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DIET PLANNER USING DEEP LEARNING

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Abstract— **This application uses a sophisticated algorithm to give the user a diet plan based on personal information like height, weight, age, gender and level of physical activities. In Today's busy life, everyone can just imagine having a well-balanced diet. A balanced diet is crucial because your organs and tissues require the right nutrients to function properly. Your body is more prone to illness, infection, weariness, and subpar performance if you don't consume healthy food. At the centre of a balanced diet are foods that are low in unnecessary fats and sugars and high in vitamins, minerals, and other nutrients. A balanced diet must include the following food types as a necessary component. Calories play an important role in our growth and energy. By following a balanced diet, you may modify your calorie consumption to suit your needs. Consuming nutrient-dense foods with the proper balance of macronutrients (carbohydrates, protein, and fat) and calories based on individual energy expenditure is a crucial component of a balanced diet to reduce morbidity and mortality and promote good nutritional status. Although the area of dietetics and nutrition has been inundated with food recommender systems**

over the years, there hasn't been much study on meal planner programmes based on compliance with macronutrient recommendations. We suggest developing a meal-planning programme that can provide tailored diet plans depending on users' requirements.

INTRODUCTION

In today's contemporary atmosphere, people from all over the world are becoming more concerned with their health and way of life. But simply staying away from junk food and working out is insufficient; we also need to consume a balanced diet. A healthy life is possible with a well-balanced diet. It provides your body with the nutrients it need for proper operation. A person requires, on average, 2000 calories per day from their food, but the precise amount varies on the person's physical characteristics, including weight, height, age, gender, and level of physical activity. Therefore, the food that you choose to eat each day has an impact on 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. If you consume wholesome meals and exercise frequently, you may achieve and maintain a healthy weight and feel better. Additionally, you could discover that getting more exercise and eating healthier can make it easier for you to manage your demanding schedule and be there for those who depend on you. You can choose from a range of daily menus with fewer calories to make it simpler for you to eat healthfully and lose weight. The sample menus offer suggestions for both ethnic and vegetarian dinners as well as classic American dishes. Keeping track of calories and food consumption can be beneficial for some people in order to support weight loss. According to research, those who track their caloric intake reduce their weight more quickly and are more likely to keep it off in the long run. These days, calorie counting is quite simple. There are numerous helpful websites and apps that assist you in keeping track of your intake and meal logs. Most of them are accessible online, and signing up

takes less than a minute. They are all available as apps for Android, iPhone, and iPad.

Literature Review

[1] Algorithms like K-means and Random Forest were used. Result obtained from this was a diet Plan based on lunch, breakfast and dinner segregation. [2] Teacher forced using reinforcement learning was implemented. Result of this experiment was a detailed report of composition of food in input. Research gap for this was more effective compositions using deep learning models. [3] Method used was Deciding model parameters/constraints. Compatibility between all constraints using the list of foods available. Results of this experiment was Selection of the optimal combination of foods (e.g. food list and food quantities), which answers your question and is in compliance with your requirements: Research Gap: Optimal composition based on frequent update of BMI and Calories. [4] Formulas used for calculating the BMI (Body mass Index) and to calculate the total calories to intake was found on internet on some research. BMI = Weight / Height 2, Calories = (Weight * 22) * Activity Multiplier, Calculating Diet & Providing Diet. Results of this The software system allows the user to create their profiles and upload all their details and their BMI is calculated by the system. Research Gap: Static Diet. [5] Method used were Particle swarm optimization and Generation of eating plans. Result was The proposed solution is based on the PSO algorithm and takes various input datasets for returning the optimal food selection for the particular training day.

Proposed System

The present project utilizes a combination of machine learning techniques, including clustering and deep learning models such as LSTM, to create a personalized and nutritionally balanced diet plan for the user. Data is collected on food items and their nutritional values from public food databases, such as the USDA, and preprocessed to remove duplicates, missing values, and normalize the data. The preprocessed data is then clustered using K-means clustering to group similar food items together, allowing the project to predict the nutritional values of the next food item based on the food items in the same cluster. An LSTM model is trained on the food items in each cluster to predict the nutritional values of the next food item. The LSTM model captures the sequence of food items and their nutritional values, making it possible to create a diet plan that is balanced and meets the user's daily calorie intake requirements. The trained model is used to create a personalized diet plan for the user that includes a variety of food items from different clusters to ensure nutritional balance.

The project's framework utilizes the Python programming language and popular machine learning libraries such as TensorFlow, Keras, and Scikit-learn. Additionally, data visualization libraries such as Matplotlib and Seaborn are employed to create interactive visualizations of the data. The algorithm used in the project involves collecting data on food items and their nutritional values from public food databases, preprocessing the collected data, clustering the preprocessed data using K-means clustering, training an LSTM model on the food items in each cluster to predict the nutritional values of the next food item, and creating a personalized and balanced diet plan for the user based on their daily calorie intake requirements and the nutritional values of the food items.

Overall, the project's analysis, framework, and algorithm enable it to create a personalized and nutritionally balanced diet plan for the user, making it a valuable tool for improving the user's health and well-being.

Project Design

This project aims to help users create a daily diet plan that meets their calorie intake requirements while ensuring that the food items they consume are nutritionally balanced. To achieve this goal, the project uses a combination of machine learning techniques like clustering and deep learning models such as LSTM to predict the nutritional values of food items and create a diet plan.

The project collects data on food items and their nutritional values from public food databases. The collected data is then preprocessed to remove duplicates, missing values, and normalize the data. Clustering is then performed on the preprocessed data using K-means clustering to group similar food items together.

The trained LSTM model is then used to create a diet plan for the user based on their daily calorie intake requirements and the nutritional values of the food items. One of the unique design features of this project is the use of clustering, which groups similar food items together, making it easier to predict the nutritional values of the next food item.

Another unique feature is the use of the LSTM model to capture the sequence of food items and their nutritional values, which allows the project to create a balanced diet plan that meets the user's daily calorie intake requirements. Deep learning techniques like LSTM are also used to handle complex and non-linear relationships between food items and their nutritional values.

The project has a user-friendly interface that allows the user to input their daily calorie intake requirements and receive a personalized and balanced diet plan that meets their nutritional needs.

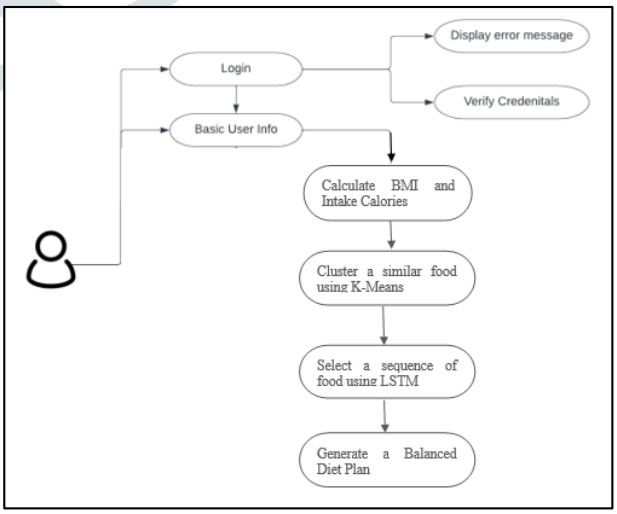

Fig.1. Use Case Diagram

Implementation

The first step in implementing this approach is to collect a dataset of foods and their nutritional information. This dataset can be obtained from various sources, such as the USDA Food Composition Databases or nutrition labels from food

packaging. It is important to ensure that the dataset is comprehensive and includes a wide variety of foods to provide adequate options for creating a balanced diet plan. Once the dataset is collected, it needs to be preprocessed to create a name_encoded column, which assigns embeddings to the food names to use as input for the LSTM model. This step is crucial for ensuring that the deep learning model can understand and learn from the dataset.

The next step is to apply K-means clustering to group similar foods based on their nutritional composition. Clustering algorithms, such as K-means, can help identify patterns in the dataset and group foods that have similar nutritional profiles. By clustering the foods, we can create a diverse set of options that meet our nutritional requirements while also providing variety in taste and texture. It is important to note that the number of clusters should be chosen carefully to ensure that there are enough options to create a balanced diet plan.

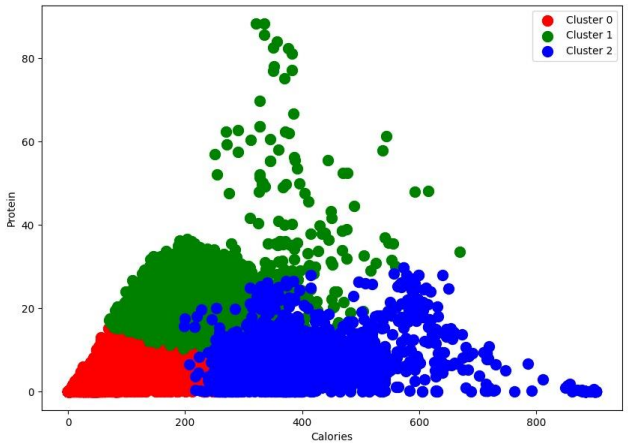

Fig.2. Dataset Clusters Diagram Using K-Means

Once we have the clusters, we can use a deep learning model, such as Long Short-Term Memory (LSTM), to generate a sequence of foods that meet our nutritional requirements. The LSTM model takes as input the last seven foods selected from the clusters and predicts the nutritional values of the next food to be added to the diet plan. These predicted values are then used to filter the available foods in the dataset, ensuring that the selected food matches the nutritional requirements. From the filtered list, a food is randomly selected and added to the diet plan sequence. This process continues until the total daily calorie intake is met.

It is worth noting that this approach can be further optimized by incorporating user feedback and preferences. For example, the LSTM model can be updated with user feedback on the selected foods to improve the accuracy of the predictions. Additionally, the clustering algorithm can be adjusted to incorporate user preferences for specific food groups or flavours. By incorporating user feedback, we can create a truly personalized diet plan that meets the individual's nutritional requirements and preferences.

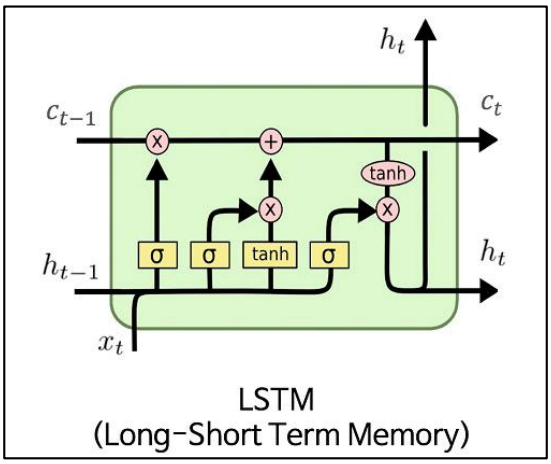

Fig.3. LSTM Architecture

In conclusion, machine learning algorithms, such as clustering and deep learning, can provide a useful tool for creating personalized and nutritionally balanced diet plans. By collecting a comprehensive dataset of foods and their nutritional information, pre-processing the data, clustering the foods, and using an LSTM model to generate a sequence of foods, we can create a diverse and balanced diet plan that meets our nutritional requirements. With further refinement and optimization, this approach can help individuals create personalized and nutritious diet plans that meet their specific needs and preferences.

RESULTS

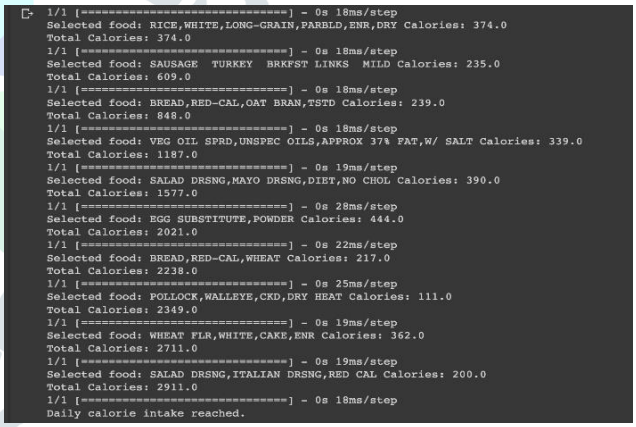

Fig.4. LSTM Model Output (List of food items)

In Fig.4, the list of foods generated by the LSTM model output is a significant achievement that can help individuals complete their daily calorie intake and maintain a balanced diet. With the help of the LSTM model output, individuals can have access to a comprehensive list of foods that cater to their nutritional requirements, and ensure that they are consuming an adequate amount of calories. The balance of essential vitamins, minerals, and nutrients in the list of foods generated by the model output can aid in the prevention of chronic diseases and promote overall health and well-being. Moreover, the practicality and convenience of the LSTM model output can help individuals adhere to the diet plan in the long run, leading to a sustainable and healthy lifestyle. Thus, the LSTM model output can be an effective tool to help individuals achieve their health and dietary goals.

Fig.5. Login Screen

Fig.6. User Details Screen

In Fig.5, the login screen for the diet recommendation app provides a secure and easy-to-use platform for users to access their personalized diet plans. To log in, the user must enter their registered mobile number and password. The app ensures security by encrypting user data and utilizing industry-standard security protocols. In addition, the app includes a password reset feature in case the user forgets their login credentials. The login screen is designed to be user-friendly and efficient, with clear instructions and an intuitive layout.

In Fig.6, the user detail screen in diet recommendation app page is designed to gather important information from the user, in order to generate a personalized and effective diet plan. The page includes a set of fields that the user must fill out, such as their age, height, weight, and gender. Additionally, the user is required to provide information about their physical activity level and whether they want to lose or gain weight. This information is used to create a customized diet plan that meets the user's individual needs and goals.

Fig.7. Goal Page

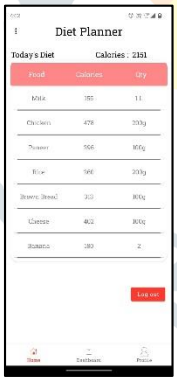

Fig.8. Recommendation Page

In Fig.7, the goal page in the diet recommendation app provides users with a clear and concise overview of their daily calorie and macronutrient goals. Users can easily view their recommended calorie intake to achieve their goal, as well as the recommended amounts of carbohydrates, proteins, and fats they should consume. This information is presented in a user-friendly format, allowing users to easily track their progress and make adjustments to their diet as needed.

In Fig.8, the recommendation page in the diet recommendation app displays a detailed list of recommended foods for the user, along with their exact quantities and corresponding calorific details. This information is generated based on the user's individual data and preferences, ensuring that the recommended diet is tailored to their unique needs and goals. The recommendation page is designed to be easy to navigate and understand, with clear and concise information presented in an intuitive format.

CONCLUSION

In conclusion, we have successfully developed a solution that employs deep learning techniques to generate a dynamic and diverse diet plan, customized to meet the nutritional requirements of the user. Our approach utilizes the powerful K-means clustering and LSTM models to accurately predict the optimal composition of foods for a healthy and balanced diet. Our solution offers a quick and easy way to create a personalized diet plan, while also providing the flexibility to adjust it as per the user's changing requirements. The user-friendly interface of our app allows users to input their dietary restrictions and preferences, generating a diet plan accordingly. Furthermore, our app includes a feature to track the user's health progress over time, enabling them to make informed adjustments to their diet plan to meet their changing needs. Our approach simplifies the process of creating a nutritionally balanced diet plan, while also helping users to achieve their health goals.

FUTURE SCOPE

The system for now provides recommendations to the user based upon their likeliness and also the system provides custom recommendation. Further this project can be extended to the user having any genetic issues such a heart problem, diabetes, hypertension etc. and add more categories of products as per various continents (countries) so as to provide solutions about recommendation to variety of users liking products with unique nutrition gainers. This project can also be amalgamated with social media to collect the reviews related to the product.

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