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HEALTH DIET PLANNER USING PYTHON

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Abstract— This project implements a machine learning-based diet recommendation system using a Decision Tree Classifier. The model is trained on a dataset containing various health parameters, including age, gender, BMI, disease type, severity, physical activity level, and dietary restrictions, to predict an appropriate dietary plan. The system encodes categorical variables, splits the dataset for training and testing, and achieves predictions with high accuracy. The trained model is saved for future use, enabling real-time diet recommendations based on user input. The model suggests personalized meal plans for categories like Low-Carb, Low-Sodium, and Balanced diets, assisting individuals in maintaining optimal health through tailored nutritional guidance.

Keywords: Age, BMI, Decision Tree, Health, Support Vector Machines (SVM),

1. INTRODUCTION

In today’s fast-paced world, maintaining a healthy diet is essential for overall well-being. However, traditional diet planning methods often lack personalization and fail to account for an individual’s unique health conditions, dietary restrictions, and lifestyle habits. Many people struggle to choose the right foods that align with their specific health needs, leading to poor dietary adherence and increased risk of chronic diseases. The need for a more effective, data-driven, and personalized approach to diet recommendations has become increasingly important.

Machine learning has emerged as a powerful tool in healthcare, enabling data-driven decisionmaking for better patient outcomes. By analysing vast amounts of health-related data, machine learning algorithms can identify patterns and make accurate predictions. In the context of diet recommendations, a machine learning-based approach can consider multiple factors, such as BMI, disease type, severity, physical activity level, and dietary preferences, to generate highly personalized meal plans. This improves the effectiveness of dietary interventions and helps individuals achieve their health goals. The proposed system employs a Decision Tree Classifier to recommend diets based on an individual's health attributes. The model is trained on a comprehensive dataset that includes various parameters such as age, gender, weight, blood pressure, glucose levels, and dietary restrictions. Once trained, the model can predict suitable diet plans such as Low-Carb, Low-Sodium, or
Balanced Diets, ensuring that individuals receive recommendations aligned with their health conditions. This automated system eliminates the need for manual diet planning and provides quick, reliable suggestions.

One of the major advantages of this system is its ability to process real-time user input and generate instant dietary recommendations. The system also provides detailed meal plans tailored to the predicted diet category, ensuring that users have practical and actionable dietary guidance. Furthermore, by continuously learning from new data, the model can be improved over time, leading to even more accurate and effective
recommendations. Overall, this machine learningbased diet recommendation system offers a fast, efficient, and personalized approach to healthy eating. It addresses the limitations of traditional diet planning methods by integrating modern data science techniques, ultimately helping individuals manage their health conditions better and improve their overall quality of life. With its ability to provide customized meal plans based on scientific analysis, this system serves as a valuable tool in promoting long- term health and wellness.

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2. LITERATURE REVIEW

2.1 Personalized Diet Recommendation Using Machine Learning:

R. Kumar et al. developed a system that uses Decision Trees and Support Vector Machines to analyse health metrics like age, weight, and dietary preferences. Their research emphasizes that AI can efficiently tailor nutrition plans by analyzing eating habits and medical history. The study confirms that machine learning-based systems outperform traditional static methods in achieving better health outcomes.

2.2 AI-Based Nutritional Planning:

Gupta, Sharma, and Verma applied classification algorithms such as Logistic Regression and Random Forest to generate dynamic nutritional suggestions. Their model integrated real-time health monitoring inputs (e.g., activity levels, glucose readings), allowing for constantly updated recommendations. Their work highlighted the inefficiency of conventional counseling and showed improved dietary compliance through AI.

2.3 Decision Tree for Dietary Pattern Prediction:

Singh and Agarwal utilized a Decision Tree algorithm to categorize users based on demographic and health indicators. This model accurately grouped users into diet types like LowCarb and Low-Sodium, demonstrating the algorithm’s precision when handling variables such as BMI and glucose levels. Their results showed higher accuracy compared to traditional rule-based systems.

2.4 AI-Powered Meal Planning for Diabetic Patients:

Ahmed et al. proposed a supervised learning model that creates customized diets based on insulin sensitivity, glucose level, and food preferences. Their system improved diabetic control by emphasizing low-glycemic foods and dynamically adjusting based on blood sugar readings, supporting diabetes management through real-time AI interventions.

3.5 Nutritional Data Mining for Meal Recommendations:

Brown and Thompson utilized data mining techniques like clustering and association rule mining to extract meal patterns from large nutritional datasets. Their approach ensured diet plans addressed nutrient deficiencies and promoted long-term health improvements by aligning food choices with medical history and goals.

2.6 Deep Learning for Food Analysis:

Patel, Desai, and Mehta employed Convolutional Neural Networks (CNNs) to recognize food items from user-uploaded images. This automated dietary tracking enabled the system to suggest diets based on visual food logs. Their study demonstrated the effectiveness of deep learning in enhancing dietary assessment accuracy.

2.7 Smart Diet Planning Using AI and IoT:

Wilson and Carter integrated wearable IoT devices with AI algorithms to continuously monitor health parameters like heart rate and glucose. Based on this data, their system delivered real-time diet suggestions. This real-time feedback loop helped improve dietary adherence and offered a highly personalized planning method.

2.8 Cardiovascular Health-Focused Meal Planning:

Chen et al. used ensemble machine learning models to optimize dietary recommendations for cardiovascular patients. By analyzing sodium intake, lipid profiles, and lifestyle data, the model reduced risk factors such as hypertension and high cholesterol, demonstrating the preventative power of AI in healthcare.

2.9 Genetic Algorithms for Adaptive Diet Planning:

Roberts and Martin explored the use of genetic algorithms to generate and evolve meal plans. These plans adjusted dynamically based on nutritional goals, user preferences, and restrictions.

Their study concluded that evolutionary optimization offered superior flexibility and personalization compared to fixed plans

3. METHODOLOGY

1. Data Acquisition

A structured dataset was used, containing multiple health-related attributes such as age, gender, body weight, height, physical activity level, dietary habits, medical conditions, and nutritional restrictions. This dataset forms the foundation for training the model.

2. Data Preparation

To ensure the quality and usability of the data, preprocessing steps were applied. This involved handling missing values, removing irrelevant columns, and converting categorical attributes into numerical format using label encoding techniques.

3. Feature Enhancement

Additional parameters like BMI were calculated using height and weight. Other health indicators, such as glucose level, cholesterol, blood pressure, and nutrient imbalance score, were retained to improve model precision.

4. Model Training

The cleaned data was divided into training and testing subsets (80% and 20%, respectively). A Decision Tree Classifier was then trained on the training data to predict diet categories such as LowCarb, Low-Sodium, and Balanced diets.

5. Model Testing and Validation

The model's performance was evaluated using the testing dataset. Accuracy and other metrics were used to assess the reliability of predictions. The trained model showed effective classification of dietary plans based on individual health profiles.

Web Application Development: Use a web framework like Flask or Django to implement the model in a web application.

Expected Outcome: The project aims to deliver a web-based system that provides personalized diet recommendations using a Decision Tree Classifier. Users can input health details to receive instant, data-driven diet suggestions such as Low-Carb, Low-Sodium, or Balanced plans. The system is expected to improve dietary habits, support chronic disease management, and offer an efficient alternative to manual consultations with high prediction accuracy and real-time results.

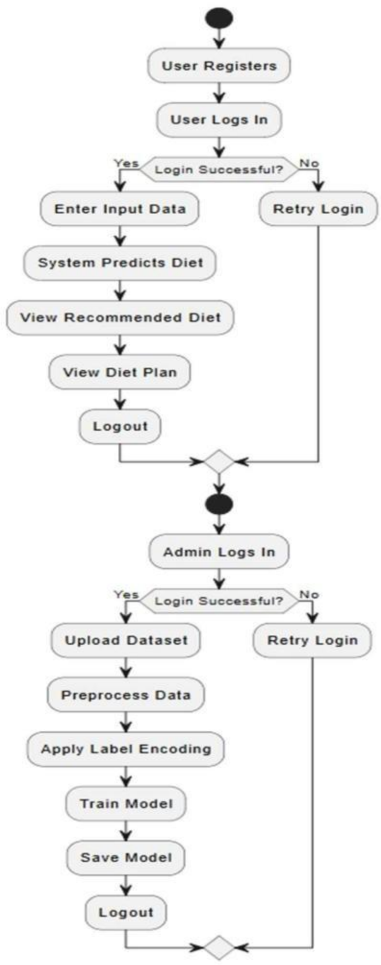

Fig: Flow Diagram

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Fig: System Architecture

4. ALGORITHMS USED

Decision Tree:

The primary algorithm used in this project is the Decision Tree Classifier, a supervised learning technique well-suited for classification tasks. This algorithm works by constructing a tree-like structure that splits the dataset based on different features, aiming to classify data points by making a series of decisions. Each internal node in the tree tests a particular attribute, and branches represent possible outcomes, leading to leaf nodes that assign the final classification.

The decision tree was selected for its simplicity, interpretability, and ability to handle both categorical and numerical data efficiently. To prepare the dataset for training, Label Encoding was applied to convert categorical variables, such as gender and disease type, into numeric values. This preprocessing step allows the algorithm to understand and process non-numeric data effectively. The dataset was then split into training and testing sets using an 80:20 ratio to assess model performance. This method ensures the model is trained on a substantial portion of the data while being tested on unseen instances to evaluate its accuracy and generalization capability.

5. WORKING

The proposed system follows a structured flow from user input to generating personalized dietary recommendations using machine learning. The working procedure involves both backend data processing and frontend user interaction.

Initially, the system starts with the collection of health data from users through a user-friendly web interface developed using the Django framework. Users are required to register and log in to the application. Once logged in, they can input their personal health details, such as age, gender, weight, height, physical activity level, existing medical conditions, dietary restrictions, and daily caloric intake.

After submission, the backend processes the input data. Certain derived metrics, like Body Mass Index (BMI), are calculated based on height and weight. Categorical inputs (such as gender or disease type) are encoded numerically using Label Encoding to make them compatible with the machine learning model.

The processed data is then passed into a *pretrained Decision Tree Classifier* model. This model was trained in advance using a comprehensive dataset that included health parameters and corresponding dietary recommendations. The model analyzes the input values and *predicts the most appropriate diet category*, such as Low-Carb, Low-Sodium, or Balanced.

Once the prediction is made, the system fetches a customized meal plan corresponding to the predicted category. This diet plan includes recommended food items and meals suitable for the user’s specific health condition and preferences.

The final recommendation, along with the tailored diet plan, is displayed to the user in real-time on the web interface. Additionally, the admin has backend access to upload datasets, preprocess data, train the model, and manage the system’s functionality through their own login module.

6. CONCLUSION

AI-driven diet recommendation systems have shown significant potential in transforming personalized nutrition planning. By leveraging machine learning techniques such as decision trees, these systems analyze health metrics, dietary preferences, and medical conditions to generate

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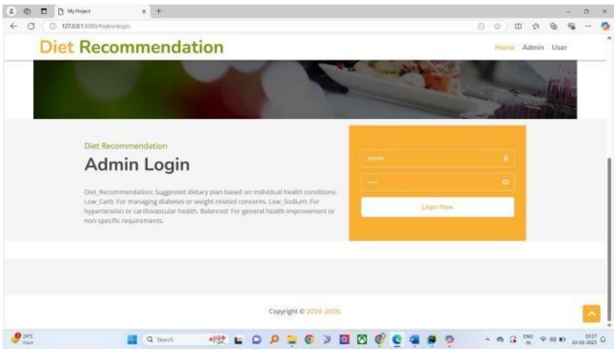
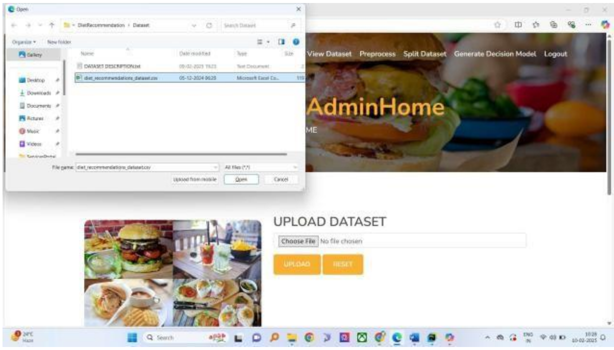
tailored diet plans. Compared to traditional methods, AIbased recommendations enhance accuracy, improve adherence, and support the management of chronic diseases like diabetes and hypertension. As advancements in AI and real-time data monitoring continue, these systems will become more precise and adaptive, ultimately promoting healthier eating habits and improving overall health outcomes.

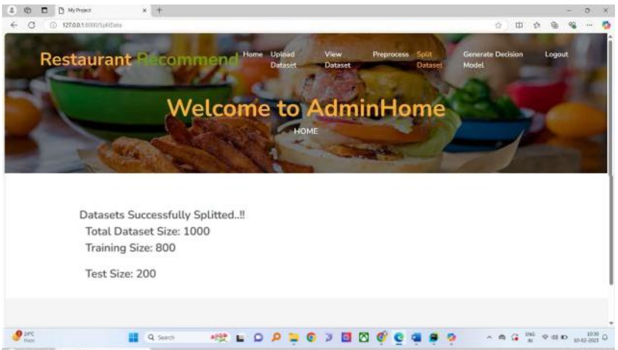
7. FUTURE ENHANCEMENT

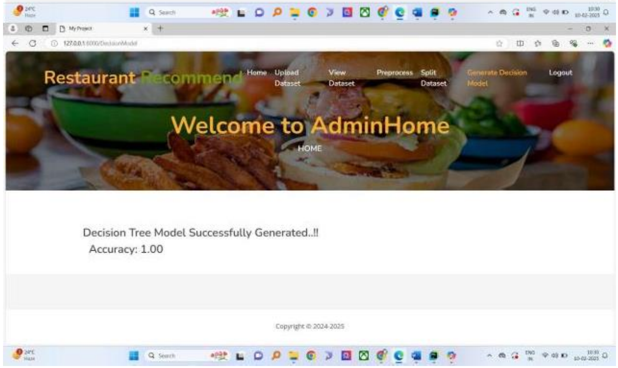
The proposed diet recommendation system has significant potential for future enhancements. It can be integrated with wearable devices like smartwatches to collect real-time health data such as heart rate, activity levels, and sleep patterns, enabling more accurate and dynamic diet suggestions. A mobile application version can increase accessibility and user engagement. Future updates may also include support for regional languages, local cuisines, and AI-powered recipe suggestions using available ingredients. The system can be expanded to consider mental health factors such as stress and mood, offering a holistic approach to diet planning. Additionally, integrating with electronic health records (EHR) can help healthcare providers monitor and support patient nutrition more effectively. Over time, adaptive learning features can enable the system to improve based on user feedback and health outcomes.

EXPERIMENTAL RESULT

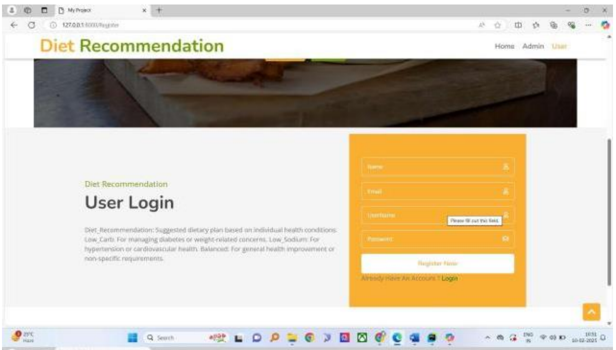


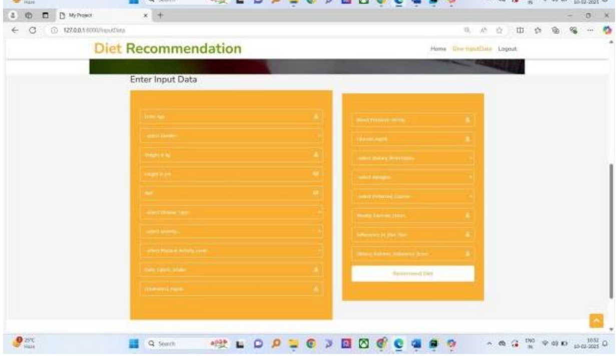


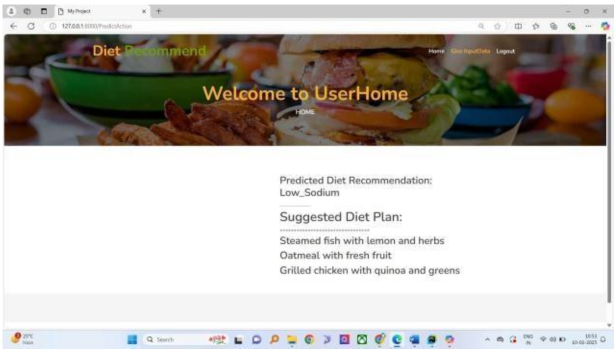




Admin Output1:







User output

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