

MEAL PLAN PREDICTION USING DECISION TREE CLASSIFIER: A REVIEW

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ABSTRACT

For two years due to this pandemic and lockdown situation. People are stuck at home with extremely sedentary lifestyles. Which increases the danger of serious health concerns like cardiovascular diseases, obesity, and diabetes are avoided by maintaining proper dietary controls. Our research will help you by suggesting a proper diet plan and exercises based on your height, weight, and days of workout. Here, our research will help us to stay fit and the decisions or the tests are performed based on data available on the taken dataset. A balanced diet means eating a variety of foods but supplying the necessary nutrients to maintain good health for our body. The best health experience is achieved by eating proper meals and avoiding increasing weight in adulthood. This research helps in predicting a meal plan for any individual.

Keywords: Python, Django Framework, Machine Learning, Decision Tree Classifier, Meal Plan, BMI, Recommendation System.

I. INTRODUCTION

The meaning of a "Meal Plan" is only eating supper ahead of time, utilizing food varieties close by and on our timetable. Nowadays, many individuals like to eat dinner ahead of time to reduce their gastric issues and to keep up with an appropriate eating routine and welfare. Compared to the last few decades, in recent years, Machine Learning is the most widely used method of classification and identification. Machine Learning is used in fields including biomedical, geographical, and industrial fields and is still marking its foot in many other new areas. It is widely used in recommendation system programs.

Nowadays, human beings are suffering from various health problems such as health problems, inappropriate diet, mental problems, etc. Many types of research show the inappropriate and inadequate intake of diet is a major reason for the various health issues. By taking a healthy diet, we can reduce the risk of these health issues. Our recommendation system helps the user take the proper diet.

This recommendation system is made by using the decision tree classifier algorithm that offers the relevant suggestions to the users by filtering from the relevant datasets and provides the meal plan based on the user's age, exercise lifestyle, and blood sugar. Decision trees are immensely powerful models that help us classify data and create predictions. Not solely that, however, it also provides us with a good deal of knowledge regarding the data.

II. OBJECTIVE

The main objective is to make an individual healthy by getting good nutrition and eating satisfying meals. This study is about a few parts of a singular's way of life and ensuring that the elements included while the framework will work.

The Django framework is used to create the Live Fit website. This website provides users with a meal prediction system, workout planner, and BMI calculator by using the user's height, weight, age, gender, blood sugar, and exercise habits to compute the BMI and deliver appropriate meals and workout plans. This website also includes a blog system, which allows users to share their experiences with other users. Django's SQLite3 relational database management system will securely store all this data.

Datasets

Our datasets contain gender, age, exercise, diabetes, diet, and workout as columns. Based on the input and conditions given by the user, it will predict and give the output to the user. Learning and prediction are two steps in the classification process. Primarily, we train our model using the age, gender, exercise, and diabetic status of the users. It will predict a user's diet and workout plan based on the data collected.

Categories for Exercises

Exercise Category	Days/Week
Sedentary	No Exercise
Lightly Active	1-3 days/week
Moderate	3-5 days/week
Very Active	6-7 days/week
Super Active	Twice/day

Body Mass Index (BMI)

BMI is an estimation that can decide whether an individual is underweight, has a typical weight, is overweight, or is fat. An individual's wellbeing dangers might increment significantly if their BMI is outside the sound reach.

$$BMI = \text{Weight} / (\text{Height})^2$$

Most general, BMI is a legitimate proportion of body heftiness. Used to check for weight classes could cause medical problems.

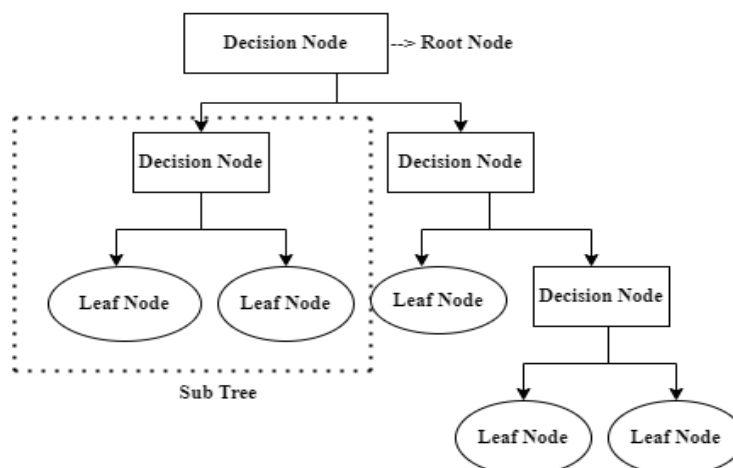
Categories for BMI

BMI	Weight Status
Below 18.5	Underweight
18.5-24.9	Normal weight
25.0-29.9	Overweight
30.0-34.9	Obesity class 1
35.0-39.9	Obesity class 2
Above 40	Obesity class 3

III. DECISION TREE CLASSIFICATION

The decision tree is one of the easiest and most popular classification algorithms. Decision trees as a rule mimic human reasoning capacity while choosing. Along these lines, it is straightforward because it shows a tree-like design.

Splitting occurs in the decision tree based on the conditions we have given.



Root Node

Root Node is from where the choice tree begins and addresses the whole dataset, which further gets partitioned into two homogeneous sets.

Leaf Nodes

Leaf nodes are the last result node, and the tree can't be secluded further in the wake of getting a leaf node.

Decision Node

A decision node is only when a sub-node parts into additional sub-nodes.

Sub Tree

Sub Tree is a tree formed by splitting the tree.

Splitting

Parting is the method involved with partitioning the choice node/root hub into sub-nodes as indicated by the given circumstances.

In the decision tree, for predicting we start from the base of the tree. We contrast the upsides of root trait and records characteristic on premise of correlation. We follow the branch relating to that worth and leap to the following node.

Advantages

Decision Tree is easy to comprehend and picture, requires little information arrangement and can oversee both mathematical and straight-out information.

Disadvantages

Decision trees can become unsteady since they can make complex trees that are not summed up well, and little inconsistencies in information can deliver totally various trees.

IV. COMPARISON BETWEEN DIFFERENT CLASSIFICATION MODELS

1. Naïve Bayes

The Naive Bayes calculation depends on Bayes' hypothesis with the suspicion of freedom among each set of elements. Naive Bayes classifiers works of art pleasantly in loads of genuine worldwide circumstances including record type and spontaneous mail separating.

Advantages

This calculation requires few preparations information to gauge the indispensable boundaries. Innocent Bayes classifiers are uncommonly quick when contrasted with extra modern strategies.

Disadvantages

Naive Bayes is known to be a horrible assessor.

2. Stochastic Gradient Descent

Stochastic gradient descent is a simple and exceptionally productive strategy to fit direct models. It is explicitly gainful when the quantity of tests could be extraordinarily huge. It helps novel misfortune highlights and ramifications for grouping.

Advantages

Productivity and simplicity of execution.

Disadvantages

Requires numerous hyper-boundaries and it is touchy to trademark scaling.

3. K-Nearest Neighbors

Neighbors-based classification is lazy learning because it does not attempt to construct a general inner model, however, stores instances of the training data. Classification is computed from an easy majority vote of the K-Nearest Neighbors of every point.

Advantages

This algorithm is easy to implement, robust to noisy training data, and powerful if training data is large.

Disadvantages

Need to decide the value of K and the computation value is high because it needs to compute the space of every instance to all the training samples.

4. Random Forest

A random forest classifier is a meta-estimator that fits many decision trees on various sub-samples of datasets and makes use of average to improve the predictive accuracy of the model and controls over-fitting. The sub-sample size is usually the same as the original input sample size however the samples are drawn with replacement.

Advantages

Reduction in over-fitting and random forest classifier is extra accurate than decision trees in maximum cases.

Disadvantages

Slow real-time prediction, tough to implement, and complicated algorithm.

Comparison Matrix

Accuracy = (True Positive + True Negative) / Total Population.

F1-Score = (2 x Precision x Recall) / (Precision + Recall).

Classification Algorithms	Accuracy	F1-Score
Decision Tree	84.23%	0.6308
Naïve Bayes	80.11%	0.6005
Stochastic Gradient Descent	82.20%	0.5780
K-Nearest Neighbors	83.56%	0.5924
Random Forest	84.33%	0.6275

V. RESULT

We created a website called Live Fit which takes the user's age, height, weight, exercise style, diabetes, and gender to predict the Meal Plan which includes Breakfast, Lunch, Dinner, and Workout Plan, and calculates the BMI.

VI. CONCLUSION

This paper concludes with the use of various classification techniques in the field of meal plan recommendation systems. As per comparisons, the decision tree classifier has good Accuracy and F1-Score when compared with other classification models.

The significance of wholesome direction is expanding consistently to lead a sound and fit life, and a solid eating regimen plan is created by tolerating the client's profile.

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