sifting in a solitary stage, accordingly saving space and cost. An uncertain operational intensifier empowers the AD8232 to make a three-shaft low-pass channel to eliminate extra noise. The client can choose the recurrence cutoff, all things considered, to suit various sorts of utilizations. Also, you can send the ECG waveform over the IoT Cloud stage and screen the sign online from any piece of the world utilizing the PC or basically utilizing the Smartphone. There is no requirement for remaining in the Hospital to screen heart action/conduct since you can screen it online from anyplace. In this manner it very well may be said progression in Patient Health Monitoring System.

Components used in our project

- **Arduino uno:** Collects the data from the sensors and retrieve them to cloud through ESP8266.

- **Esp8266 Wifi module:** Connected to internet using Wi-Fi and sends received data from Arduino to cloud.
- **Pulse sensor:** It senses the actual pulse rate of the patient.
- **LM35 temperature sensor :** It senses the temperature and provide an output according to the patient's body temperature variation.
- **2x16 line LCD display :** Used for displaying the body temperature and heart beat rate.
- **Cloud i.e. Thing speak :** Used for collecting the data and storing them in cloud for further use.
- **AD8232 ECG Sensor:** Monitor the ECG Waveform on Thing Speak.

This was all about health monitoring system using IoT and sensors. Now let us see how we implemented health disease prediction using machine learning.

IMPLEMENTATION OF HEALTH DISEASE PREDICTION USING MACHINE LEARNING

step1: libraries imported

```
axes3d
standardscaler
plt
tkinter is used to build a Graphical User Interface in Python
np
pd
os
```

step2: list of symptoms as l1

L1 is the list made for various Symptoms which are generally showed up in people for various Diseases.

step3: disease is variable name where diseases are listed Disease is the list made for different Diseases which are for the most part appeared in different individuals.

step4: creating a vacant list equivalent to a number of diseases in list L1, L2 is appended in a number of zeroes.

step5: reading the training file

There is a CSV document containing diseases and symptoms, named training.csv, which is utilized to prepare the model. Read_csv() function is utilized to store the information in the dataframe, named df. Utilizing replace() function, prognosis column that are the different diseases, it is replaced by the numbers from 0 to n-1, where n is the number of different diseases present in .csv record. Head() function is utilized to print the initial five rows of the preparation dataframe

step6: creating the distribution graph for column

step7: creating the scatter and density plot

step8: putting the symptoms in X and diseases in y for training the model. output for the x in which different symptoms has the values 0 or 1 according to their presence in the particular diseases. output for y in which different disease has values according to their symptoms.

step 9: we are using decision tree for training the model and predicting the disease on testing the dataset according to symptoms which is entered by users. final decision tree is stored in a variable named 'pred1'. accuracy of predicting the disease is printed using accuracy_score and confusion matrix is created.

step 10: the scatter plot is created for the symptoms and diseases which are given by the user.

step 11: we are using random forest algorithm for storing the predicted diseases.

step 12: we are using KNN function for finding a pattern in data which links data to results and it improves upon the patter recognition with every iteration. k nearest neighbour is a supervised learning algorithm.It is a basic yet essential algorithm. It finds extensive use in pattern finding and data mining. We have used K Nearest Neighbour to classify our dataset and achieved ~92% accuracy.

step 13: we are using naive bayes function for an assumption that features make an independent and equal contribution to the prediction.In our project we have used naïve bayes algorithm to gain a ~95% accurate prediction.naive bayes algorithm is a family of algorithms based on naïve bayes theorem.They share a common principle that is every pair of prediction is independent of each other.

step 14: wea re using GUI model.Graphical User Interface is build using tkinter library in Python. Root is used to start the GUI. It is configured with the background that is set to “Ivory”. GUI titlt is given as “Smart Disease PredictorSystem” using title() function in tkinter library. Resizable function is used to fix the size GUI.Here, variables are defined like Name, Symptom1, Symptom2, etc and they initialised to “Select Here”using set() function in tkinter library. It is the definition of the function “Reset()” which is used to reset the GUI inputs which are given by the user. It is called when user click on the button “Reset Inputs” from the GUI. It is the definition of the function “Exit()” which is used to come out from the GUI. It is called whenuser click on the button “Exit System” from the GUI. These are the labels for showing the Symptoms of the disease. It is created using label() function from tkinter library. Its features are configured using config() function and their grid is set by using grid()function from tkinter library. NameEn is the entry box created for getting the name of the patient using Entry() function in tknirter library. S1, S2, S3, S4, S5 are the option menu used to get symtoms from the user which is created using Optionmenu in tkinter library. *OPTIONS is the list of unique symtoms.

3. Results

The incorporation between remote sensor associations and cloud processing will make another time of innovation in numerous perspectives like patient checking with negligible expense, lessening the amount of included beds in centers, and improving clinical staff performance. The proposed framework can be set-up in the clinics and enormous measure of information can be acquired and put away in the online data set. Indeed, even the results can be made to be gotten to from portable through an application. As the title says, the outcome of Smart Health Monitoring structure is of ludicrous use to patients and experts too. . The patient can check their prosperity status at whatever point from the comfort of their homes and visit facilities exactly when they genuinely need to. This ought to be conceivable by using our structure whose result are welcomed on the web and can be seen from anyplace all throughout the planet.

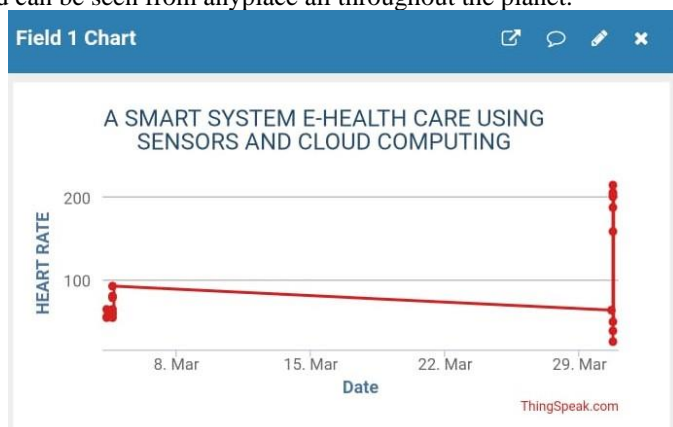


Fig 1:This is the reading we observe of health rate in thingspeak



Fig 2: This is the reading we observe of temperature in thingspeak

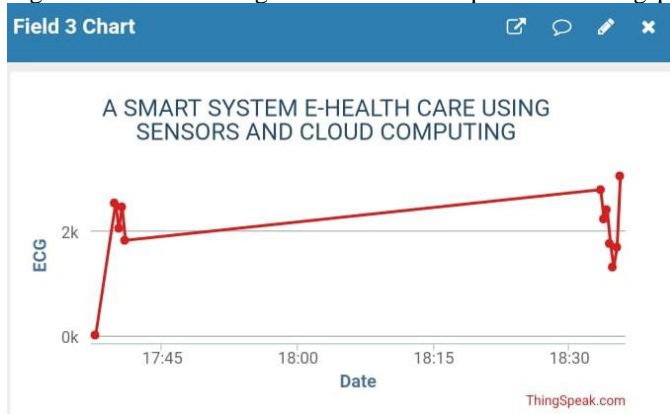


Fig 3: This is the reading we observe of ECG in thingspeak

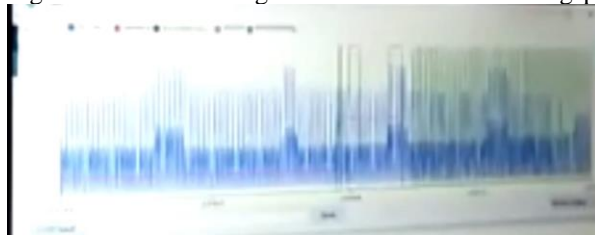


Fig 4: This is the result we see in serial port monitor

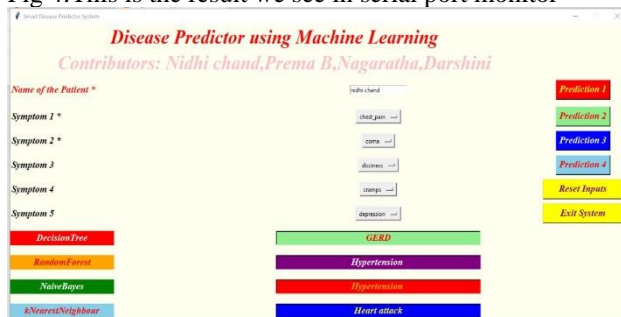


Fig 5: This is the result we see when we predict the disease

4. Conclusion

The internet of things (IoT) based Health care Management System is very valuable for the mature age people groups and heart patient in light of the fact that the two of them need to routinely check their wellbeing status. On the off chance that they contain this framework with them, they can effectively check their medical issue at home without going to hospital. Doctor can screen their patient distantly. This saves life just as time and cash of that patient. In future, we can stretch out this framework to measure circulatory strain, ECG and Blood oxygen level to screen patient's wellbeing status. We likewise expand this framework to send messages by utilizing WhatsApp or any other social informing stages. with the help of AI computation can make a couple of

wonders in the field of clinical science. The finding of the disorder simplified for subject matter experts and medication can be given on time. As we probably are aware in Covid-19 circumstance, specialists and medical services laborers are so much occupied with Covid-19 patients and they can't do exam of the patients who are having fever, influenza and so on With the assistance of this gadget individuals can do their ordinary test while sitting at home and can find earlier ways to secure themselves from this event.

References

1. K.Vembandasamy, IJSET - International Journal of Innovative Science, Engineering & Technology, Vol. 2 Issue 9, September 2015, "Heart Diseases Detection Using Naive Bayes Algorithm".
2. Vidya Zope¹, Pooja Ghatge², Aaron Cherian³, Piyush Mantri⁴, Kartik Jadhav, IJSRD - International Journal for Scientific Research & Development| Vol. 4, Issue 12, 2017, "Smart Health Prediction using Machine Learning".
3. Nikita Kamble, International Journal of Scientific Research in Computer Science Engineering and Information Technology, Vol. 2, Issue 5, 2017, "Smart Health Prediction System Using Data Mining".
4. G.Pooja reddy, International Journal of Innovative Technology and Exploring Engineering (IJITEE), Vol-8 Issue-6, April 2019, "Smart E-Health Prediction System Using Data Mining".
5. Industrial Process Automation And Monitoring Using IOT, Chelluri Pardhasaradhi, A Daisy Rani, International Journal Of Advance Research In Science And Engineering <http://www.ijarse.com> IJARSE, Volume No. 09, Issue No. 10, October 2020 ISSN-2319-8354(E)
6. S.SHARMILA, International Journal of Advanced Networking & Applications (IJANA), Vol: 08, Issue: 05, 2017, "Analysis of Heart Disease Prediction Using Data mining Techniques".