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AI Based Personalized Health and Wellness Management System

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A B S T R A C T :

graceAI is a personal health and wellness management application that helps users easily manage their healthier meals and track their nutrition. Many struggle to follow a diet that aligns with their physiology, culture, and ingredients they have access to. Many diet applications also do not focus on tracking but just on target numbers, offer western meals, and can encourage overly restrictive diets. graceAI is a centralised, free online application that will allow users to personalise their calorie and macronutrient targets, plan weekly meals, organise their grocery list by section, log daily meals, view the health care and home remedies section, view recipes worldwide and utilise the AI based assistant Chef Grace. The daily energy target is calculated using the Mifflin-St Jeor equation and ensures a minimum of 1200kcal is prescribed. Menus are available by region in India, following Jain and Sattvic diets and globally. The application can be accessed via a responsive website with a front end using React, hosted on Vercel. Data is protected to ensure privacy following the DPDP Act 2023 in India. User data can be exported or deleted. The application can be split into different modules to allow users to login and add their profile, calculate their target, plan meals, organise their grocery list, log their daily meals, view health tips, recipes, Chef Grace and data protection. Calculating the target ensures that the weekly menu, grocery list and tracker can be created. graceAI aims to make eating healthier easier by providing an application that can calculate your target, plan your meals with consideration for your culture and utilise an AI assistant to provide recipe tips. This can be improved further by adding more regional languages, condition specific meal plans reviewed by a dietitian and verified nutrition sources. The application will be used as a learning tool to help with your wellness. More testing will be carried out to ensure the application is functioning as intended and will provide accurate nutrition, reliable assistance and benefits to users.

Keywords: Meal Plan, Nutrition, Mifflin-St Jeor Equation, Calorie Calculator, Conversational AI, Indian Cuisine, Wellness Management, Web Application.

Introduction

Eating healthily plays a large role in long term wellbeing. Individuals and families will often have to decide what to cook, how much to eat, what to buy and how to stay on track with their health goals. Creating a meal plan to ensure that you are eating the right amount of energy, following your culture and using the ingredients you have can be time consuming. In India there are many differences in food based on region, religion and family traditions. This makes it hard to follow generic diet advice. Therefore users may spend a lot of time looking for recipes, calculating and creating shopping lists using multiple tools.

graceAI aims to provide a personal health and wellness management application that can calculate targets, plan meals, organise grocery lists, track daily meals, provide health tips and utilise an AI to provide recipe ideas. This is done using a user friendly website for users to add their profile, calculate their daily calorie and macronutrient targets, view their weekly meal plan, create a grocery list and log their meals. The application is web based, using a front end using React. The meal plan can be created based on regional cuisines in India such as Tamil Nadu, Kerala, Rajasthan, Punjab, Bengal and Gujarat. They can also be created based on Jain, Sattvic, vegan, keto and diabetic friendly preferences.

graceAI ensures that users form a healthy and positive relationship with their food. The calorie calculator uses the Mifflin-St Jeor equation and ensures that there is a minimum of 1200kcal per day. Users can log if they have eaten their meal, eaten something different or skipped their meal without penalty. The assistant Chef Grace can create recipes step by step based on the ingredients the user already has. Additional features include the health care and home remedy section, heritage recipes and exporting and deleting data. graceAI aims to save time by providing a centralised application that can plan, track and provide tips.

Objectives

The main aim of graceAI is to create a safe, personal and culturally aware meal planner and wellness management application. Specific objectives include:

1. Calculate personal daily calorie and macronutrient targets using the Mifflin-St Jeor equation.
2. Ensure a minimum of 1200kcal is prescribed.
3. Create a weekly meal plan based on regional cuisines in India, Jain, Sattvic and globally.
4. Provide a grocery list organised by section.

5. Allow users to log their daily meals honestly.
6. Provide health care and home remedies for common conditions. Medical disclaimers are included.
7. Provide an AI based assistant Chef Grace, who can create step by step recipes based on ingredients the user has.
8. Ensure user data is protected following the principles of the DPDP Act 2023. Data can be exported and deleted.
9. Create a user friendly application that is cost effective with no subscriptions or advertisements.

Literature survey

Research has shown the importance of personalising nutrition, ensuring energy is accurately calculated and ensuring technology is used responsibly. Equations can be used to predict your basal metabolic rate based on your sex, age, height and weight. The Mifflin-St Jeor equation has been reported to give good results for healthy adults [1] and [2]. Once calculated the value can be multiplied by an activity factor to provide the total daily energy expenditure. From here a target can be set to meet the desired goal. National guidance such as the ICMR-NIN Dietary Guidelines for Indians is available to guide users to eat a balanced meal [4]. Modern web frameworks such as React can provide modular and user friendly interfaces[5]. Web applications can be hosted using cloud hosting platforms such as Vercel [6]. Conversational AI can be used to understand free text questions and provide recipes and nutrition suggestions using natural language. However, there can be errors with AI generated content so should be provided as guidance. Legislation such as the Digital Personal Data Protection Act 2023 ensures that personal data should be carefully collected [3]. Security guidance can be found from OWASP to ensure applications are safe [7]. This has provided the basis for graceAI to be created as a centralised wellness application. graceAI aims to save time by ensuring calculations are safe, considering culture and utilising an AI assistant.

Methodology

graceAI uses a modular approach to create a web based application. The front end has been created using a responsive website with React. This has been hosted using Vercel at grace-ai-siet.vercel.app. The application has logic to manage the nutrition calculator, meal planner, grocery list and assistant.

When opening the application users can select to create a meal plan. They will be asked to enter their profile details including their biological sex, age, height, weight, activity level and wellness goal. The nutrition module will calculate the basal metabolic rate using the Mifflin-St Jeor equation. For females this is: BMR = 10W + 6.25H - 5A - 161 and for males: BMR = 10W + 6.25H - 5A +5. W is weight in kg, H is height in cm and A is age in years. This value will be multiplied by an activity factor to calculate the total daily energy expenditure. The target will then be calculated based on the goal of eating with a gentle deficit, maintaining or gaining lean mass. There is a minimum of 1200kcal prescribed and protein, carbohydrates and fats targets will be calculated from the daily target. Using the calculator in the application a female aged 28, height 165cm and weight 62kg would have a BMR of 1350kcal and a TDEE of 2093kcal. This would give a recommended target of 1693kcal, with protein, carbohydrates and fats of 106g, 190g and 56g to meet the goal of gentle deficit.

Once the targets have been saved the meal planner will create a daily meal plan for breakfast, lunch, snack and dinner. This will be based on the target and cuisine/diet preference selected. A grocery list will be created based on the meal plan organised by section. Throughout the week users can log their meals using the daily tracker. At anytime users can open a recipe in Chef Grace, ask a nutrition question or enter ingredients they have to get recipe suggestions.

Testing will be carried out to ensure the application is functioning correctly, including functional, integration and usability testing. Any claims regarding accuracy or performance should only be included if they have been measured.

Existing system

Traditionally diet planning has been done using printed diet charts, manually calculating calories, calorie counting applications or general recipe websites. This can require multiple tools to calculate requirements, create meal plans, create shopping lists and search for recipes. Many applications focus heavily on the numeric side of eating which can cause stress. Many are based on western foods and may not recognise regional dishes or Jain and Sattvic meals. Some provide aggressive calorie deficit and do not have clear minimums. Many require payment for subscriptions and collect more personal data than needed. This shows that a centralised, free and privacy focused application is needed.

Proposed system

graceAI aims to provide a personal health and wellness management application that can calculate targets, plan meals and provide guidance. Users can login, view a personal overview, meal planner, grocery list, health care, daily rhythm tracker and Chef Grace. The meal planner considers regional cuisines in India, Jain, Sattvic and globally. There is a minimum to ensure calorie targets are not too low. The AI assistant will help users cook using ingredients they already have. The health care section provides first line home care information with a reminder to speak with a doctor. The application is free with no advertisements. Users can export or delete their data. The application uses common web technologies to create a cost effective base.

Module description

1.1. Sign-in and Profile Module

This module allows users to login to the application. Users will enter their biological sex, age, height, weight, activity level and wellness goal. Input validation has been added to ensure users have entered the correct information. If there are any issues with the inputs clear messages will be shown. Only the necessary information is collected.

1.2. Metabolic Target Calculator Module

The calculator will calculate the basal metabolic rate using the Mifflin-St Jeor equation. This will be multiplied by an activity factor to calculate the total daily energy expenditure. The daily calorie target will be calculated based on the selected goal. There will be a minimum of 1200kcal prescribed and protein, carbohydrates and fats will be calculated.

1.3. Overview and Meal Planner Module

The overview will show the users targets. The meal planner will create a daily meal plan for breakfast, lunch, snack and dinner. This will show how long it will take to cook, energy and key nutrients. The meal plan will be based on the selected cuisine/diet.

1.4. Grocery List Module

This module will create a shopping list based on the weekly meal plan. This has been organised based on sections such as produce, grains and dairy to make shopping quicker and reduce the chance of forgetting items.

1.5. Daily Rhythm Tracker Module

This module allows users to log what they have eaten. They can select if they have eaten as planned, eaten something different or skipped. This has been made flexible so there is no penalty for skipping/ eating something different. Meals and vitals will be logged day by day throughout the calendar week.

1.6. Health Care and Home Remedies Module

This module provides first line home care and nutrition information. This includes information on common conditions such as fever, cold, allergies, hair fall and skin care. Medical disclaimers have been included and users are reminded to speak with a physician. Emergency contact numbers including 112 and Tele-MANAS 14416 are displayed.

1.7. Recipe Library Module

This module provides heritage recipes from regions in India, Mediterranean, East and Southeast Asia and Americas. Users can browse recipes and open any recipe in Chef Grace.

1.8. Chef Grace AI Assistant Module

This is an AI assistant that can answer cooking and nutrition questions using natural language. Suggestions can be provided based on what ingredients the user has. This will return a bullet point list of ingredients and numbered steps. As this is AI generated there can be errors so it is provided as guidance.

1.9. Privacy and Data Module

It is stated that user data will not be sold. There are no advertisements. User data can be exported and deleted at anytime. This follows the principles of the Digital Personal Data Protection Act 2023. Controls have been put in place to ensure personal information is kept secure.

System requirements

1.10. Hardware Requirements

An Intel Core i3/i5 or similar processor would be suitable for basic development. At least 8GB of RAM and 256GB of storage is recommended to run the code editor, browser and development tools. End users will only need a device with a modern web browser.

1.11. Software Requirements

The front end has been created using a responsive website with React. This uses HTML, CSS and JavaScript. The application has been hosted using Vercel. [Confirm and complete: Backend/API, AI Model/Service, Authentication, Database and Development Tools (Visual Studio Code and Postman)].

Conclusion

graceAI aims to provide a centralised, free and user friendly application to personalise meal plans and help with daily wellness. The application has a modern interface, uses the Mifflin-St Jeor equation to calculate targets, considers culture when creating weekly meal plans, organises grocery lists, flexible tracking, health tips and an AI assistant to help cook. The application ensures calorie targets are not too low, users can log without judgment and data can be exported and deleted. Further testing will be carried out to ensure the application is providing accurate nutrition, reliable assistance and benefits to users. Overall it provides a practical base for an intelligent personal wellness system. This can be improved further by including more regional languages, a larger recipe database, condition specific meal plans reviewed by a dietitian and verified nutrition sources.

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