DIET SUGGESTION AND DISEASE PREDICTION USING MACHINE LEARNING

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Abstract - *In today's modern-world, human beings all over the globe are getting extra inquisitive about their fitness and life-style. But simply avoiding junk meals and doing an workout is not sufficient, we require a balanced eating regimen. Also correct analysis of any fitness-related trouble is vital for the prevention and remedy of the disease. A balanced diet based on our height, weight, age and a set of questions that ask our daily intake of food which helps to calculate the nutrient surplus or deficient in our body. A balanced diet is very much important which makes our body healthy . Additional feature of predicting the disease based on the symptoms which may help the patients to be aware of the disease where multiple machine learning algorithm like DecisionTree, RandomForest and NaïveBayes predicts the disease. The most common effects of unbalanced eating are lack of energy, concentration, irritability, water retention, constipation and insufficient or unrest sleep. Hence having balanced diet is very much important. Thus, a proposed system gives suggestion on your diet and also helps to predict the disease based on the symptoms.*

Index Terms - **Machine Learning, Disease Prediction, Random Forest Algorithm, Decision Tree ,Symptoms NaïveBayes, Diet Suggestion, Diet Plan**

1.INTRODUCTION

In these modern era, people are suffering from various health issues such as fitness problem, inappropriate diet, mental problems etc. There has been a drastic increase in the number of people suffering from chronic diseases, vitamin deficiency, hair problems. Working man/women who is running after jobs doesn't have time to look after her/his daily dietary issues, so this project helps to improve the nutrient that the person lacks. Also this project helps to predict the disease , that reduces the consultant fees of doctor. The main objective of this work is to recommend a diet to the individual with a note to increase the specific nutrient which he/she lacks. The recommender system deals with a volume of information present by filtering the most important information based on the data provided by a user. The predictor system helps to predict the disease based on the symptoms provided by the user. The recommendation process functions in such a way that Collecting Details from user, Training the model and Diet Recommendation. The prediction process has also three stages Collecting Symptoms from the user, Training Phase(multiple algorithms) and finally disease prediction. After gathering of facts Learning Phase comes in which diverse conclusions are made out of that data that is collected and in remaining section that is Recommendation Phase which gives the detailed diet to the user. In our project the output of prediction is based on the symptoms provided by the user and diet suggestion is based on the height, weight, age, gender and set of questions related to daily eating routine.

2. PROBLEM STATEMENT

The junk food intake price is alarmingly excessive and this therefore has led to the intake of bad meals. This results in diverse fitness problems along with obesity, diabetes, an growth in blood strain etc. Hence it has become very crucial for human beings to have a great balanced dietary wholesome fitness program. But in this rapid growing generation now not all people has the money and time to spend on personal dietitian and nutrients who will charge upon and deal with their fitness via advising them a wholesome diet plan according to the person individual personal information. In this report we have look upon the disease prediction based on his/her symptoms and a diet suggestion module to suggest a satisfactory solution to them for healthy life.

3. OBJECTIVES

1. The objective of this study is to concentrate on improvement of particular nutrients in the body on considering various important aspects of the user's lifestyle.
2. The application eliminates the travelling cost or consultation fees in visiting a dietician.
3. Improves your mental health, fitness. Staying healthy is all about being consistent with daily exercises, being discipline.
4. Being fit is all about the 70/30 rule. Here's the way it goes, for someone to stay healthy he/she need to cognizance 70% on his dietary consumption and 30% on his bodily interest/exercise.

4. EXISTING SYSTEM

Several works are projected for various recommendation systems associated with diet and food. These systems ar used for food recommendations, menu recommendations, diet set up recommendations, health recommendations for specific diseases, and formula recommendations. Majority of those recommendation systems extract users' preferences from completely different sources like users' ratings.

A Food Recommendation System (FRS) [1] is projected for diabetic patients that used K-mean cluster and Self-Organizing Map for cluster analysis of food. The projected system recommends the substituted foods in keeping with nutrition and food parameters. However, FRS doesn't adequately address the illness level issue as a result of the amount of polygenic disease could vary hourly in numerous things of the patient and also the food recommendations may vary consequently.

Tags and latent issue square measure used for golem based mostly food recommender system [2]. The system recommends customized direction to the user supported tags and ratings provided in user preferences. The planned system used latent feature vectors and matrix factorization in their rule. Prediction accuracy is achieved by use of tags that closely match the recommendations with users' preferences. However, the authors don't think about the nutrition so as to balance the diet of the user per his desires.

Content based mostly food advocate system [3] is planned that recommend food recipes per the preferences already given by the user. the well-liked recipes of the user square measure fragmented into ingredients that square measure allotted ratings per the keep users' preferences. The recipes with the matching ingredient square measure counseled. The authors don't think about the nutrition factors and therefore the balance within the diet. Moreover, possibilities of identical recommendation also are gift as a result of the preference of the user might not amendment on usual.

All these mentioned system provides the diet on high ratings or the general dietary system just in case of food recommendation for specific diseases, the systems advocate totally different foods for patients while not knowing the extent of unwellness which can vary in numerous cases and cause severe effects on patients. Similarly, just in case of food recommendations to balance the diet, nutrition factors square measure unnoticed that square measure abundantly vital to advocate food and balance diet.

5. PROPOSED SYSTEM

The System consists of two modules namely:
1. Disease Predictor-It predicts the disease by analyzing the symptoms provided by the user with three machine learning algorithms.
2. Diet Suggestion- It works in a Machine Learning Environment, were it calculates the user data and accordingly give the recommended Diet plan to work on.

5.1 DISEASE PREDICTOR

A licensed dataset from kaggle that contains 41 diseases and their symptoms. Accordingly, we train the dataset to get the desired results for the user. We used mainly 3 Algorithms here which are:

1. Decision Tree Classifier
2. Random Forest Classifier
3. Naïve Bayes

Based on the symptoms provided by the user, the model predicts the disease.

- **Decision Tree Classification Algorithm**

In a Decision tree, there are nodes, which can be the Decision Node and Leaf Node. Decision nodes are used to make a couple of branches and make decisions , whereas Leaf nodes are the output of those choices and do not incorporate any further branches. The choices or the take a look at are performed on the premise of features of the given dataset. It is known as a selection tree because, just like a tree, it begins with the foundation node, which expands on similarly branches and constructs a tree-like structure. A decision tree certainly asks a question, and primarily based on the solution (Yes/No), it further split the tree into sub trees. The decision tree classifier takes the decision between diseases and produces the output with accuracy of 93%.
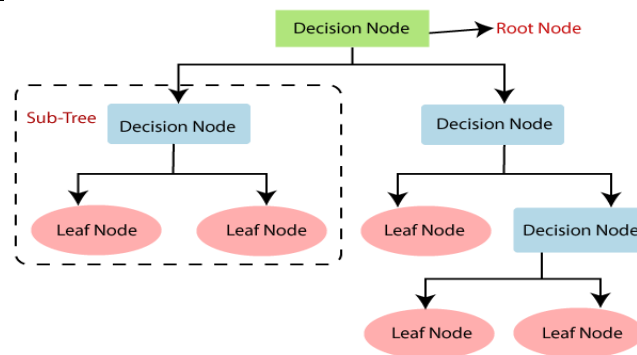
Fig -1 Decision Node tree

• **Random Forest Classifier Algorithm**

"Random Forest could be a classifier that contains variety of call trees on varied subsets of the given dataset and takes the typical to boost the prophetic accuracy of that dataset." rather than counting on one call tree, the random forest takes the prediction from every tree and supported the bulk votes of predictions, and it predicts the ultimate output. The bigger range of trees within the forest ends up in higher accuracy and prevents the matter of over fitting. Therefore, below square measure 2 assumptions for a stronger Random forest classifier:
There ought to be some actual values within the feature variable of the dataset in order that the classifier will predict correct results instead of a guessed result. The predictions from every tree should have terribly low correlations .In our project Random Forest Classifier predicts the output at accuracy of 94%.
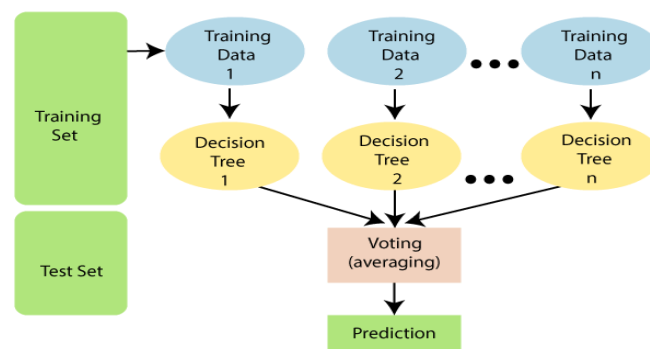

Fig -2 Decision Tree

• **Naïve Bayes Algorithm**

Naïve Bayes algorithmic rule may be a supervised learning algorithmic rule, that relies on mathematician theorem and used for finding classification issues. It is primarily employed in text classification that has a high-dimensional coaching dataset. Naïve Bayes Classifier is one in all the straightforward and best Classification algorithms that helps in building the quick machine learning models that may create fast predictions. It is a probabilistic classifier, this suggests that it predicts on the thought of the chance of associate item.

$$P(H|E) = \frac{P(E|H) * P(H)}{P(E)}$$

Fig -3 Probability function

5.2 DIET SUGGESTION
In diet suggestion module , the dataset consists of age, gender, height, weight, proteins, fats, etc. It mainly concentrates on creating an application for diet suggestion where user provides inputs to certain predefined questions along with their age, gender, height and weight. Based on the answers/inputs provided by the user, the application runs a Machine learning algorithm in the backend which calculates the nutrient deficiency and the nutrient surplus of the user. It also provides a diet plan and indicates to increase the specific nutrient in our daily meal by analyzing the users input data .A pre-trained Classification model has been created the usage of Random Forest Classifier. The motive for deciding on Random Forest Classifier as it includes some of choice trees on numerous subsets of the given dataset and takes the common to enhance the predictive accuracy of that dataset. Random Forest, like its call implies, includes a big range of character choice trees that operate as an ensemble. Each person tree in the random forest spits out a category prediction and the class with the maximum votes becomes our model's prediction.

6 SYSTEM ARCHITECTURE

In disease prediction, the user enters the symptoms (maximum of 5 symptoms). Based on the symptoms provided by the user . Multiple ML models predicts the disease.
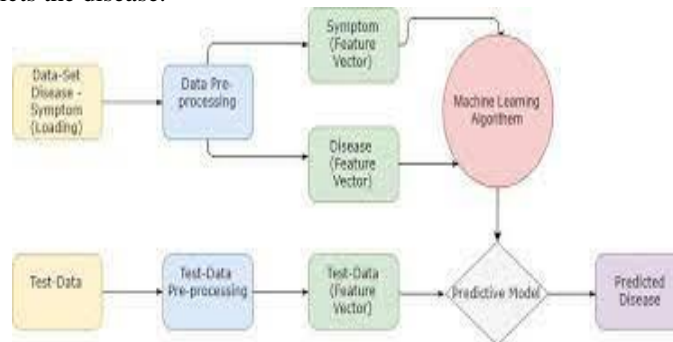

Fig.4 System Architecture

In Diet suggestion module, the user enters the gender, age, height, weight and answers a set of predefined questions based on the regular food habits. The pertained model by Random Forest Classifier Algorithm suggests a proper diet to the person with an extra bonus of asking the user to include particular nutrient in their diet.
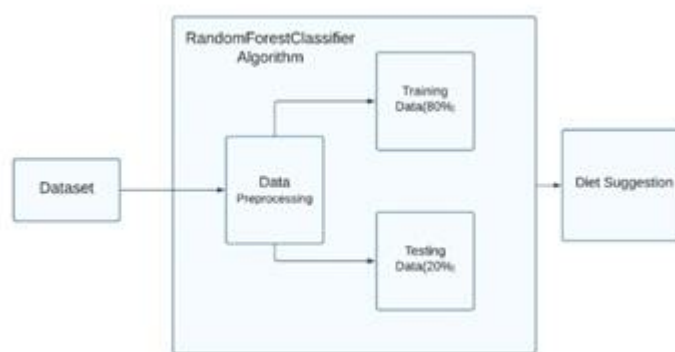

Fig 5 Random forest Classifier

7. RESULT

We have created a website where the Disease predictor gets the symptoms from the user and in the backend the decision tree, RandomForest, NaiveBayes algorithm predicts the disease. The output is shown in fig.7.1
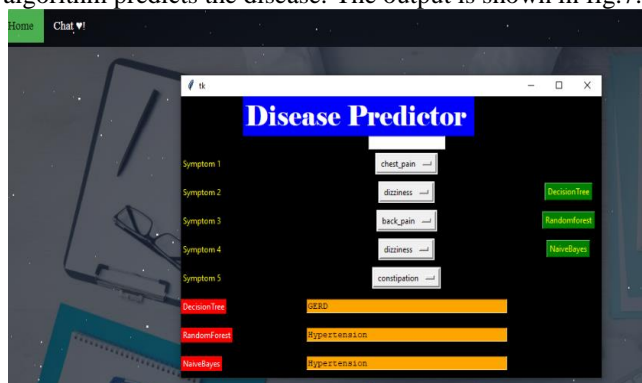

Fig.6: Details gathering page

The diet Suggestion module functions by getting the users input as age ,gender, weight, height and then set of questions. The pre trained model suggests a diet plan to the user.
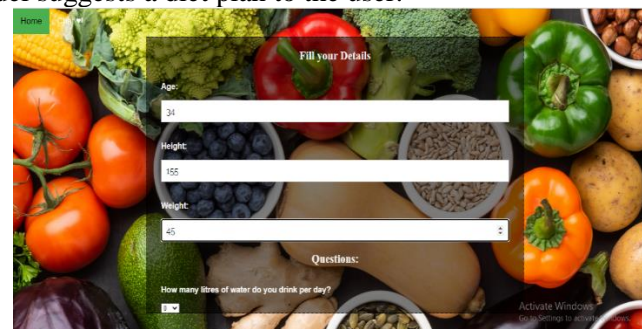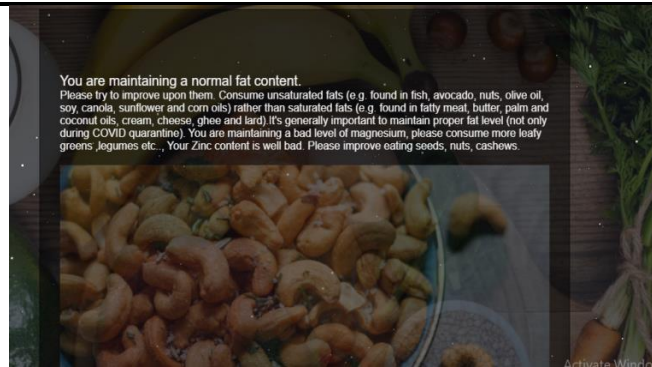

Fig.7: input details

Fig. 8 : output details

8.CONCLUSION

The emerging technologies like machine learning and artificial intelligence playing a important part in the development of the IT (Information Technology) industries. We have made use of these technologies and created a website for people who are consult about their diet and want to lead a healthy life. The importance of nutritional guidance is increasing day by day to lead a healthy and fit life.

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