

Website on Diet Recommendation Using Machine Learning

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Abstract - In today's modern world people all around the globe are becoming more interested in their health and lifestyle. But just avoiding junk food and doing an exercise is not enough, we require a balanced diet. A balanced diet based on our height, weight and age can lead a healthy life. Combined with physical activity, your diet can help you to reach and maintain a healthy weight, reduce your risk of chronic diseases (like heart disease and cancer), and promote your overall health. A balanced diet is one that gives your body the nutrients it needs to function correctly. Calories in the food is the measure of amount of energy store in that food. Our body use calories for basically everything like breathing, walking, running etc. On average a person needs 2000 calories per day but specifically intake of calories depends upon persons physical aspects like weight, height, age and gender. So, your food choices each day affect your health — how you feel today, tomorrow, and in the future. Thus, a proposed system gives recommend you a diet plan based on your physical aspects and your end goal.

Key Words: Machine Learning, KNN, Random Forest Algorithm, Recommendation System, Diet Plan, BMI, Calories

1. INTRODUCTION

Nowadays, a human being is suffering from various health problems such as fitness problem, inappropriate diet, mental problems etc. Various studies depict that inappropriate and inadequate intake of diet is the major reasons of various health issues and diseases. A study by WHO reports that inadequate and imbalanced intake of food causes around 9% of heart attack deaths, about 11% of ischemic heart disease deaths, and 14% of gastrointestinal cancer deaths worldwide. Moreover, around 0.25 billion children are suffering from Vitamin-A deficiency, 0.2 billion people are suffering from iron deficiency (anaemia), and 0.7 billion people are suffering from iodine deficiency. The main objective of this work to recommend a diet to different individual. The recommender system deals with a large volume of information present by filtering the most important information based on the data provided by a user and other factors that take care of the user's preference and interest. It finds out the match between user and item and imputes the similarities between users and items for recommendation based on their physical aspects (age, gender, height, weight, body fat percentage), preference (weight loss or weight gain). The recommendation process

has basically three stages that are Information Collection Phase, Learning Phase and Recommendation Phase. The information is firstly collected about a particular problem and the various solutions related to that problem are categorized. After the collection of information Learning Phase comes in which various conclusions are made out of that information which is gathered and in last phase i.e. Recommendation Phase an output is given in which various recommendations are made. In our project the output of recommendation is based on user's physical aspects, preference and their Body mass Index (BMI).

1.1 Problem Statement

The fast-food consumption rate is alarmingly high and this consequently has led to the intake of unhealthy food. This leads to various health issues such as obesity, diabetes, an increase in blood pressure etc. Hence it has become very essential for people to have a good balanced nutritional healthy diet. But in this fast pace generation not everyone has the time and money to spend on personal dietitian and nutrition who will look upon and take care of their health by advising them a healthy diet plan according to the individual personal information. In this report we have discussed person unhealthy eating habit and tried to provide a satisfactory solution to them for healthy life.

2. OBJECTIVES

1. The objective of this study is to consider various important aspects of the user's lifestyle and make sure that these factors are incorporated while the system works on a solution to build and recommend a healthy and nutritious diet for the user.
2. A good nutritious healthy diet and a moderate amount of physical activity can help in maintaining a healthy weight. But the benefits of good nutrition have a lot more to do than just managing the weight.
3. Being fit is all about the 70/30 rule. Here's how it goes, for a person to stay healthy he/she must focus 70% on his dietary intake and 30% on his physical activity/exercise.

3. EXISTING SYSTEM

Several works have been proposed for different recommendation systems related to diet and food. These systems are used for food recommendations, menu

recommendations, diet plan recommendations, health recommendations for specific diseases, and recipe recommendations. Majority of these recommendation systems extract users' preferences from different sources like users' ratings.

A Food Recommendation System (FRS) [1] is proposed for diabetic patients that used K-mean clustering and Self-Organizing Map for clustering analysis of food. The proposed system recommends the substituted foods according to nutrition and food parameters. However, FRS does not adequately address the disease level issue because the level of diabetes may vary hourly in different situations of the patient and the food recommendations may also vary accordingly.

Tags and latent factor are used for android based food recommender system [2]. The system recommends personalized recipe to the user based on tags and ratings provided in user preferences. The proposed system used latent feature vectors and matrix factorization in their algorithm. Prediction accuracy is achieved by use of tags which closely match the recommendations with users' preferences. However, the authors do not consider the nutrition in order to balance the diet of the user according to his needs.

Content based food recommender system [3] is proposed which recommend food recipes according to the preferences already given by the user. The preferred recipes of the user are fragmented into ingredients which are assigned ratings according to the stored users' preferences. The recipes with the matching ingredient are recommended. The authors do not consider the nutrition factors and the balance in the diet. Moreover, chances of identical recommendation are also present because the preference of the user may not change on daily basis.

The above-mentioned diet recommendation systems are specifically dealing with some diseases or related to balance the diet plans. In case of food recommendation for specific diseases, the systems recommend different foods for patients without knowing the level of disease which may vary in different cases and cause severe effects on patients. Similarly, in case of food recommendations to balance the diet, nutrition factors are ignored which are very much important to recommend food and balance diet.

4. PROPOSED SYSTEM

The System works in a Machine Learning Environment, where it calculates the user data and accordingly give the recommended Diet plan to work on.

We have divided the dataset in 3 categories:

- 1.Lunch_data
- 2.Breakfast_data
- 3.Dinner_data

Accordingly, we train the ML model with different inputs to get the desired results for the user. We used mainly 2 Algorithms here which are:

- 1.KMeans
- 2.Random Forest

According to the choice which user takes in healthy diet, weight gain or weight loss the model as per the data and category selected will generate a diet plan for the user.

4.1 K-Means Algorithm

Kmeans algorithm is an iterative algorithm that tries to partition the dataset into pre-defined distinct non-overlapping subgroups (clusters) where each data point belongs to only one group. It tries to make the intra-cluster data points as similar as possible while also keeping the clusters as different (far) as possible. It assigns data points to a cluster such that the sum of the squared distance between the data points and the cluster's centroid (arithmetic mean of all the data points that belong to that cluster) is at the minimum. The less variation we have within clusters, the more homogeneous (similar) the data points are within the same cluster.

The way kmeans algorithm works is as follows:

- 1.Specify number of clusters K.
- 2.Initialize centroids by first shuffling the dataset and then randomly selecting K data points for the centroids without replacement.
- 3.Keep iterating until there is no change to the centroids. i.e assignment of data points to clusters isn't changing.
- 4.Compute the sum of the squared distance between data points and all centroids.
- 5.Assign each data point to the closest cluster (centroid).
- 6.Compute the centroids for the clusters by taking the average of the all data points that belong to each cluster.

In our project the data set is divided into three categories lunch, breakfast, dinner with the help of k means clustering algorithm the below diagram shows how all three categories are separated from the cluster a dataset This helps us to finally divide the dataset into train and test dataset for all three categories and further the model is built in using the random forest algorithm.

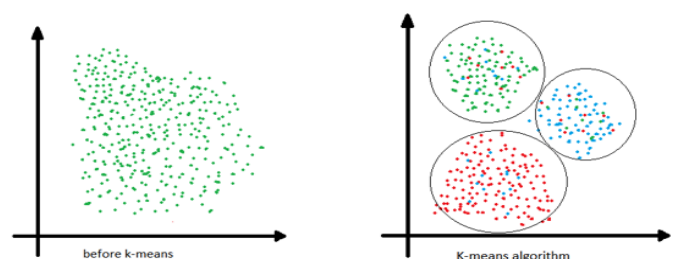


Fig-1: K-Means Algorithm

4.2 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. But one thing to note is that creating the forest is not the same as constructing the decision tree with information gain or gain index approach. The decision tree is a decision support tool. It uses a tree-like graph to show the possible consequences. If you input a training dataset with targets and features into the decision tree, it will formulate some set of rules. These rules can be used to perform predictions.

When we have our dataset categorized into 3 category so now Random forest helps to make classes from the dataset. Random forest is clusters of decision trees all together, if you input a training dataset with features and labels into a decision tree, it will formulate some set of rules, which will be used to make the predictions.

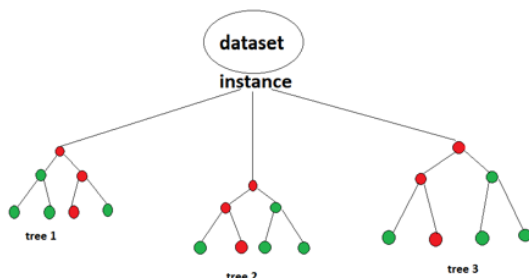


Fig-2: Random Forest Algorithm

5. IMPLEMENTATION AND DESIGN

5.1 User flow

User's will request to system by providing their physical information and after analyzing the data as a response the system (ML model) will recommend a diet which include (breakfast, lunch, dinner) based on the user information accordingly.

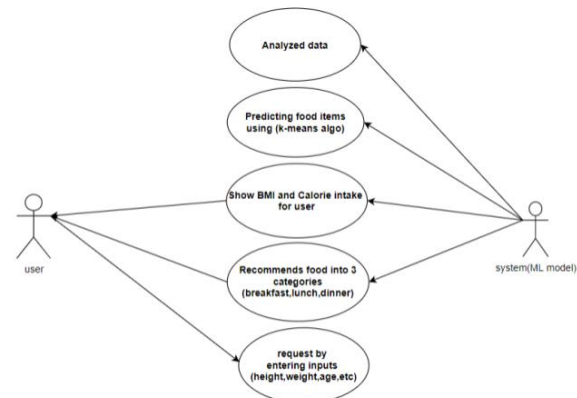


Fig-3: UR diagram

5.2 System Architecture

1. User's will enter the necessary information like their age, gender, weight etc. on the website.
2. The information will then go through the ML model in following manner:
 - 2.1 K-Means is used for clustering to cluster the food according to calories
 - 2.2 Random Forest Classifier is used to classify the food items and predict the food items based on input
3. After analyzing all the data the system will respond by showing user's BMI and their current state (Overweight, Underweight, Healthy)
4. The System will then recommend diet to the users into three categories (breakfast, lunch, dinner) based on input
5. The Users can choose from multiple recommended items and make their diet plan.
6. After selecting food items the system will calculate selected food calories and show user's comparison between how much calories they chosen against how much they need to consume daily.
7. Accordingly then the User's will make its diet plan.

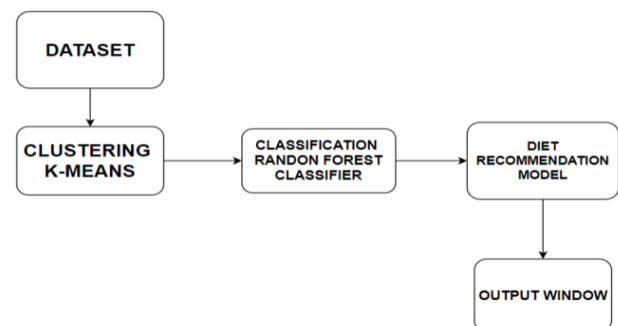


Fig-4: System Workflow

6. RESULT

We have created a website which recommend the food items in which we have implemented BMR by taking input

age, gender, and how much activities user's doing regularly. For training of the system, the initial process involves the segregation of food items depending upon the meal for which they are consumed i.e. Breakfast, Lunch and Dinner. The clustering of various nutrients depending upon which are essential for the weight loss, weight gain and healthy is performed. After the clustering is performed, using Random Forest classifier, the nearest food items are predicted which best suited for the appropriate diet. Our diet recommendation system allows users to basically get the desired healthy diet on the bases of BMI to get balanced diet plans.

is increasing day by day to lead a healthy and fit life and by accepting the user's preferences and a user's profile in the system a healthy diet plan is generated.

REFERENCES

- [1] Phanich, M., Pholkul, P., & Phimoltares, S., "Food recommendation system using clustering analysis for diabetic patients," in Proc. of International Conference on Information Science and Applications, pp. 1-8, IEEE, April 2010. Article .
- [2] Ge, M., Elahi, M., Fernaández-Tobías, I., Ricci, F., & Massimo, D., "Using tags and latent factors in a food recommender system," in Proc. of the 5th International Conference on Digital Health, pp. 105-112, ACM., May 2015.
- [3] Freyne, J., & Berkovsky, S., "Evaluating recommender systems for supportive technologies," User Modeling and Adaptation for Daily Routines, pp. 195-217, Springer London, 2013.
- [4] Prof. Prajkta Khaire, Rishikesh Suvarna, Ashraf Chaudhary, "Virtual Dietitian: An Android based Application to Provide Diet", International Research Journal of Engineering and Technology (IRJET), Volume: 07 Issue: 01 | Jan 2020
- [5] Shivani Singh, Sonal Bait, Jayashree Rathod, Prof. Nileema Pathak, "Diabetes Prediction Using Random Forest Classifier And Intelligent Dietician ", International Research Journal of Engineering and Technology (IRJET), Volume: 07 Issue: 01 | Jan 2020

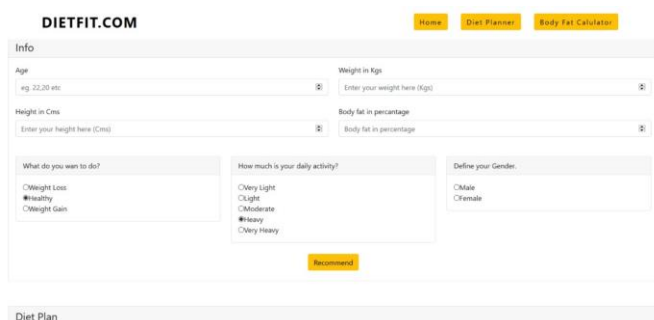


Fig-5: Input Detail page

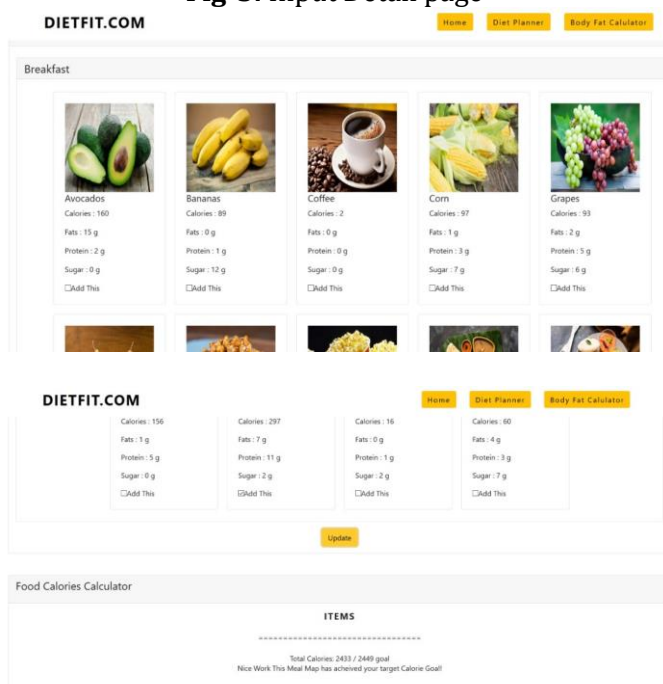


Fig 5,6: Output page (Recommended food Items)

7. 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 create a website for people who are consult about their diet and want to lead a healthy life. The importance of nutritional guidance