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Integrated BP and Sugar Monitoring System

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ABSTRACT

Diabetes and blood pressure are said to be more prevalent than any other lifestyle diseases in India, which is home to about 70 million + people with this chronic ailment. Blood pressure is the major disease that has ranked the third largest cause of disability In this proposed paper, the application helps in monitoring BP and sugar and also provides diet and meal planning. Various Machine learning algorithms were studied and based on the algorithm having the highest accuracy was selected. By following discipline in the daily meals with appropriate calories and nutrients, the patients can maintain as well as recover from such lifelong diseases. The System provides the daily calorie requirement based on the data submitted by the patient and provides the diet plan appropriate to the calories provided. Also, a visual representation will be provided in charts and graphs, which will help the patient monitor and control Blood pressure and Sugar.

INTRODUCTION

According to the World health organization, Blood pressure is a global public health issue. And 31 % of deaths happen due to blood pressure. Apart from this, blood pressure can give rise to various other diseases such as heart attack, diabetes, strokes, etc. Similarly, diabetes is the most common disease in India. The count of pre-diabetic patients is estimated around to be 492 million+. The count of diabetic people has raised to 422 million(2014) from 108 million in 1980. By 2040 this count would increase up to 480 million. The research has shown a significant link between blood pressure and sugar over the past few years. Some of the common risk factors associated with blood pressure and diabetes are age, inappropriate body mass index(BMI), cholesterol, less physical activity, and inherited from parents. Treatment involves monitoring blood pressure and sugar, changing lifestyles, and switching to healthy lifestyles and foods. Along with the medication diet planning helps them to control blood pressure and sugar up to a certain standardized level. Medical research evidence has proposed that the early detection of blood pressure, and sugar and its correction in the form of lifestyle habits and discipline could reduce the further increase in diseases and their consequences. The proposed system will help in monitoring the diseases and their recovery through diet planning features.

Proposed Work

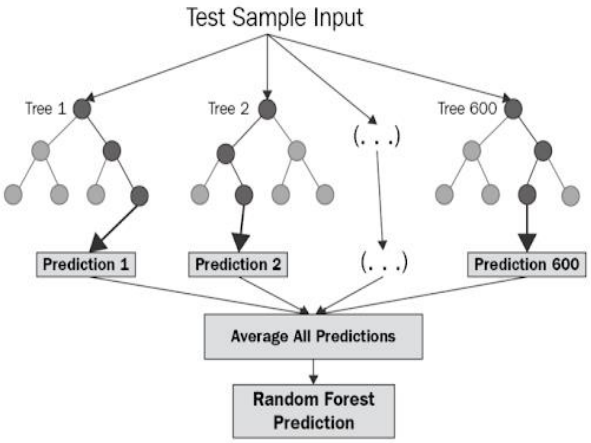
This section consists of the work done by the team. Various parameters were taken into consideration which can trigger the BP and sugar. The parameters and features taken into consideration were: Systolic blood pressure, Diastolic blood pressure, Height, Weight, Body Mass Index (BMI), Gender, Age, Activity Factor, Fasting Glucose level, and Post Prandial (PP). The information was collected, and the dataset was prepared. The entries in the dataset were near about 200 and it was used for both training and testing of the model. Also, the UI interface and the backend request, and the response part is handled by the Django and Django Rest Framework which are Python framework as they are more compatible with a machine learning algorithm. Different machine learning algorithms can be considered for this project work but the Random Forest regressor is particularly suitable for regression problems where the target variable is continuous. It is a machine learning method that considers multiple decisions from the tree and makes an appropriate decision. It is an effective method to estimate the missing data and maintain accuracy with a large proportion.

Proposed System

Part 1: BP and Sugar Management System

With a Good prediction model and Accurate detection technique, diagnosis can be made more efficient. The Random Forest Regressor is used to train the model. The Random Forest Regressor is a supervised learning algorithm that uses ensemble learning for classification and regression.

A large number of decision trees are generated by the Random Forest algorithm. Each decision tree is trained on the random subset of the data and the random subset of the features. All trees are taken into consideration and are combined to produce the final output.



Part 2: Diet planning system

Diet planning plays a key role when it comes to one's health. It not only helps in maintaining a person's health in day-to-day life but also prevents chronic diseases in the future. The patient needs nutritional components in a proper amount which can help the patient to live longer and healthier life. Due to excessive consumption, the patient becomes obese and this can lead to other diseases like obesity on the other hand, less consumption of food leads to weakness in the body which can also affect the immunity of the patient. Hence to overcome, all this diet planning is essential.

In this diet planning system, the diet will be suggested to the patient with the help of the data provided by the patient. Based on the provided the calorie count will be calculated. The steps for calculating the calories are as follows :

Step 1: Calculate the BMR (Basal Metabolic Rate) using the Muffin - St. Joer Equation. The equations of BMR for males and females are as follows :

● **Male** : $(10 \times weightinkg) + (6.25 \times heightincm) - (5 \times ageinyears) + 5$

● **Female** : $(10 \times weightinkg) + (6.25 \times heightincm) - (5 \times ageinyears) - 161$

Step 2: Predicting the calorie count using Machine Learning Model. The physical activity of the person is taken into consideration and it is segregated into 4 types which are as follows :

- Sedentary (little or no exercise)
- Lightly active(Light exercise or Light activity or sports 1-3 days in a week)
- Moderately active(Moderate exercise or Moderate activity or sports 5-6 days in a week)
- Extra active (Hard exercise or Hard activity or sports or any physical training)

Step 3: After receiving the calorie count, the dataset for different types of food and their respective calories was prepared which consists of 6 different food types. The food types are vegetables, fruits, milk and milk products, snacks, chapatis, and their different types, and sweet dishes. The calorie count is divided into 4 parts breakfast, lunch, snacks, and dinner. And the food items matching the calories were mapped and assigned to particular meals. The collected dataset is having two columns namely: The name of the food item and the second column is the calorie count of that corresponding food item. The dataset also consists of the quantity of the food item in kilograms, grams or millilitres depending upon the item.

The System flow

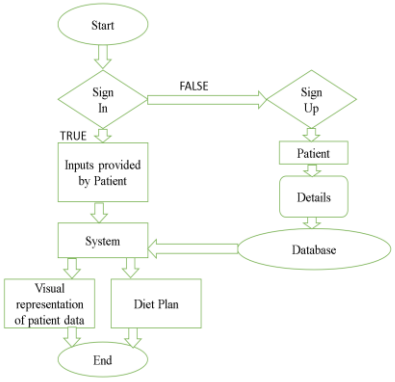


Figure 1: System flow chart

The above flowchart elaborates on the system in a detailed manner. When a patient comes to the application for the first time he/she has to Sign Up. For the successful Sign up the patient was redirected to the Sign in page. After signing the patient enters the information regarding the patient. The successful submission of the information the data is stored in the database and it is provided to the system. The system works according to the algorithm and gives calorie count as the output . The information about the patient is represented visually (Graphs) so that the patient and the doctor can easily predict the future of health and monitor it continuously.

The Overview of the System

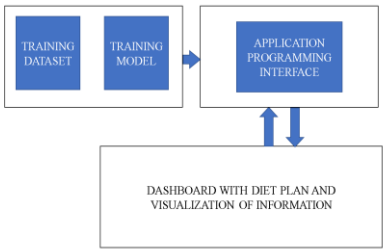


Figure 2: Overview of System

The above system depicts the overview of the System. The collected dataset is divided into two parts: the Training and Testing datasets. The system also contains the training model which will be connected to the API(Application programming interface) which will deal with the request and response made by the patient. Response received by the patient will be in the form of visual or graphical data and also with a diet planning chart.

The System Interface

Day	Breakfast	Lunch	Dinner	Snacks
Monday	Cerial(cooked)1/2 cup	Peas(cooked)1/2 cup Whole milk 1 cup Paneer/Chicken (white, no skin)	Corn(cooked) 1/2 cup Eggs 1 Beets	Apple
Tuesday	Cereal(cooked)1/2 cup	Peas(cooked)1/2 cup Whole milk 1 cup Paneer/Chicken (white, no skin	Corn(cooked)1/2 cup Eggs 1 Beets	Apple
Wednesday	Cereal(cooked)1/2 cup	Peas(cooked)1/2 cup Whole milk 1 cup Paneer/Chicken (white, no skin	Corn(cooked)1/2 cup Eggs 1 Beets	Apple
Thursday	Cereal(cooked)1/2 cup	Peas(cooked)1/2 cup Whole milk 1 cup Paneer/Chicken (white, no skin	Corn(cooked)1/2 cup Eggs 1 Beets	Apple
Friday	Cereal(cooked)1/2 cup	Peas(cooked)1/2 cup Whole milk 1 cup Paneer/Chicken (white, no skin	Corn(cooked)1/2 cup Eggs 1 Beets	Apple
Saturday	Cereal(cooked)1/2 cup	Peas(cooked)1/2 cup Whole milk 1 cup	Corn(cooked)1/2 cup Eggs 1	Apple

Conclusions

The proposed system is trained to control and continuous monitoring of the blood pressure and sugar of the patient using machine learning algorithms. Also, a complete diet plan is provided to the patient which will not only help the patient to live a healthier life but also cure chronic diseases such as blood pressure and sugar to a greater extent. Also, the history of the patient data will be kept so that his readings can be monitored and can be represented in the form of graphs.

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