Diet Recommendation System Using Machine Learning

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Abstract –

People from all around the world are getting more concerned about their health and way of life in today's modern environment. However, avoiding junk food and exercising alone are insufficient; we also need to eat a balanced diet. We can live a healthy life with a balanced diet based on our height, weight, and age. Your diet can help you achieve and maintain a healthy weight, lower your chance of developing chronic diseases (including cancer and heart disease), and improve your general health when combined with physical activity. A balanced diet provides your body with the nutrition it needs to operate properly. The quantity of energy that a food contains is measured in calories. We use calories every single day to breathe, move around, walk, run, etc. A person requires, on average, 2000 calories a day, but the precise amount depends on the person's physical characteristics, including weight, height, age, and gender. Therefore, the food decisions you make each day have an impact on your health and how you will feel now, tomorrow, and in the future. As a result, a suggested system recommends a diet for you based on your physical characteristics and your end aim.

I. INTRODUCTION

Humans now face a wide range of health issues, including issues with mental health, poor food, and exercise. Numerous studies show that poor nutrition quality and dietary inadequacy are the primary causes of many illnesses and health problems. According to a WHO research, inadequate and unbalanced dietary intake is responsible for roughly 9% of global fatalities from heart attacks, 11% from ischemic heart disease, and 14% from gastrointestinal cancer. Moreover, roughly 0.25 billion children are suffering from Vitamin-A inadequacy, 0.2 billion individuals are suffering from iron shortage (anaemia), and 0.7 billion people are suffering from iodine deficiency. The major goal of this work is to give advice on a diet to various people. The recommender system handles the abundance of information by filtering the most crucial information based on the information provided by a user and other criteria that take into account the user's choice and interest. Based on their physical characteristics (age, gender, height, weight, body fat percentage), preferences, and match between user and item, it assigns similarities between users and objects for recommendations (weight loss or weight gain). The information gathering phase, the learning phase, and the recommendation phase are the three main phases of the recommendation process. Prior to categorising the numerous solutions to a given problem, information is first gathered regarding that problem in question. Following the information gathering phase, the learning phase begins, during which various inferences are drawn from the information acquired, and the recommendation phase concludes with the delivery of an output that includes numerous recommendations. In our project, the suggestion output is based on the user's physical characteristics, preferences, and BMI (BMI).

II. OBJECTIVES

1. The goal of this study is to take into account many significant components of the user's lifestyle and ensure that these elements are taken into account when the system develops and recommends a user-friendly, wholesome diet.
2. A healthy weight can be maintained with good nutritious food and a modest amount of exercise. But the advantages of healthy eating go far beyond just controlling weight.
3. The 70/30 guideline is the key to staying in shape. In order to maintain good health, a person must place 30% of their attention on exercise and 70% of their attention on their dietary consumption.

III. EXISTING SYSTEM

For various diet and food recommendation systems, a number of works have been put forth. Food recommendations, menu suggestions, diet plan recommendations, health recommendations for particular diseases, and recipe recommendations are all made using these systems. Most of these recommendation systems get information about user preferences from various sources, such as user ratings.

- For diabetic patients, a Food Recommendation System (FRS) [1] that uses K-mean clustering and Self-Organizing Maps for food clustering analysis is proposed. According to nutrition and food factors, the proposed approach suggests the replaced foods. FRS, however, falls short in addressing the disease level issue because the patient's degree of diabetes can change hourly depending on their circumstances, and thus, so can the meal recommendations.
- For an Android-based food recommendation system [2], tags and latent factors are used. Based on tags and ratings entered in the user's preferences, the system suggests a customized recipe to the user. The proposed system's approach made use of matrix factorization and latent feature vectors. By using tags that closely match the recommendations with users' tastes, prediction accuracy is attained. To balance the user's diet in accordance with his needs, the writers do not take nutrition into account.

The techniques for recommending diets described above deal specifically with certain ailments or have to do with how well-balanced diets are. When recommending meals for specific conditions, the systems do so without taking into account the severity of the ailment, which can vary between individuals and have a negative impact on patients. Similar to this, while making food suggestions to balance a diet, nutrition aspects that are crucial for making food recommendations and creating a diet that is balanced are disregarded.

IV. PROPOSED SYSTEM

The system operates in a machine learning environment where it analyses user data to determine the best diet to follow. We separated the dataset into three groups:

1. Lunch Data
2. Breakfast Data
3. Dinner Data

As a result, we train the ML model with various inputs to produce the intended user outputs. Here, we mainly employed 2 algorithms, which are:

1. K-Means
2. Random Forest

The model will produce a diet plan for the user based on the user's preference for a healthy diet, weight gain, or weight loss, as well as the data and category they have chosen.

K-MEANS ALGORITHM

K-Means Clustering is an unsupervised learning algorithm that is used to solve the clustering problems in machine learning or data science. This algorithm's primary goal is to reduce the total distances between each data point and its corresponding clusters. The algorithm starts with an unlabelled dataset as its input, separates it into k clusters, and then continues the procedure until it runs out of clusters to use. In this algorithm, the value of k should be predetermined. The two primary functions of the k-means clustering algorithm are:

• Uses an iterative technique to choose the best value for K centre points or centroids. • Chooses the nearest k-center for each data point. A cluster is formed by the data points that are close to a specific k-center.

As a result, each cluster is distinct from the others and contains data points with some commonality. The K-means Clustering Algorithm's operation is illustrated in the diagram below:

The k-means clustering algorithm is used in our project to partition the data set into the three categories of lunch, breakfast, and dinner. The diagram below demonstrates how to declump a dataset's cluster into all three categories. This allows us to eventually separate the dataset into train and test datasets for each of the three categories, and the random forest approach is then used to build the model.

RANDOM FOREST ALGORITHM

Random Forest algorithm is a supervised classification algorithm. We can see it from its name, which is to create a forest by some way and make it random. There is a direct relationship between the number of trees in the forest and the results it can get: the larger the number of trees, the more accurate the result. A tool for supporting decisions is the decision tree. The potential effects are displayed using a graph that resembles a tree. The decision tree will create a set of rules if you provide it with a training dataset that includes targets and features. Predictions can be made using these rules.

After categorising our dataset into three categories, Random Forest now assists in creating classes from the dataset. If you feed a training dataset containing features and labels into a decision tree, it will come up with a set of rules that it will use to make predictions. Random forest is a collection of decision tree clusters.

IMPLEMENTATION AND DESIGN

*USER FLOW*Users will submit their physical information to the system upon request, and the system (ML model) will prescribe a diet that includes breakfast, lunch, and dinner based on the user information in accordance after analysing the data.

SYSTEM ARCHITECTURE

1. Users will enter the relevant data on the website, such as their age, gender, weight, etc.
2. The data will then proceed through the ML model as follows:
   - 2.1 The meal is grouped according to calories using K-Means clustering.
   - 2.2 Based on input, the food items are classified and predicted using the Random Forest Classifier.
3. The system will display the user's BMI and current state (overweight, underweight, or healthy) after processing all the data.
4. Based on input, the system will then suggest a diet to the users in three categories (breakfast, lunch, and dinner).
5. The Users can create their own diet plan and select from a variety of suggested foods.
6. Following the user's selection of food items, the system will compute the calories of those foods and display a comparison between the user's selection of calories and the recommended daily intake.
7. The User will next create its diet plan in accordance with this.

V. RESULTS

As soon as the project is launched, a dialogue box asks the user for information such as their age, preference of being vegetarian or not, weight in kilogrammes, height in centimetres, and aim, which can be either weight loss, weight gain, or simply being healthy.Our system analyses their BMI (Body Mass Index) and suggests a list of food items depending on the necessary amount of calories once the details are supplied and the option Weight Gain is selected.Alternatively, the option for weight loss is also available. It's the same with the Healthy option, which offers a list of foods to eat to keep healthy.

VI. CONCLUSION

Emerging technologies like artificial intelligence and machine learning are crucial to the growth of the IT (Information Technology) industries. We have utilised these technologies to develop a software for those seeking advice regarding their diets and to live a healthy life. To live a healthy and fit life, nutritional guidance is becoming more and more important. A healthy diet plan is developed by the system by accepting the user's preference and profile.

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