Smart Health Disease Using Naive Bayes

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Basic Principle

- Smart health care system is machine learning based automated system that helps to generate prediction about health condition and disease possibility based on the health condition
- Patients log into this software and set his daily health records. Based on that records system will prdict health condition and generate that prediction as a graph result.
- Every patient will have their personal doctor. Doctor can see their condition and based on the condition they will give treatment.
- System will automatically suggest medicine of other test which can be show directly from doctor or patient panel.
- System will create daily report about health status based on basic body parameters (e.g: heart rate, temperature, diabatese, blood pressure, OS);

Proposed Model

- System designed the analyzed based on five model of body parameter. We used 10000 data as training data and 100 data as testing data.
- System models are 1. Heart rate, 2. Temperature, 3. Blood Pressure, 4. Diabetes, 5. Oxygen saturation
- For data filtering we used cross testing for filtering similar or undefined data.
- We compared previous data parameters and present data parameters thus we came into a final prediction result that generate current health status and future health probability.
- After generating the results it shows in user panel where users can view current data.
- They can set consultation to an specific doctor.
- Doctor can give them treatment based on their condition.

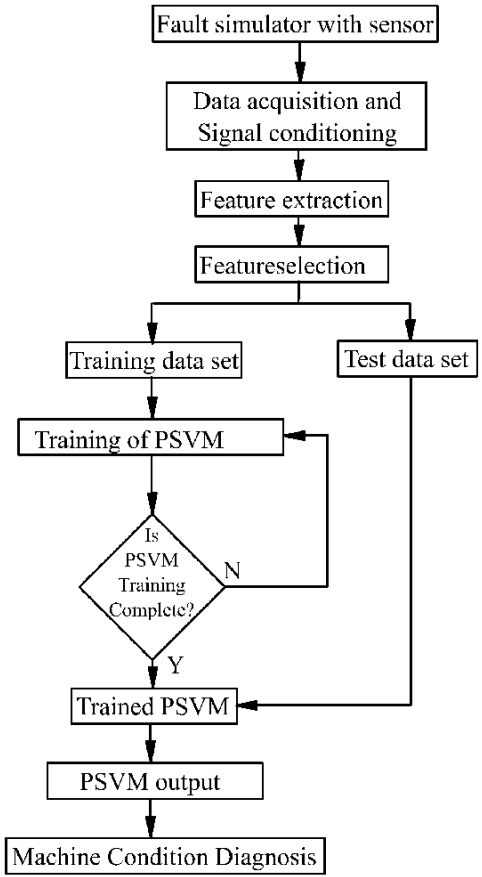
Abstruct

- This project describes the steps of building advanced health care using machine learning and efficient monitoring systems in medical. We propose the system that deal with large data sets and solves the main problems of the current monitoring system. In fact, the current monitoring system in medical has many issues to detect real states of patients namely critical and normal states. It frequently generates a high number of false alarms having bad effects on the working conditions. Besides, these alarms can threat the patient life by misleading medical staff. Our aim, in this paper, is to avoid false alarms and keep a high level of sensitivity by improving the current monitoring system. In addition, our purpose is to generate groups of patients suffering from similar diseases and building a general model for similar patients. The obtained models will make the classification of new patients possible.

Methodology

- We have used electron desktop application builder for making the ui of this system and node js for data prefetch. We have used python flask for backend api generation and python machine learning models for prediction generation.
- We have used sqlite database for data setting and the parameters are being used on data analysis based on filtering values.
- For body parameters calculation we have used linear regression analysis.
- For data fetching we have used flusk api methology.
- At first user log into system from desktop application, then system will check the data from api then the system will return the required parametrers as JSON format.
- Using that format we have used system calculation.

Flow Chart


Fault simulator with sensor
Data acquisition and Signal conditioning
Feature extraction
Featureselection
Training data set
Test data set
Training of PSVM
Is PSVM Training Complete?
N
Y
Trained PSVM
PSVM output
Machine Condition Diagnosis

Algorithm

- User will insert data from user panel
- Data will be analyzed from the api and set as training data. After filtering main parameter will be taken
- After setting training data user will be suggested to give the current parameter . So they have been take as testing data. From testing data it will be compared with our models and other algorithms and filters.
- After filtering we shall see the most used value parameters of the system.
- We shall have a medicine models where users can see the suggestion based on their body condition.
- System report will be generated daily which will be visible from the doctor panel.
- From doctor panel they can suggest treatment or other things.
- From test panel user will apply for test and tester can upload test result based on the application.

Previous work (cont.)

A new machine learning-based healthcare monitoring model for student's condition diagnosis in Internet of Things environment [1]

Advancement in sensor technologies has resulted in rapid evolution of Internet of Things (IoT) applications for developing behavioral and physiological monitoring systems such as IoT-based student healthcare monitoring system. Nowadays, a growing number of students living alone scattered over wide geographical areas, and tracking their health function status is necessary. In this paper, an IoT-based student healthcare monitoring model is proposed to continuously check student vital signs and detect biological and behavioral changes via smart healthcare technologies. In this model, vital data are collected via IoT devices and data analysis is carried out through the machine learning methods for detecting the probable risks of student's physiological and behavioral changes. The experimental results reveal that the proposed model meets the efficiency and proper accuracy for detecting the students' condition. After evaluating the proposed model, the support vector machine has achieved the highest accuracy of 99.1% which is a promising result for our purpose. The results outperformed decision tree, random forest, and multilayer perceptron neural network algorithms as well.

Previous work (cont.)

Interpretability of machine learning□based prediction models in healthcare[2]

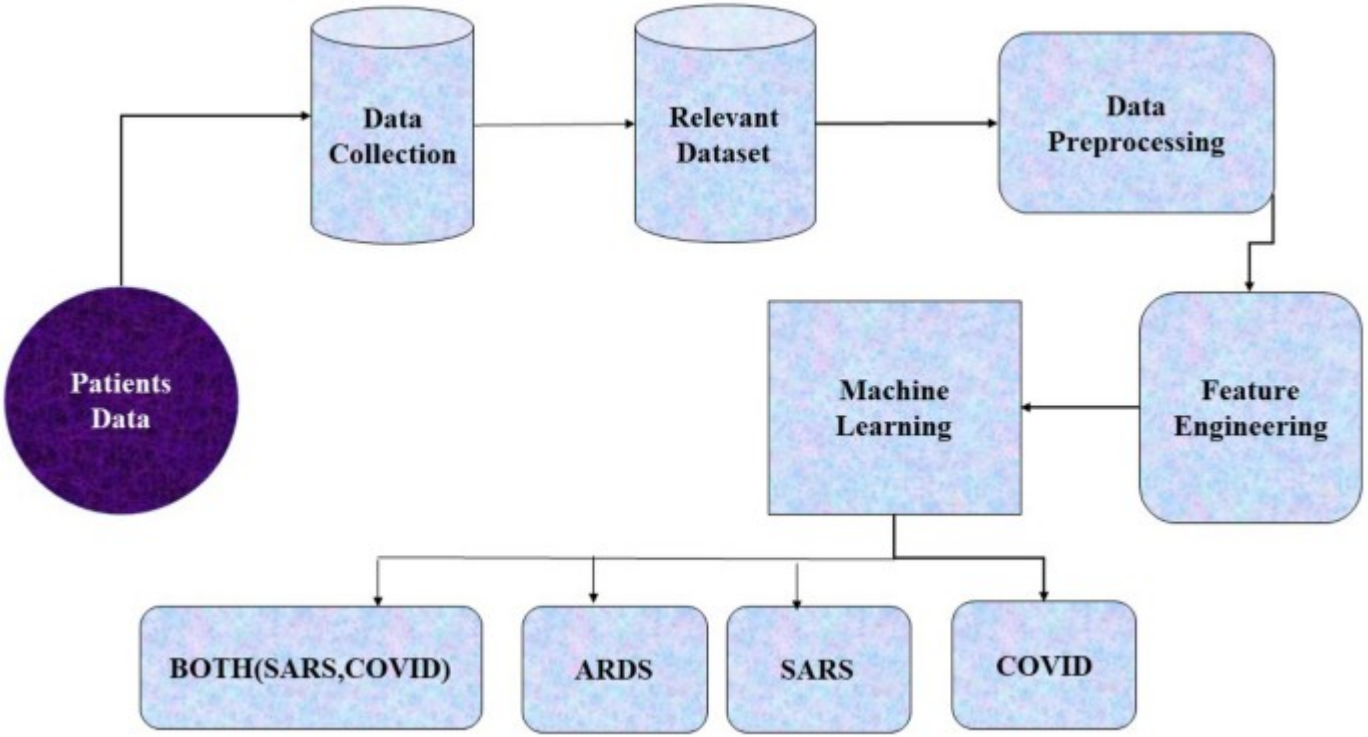
There is a need of ensuring that learning (ML) models are interpretable. Higher interpretability of the model means easier comprehension and explanation of future predictions for end□users. Further, interpretable ML models allow healthcare experts to make reasonable and data□driven decisions to provide personalized decisions that can ultimately lead to higher quality of service in healthcare. Generally, we can classify interpretability approaches in two groups where the first focuses on personalized interpretation (local interpretability) while the second summarizes prediction models on a population level (global interpretability). Alternatively, we can group interpretability methods into model□specific techniques, which are designed to interpret predictions generated by a specific model, such as a neural network, and model□agnostic approaches, which provide easy□to□understand explanations of predictions made by any ML model. Here, we give an overview of interpretability approaches using structured data and provide examples of practical interpretability of ML in different areas of healthcare, including prediction of health□related outcomes, optimizing treatments, or improving the efficiency of screening for specific conditions. Further, we outline future directions for interpretable ML and highlight the importance of developing algorithmic solutions that can enable ML driven decision making in high□stakes healthcare problems.

Previous work (end.)

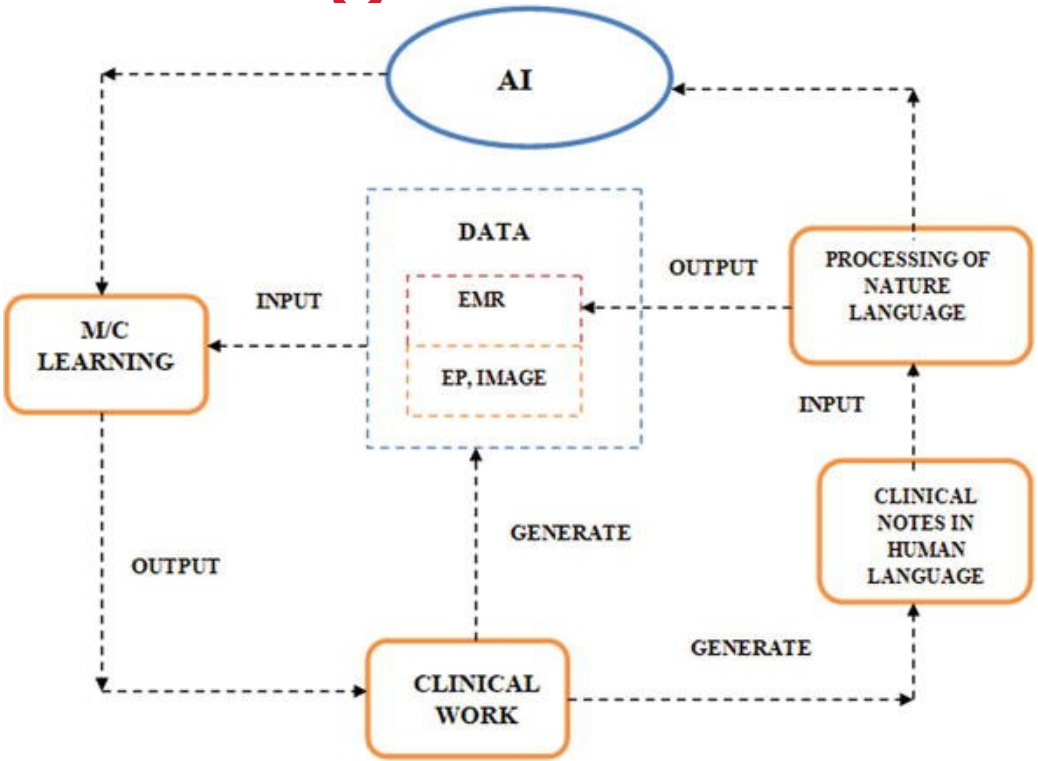
Big Data and Machine Learning Based Secure Healthcare Framework[3]

The paper presents a brief introduction to big data and its role in healthcare applications. It is observed that the use of big data architecture and techniques are continuously assisting in managing the expeditious data growth in healthcare industry. Here, initially an empirical study is performed to analyze the role of big data in healthcare industry. It has been observed that significant work has been done using big data in healthcare sector. Nowadays, it is intricate to envision the way the machine learning and big data can influence the healthcare industries. It has been observed that most of the authors who implemented the use of machine learning and big data analytics in disease diagnosis have not given significant weightage to the privacy and security of the data. Here, a novel design of smart and secure healthcare information system using machine learning and advanced security mechanism has been proposed to handle big data of medical industry. The innovation lies in the incorporation of optimal storage and data security layer used to maintain security and privacy. Different techniques like masking encryption, activity monitoring, granular access control, dynamic data encryption and end point validation have been incorporated. The proposed hybrid four layer healthcare model seems to be more effective disease diagnostic big data system.

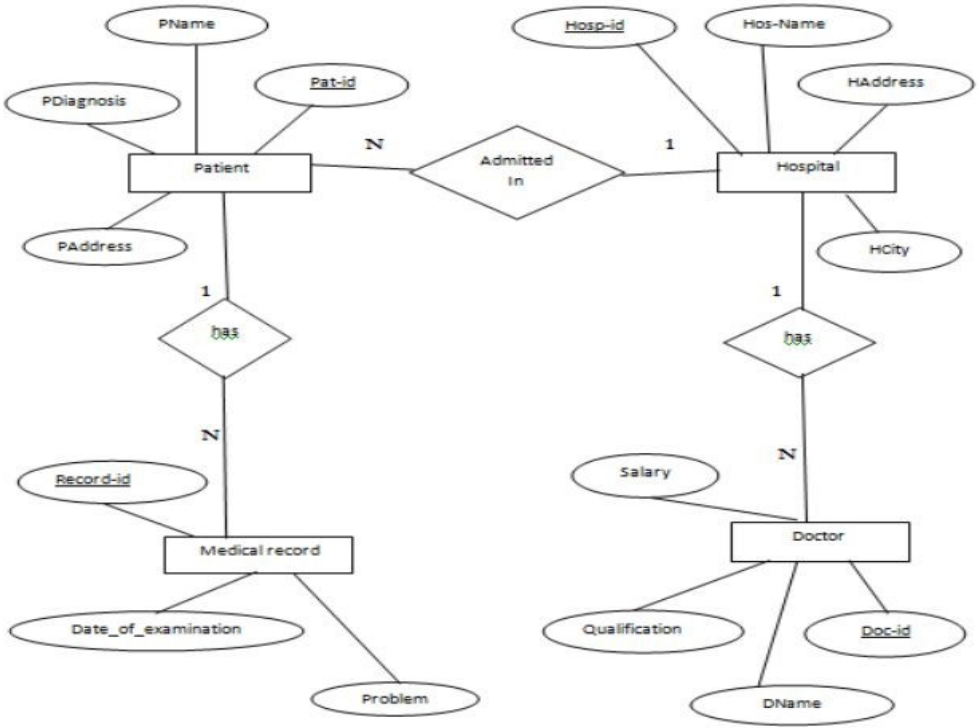
Database Model



System Design



ERD


PName
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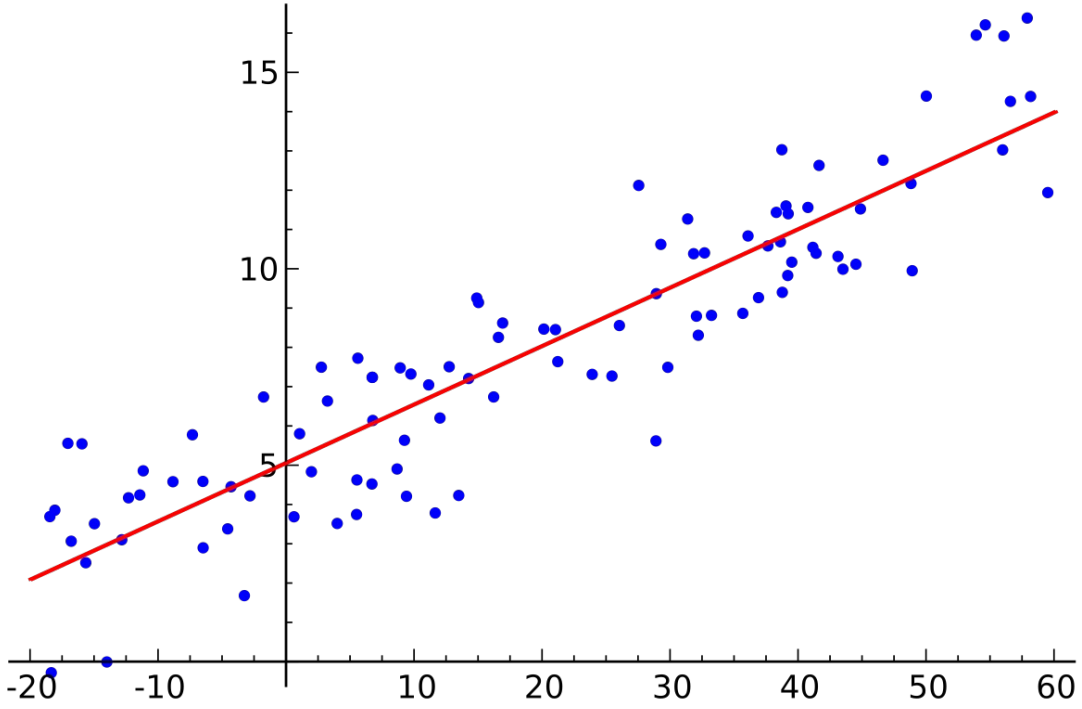
Machine Learning Algorithm



Graph Description

In this segment we are going to explain about the machine learning graph. We have represented the linear regression analysis method of machine learning. By this method we have implemented the disease prediction system according to real human body condition. Suppose we have a heart rate measurement machine that took regular user data. Now based on few days results the machine can suspect the upcoming body condition and predict the upcoming thread. This will not only prevent from certain accidental disease attack but also help to solve the current problems of human body by analyzing the body factors. In this graph we have taken fect results. The line that has been given is the marginal value of body condition changes. Its represents a linear pattern for body condition. Now in this graph we shall filter out the similar and error nous data or similar data or irrelevant data thus we shall get a basic prediction report from the graph.

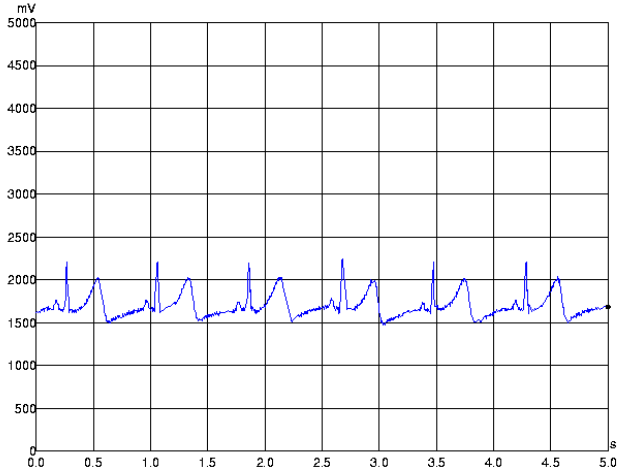
System Calculation

Simple linear regression is a type of regression analysis where the number of independent variables is one and there is a linear relationship between the independent(x) and dependent(y) variable. The red line in the above graph is referred to as the best fit straight line. Based on the given data points, we try to plot a line that models the points the best. The line can be modelled based on the linear equation shown below.

$y = a_0 + a_1 * x$ ## Linear Equation

The cost function helps us to figure out the best possible values for a_0 and a_1 which would provide the best fit line for the data points. Since we want the best values for a_0 and a_1, we convert this search problem into a minimization problem where we would like to minimize the error between the predicted value and the actual value.

System Output

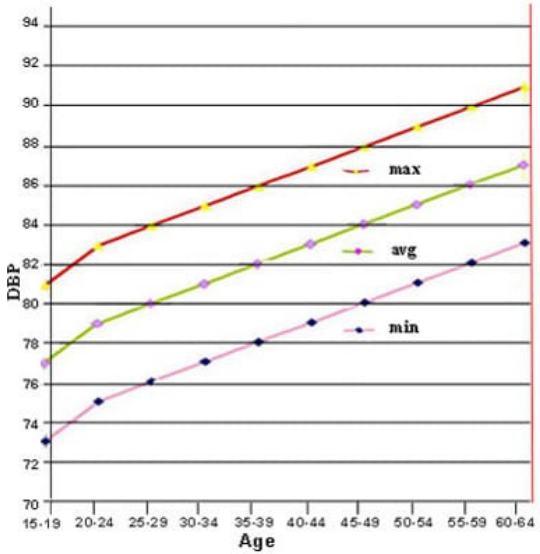


System typical output of heart rate monitoring. This graph represents three wave output. PR wave, RS wave, ST wave. By determinng their depletion area we can easily determind hearth condition.

Result and Implementation (cont)

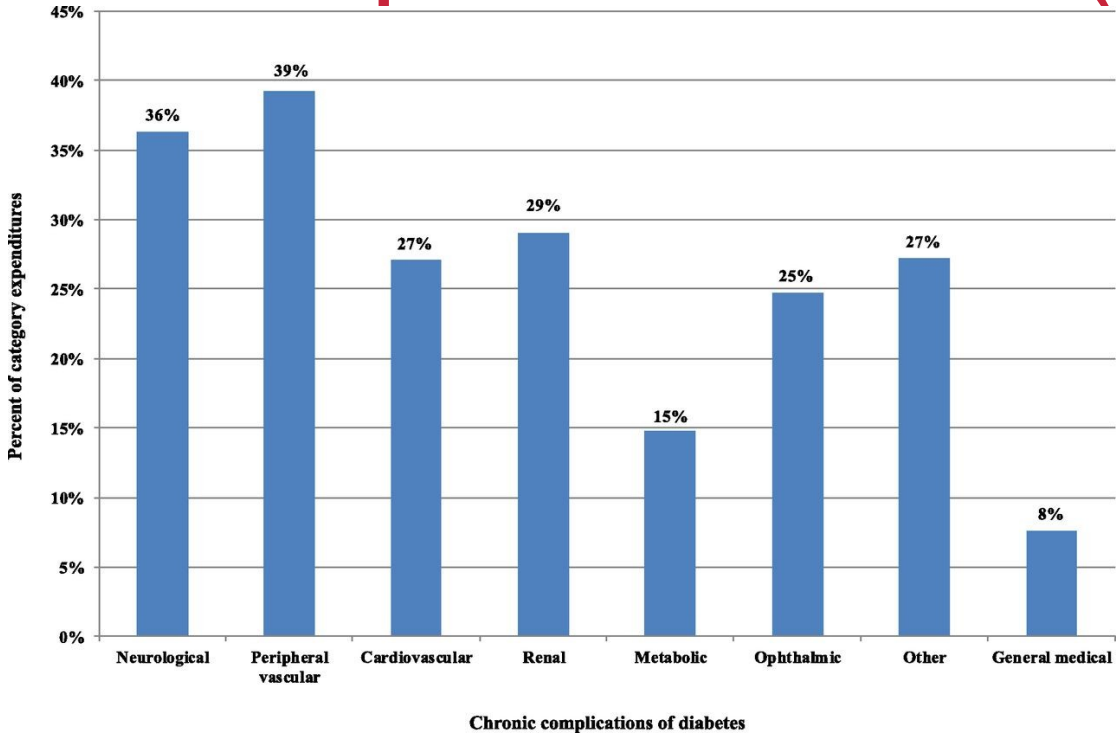
- System return three types of result.
- 1. Daily basis health chart. 2. Weekly basis health chart. 3. Monthly basis health chart.
- Doctor can analyze the output results and can calculate over this values. And also can give a certain chart.
- Patients can ask for special treatment.

Result and Implementation (cont)



This graph represents the diastolic blood condition of body. There are a age range. Based on the age range any taken data from the body or upcoming changes is normal or not our system can predict that.

Result and Implementation (end)



In this graph we have shown chronic complications of a diabetes patients. We took heart rate, blood pressure, sugar, temperature and few more basic readings. Now by this we have returned the basic graphical representation of diabetes conditions. We know there are some basic complications like hypertension, eye problem , heart disease , kidney disease nerve damage. And many more. Now according to the given parameters our users can have a overall result of their diabetes. Not only that but also user can take advance preparation for any kind of upcoming health thread.

Advantages

- User will not need medicine prescription from doctor , system will provide them automatically.
- User will see daily report analysis based on given data.
- User can consult any doctor based on his body condition.
- Most of the time user can give themselves treatment. And at the end of the day they will be cured.
- Doctor can view or study any test case more generously.
- User daily test report can be downloaded.

Dis-Advantages

- Sometimes result can me varied based on overall analysis.
- There are some error nous value because of low calculations.
- Algorithms are mostly predefined values.
- Most of the data comes from the server so there can be little bit delay.
- System data can be varied from the test results.

Future Implementation

- .
- We shall use more training data for more accurate data analysis.
- We shall use more advance filtering for future implementation
- Data taking value will be more accurate
- Result will be more accurate.
- There are some bug at current feature like unit testing is not done yet, large scalling values are not calculated. This fixes will be solved.

Conclusions

Our machine learning based health prediction system uses advanced feature to reduce human efforts and help us to maximize our health condition.

Although prediction is not fully accurate but it returns mostly accurate value as it uses machine learning model.
This system can be designed for more accurate data.

For better user experience we shall use artificial intelligence in future.

Reference

1. Cai Y et al (2018) Software defined status aware routing in content-centric networking. In: 2018 International conference on information networking (ICOIN). IEEE

2. Ozgur C., Kleckner M., Li Y.Selection of Statistical Software for Solving Big Data Problems: A Guide for Businesses, Students, and Universities., Sage Open (2015), pp. 1-12.

3. Ghanbari-Adivi F, Mosleh M (2019) Text emotion detection in social networks using a novel ensemble classifier based on Parzen Tree Estimator (TPE). Neural Comput Appl 31(12):8971–8983