IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

AI DIETITIAN

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Abstract:

In recent years, artificial intelligence (AI) has made significant advancements in the field of healthcare. One of the applications of AI in healthcare is AI dietitian, which aims to provide personalized dietary recommendations to individuals based on their health data and dietary preferences. This research proposes an expert system method to recommend a personalized diet plan. The system consists of a recommender module that uses machine algorithms to recommend personalized diet plans based on factors such as age, gender, height and weight. The system stores and processes this data and then calculates the nutrient B.M.I value needed to fill up user's needs. There is also an another options where user can request the diet plan with the dietitian. User can also connect with the nearby dietitian from the contact page of this web application. One can also check the calories details of food which also help him/her to get the better diet.

Key Words: Artificial Intelligence, Dietitians, Nutrition, Food Calorie, body type, height, weight

Introduction:

Maintaining a healthy diet is a critical aspect of overall health and well-being. However, with the rise in the prevalence of chronic diseases, such as diabetes and obesity, there is a growing need for personalized dietary recommendations. AI dietitian, also known as AI-based personalized nutrition, is a technology that leverages AI algorithms to provide personalized dietary recommendations to individuals based on their health data, dietary preferences, and lifestyle.

AI dietitian uses machine learning algorithms to analyze vast amounts of data, including health data, dietary preferences, and lifestyle factors, to provide personalized dietary recommendations. The AI dietitian algorithm takes into account various factors, including age, sex, weight, height etc. to provide personalized dietary recommendations that meet the individual's unique nutritional needs.

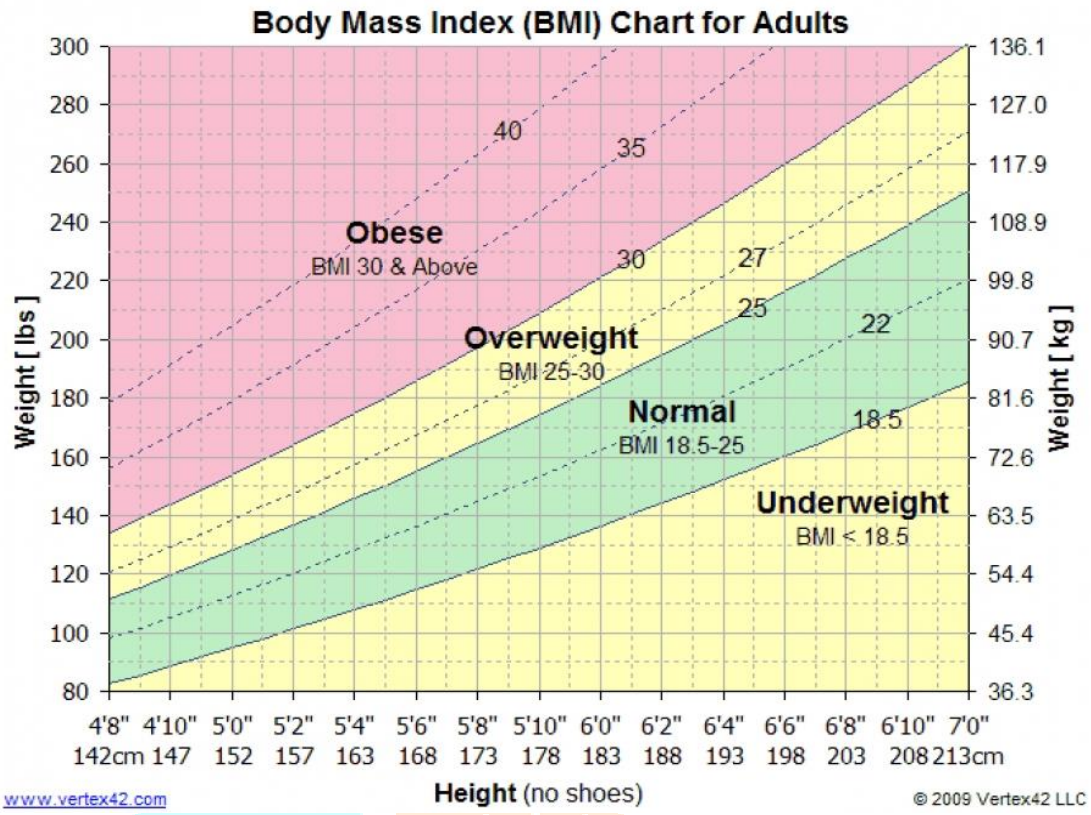


Figure 1: Body Mass Index chart for adults

Body Mass Index(BMI) is calculated using the height of a person and the weight of a person. BMI is given as the weight of a person(in kgs) divided by the height of a person(in meters) squared.

Figure 1 shows the Body Mass Index of adults and their categorization as Obese(BMI>30), Overweight(BMI between 25-30), Normal(BMI between 18.5-25), and Underweight(BMI<18.5) based on their Body Mass Index.

Diet plan varies from person to person, which was not kept in mind while developing most of systems and AI applications. The application is most important to keep track on health status of the user. No need of special dietitian and no more need of wasting money out for checking up yourself. This web application will help you out.

LITERATURE SURVEY:

1."Development and evaluation of a web-based intelligent dietitian system for personalized nutrition" by Li et al. (2018) describes the development and evaluation of a web-based intelligent dietitian system that utilizes a hybrid intelligent algorithm to provide personalized nutrition recommendations to users. The study found that the system was effective in providing accurate and personalized recommendations, and had potential for use in clinical settings.

2."Personalized nutrition by prediction of glycemic responses" by Zeevi et al. (2015) describes the use of machine learning algorithms to predict individual glycemic responses to foods. The study found that personalized nutrition recommendations based on these predictions led to better glycemic control in individuals with type 2 diabetes.

3."Using AI for personalized nutrition recommendations in type 2 diabetes management" by Raj et al. (2021) explores the use of AI for providing personalized nutrition recommendations to individuals with type 2 diabetes. The study found that AI-based recommendations were more effective than traditional dietary counseling in improving glycemic control and reducing cardiovascular risk factors.

4."A review of mobile applications for personalized dietary recommendations" by Villinger et al. (2019) provides a comprehensive review of mobile applications that provide personalized dietary recommendations. The study found that while many of these applications were effective in providing personalized recommendations, there was a need for further research on their long-term effectiveness and sustainability.

5."Machine learning for personalized nutrition: prediction and prescription" by Celis-Morales et al. (2020) provides an overview of the use of machine learning in personalized nutrition. The study discusses the potential of machine learning algorithms to predict individual dietary needs and preferences, and to provide personalized nutrition recommendations that are tailored to the individual's unique biology and lifestyle factors.

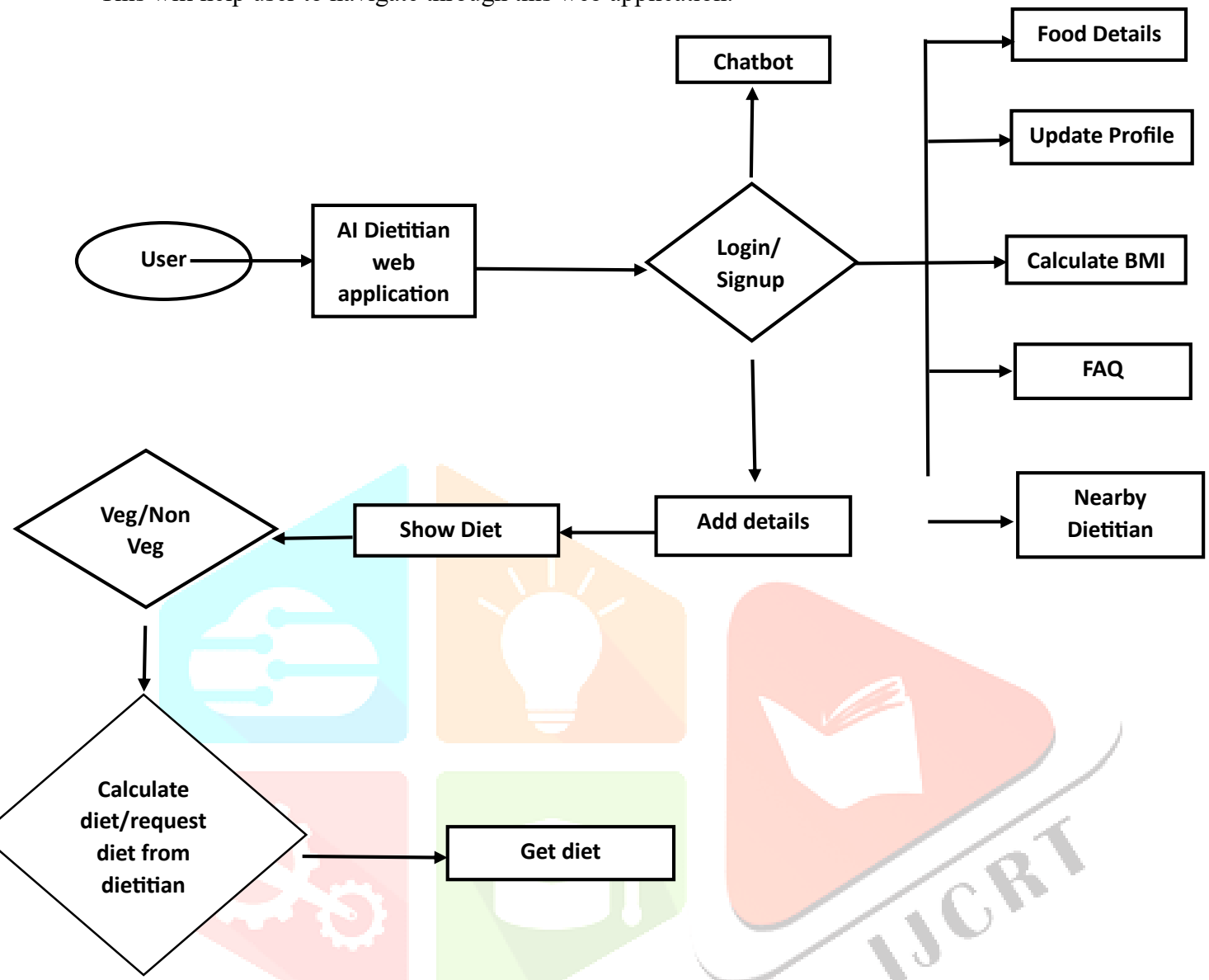
6."Intelligent Nutrition Assistance: A Review of AI Applications in Dietary Assessment" by Dong et al. (2019) provides an overview of the use of AI in dietary assessment and personalized nutrition. The study found that AI-based approaches, including image recognition and natural language processing, can improve the accuracy and efficiency of dietary assessment, which can lead to more personalized and effective nutrition recommendations.

7."Artificial Intelligence and Nutrition: Insights and Applications" by Kachouie et al. (2020) explores the potential of AI in the field of nutrition, including personalized nutrition and dietary monitoring. The study discusses the use of AI algorithms to analyze dietary data, predict individual dietary needs, and provide personalized recommendations to improve overall health and wellness.

8."A systematic review of digital interventions for improving diet quality and nutrition outcomes in children and adolescents" by Powell et al. (2020) provides a review of digital interventions, including mobile applications and websites, aimed at improving dietary quality and nutrition outcomes in children and adolescents. The study found that many of these interventions utilize AI algorithms to provide personalized nutrition recommendations and tracking, and that these interventions show promising results in improving dietary habits and health outcomes.

PROPOSED SYSTEM:

The below Figure show the flow chart for user that user find after visiting the AI Dietitian web application. This will help user to navigate through this web application.



Different components of the system are:

A. Web Application

This application is a web application which helps the user as easy and better interaction, here user will provide their data as input and this system will generate a proper diet plan for them as output. For storing user's data and their authentication this system user MySQL database.

B. About

About page will describe the details about the whole web application that what can user get from this web application.

C. Signup/login

This is the signup page where user and dietitian both can signup themselves. User signup form include the name, email id and password but for the dietitian a passkey is needed along with name, email id and password that will do differ the login foe user and dietitian.

D. User Database

User Database will store all the data that will be given by the user and the necessary things that are needed from user to create a proper diet plan for user.

Here below are the information that will store in database are –

1.Name

2.Age

3.Gender

4.Height

5.Weight

6.E-mail id

7.Food preference

System will use these above data to calculate BMI and diet plan for the users.

C. Dashboard

After the user login he/she will direct to dashboard page. The dashboard will contain the many options that can user use like :

1.Profile:

After login user will see their profile and the added information like name, height, weight, gender and BMI and also a BMI graph of previous 7 days.

2.Calculate BMI:

Here user can check his BMI just by adding his height and weight and check whether he is underweight, overweight or he is good.

3.Add Details:

In this page user can add his details like height, weight and gender and fill the form that whether he wants to gain weight or loose weight or maintain weight with his activity level.
This information will store in database that help to calculate the diet plan according to the user's goal.

4.Show Diet:

In this section user can calculate a diet plan for it whether he wants a veg or non-veg type food and can also update his details if needed. If user is not satisfied with the calculated diet or if he found some unavailability of foods that are calculated, he can directly request the diet from dietitian.

5.FAQ:

Here user will get some frequently asked question and its answer on this application

6.Nearby Dietitian:

In this section user can get a details of the dietitian present in his nearby location and can contact with them and can get consultation with them.

E. Chatbot

An AI chatbot is also here for the user that will help user to interact with it and can easily navigate the application and user can also ask the direct link to all the pages from this AI chatbot. It also solve the queries of the user related to diet and health.

ALGORITHM DESIGN

Step 1: Collect user information

user_information = collect_user_information()

Step 2: Assess user goals and preferences

user_goals = assess_user_goals()

user_preferences = assess_user_preferences()

Step 3: Calculate basal metabolic rate (BMR)

bmr = calculate_basal_metabolic_rate(user_information)

Step 4: Determine total daily energy expenditure (TDEE)

tdee = determine_total_daily_energy_expenditure(bmr, user_information)

Step 5: Define macronutrient distribution

macronutrient_ratios = define_macronutrient_distribution(user_goals)

Step 6: Generate personalized meal plans

meal_plans=generate_personalized_meal_plans(user_preferences,macronutrient_ratios, tdee)

Step 7: Offer recipe suggestions

recipe_suggestions = offer_recipe_suggestions(user_preferences)

Step 8: Monitor progress and provide feedback

logged_data = prompt_user_to_log_meals_and_activities()

progress = analyze_progress(logged_data, user_goals)

feedback = provide_feedback(progress)

Step 9: Adaptation and learning

if feedback.suggestions:

meal_plans = adapt_meal_plans(meal_plans, feedback.suggestions)

Step 10: Considerations for special cases

special_diet_requirements = assess_special_diet_requirements(user_information)

special_meal_plans = generate_special_meal_plans(special_diet_requirements)

Step 11: Privacy and security

implement_privacy_and_security_protocols()

The detailed algorithm of this web application are given below:

1.Collect user information:

Prompt the user to enter their age, gender, weight, height, and activity level.

Store the user information securely for further calculations and personalization.

Implement data validation and error handling to ensure accurate input.

2.Assess user goals and preferences:

Ask the user about their dietary goals, preferences, and any specific requirements.

Provide options for weight loss, weight gain, or maintenance goals.

Collect information on food preferences, allergies, dietary restrictions, and cultural considerations.

3.Calculate basal metabolic rate (BMR):

Use the user's age, gender, weight, and height to calculate their BMR.

Apply an appropriate formula such as the Harris-Benedict equation or Mifflin-St Jeor equation.

Consider any adjustments based on specific health conditions or considerations.

4.Determine total daily energy expenditure (TDEE):

Adjust the BMR based on the user's activity level to calculate the TDEE.

Multiply the BMR by a specific factor corresponding to their activity level.

Take into account any additional factors like pregnancy or lactation, if applicable.

5.Define macronutrient distribution:

Determine the ideal macronutrient ratios based on the user's goals and health factors.

Consider evidence-based recommendations or guidelines for a balanced diet.

Account for the user's preferences and any specific dietary requirements.

6.Generate personalized meal plans:

Utilize a comprehensive food database with nutritional information.

Calculate the user's daily calorie target based on their TDEE and goals.

Create customized meal plans that align with the user's goals, preferences, and macronutrient distribution.

Consider factors like portion sizes, meal frequency, and timing.

7.Offer recipe suggestions:

Analyze the user's food preferences, dietary restrictions, and nutrient requirements.

Provide recipe suggestions that align with their preferences and nutritional needs.

Consider ingredient availability, cooking skills, and cultural preferences.

Include detailed instructions, ingredient lists, and nutritional information for each recipe.

8.Monitor progress and provide feedback:

Encourage users to log their meals, activities, and progress regularly.

Analyze the logged data to track progress towards the user's goals.

Provide personalized feedback, insights, and recommendations based on the user's progress.

Offer suggestions for improvement, adjustments in meal plans, or modifications in goals if necessary.

9.Adaptation and learning:

Continuously learn from user feedback and data to improve the accuracy of recommendations.

Adapt the meal plans and recommendations based on the user's progress and changing needs.

Incorporate machine learning techniques to refine the algorithm and enhance personalization.

10.Considerations for special cases:

Identify any special dietary requirements or health conditions specified by the user.

Customize meal plans and recipe suggestions to accommodate special diets such as vegetarian, vegan, gluten-free, or specific health conditions.

Ensure accurate nutrient analysis and appropriate recommendations for special cases.

11.Privacy and security:

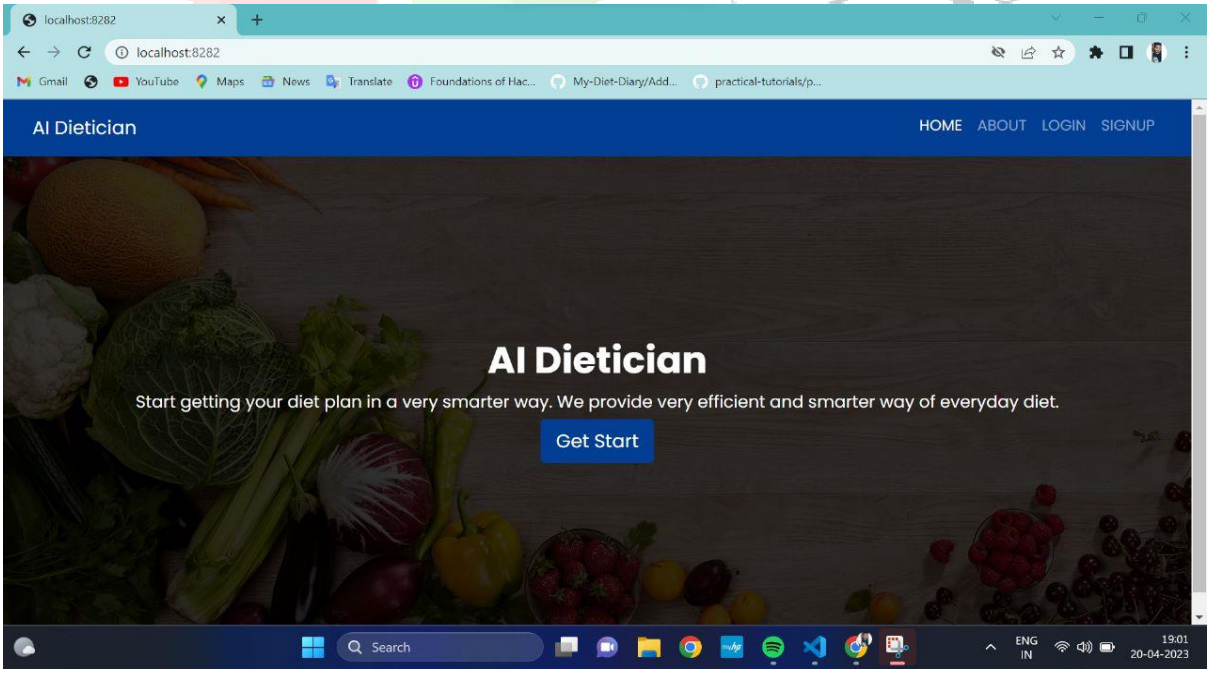
Implement robust security measures to protect user data and ensure privacy.

Comply with relevant data protection regulations and industry standards.

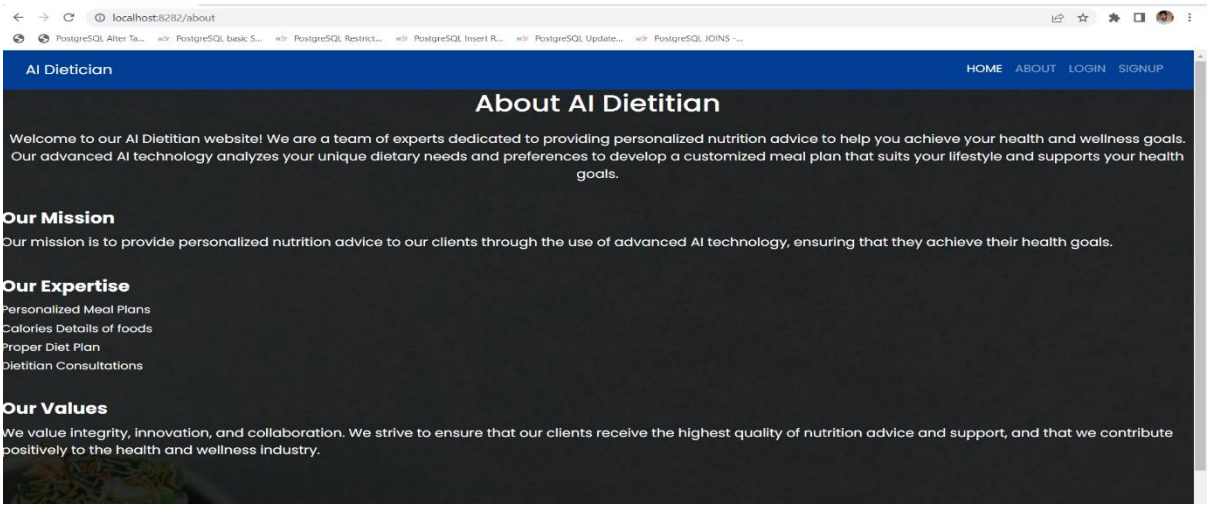
Encrypt sensitive information, use secure authentication methods, and regularly update security protocols.

RESULT:

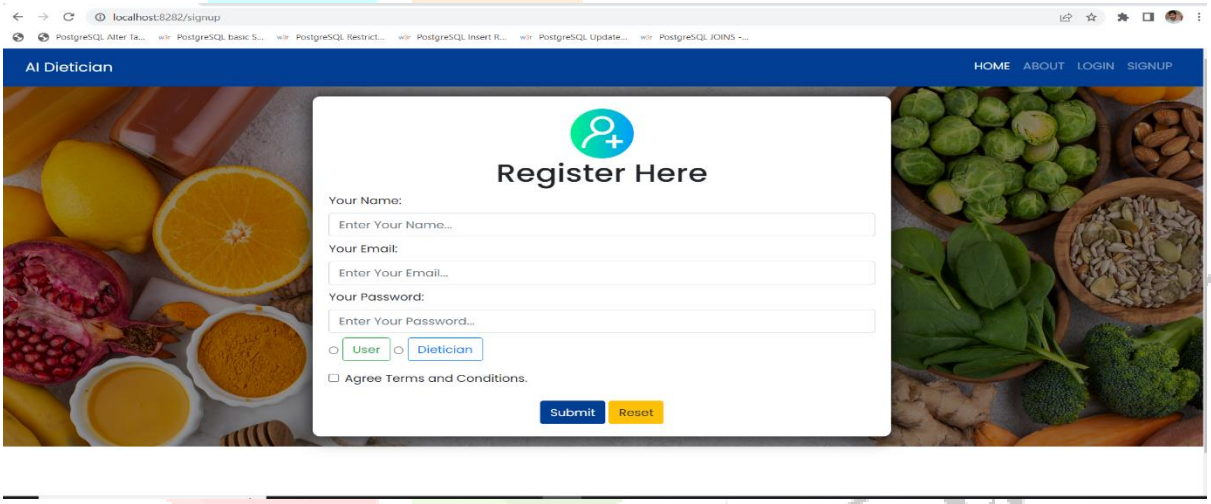
The home page is the first page that user see when it start the application it consist of the link of other pages as shown below in figure



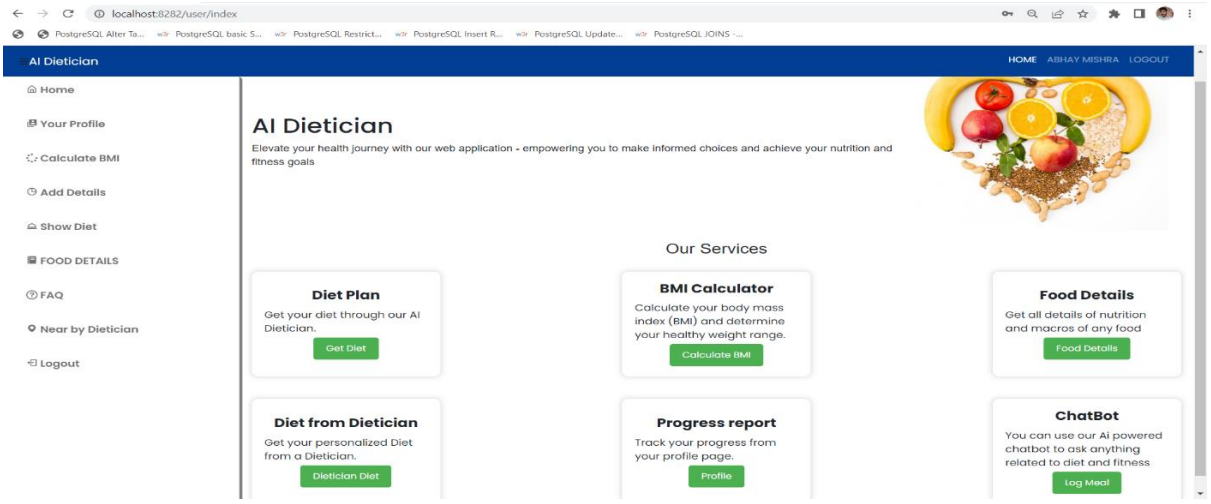
The about page will describe the basic details about the application and the things that user can do through this web application



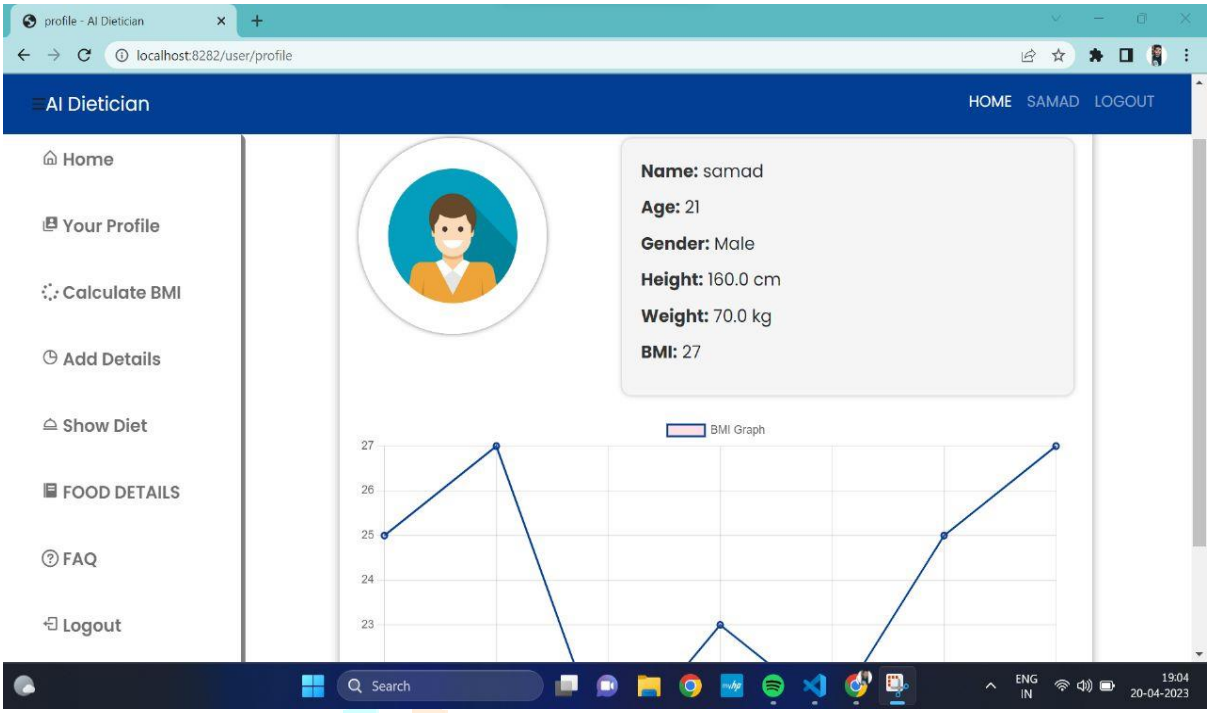
The signup page is allow the user and dietitian both to register themselves. The data of both user and dietitian get stored in database. Only after the successful user and dietitian can login into this web application.



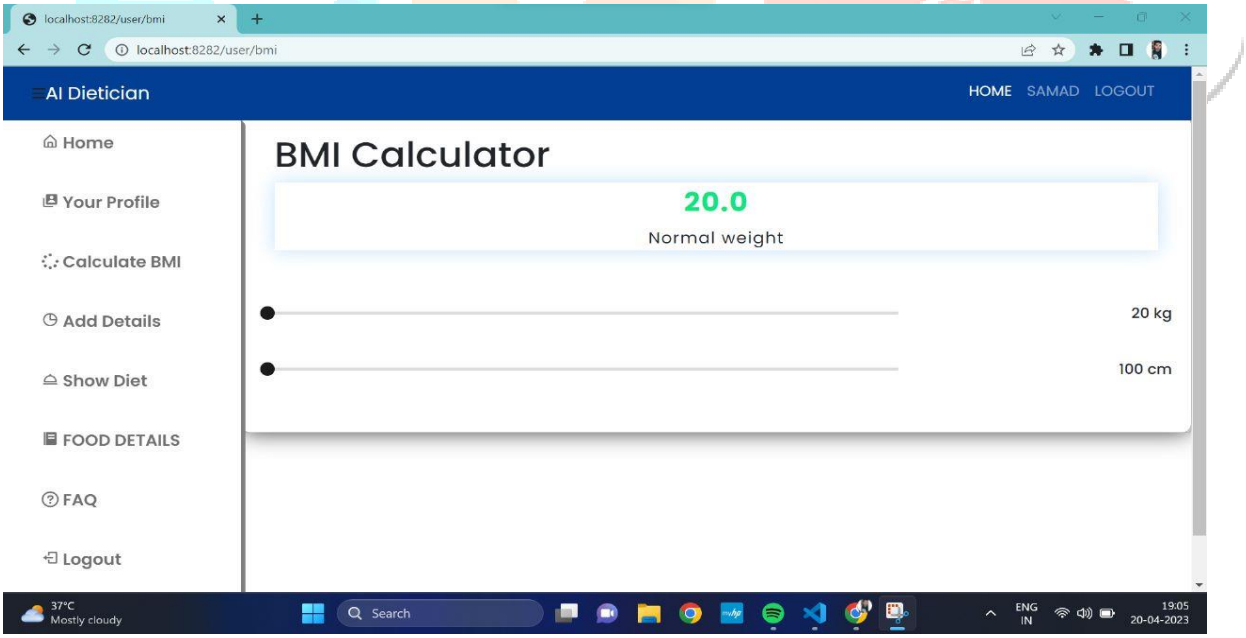
When the user successfully login into the will application a user dashboard is open where he can get all the options like profile, calculate BMI, diet plan, food details etc.



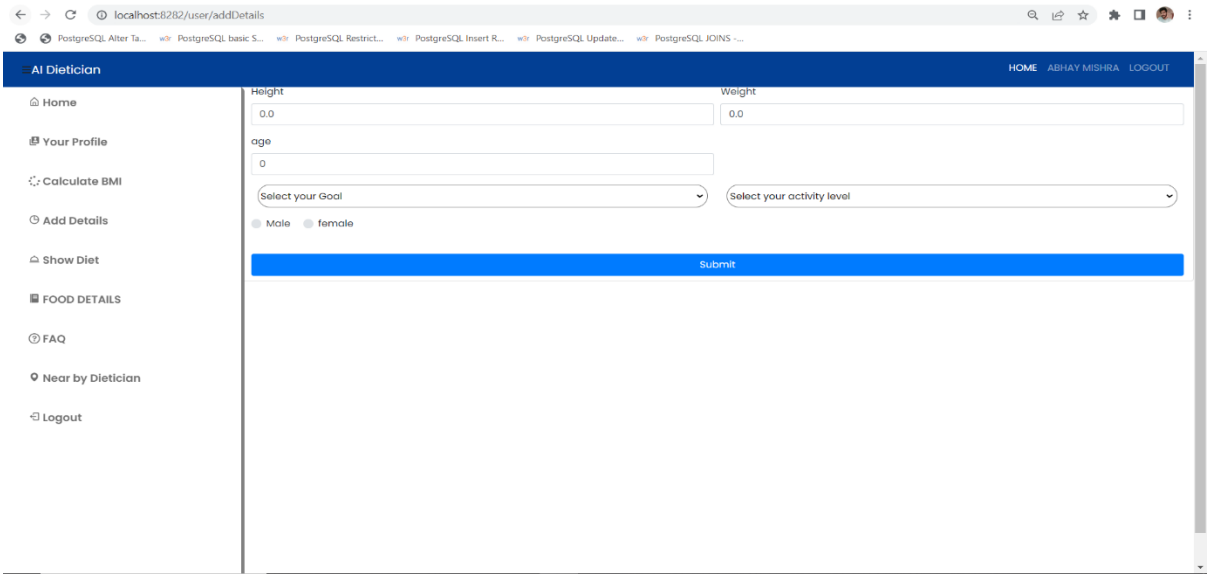
User can see his profile from the your profile page that also show the BMI graph of last seven days.



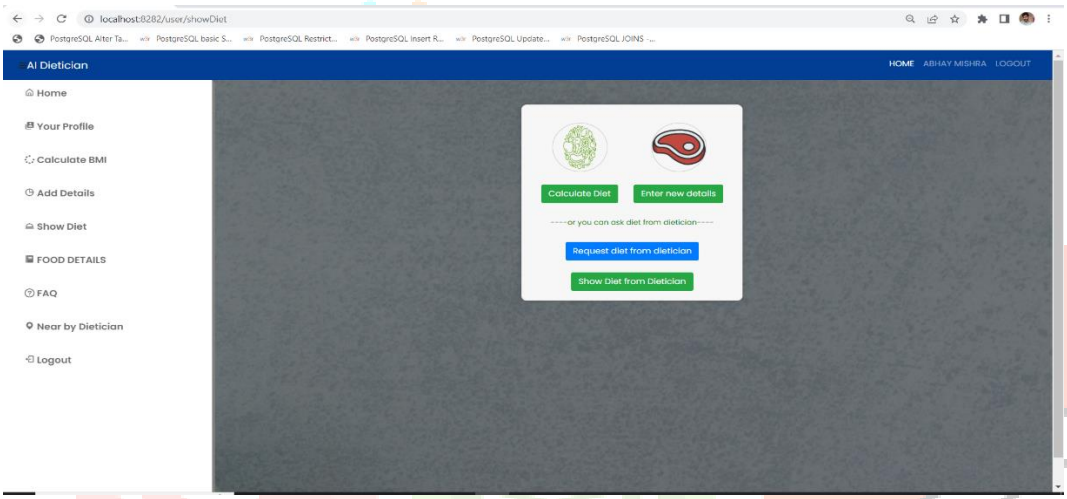
User can calculate their BMI by the given BMI calculator. The BMI is general Body Mass Index calculation that user can use to know about his/her health status. For most adults, an ideal BMI is in the 18.5 to 24.9 range. For children and young people aged 2 to 18, the BMI calculation takes into account age and gender as well as height and weight. If your BMI is: below 18.5 – you're in the underweight range

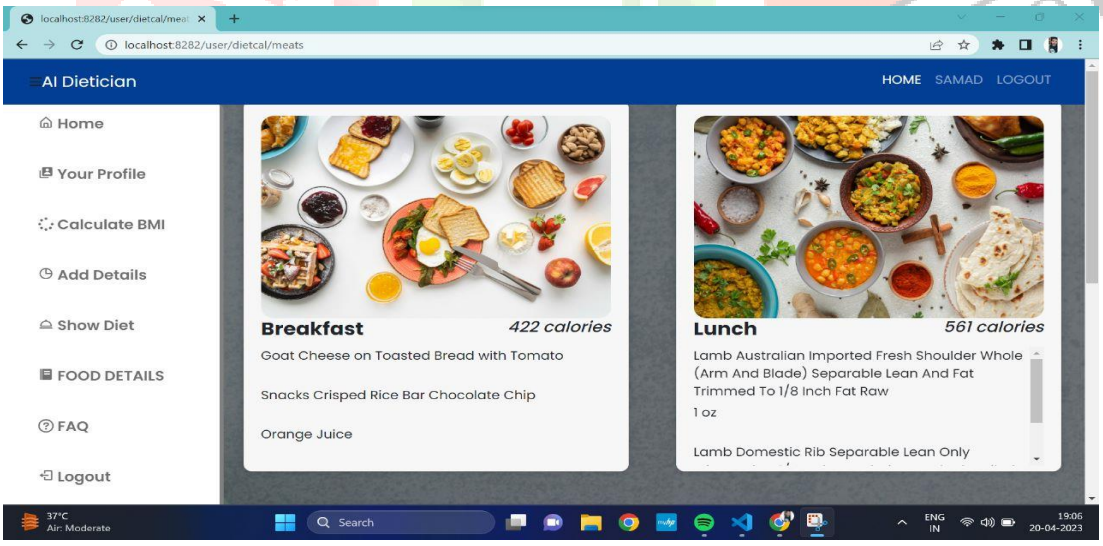


The add details page is like a prediction form that user have to fill which includes the details like height, weight, age , goal, and activity level.

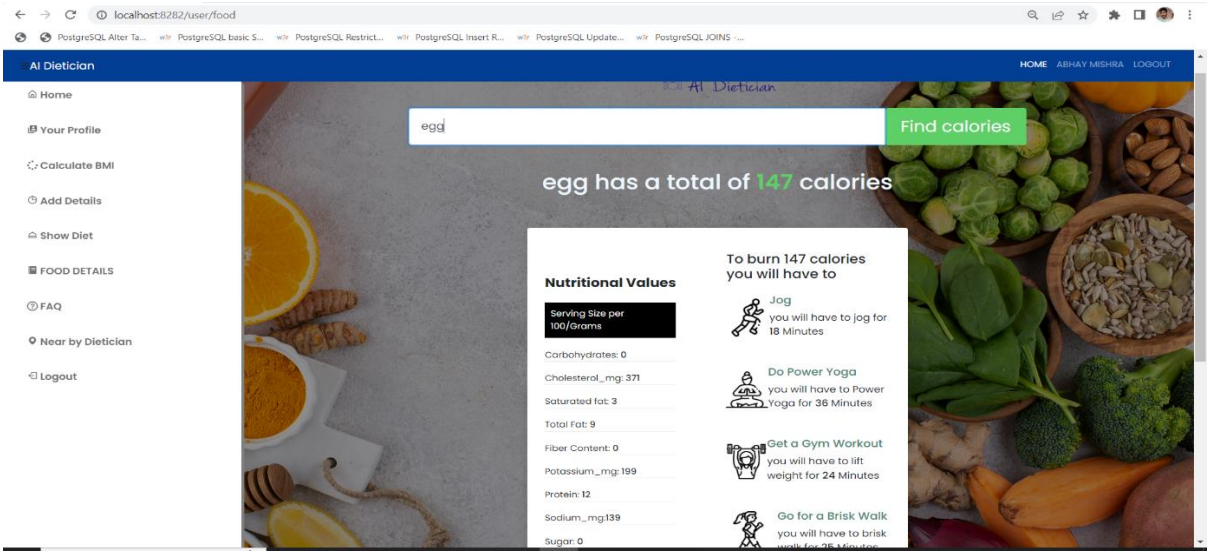


User can calculate the diet plan from the show diet page in both veg and non-veg category and can also request the diet from the registered dietitian.

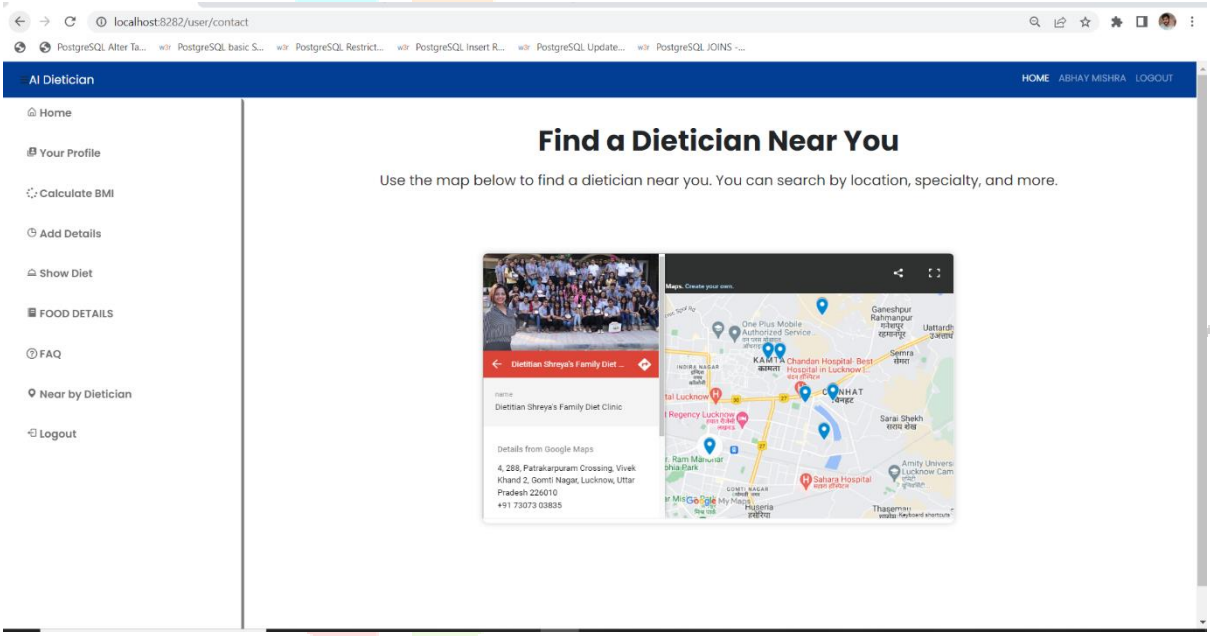




The food details section help the user to see the details of food like calories, protein, fat, carbohydrates, etc in a specific food item and see the different method with timings like running, yoga, exercise to consume the calories.



The Nearby Dietitian page will help the user to get the details of the dietitian present at their locations and can contact them easily.



Conclusion:

This web application will help be very useful for everyone to maintain their health with the proper diet plan suggested by AI dietitian application. The user will also get different types of diet for according to their BMI and their goals. The food details section help user to eat food according to the calories needed as it shows the calories of different food items. From this application the cost of a personal dietitian will be reduced. It will save time as it will be an excellent feature of use anytime anywhere.

ACKNOWLEDGEMENT

A special thanks of gratitude to our guide Dr. Ashish Awasthi who helped us in doing a lot of Research and we came to know about so many new things. The one to guide us throughout our project. Special thanks to teammates for all the cooperation and support while completing the project. Last but not the least thanks to our parents who were always a great motivation and moral support while completing this.

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