

How to Cite:

Nagrare, T., Takhhoware, P., Kasetwar, A., & Khanooni, M. W. (2022). Health prediction system using machine learning. *International Journal of Health Sciences*, 6(S4), 10361–10373. <https://doi.org/10.53730/ijhs.v6nS4.11079>

Health prediction system using machine learning

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Abstract---The emergence of the coronavirus (covid-19) pandemic has substantially elevated the worldwide demand for the healthcare system. Massive numbers of elderly and prone human beings are scuffling to fitness situations such as high blood pressure, diabetes, heart attack, and so on. Here in our project, I am making healthcare with the help of an algorithm and deep learning method to predict the disease. A user interacts with the system just like one interacts with his doctor and based on the symptoms provided by users and the system will identify the symptom and predict the disease. Thus, target to layout and implement a low- priced and smart healthcare system that allows non-stop assessment and tracking of patient fitness, thus BP and frame temperature monitoring is critical for that I used sensors that transmit information over a wi-fi network via a wi-fi module that allows fact analytics and visualization by using healthcare workforce.

Keywords---predict disease, data mining, medical diagnosis, web application, blood pressure, body temperature.

Introduction

The emergence of the corona virus (covid-19) pandemic has appreciably increased the global demand for healthcare services. Large numbers of elderly and vulnerable people are battling health conditions such as hypertension, diabetes, heart attack, etc. Here in our project, I am making healthcare with the help of an algorithm and deep learning method to predict the disease. A user interacts with the system just like one interacts with his doctor and based on the symptoms provided by users and the system will identify the symptom and predict the disease. Thus, target to layout and implement a low-priced and smart healthcare system that allows non-stop assessment and tracking of patient fitness, thus BP and frame temperature monitoring is critical for that I used sensors that transmit information over a wi-fi network via a wi-fi module that allows fact analytics and visualization by using healthcare workforce. At the time of registration, the patient or relative need to fill in full information about the patient disease along with disease history. Thus, it aims to design and implement an affordable and smart healthcare system that allows continuous assessment and monitoring of patient health, thus BP and body temperature monitoring is essential for that I used sensors that transmit data over a wireless network through a Wi-Fi module that facilitates data analytics and visualization by healthcare staff. Hence, blood pressure and body temperature have been identified as the major vital physiological parameters to monitor the patient's health status. Focuses on the doctor and patient interaction in case of any emergency, our embedded project will send an SMS to the relative as Ill as the doctor. A couple of disease predictions using system learning to know. This WEB app evolved using Python. The fashion receiver's to expect the disease had been skilled on large data sets. All links for data sets and therefore the Python notebooks used for version advent are cited below all through this read me. The WEB app can are expecting the following disease. Diabetes, Heart Disease, Liver Disease, Malaria, Pneumonia Kaggle dataset will help you apply your present information to extraordinary use. Making use of understanding the area of medical technological know-how and making the venture of medical doctors clean is the primary reason for this dataset. Forms of illnesses can be anticipated. The aim of this project is to monitor the patient's health by doctors and relatives, To Predict diseases on the base of daily monitoring of patient health.

Research on the topic has concluded that by using wearable sensors, the machine learning Algorithm can automatically detect disease. A user interacts with the WEB application just like one interacts with his doctor and based on the symptoms provided by users and the system will identify the symptom and predict the disease.

Literature Survey

This project aims to monitor the patient's health by doctors and relatives, To Predict diseases on the base of daily monitoring of patient health. The doctors and

relatives focus on the doctor and patient interaction. On the other hand, Aneeshkumar [1] used a methodology to effective classification of liver and non-liver disease dataset. Technology lets doctors focus only on treating patients. Zhaoui et al [5] composed the introduction of the deep learning concept called convolutional neural network and using convolutional network finding the accuracy of the infected or not infected blood cell. Dr. D. Shanmuga Priyaa used [6] In this study two different data mining classification techniques was used for the prediction of various diseases and their performance was compared in order to evaluate the best classifier. An important challenge in data mining and machine learning areas is to build precise and computationally efficient classifiers for Medical applications. User interacts with the WEB application just like one interacts with his doctor and based on the symptoms provided by users and the system will identify. [4]. Ani R, Krishna and Anju introduce the objective of such a system to quickly predict the disease from the parameters like blood pressure, body temperature and heartbeat rate of patient. The symptoms and predict the disease. [3] P. Deepika, P. Vinothini composed the system ARDUINO acts as a bridge of wireless sensors placed in the patient's body such as blood pressure sensor, temperature sensor, heart beat rate sensor etc., and cloud. Provide disease predictive health monitoring at home, particularly useful for patients, who have to live alone. Ameen MA [10] proposed and introduced disease prediction, use of device getting to know, is totally via with the assistance of device studying and python programming language and the usage of the dataset it is available formerly through the hospitals the usage of that I am going to expect the disease.

Work Procedure

- At first, I am planning to collect as much data set as I can from the Kaggle Website.
- Then the collected data sets will be trained using the Machine Learning Algorithm.
- Then, the best algorithm is taken and rendered into the model.
- Then the model will be kept in the backed server as a pickle file. JWT Connection will be made between the front-end and the back-end of the communication.
- The Basic Tasks of this project to classified into 3 types, developing an environment to train the model using data sets, integrating the model into the server as a pickle file, and developing a WEB application for the User Experience.
- The Project solely depends upon the data set of patient's attributes for prediction, so the data sets are fetched from the Website called 'Kaggle'.
- About 2000 unique attribute data sets are collected from the Kaggle Website for precise model rendering using Machine Learning.

Algorithms used

Random forest disease detection

Algorithm I am used in my project is random forest, Random Forest: The random wooded area might be a supervised mastering rule that is hired for every class, moreover as regression. However, but, it's in the main used for classification

issues. As I all know that a forest is formed of trees and additional trees mean an additional sturdy forest. In addition, the random forest rule creates call timber on information samples and so receives the prediction from every one of the thoughts, and eventually selects the most effective decision by means of a method that of the vote. It's AN ensemble technique that is healthier than one call tree; as a result it reduces the over fitting by averaging the result.

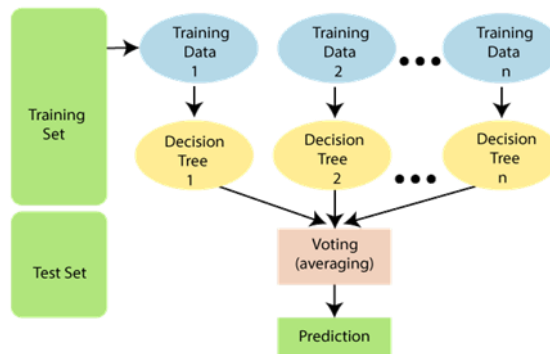


Figure 1: Random forest disease detection

CNN Algorithms

A convolutional neural network (convnet/CNN) is a deep learning algorithm that may absorb an entered image, assign importance (learn able Lights and biases) to numerous elements/items within the image, and be able to differentiate one from the opposite. In- side deep studying, a convolutional neural network or CNN is a kind of artificial neural community that is extensively used for photo/object popularity and class. Deep studying, therefore, acknowledges gadgets in a photo by using a CNN. I suggest an entirely computerized convolutional neural community (CNN) primarily based version for the analysis of malaria from microscopic blood cell pictures.

Due to the success of deep learning algorithms in analyzing medical images, Convolutional Neural Networks (CNNs) have gained much attention for disease classification. In addition, features learned by pre-trained CNN models on large-scale datasets are much useful in image classification tasks. In this work, I appraise the functionality of pre-trained CNN models utilized as feature-extractors followed by different classifiers for the classification of abnormal and normal chest X-Rays. I analytically determine the optimal CNN model for the purpose. Statistical results obtained demonstrates that pre trained CNN models employed along with supervised classifier algorithms can be very beneficial in analyzing chest X-ray images, specifically to detect Pneumonia. Chest X-Rays which are used to diagnose pneumonia need expert radiotherapists for evaluation. Thus, developing an automatic system for detecting pneumonia would be beneficial for treating the disease without any delay particularly in remote areas.

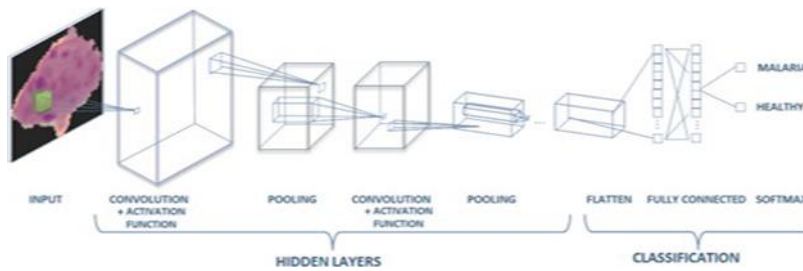


Figure 2: CNN Algorithms

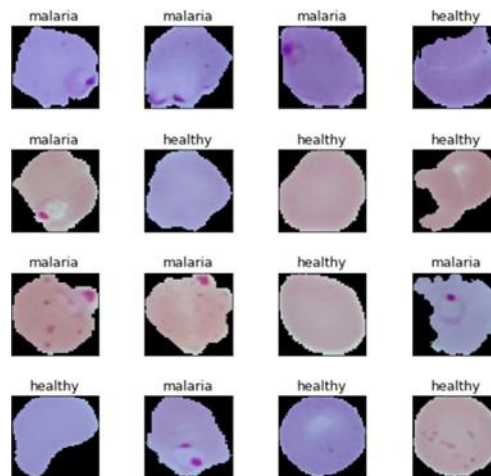


Figure 3: Blood cell



Figure 4: HTMP WEB page for malaria

Algorithm is used in pneumonia detection

I analytically decide the optimal CNN model for the purpose. Statistical consequences received demonstrate that pre trained CNN models employed at the side of supervised class- sifter algorithms can be very beneficial in analyzing chest x-ray snapshots, particularly to discover pneumonia.

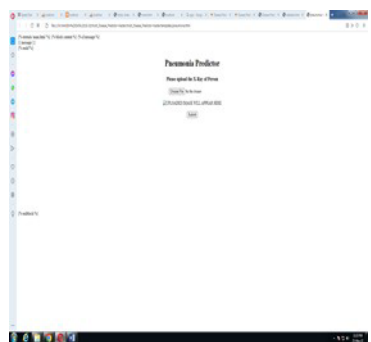


Figure 1: HTMP WEB page

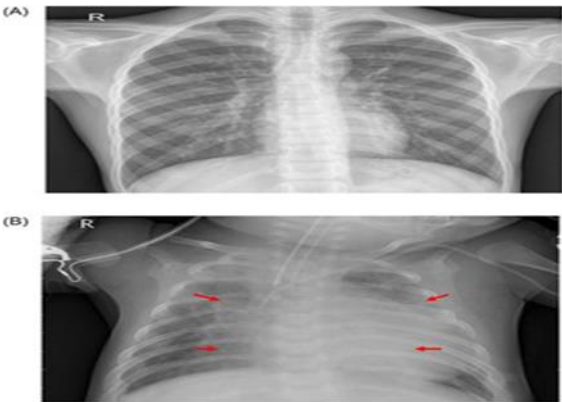


Figure 2: X-ray plates that display

System Architecture

It is the purpose of this paper to present the design and implementation of a health- care monitoring system customized to meet the needs of patients using several hardware components.

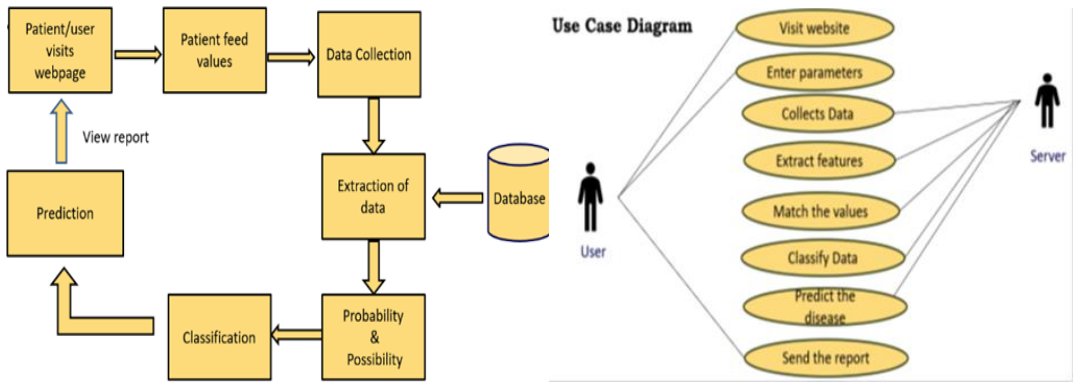


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Hardware Description ArduinoUNO

In the specification of the Arduino Uno microcontroller board there are 14 digital pins on the right and left side of the board for input/output, 6 analog inputs, a 16 MHz crystal oscillator, a USB link, a power jack, an ICSP header, and a reset button (of which 6 can be used as PWM outputs). It includes anything required to help the microcontroller; simply connect it to or power it with an ACC device with a USB cable.



Figure 5: Arduino UNO

Microcontroller ATmega328/P

The atmel® picopower® atmega328/p is a low-energy CMOS 8-bit microcontroller based totally on the avr® greater RISC structure. Via executing powerful commands in a single clock cycle, the atmega328/p achieves throughput near 1MIPS according to MHz this powers the system designed to optimize the device for power consumption versus processing speed.

ESP8266 NodeMCU Wi-Fi Devkit

The core of this module is the esp32 chip that is scalable and adaptive. Two CPU cores can be individually controlled. The clock frequency is adjustable from eighty MHz to 240 MHz and supports rtos. It is a general-purpose Wi-Fi+BT+BLE MCU module. ESP-WROOM-32s the module integrates traditional Bluetooth, Bluetooth, low energy, and Wi-Fi. A wide range of making use of wi-fi supports a large variety of verbal exchange connections, in addition to a right away connection to the internet via a router; Bluetooth permits customers to hook up with a cell smartphone or broadcast a BLE beacon for sign detection.

Internet of Things (IoT)

Internet of Things, more commonly IoT is an emerging concept in the technical world. I want more comfort in our lives. The net has emerged as a core part of our lifestyle. This IoT is based on this collaboration of comfort and the Internet. Anyone who is new to this topic is anxious to know what the Internet of things (IoT) is. Ill, the Internet of things is a network of physical devices connected to each other for the exchange of data and information through sensors and actuators. These actuators and sensors are embedded in these devices which allow them to exchange data with each other. In simple terms, IoT means letting the devices connect to the internet to make our life much easier. The ‘things’ here refer to the Internet of things devices like chips, cameras, sensors, or other physical devices.



Figure: Internet of Things (IoT)

Pulse Oximeter and Heart-Rate Sensor IC

Max30100 is an integrated pulse oximeter and heart charge screen sensor solution. It's an optical sensor that derives its readings from emitting wavelengths of mild led — a red and an infrared one – then measures the absorbance of pulsing blood through a photo detector. This particular led coloration aggregate is optimized for reading the records via the end of one's finger. Its miles are absolutely configurable via software registers and the digital output statistics are saved in a sixteen-deep FIFO within the tool. It has an i2c virtual interface to talk with number microcontrollers.

Body Temperature (BT) Sensor (LM35)

The LM35 is the preferred to thermistors and thermocouples as it calibrates itself, has a low heating capability, and has high precision. This sensor outputs a

voltage in centigrade with a sensitivity of 10mV/degree Celsius. The LM35 can output voltages in various degrees Celsius; this component interfaces with Arduino Uno via the ADC (Analog to Digital Converter) module. This project aims to monitor the patient's health by doctors and relatives, To Predict diseases on the base of daily monitoring of patient health, Research on the topic has concluded that by using wearable sensors, the machine learning algorithm can automatically detect Parkinson's disease Machine learning allows us to build models that associate a broad range of variables with a disease. Data science and machine learning platform Neural Designer brings together different data types into a single model to better diagnose diseases.

Applications

The information gathered helps give the best prescription drug plan for individual patients, based on their needs and interests. The device can show the patient which of the various plans will be the most beneficial, considering their individual needs and character that align with those of other past patients. It describes a tool by which the quality of treatment for bed rest patients is improved using a WEB application. The patient's temperature and blood pressure data are monitored and stored in the cloud using the Internet of things (IOT) application. Digital healthcare WEB applications are capable of diagnosing a disease that a patient is suffering from using his/her symptoms, and sending them a notification at the specified time so they can take their medication. One of the great things about this application is that it also sends them alerts when they should take a dose of insulin, an antibiotic, or any other medication.

Module design based on random forest algorithm for different diseases Diabetes

The kaggle data set will help you apply your existing knowledge to great use. Applying Knowledge to the field of Medical Science and making the task of physician easy is the main purpose of this data set. This dataset has 132 parameters on which 42 different types of Diseases can be predicted. This dataset is at the beginning of the country-wide institute of Diabetes and Digestive and kidney sicknesses. The goal of the dataset is to diagnostically be expected whether or now not a patient has any kind of diseases, based on certain diagnostic measurements inside the dataset.

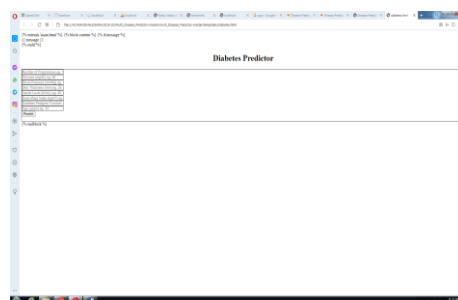


Figure: HTMP Web Page

Trees, the family of Machine Learning models I saw just before. Random Forest introduces randomness and numbers into the equation, fixing many of the problems of individual decision trees, like over fitting and poor prediction power. In a Random Forest, tree has constructed the use of a subset of training facts, and typically only a subset of possible capabilities. As increasingly trees are built, a wider range of our data is used, and more features come into play, making very powerful, aggregated models. Individual trees are built independently, using the same procedure as for a normal decision tree but with only a random portion of the data and only considering a random subset of features at each node. Aside from this, the training procedure is the same as for an individual Decision Tree, repeated N times. To make a prediction using a Random Forest, an individual prediction is obtained from each tree. Then, if its miles classification trouble, I take the maximum common prediction as the end result, and if it is a regression problem, I take the common prediction from all person timber as the output price.

Methodology

For the proposed study, the dataset was taken from the Kaggle site. Then it was down- loaded in an Excel file using a comma separate format. Data has been processed by Python programming using Jupiter notebook. The data set contains 303 sample instances as shown in table3. The dataset contains 14 clinical features as shown in Table 2. Different types of Python libraries such as pandas, Sklearn, Numbly, and matplotlib are used for processing the algorithms. Using the explorative data analysis technique, data was analyzed in Jupiter notebook. A 10-fold cross-validation technique is used for splitting the data set into training and testing data. Then using a random forest algorithm, the dataset was processed.

Results and Discussion

The results of the patient health monitoring system Ire evaluated based on testing of the designed device prototype and interviews via questionnaires. The developed system was tested with ten (10) patients and the questionnaire was administered to 50 subjects between the age group of 30 years to 100 years to determine the usability and authenticity of the system and to ascertain the level of health status of the patient related to healthy or un- healthy conditions. In an attempt to ensure accurate data measurement, five experiments each (to obtain the average value generated by the sensors) Ire taken from the subjects with time duration of 1 min for heartbeat measurement and 3 min for body temperature measurement. The developed system was compared with the conventional heartbeat stethoscope and digital thermometer for measurement deviation. Moreover, the difference between the developed system (measured data) and the conventional measuring devices (actual data) was evaluated to show the effectiveness of the developed system. Disease prediction and treatment recommendation using machine learning. One can view the hospital using an android application nearby to his location in case he needs to take any health-related test or emergency based on the location he chooses. One can view the predicted disease, medication required, and nearby hospitals according to the prediction.

A dedicated system, which can solve all queries regarding medicine.. Effective Symptom- based disease prediction. Suggest nearby hospitals based on the disease.

This project aims to monitor the patient's health by doctors and relatives, predict disease on the base of daily monitoring of patient health, and reach the doctor. Diagnosis is always a concern for people living in a rural area. At the same time, medicine availability also has a major impact excluding the factor of a major complete cure.

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