

# Health Monitoring Using Machine Learning

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**Abstract:** - Good Health is one of the primary factors that a human requires to move ahead with his life. The health care system's goal is to enhance the population in the most effective way, in the light of society's available resources and needs. In majority of countries, the death rates are becoming high due to the lack of well-timed medical instruments and treatments. These health risks can be shut out by providing standard health care services. Our Health Monitoring System is a Web Application, which is created by using Flask framework. In this Health Monitoring System, we have used Decision Tree Classification (Supervised Machine Learning technique) for good prediction of results. Here, we have used our own dataset to train and evaluate our model. Based on that evaluation, we would be able to predict the patient's health level and area of risk.

**Key Words:** — *Health Monitoring System, Decision tree algorithm, Flask, Risk level.*

## I. INTRODUCTION

Proper monitoring of health is the major problem today. Due to absence of proper health monitoring systems, patient suffer from serious health related issues. Nowadays, there are lots of devices to monitor the patient's health over internet. Experts on health are taking full advantage of these devices to keep an eye on their patient's health. With hundreds of new healthcare technology companies, machine learning is revolutionizing the healthcare industry. In this paper, we will make Health Monitoring System which records the patient's BMI, age, gender, body temperature, body pressure, pulse rate, alcohol consumer or not and smoker or not. This system can empower people to manage a healthy lifestyle with early risk predictions and appropriate individualized recommendations.

To develop a system which is intelligent, automated, personalized, contextual, and behavioral recommendations to achieve personal wellness goals, which also addresses health related problems as a study case, we propose to (a) identify health risk factors, (b) perform data collection from controlled trials, (c) data analyses, and (d) perform a predictive analysis with machine learning algorithms for future health risk predictions and behavioral interventions. This system uses Decision tree classification algorithm which helps in achieving good accuracy and prediction of the patient's health risk level.

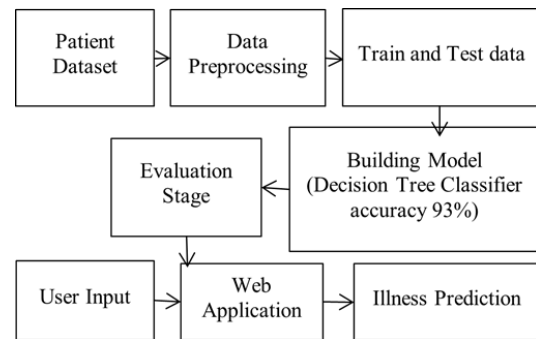


Fig. 1. Health Monitoring System

## II. RELATED WORK

Many researchers have worked under various medical fields aiming to provide a better Health Monitoring System which helps people to stay healthy. This public health problem is present almost in every other countries for the last ten to fifteen years. Obesity and overweight remain as a significant public health problem around the world. It has prevailed among pre-school students and childbearing-age women at a low rate. But it is increasing among school students rapidly and scores high in adults, mainly in the group of girls or women with less education or schooling. Many projects have been conducted by different research groups on obesity-related risk predictions with machine learning and deep learning approaches to generate useful regression and classification models.

Jindal used ensemble machine learning for obesity prediction based on the key determinants-age, height, weight, and BMI. This model utilized Random Forest (RF), generalized linear model, and partial least square, with a prediction accuracy of

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89.68%. Grabner done a study on National Health and Nutrition Examination Survey (NHANES), National Health Interview Survey (NHIS), and Behavioural Risk Factor Surveillance System (BRFSS) datasets from the 1970s to 2008 to analyse the trend of BMI in the USA over time and across race, gender, socioeconomic background, and status (SES). It was observed that SES–BMI gradients were steadily more significant for women than for men. Seyla studied how to classify obesity from dietary and physical activity patterns using machine learning classification algorithms and, as a result, support vector machine (SVM) outperformed other classifiers. Similarly, Zheng, Meghana, Bassam, Singh, Golino were used so many Machine Learning techniques to predict obesity incidence at the country level, based on countrywide sales of a small subset of food and beverage classes, if increased blood pressure by body mass index (BMI), waist (WC) and hip circumference (HC), and waist hip ratio (WHR), physical activity to balance calories intake and consumption, and classified the various risk and consequences. Many authors agrees that Machine learning are natural extensions to conventional statistical methods. It has become an essential tool for the modern healthcare system. The best rational methods must be utilized to ensure that the result is robust and valid. It is true in healthcare because these algorithms can affect the million lives of people.

### III. TRADITIONAL SYSTEM

In the traditional system, the patient needs a particular treatment to get him cured or his state will be more in danger and he can even die. Unfortunately, there are many false reports triggered by the current monitoring systems. In fact, the monitoring system can trigger an alarm that does not indicate a real critical state. But in some cases, they are due to a wrong setting of parameters, or a bad setting of monitoring devices. Besides, the monitoring systems do not consider the relation between the measured parameters. It separately measures each parameter which can lead to false reports. Hence, false reports present a real danger for the patient life. They do not report the real state of patients which can make the monitoring task more complicate. Furthermore, the working condition of the medical staff become more difficult and make patients under more pressure.

## IV. PROPOSED METHOD

### A. Dataset Collection

The first step is to create a dataset that will hold the training data for the model. Here, we have created our own dataset which includes parameters such as gender, age, BMI, body temperature, body pressure, pulse rate, alcohol consumer or not, smoker or not, sleep hours and health level which is in the scale 0,1 and 2. If any of the parameters contains null values, those values are dropped from the dataset and perform data preprocessing.

### B. Dataset Preprocessing

The collected data are categorized among two groups-continuous and categorical. We have used Decision Tree Classifier for training and testing the model. Several selected datasets are small, some are noisy, and the remaining contains a good volume of data to train the model. Data mining was included to filter the data samples from each of the datasets and to discard samples containing outliers. Data mining involves pattern discovery, the calculation of feature association (and correlation), feature selection, classification, clustering, and outlier analysis. After creating the datasets, pre-processed it by Data Visualization (boxplot) for checking the outliers then the categorical columns are encoded using Label Encoding technique.



Fig. 2. Data Preprocessing Levels

### C. Training and Testing

Training and Testing includes splitting dataset for training and testing (80/20). The model is implemented using Decision Tree Algorithm (classifier). Decision Tree Classification is also called CART (Classification and Regression Algorithm) which builds regression or classification models in the form of a tree structure. It breaks down a dataset into smaller subsets and it performs a prediction.



Fig. 3. Model Building Menu Items

### D. Model Evaluation

After the prediction process, the model is evaluated with the help of classification accuracy metric. Accuracy metric is the fraction of predictions in our model by total number of predictions. When the dataset is tested and predicted, it shows the best solution in the accuracy score of our model has 93%.

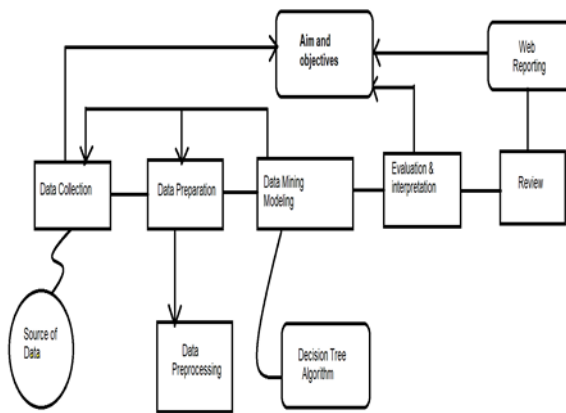


Fig. 4. Flow Chart for Proposed System

After evaluation, we have created a web application using Flask framework where anyone can enter their health details as parameters and get their health risk level in the rate scale of 0, 1 and 2.

## V. APPLICATION

The applications of health monitoring using machine learning are early detection of cardiovascular diseases and chronic diseases, Clinical Decision Support System (CDSS) which

can assist physicians, nurses, patients, and other care givers to make better decision. Normal people can also use this system to find out whether they are suffering from a serious health issue and cure it accordingly by contacting near hospitals.

## VI. CONCLUSION

In this paper, we proposed a method to prevent the disease with early intervention rather than go for treatment after diagnosis. Using this proposed system, it is possible to get more accurate results for disease prediction and enables healthcare professionals in better decision-making, identifying trends and innovations, and improving the efficiency of research and clinical trials. It improves the delivery system of healthcare services, cutting down costs, and handling patient data very precisely.

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