Capstone Project Phase A
24-1-D-36

AI-Driven Web App For Dietary Restricted Individuals

Supervisor
Dr. Natali Levi
nataly l@braude.ac.il

Ilanit Azran - 208657320
ilanit.hanooko@e.braude.ac.il

Noy Biton - 312238678
Noy.biton@e.braude.ac.il

Project's Git Repository

Abstract

In the digital era, managing dietary restrictions presents unique challenges and opportunities, particularly for individuals with specific dietary needs due to health conditions or personal choices. The "AI-Driven Web App for Dietary Restricted Individuals" addresses these challenges by utilizing the OpenAI 'GPT-4' API to enhance dietary management. This project aims to develop a web application that provides personalized recipe solutions and crucial information about ingredient suitability. Distinguished by its ability to cater to complex dietary restrictions, the application offers features for managing recipe collections and sharing recipes across social platforms. By harnessing the capabilities of the 'GPT-4' API, this web application simplifies meal preparation and educates users on safe dietary practices, thereby improving quality of life and promoting informed food choices. The intended users include individuals with allergies or dietary restrictions, caregivers, and professionals in the food and health industries. This project demonstrates the transformative potential of utilizing advanced language models in dietary management and underscores the need for innovative digital tools in nutrition and health.

1. Introduction

In the evolving landscape of nutrition and culinary arts, the digital era presents unique challenges and opportunities, especially for those managing dietary restrictions. Our project, "AI-Driven Web App for Dietary Restricted Individuals," is designed to tackle two prevalent issues that stand as significant barriers to achieving dietary health and wellness.

The first challenge is the difficulty in finding recipes that are specifically tailored to meet diverse dietary needs. This problem extends beyond individual concerns, impacting entire households where there is a need to balance dietary restrictions with the varied taste preferences and nutritional requirements of each family member. The scarcity of resources offering adaptable and inclusive culinary solutions creates a significant gap, making daily meal preparation a complex task for those juggling multiple dietary considerations.

Equally crucial is the challenge of understanding and identifying restricted or unrecommended ingredients, particularly for individuals with specific health conditions or dietary limitations. The gap in knowledge about which ingredients should be avoided can lead to unintentional health risks. This lack of information is a widespread issue, affecting not only individuals with diagnosed conditions but also those who might be unaware of their dietary sensitivities or the effects certain foods have on their overall health.

In the contemporary digital environment, applications such as MyFitnessPal and Yummly represent significant strides in dietary management. MyFitnessPal offers features including diet tracking and categorization of recipes under specific dietary labels. However, its capabilities are not yet sufficiently advanced to address the intricate needs of individuals with multiple, overlapping dietary restrictions. Similarly, Yummly, while lauded for its recipe recommendations, occasionally exhibits algorithmic inconsistencies, failing to consistently filter out allergens, even when dietary preferences are explicitly stated. This highlights the need for more sophisticated, AI-driven platforms that can adeptly navigate the complexities inherent in multifaceted dietary restrictions. Extending beyond applications, the broader digital landscape, while offering forums like the r/glutenfree subreddit for specific dietary discussions, falls short in addressing the broader spectrum of dietary restrictions. This limitation extends to social media groups, where knowledge is often anecdotal, based on personal experiences rather than expert guidance. Additionally, these platforms suffer from suboptimal search functionalities and delayed interactions, as responses to recipe requests depend on user availability and group moderation. The inadequacy of existing culinary websites in implementing intelligent search functionalities further compounds this challenge. Current platforms often fail to accurately interpret and filter search queries tailored to specific dietary exclusions. Collectively, these issues underscore the critical need for sophisticated digital tools that can adeptly navigate the complexities of dietary restrictions, providing precise, reliable, and timely solutions for diverse dietary requirements.

Our project seeks to address these challenges by leveraging the power of artificial intelligence. The goal is to develop a web application that not only provides personalized recipe solutions but also imparts essential knowledge about ingredient suitability. This initiative aims to transform dietary management from a daunting task into an informed, manageable aspect of daily life, empowering individuals and families to make better, healthier food choices. In addition to providing recipes, our project offers enhanced functionality for users to manage

their recipe collections. Users have the ability to save recipes to their personal profile, and they can also edit or delete these selections as needed. Another significant feature of our app is the capability to share recipes across social platforms, such as WhatsApp and Telegram. This functionality not only enriches the user experience but also fosters the sharing of dietary knowledge and within a broader social context. In response to the identified gaps within current digital solutions, our project introduces the "AI-Driven Web App for Dietary Restricted Individuals." This innovative platform is designed to transcend the limitations of existing applications and forums, with its core strength residing in sophisticated AI algorithms. These algorithms are adept at processing complex dietary needs and preferences, setting our solution apart in its capability and efficiency. Unlike conventional digital tools, our web application will offer a dynamic, user-centric approach, capable of generating personalized recipes that cater to multiple, overlapping dietary restrictions. By harnessing the power of AI, the application aims to provide accurate nutritional solutions. This approach not only addresses the need for precise dietary management but also elevates the standard of digital resources available to individuals with dietary restrictions, paving the way for a more inclusive and informed dietary landscape.

The potential stakeholders of our app are mainly individuals with allergies or dietary restrictions, parents of children with these health issues and health-conscious Individuals who might benefit from the recipes offered by the app that align with their nutritional needs and goals. Another significant share of our users are caregivers and social hosts who are responsible for cooking for individuals with dietary restrictions in social gatherings or educational settings, ensuring everyone's dietary needs are respectfully accommodated. In addition to personal users, professional users might also benefit from our platform such as food industry product developers, who can leverage the app for insights into recipe innovation for allergy-sensitive markets. Also culinary professionals like pastry chefs, bakery owners, and chefs will find the app a valuable resource in allergy-friendly menu development, as well as clinical nutritionists working with patients who have allergies or dietary restrictions who can provide customized nutritional advice using our platform.

The project document is arranged as follows:
Section 2 expands on the tools and methods available today, and discusses the need for our web application to solve the problem. Section 3 expands on our expectations that we would like to achieve in our project, and describes in depth the algorithms developed in order to reach our desired achievements. Section 4 describes and explains our work process, by describing the engineering development process and our plan for the further stages ahead. In addition, this section describes the models developed or used, the appearance of the user interface and explains the algorithms used during the work phases. Section 5 describes the testing process of our system, including the testing environment chosen to perform tests.

2. Related Work

2.1. Food Allergies

A food allergy is characterized as an adverse immunological reaction to food proteins, a condition that prevalently affects approximately 5% of children and 3-4% of adults in Western nations. [6] “Food allergies are common, result in both acute and chronic disease, might be increasing in prevalence, affect quality of life,
and can be severe and potentially fatal.” [6] These allergic responses are classified into two types: IgE-mediated and non-IgE mediated. IgE-mediated allergies manifest as

immediate reactions upon exposure to the allergen, which might be life threatening, whereas non-IgE mediated allergies are typically associated with gastrointestinal disorders. Effective management of food allergies necessitates the avoidance of known allergens and preparedness for emergent reactions. It is imperative that patients carefully examine food labels, be aware of the potential cross-contamination with allergens during food preparation, and always carry emergency medications, such as epinephrine auto-injectors.

2.2. Dietary Restricted Individuals

Individuals adhering to dietary restrictions, such as vegans, vegetarians, diabetics, and ketogenic dieters, face challenges in finding recipes that align with their nutritional needs. Vegans and vegetarians require alternatives that meet their protein and vitamin requirements, while diabetics and those on ketogenic diets need meals that adhere to specific carbohydrate and fat guidelines. The difficulty in locating suitable recipes is compounded by the widespread presence of incompatible ingredients in mainstream food products and the limited availability of tailored options in conventional culinary resources. Importantly, individuals having allergies, as well as dietary limitations, are dealing with greater difficulties when finding suitable recipes since their Permitted ingredient list is limited. This scarcity necessitates a vigilant approach to dietary planning, increasing the time and effort required for meal preparation and underscoring the need for more comprehensive, accessible culinary solutions for these populations.

2.3. Nutritional Solutions And AI

Artificial intelligence is anticipated to revolutionize diet planning through the automated and efficient application of professional nutritional knowledge. [5] Research has demonstrated that AI can surpass human nutritionists in devising diet plans that are superior in nutritional adequacy. [5] Consequently, AI could play a pivotal role in developing dietary solutions for individuals with food allergies or nutritional limitations. Populations subjected to dietary restrictions often suffer from inadequate nutrition, as the elimination of critical food items can result in deficiencies in essential nutrients, such as protein, vitamins, and minerals, as well as their overall energy levels. [7]

2.4. Technologies

2.4.1. Artificial intelligence API

An "AI API" or "Artificial Intelligence Application Programming Interface" provides a set of protocols, rules, and tools that allow developers to integrate artificial intelligence functionalities into their software without building AI algorithms from scratch. These APIs facilitate the inclusion of advanced data processing and machine learning capabilities, speeding up development and reducing costs. By using AI APIs, developers can access pre-built AI models, making it easier to implement complex AI systems. [4]

2.4.1.1. Llama AI API

LLaMA is designed to perform a variety of natural language processing (NLP) tasks, such as answering questions, summarizing texts, and generating human-like text. Available in multiple sizes,

these models offer flexibility in computational cost and application performance, catering to diverse needs. LLaMA is open-source, which enhances its accessibility and facilitates widespread use and development within the community. The LLaMA API further enables developers to seamlessly integrate this powerful language processing tool into their applications, maximizing its utility across various technological landscapes. [8]

2.4.1.2. OpenAI API

ChatGPT is an advanced language generation model developed by OpenAI, based on the Generative Pre-trained Transformer (GPT) architecture. The ChatGPT API allows developers to seamlessly incorporate this language model into their applications, thereby enhancing conversational AI capabilities. This API enables applications to provide interactive user experiences and dynamic content creation, effectively leveraging the power of sophisticated conversational AI.

2.4.1.3. Gemini API

Gemini models are adept at a wide range of tasks, such as generating and interpreting images, understanding videos, and tackling mathematical challenges. The Vertex AI Gemini API and Google AI Gemini API provide developers with the tools to embed Gemini model capabilities into their applications. These APIs facilitate seamless integration, allowing developers to leverage the advanced functionalities of Gemini models to enhance the intelligence and versatility of their digital solutions. [1]

Dataset	Method							
	Llama-2-70b (0-shot, SP)	Llama-2-70b (k-shot, CoT)	Gemini Pro (0-shot, SP)	Gemini Pro (k-shot, CoT)	GPT-3.5 Turbo (0-shot, SP)	GPT-3.5 Turbo (k-shot, CoT)	GPT-4 Turbo (0-shot, SP)	GPT-4 Turbo (k-shot, CoT)
CommonsenseQA	72.0	76.5	76.5	79.0	73.0	76.0	78.0	**80.0**
Cosmos QA	77.0	81.0	81.5	84.5	75.0	78.5	86.5	**88.0**
αNLI	77.5	80.5	79.5	81.5	75.5	78.0	87.0	**88.0**
HellaSWAG	73.0	77.0	76.0	78.5	78.0	80.0	94.0	**95.0**
TRAM	66.0	70.0	73.5	76.0	68.5	72.0	79.5	**82.0**
NumerSense	74.0	75.5	80.0	82.0	81.5	82.5	85.0	**86.0**
PIQA	74.0	78.5	89.0	90.5	87.0	89.5	94.5	**95.5**
QASC	78.0	82.0	80.0	82.5	83.0	85.0	91.5	**92.5**
RiddleSense	62.5	66.0	75.0	82.5	71.5	75.0	94.0	**95.0**
Social IQa	71.0	77.5	73.0	78.5	73.0	78.0	82.0	**84.5**
ETHICS	88.0	89.5	87.0	87.5	94.0	95.0	97.0	**98.0**
Average	73.9	77.6	79.2	82.1	78.2	80.9	88.1	**89.5**

Table 1: Performance comparison of four LLMs across 11 language-based commonsense reasoning datasets. [9]

2.4.2. DataBase

In the rapidly evolving digital ecosystem, the exponential growth of the Internet and the proliferation of data sources have substantially challenged traditional data management paradigms, particularly impacting storage capacity and data usability. Traditional Relational Database Management Systems (RDBMS) struggle with the volume and complexity of modern data, which has led to the rise of NoSQL systems, or "Key-Value Store" systems.[2]

These are designed for massive scalability and flexible data models that support quick application development and deployment.

NoSQL databases like MongoDB, CouchDB, and Cassandra replace traditional table-based structures with document-oriented or key-value pair models. This adaptation better handles semi-structured data and improves the performance and scalability of web applications across distributed networks. They provide essential "on-demand" scalability for managing large datasets and fluctuating workloads.

Moreover, NoSQL systems streamline application rollouts by simplifying schema and database management in a rapidly changing data environment. This efficiency is why many modern enterprises increasingly adopt NoSQL solutions. As we incorporate a database into our project, it's crucial to leverage NoSQL's capabilities to manage large volumes of semi-structured data efficiently. This shift towards NoSQL is not just a trend but a necessary evolution to meet the demands of today's data management challenges [2].

Sl No	**Name of NoSQL**	Sl No	**Name of NoSQL**
1	PNUTS	10	CouchDB
2	BigTable	11	Voldemort
3	HBase	12	MongoDb
4	Hypertable	13	Infinispan
5	Azure	14	Dynomite
6	Cassandra	15	Redis
7	Xeround	16	ClearDB
8	SimpleDB	17	Google AppEngine Data Store
9	Dynamo		

Table 2: List of NoSQL database studied on Chandra et al. (2012) [2]

2.4.3. Authentication Method

User authentication on the World Wide Web involves verifying the identity of a user logging into a network.

Password-based authentication is one of the most traditional forms, known for its straightforward implementation. Despite its simplicity and widespread use, this method's security relies heavily on password strength and user practices. Moreover, third-party authentication methods such as OAuth and Single Sign-On (SSO) offer a balance of convenience and security. These methods allow users to access multiple independent web resources after logging in once, using credentials stored by a third-party service like Google or Facebook. Another notable authentication method involves cryptography and biometrics. These methods provide a higher level of security and are becoming essential in environments that require stringent security measures.

The most promising application areas for authentication methods on the World Wide Web suggest that third-party authentication ranks as the most user-friendly, whereas password-based methods are the easiest to implement. However, methods employing cryptography and biometrics are highlighted as the most secure, providing robust defense mechanisms against unauthorized access. [4]

3. Expected Achievements

In our project, we anticipate the creation of an intuitively designed, user-friendly website that is accessible on any device at any time, thereby simplifying the task of custom recipe searching with a swift response time of no more than 10 seconds. We aim to effectively integrate and utilize an AI API, channeling the profound capabilities of artificial intelligence into our project. A primary focus is to enhance user experience by extensively customizing the generated recipes according to individual preferences, facilitated by user feedback. Additionally, we are committed to ensuring the timely delivery of our project products as per the established schedule.

The primary objective of our project is to enhance the quality of life for individuals with dietary restrictions by providing them, or their families, with nutritional alternatives for recipes that cannot be consumed in their original form. Our tool is also invaluable for those tasked with preparing meals for social gatherings that include attendees with varied dietary requirements. Furthermore, we aspire to elevate the awareness of unique dietary needs within different social groups.

The criteria for measuring the success of our project include the ability to generate precise responses through AI technology, ensuring that when users request recipes devoid of harmful ingredients, they receive appropriate suggestions tailored to their dietary needs. Additionally, we strive to generate a wide array of responses for commonly requested user prompts on our website, offering our users a rich variety of recipes within each category.

4. Engineering Process

4.1. Process

4.1.1. System Requirements

4.1.1.1. Functional Requirements

1. The system allows users registration.
2. The system allows user login.
3. The system allows typing a prompt.
4. The system allows viewing a response.
5. The system allows saving responses.
6. The system allows editing responses.
7. The system allows viewing saved responses.
8. The system allows user classification.
9. The system allows adding children.
10. The system allows adding menus.
11. The system allows adding patients.
12. The system allows deleting children.
13. The system allows deleting menus.
14. The system allows deleting patients.
15. The system allows editing children.
16. The system allows editing menus.
17. The system allows editing patients.
18. The system allows sorting saved responses.
19. The system allows filtering saved responses.

20. The system allows sharing a response.

4.1.1.2. Non-Functional Requirements

1. User registration is done by filling a registration form.
   1.1. User registration is done by Google authentication service.
   1.2. A registered user is saved to a database.
2. User login is done by filling a login form.
   2.1. User login is done by Google login service.
3. Typing a prompt is carried out by the user.
4. A response is generated by ‘GPT-4’ API
   4.1. A response is displayed after receiving a suitable fetch status.
5. Saving a response is being done by the user.
   5.1. Saving a response is being done by clicking on the heart icon.
6. Editing a response is being done by the user.
   6.1. Editing a response is being done by clicking on the pencil icon.
7. Viewing saved responses is done by clicking on the “Saved recipes” button.
8. User classification is possible upon registration.
   8.1. User classification can be done on the settings menu.
   8.2. A user can be classified as a “dietary restricted individual”.
   8.3. A user can be classified as a “parent”.
   8.4. A user can be classified as a “dietary caregiver”.
   8.5. A user can be classified as a “dietitian”.
9. Adding children is allowed for a user classified as a “parent”.
10. Adding menus is allowed for a user classified as a “dietary caregiver”.
11. Adding patients is allowed for a user classified as a “dietitian”.
12. Deleting children is allowed for a user classified as a “parent”.
13. Deleting menus is allowed for a user classified as a “dietary caregiver”.
14. Deleting patients is allowed for a user classified as a “dietitian”.
15. Editing children is allowed for a user classified as a “parent”.
16. Editing menus is allowed for a user classified as a “dietary caregiver”.
17. Editing patients is allowed for a user classified as a “dietitian”.
18. Sorting saved responses is being done by the user.
    18.1. Sorting saved responses is done in the “saved recipes” section.
    18.2. A user can sort saved responses by A-Z.
    18.3. A user can sort saved responses by Z-A.
    18.4. A user can sort saved responses by ascending creation date.
    18.5. A user can sort saved responses by descending creation date.
19. Filtering saved responses is being done by a user classified as a “dietitian”.
    19.1. Filtering saved responses is done in the “saved recipes” section.
    19.2. A user classified as a “dietitian” can filter saved responses by age.
    19.3. A user classified as a “dietitian” can filter saved responses by gender.

19.4. A user classified as a “dietitian” can filter saved responses by dietary restriction.

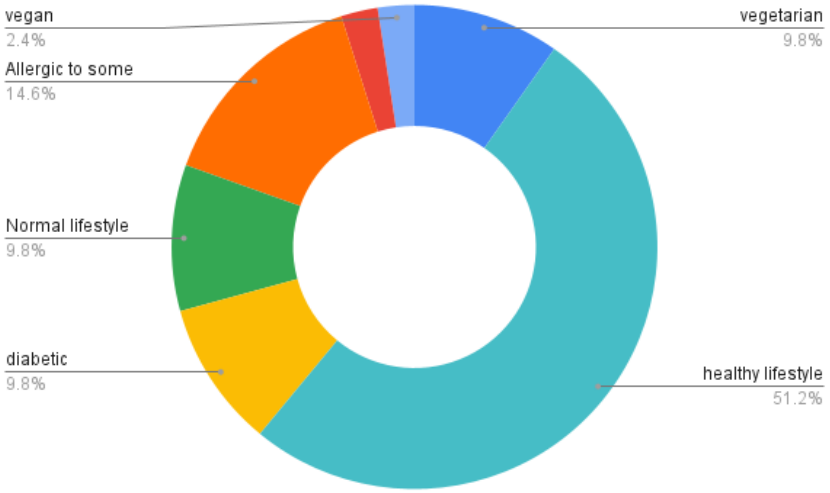
20. The system allows sharing a response via “WhatsApp”.

20.1. The system allows sharing a response via “Telegram”.

4.1.2. Requirements Gathering Process

Our main goal is to establish a quality product that our target audience will benefit the most, therefore we created a questionnaire that aims to understand the needs of users that are dealing with dietary limitations, and how confident they are using an AI tool for their nutrition. We distributed the questionnaire through whatsApp groups and contacts in our immediate surroundings. The questionnaire has received 36 responses, which allowed us to lay the foundations for our requirements gathering process.

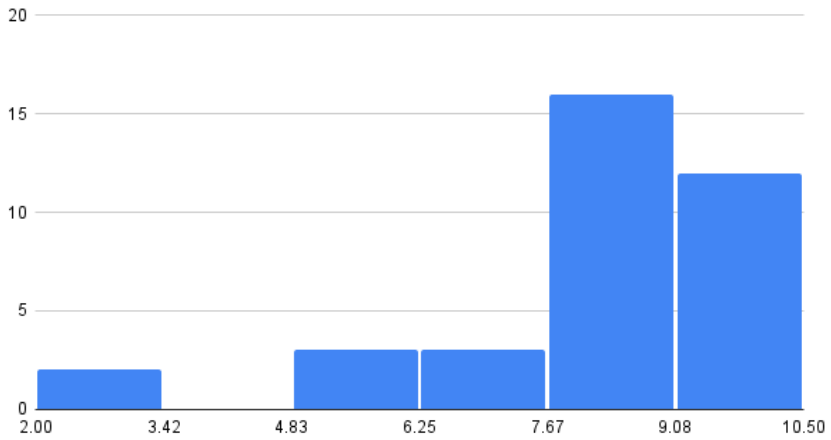
When creating the questionnaire it was important for us to understand our audience, therefore the first question was “Do you or a family member belong to one of the following target groups?”. The answers were distributed in the following way described in graph 3:



Graph 3: Distribution of target groups of respondents.

More than 50% of our respondents are having a healthy lifestyle, and our App may benefit them when searching for recipes without certain unhealthy ingredients. About 14% of our respondents are allergic to some kind of food, and in a further analysis of this population, 100% of them are not using any application to manage their nutrition. We also received that 9.8% of our respondents are diabetic, vegetarian or having a normal lifestyle, and only 2.4% of them are vegan or carbs lovers.

During the answers collection process, many respondents brought up the need of a convenient and user-friendly application, as well as the concern of not getting reliable responses. When asked on a scale of 1-10 about how technological they are, most of the respondents claim that they are above 8, as can be seen in the histogram graph 4 below:



Histogram graph 4: On a scale of 1-10, how technological are you?

After analyzing the data from the questionnaire, we were more familiar with our users' needs, and managed to brainstorm ideas that model their needs into a list of functional and non-functional requirements.

4.1.3. Development Process

4.1.3.1. Development methodology

To select the most appropriate software development methodology for our project, we evaluated various approaches and determined that Agile methodology is the most fitting. Agile emphasizes bringing together people, processes, connectivity, technology, and timing to efficiently tackle specific tasks. It advocates for a flexible, iterative development process, allowing us to break down feature delivery into manageable components while maintaining the adaptability to accommodate changes. This approach recognizes that software development is empirical, benefiting from goal-oriented collaboration and adaptability rather than rigid, predictive methods. Agile supports a dynamic environment where guidelines provide structure but methods remain flexible, facilitating rapid and efficient progress.

4.1.3.2. Client Engagement in Development

In the Agile development approach for our web application, engaging clients is fundamental to the process. Clients are involved throughout, giving feedback after each development cycle, or 'sprint.' This continuous collaboration allows for adjustments to be made in real time, ensuring that the project evolves in line with the client's needs and expectations. Such regular interaction guarantees that the final product is closely aligned with what the client envisioned, and it often reduces the need for major changes after launch. This method is a practical way to keep clients connected and invested in the development of their product.

4.1.3.3. Tools And Technologies

4.1.3.3.1. MongoDB

MongoDB is a leading NoSQL database that uses JSON-like documents with dynamic schemas instead of traditional tables. We chose MongoDB for its

flexibility, scalability, performance, and ease of deployment that makes it ideal for handling large volumes of data and complex structures, commonly required in big data and real-time applications.

4.1.3.3.2. OpenAI's 'GPT-4' API

OpenAI's 'GPT-4' API provides developers with access to the latest Generative Pre-trained Transformer model, GPT-4, which excels in generating human-like text based on provided inputs. This advanced language model is designed for complex text synthesis and natural language understanding, making it ideal for creating automated content and conversational agents. The API allows developers like us to integrate these capabilities into various applications, enhancing their functionality with sophisticated natural language processing tools.

4.1.3.3.3. Google Authentication API

The Google Identity Platform facilitates user sign-in to applications and services via a Google account, with Google Sign-In being a prominent method within this system. Google Sign-In supports authentication across multiple platforms including Android and iOS applications, websites, and various devices. [3] Complementing this, Google APIs employ the OAuth 2.0 protocol for authentication and authorization, which allows users to authenticate without exposing their credentials to third parties. For example, if a user wants to log into a popular service like Spotify using their Google account, OAuth 2.0 facilitates this authentication in a secure manner that prevents Spotify from accessing the user's Google password.

4.1.3.3.4. Web Development

In the development of our project, we strategically selected a combination of web development tools that support our objectives of delivering a highly responsive and scalable web application. We employed a single-page application (SPA) architecture using React, renowned for its efficiency in updating and rendering only the necessary components upon data changes, thereby facilitating a highly responsive user interface. For the application's styling, we adopted Tailwind CSS, a utility-first CSS framework that significantly accelerates the development process. Tailwind CSS streamlines the implementation of custom designs with minimal coding, which is crucial for maintaining an adaptable and maintainable codebase. For server-side operations, we selected Node.js due to its single programming language model allowing uniform JavaScript coding across both client and server ends. This integration enhances developer productivity and reduces errors by simplifying the development environment. Node.js also allows our application to efficiently manage thousands of concurrent connections, making it ideal for high-traffic environments requiring real-time data processing. This selection of technologies ensures that our application not only meets aesthetic standards but also excels in performance and scalability, characteristics imperative to contemporary web solutions.

4.1.3.4. Expected Challenges And Constraints

4.1.3.4.1. Choosing An AI API

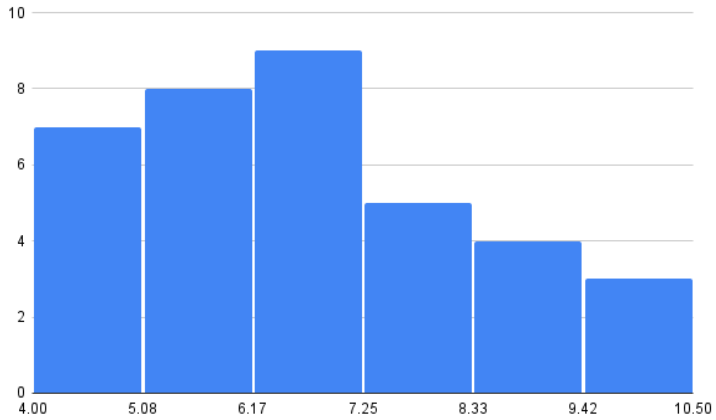
A significant challenge in developing our application is selecting the appropriate AI API, as its performance heavily depends on this choice, and selecting an unsuitable API could significantly diminish the app's efficiency. The specific capabilities each API offers greatly affect its suitability for tasks such as natural language processing or data analysis. Efficiency, accuracy, and response times can vary between APIs, influencing user experience and process outcomes. The cost structure, whether subscription-based, pay-per-use, or tiered, must align with budget constraints. Additionally, the ease of API integration into existing systems is critical, affecting practical deployment and operational smoothness. These factors are essential for a balanced and strategic AI API selection process.

4.1.3.4.2. Relying On An API

A primary challenge in developing our application is its reliance on an AI API for its core functionality of typing a prompt asking for a recipe. This dependency places our app at risk as if the original service undergoes maintenance or experiences an unexpected shutdown. Such interruptions could compromise the app's ability to perform its essential tasks, potentially leading to significant disruptions in service. Since the stability and reliability of the API provider are critical for ensuring continuous operation and optimal performance, choosing a trustworthy API provider with a stable infrastructure should mitigate the risk of reliance on an AI API.

4.1.3.4.3. Trusting AI Responses

Insights from our questionnaire indicate a pressing challenge as users are wary of relying on AI for nutrition and health guidance. As depicted in Histogram graph 5, responses varied on the degree of reliance on AI-generated recipes, on a scale from 1 to 10.



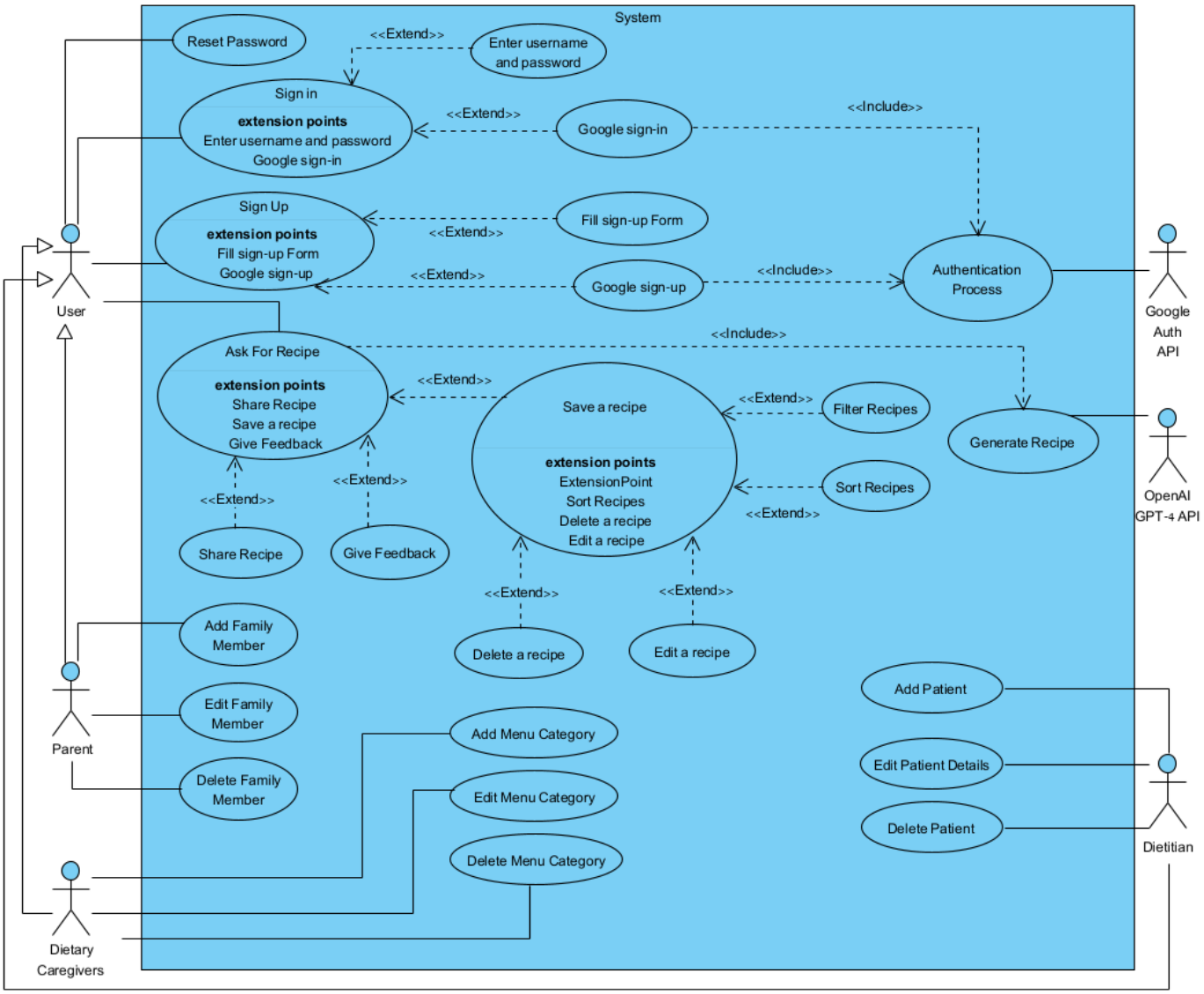
Histogram graph 5: On a scale of 1-10, how much would you rely on a recipe that artificial intelligence generated?

This variability underscores the critical challenge we face, given that our app's functionality is deeply intertwined with AI-generated content. To mitigate this concern, it is imperative to ensure that prompts to the AI are meticulously

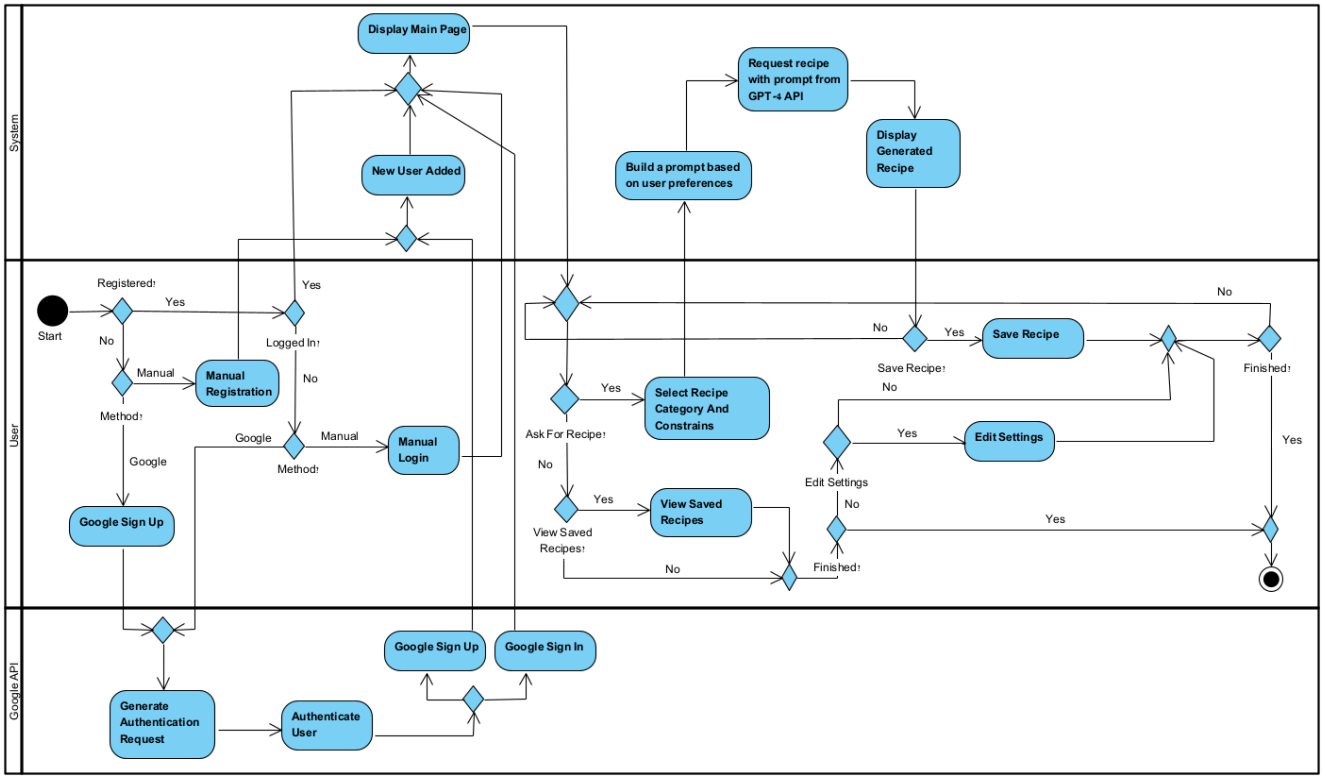
crafted to enhance the quality and reliability of the generated responses. Minimizing user's efforts on crafting an appropriate prompt is essential to foster trust and dependability on AI in our application. Therefore we'll integrate an easy user interface allowing the user to easily determine which recipes to get and under which constraints.

4.2. Product

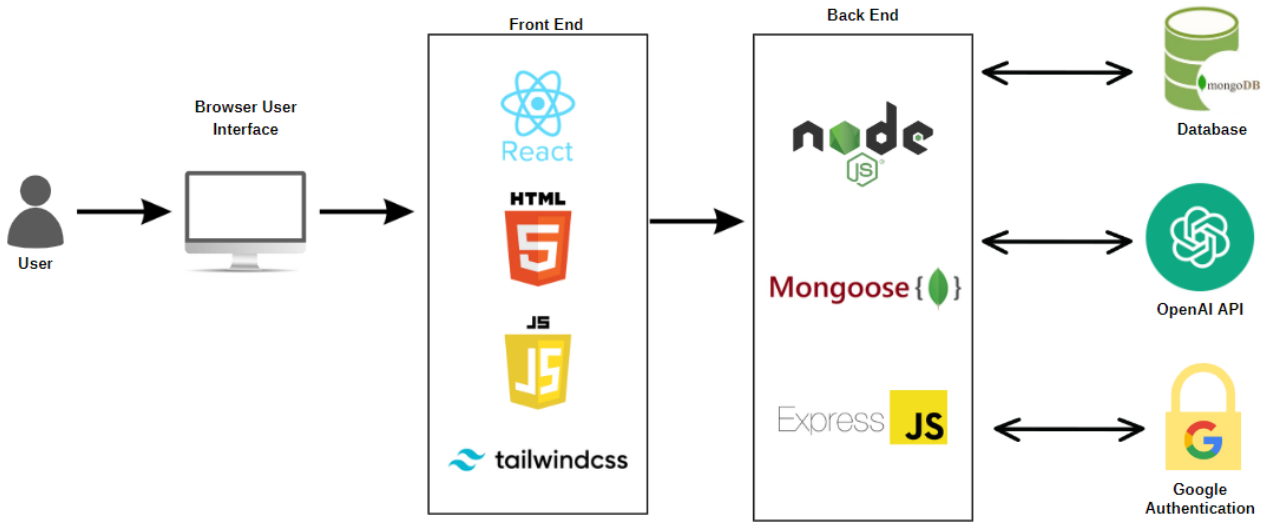
4.2.1. Use-Case Diagram



4.2.2. Activity Diagram

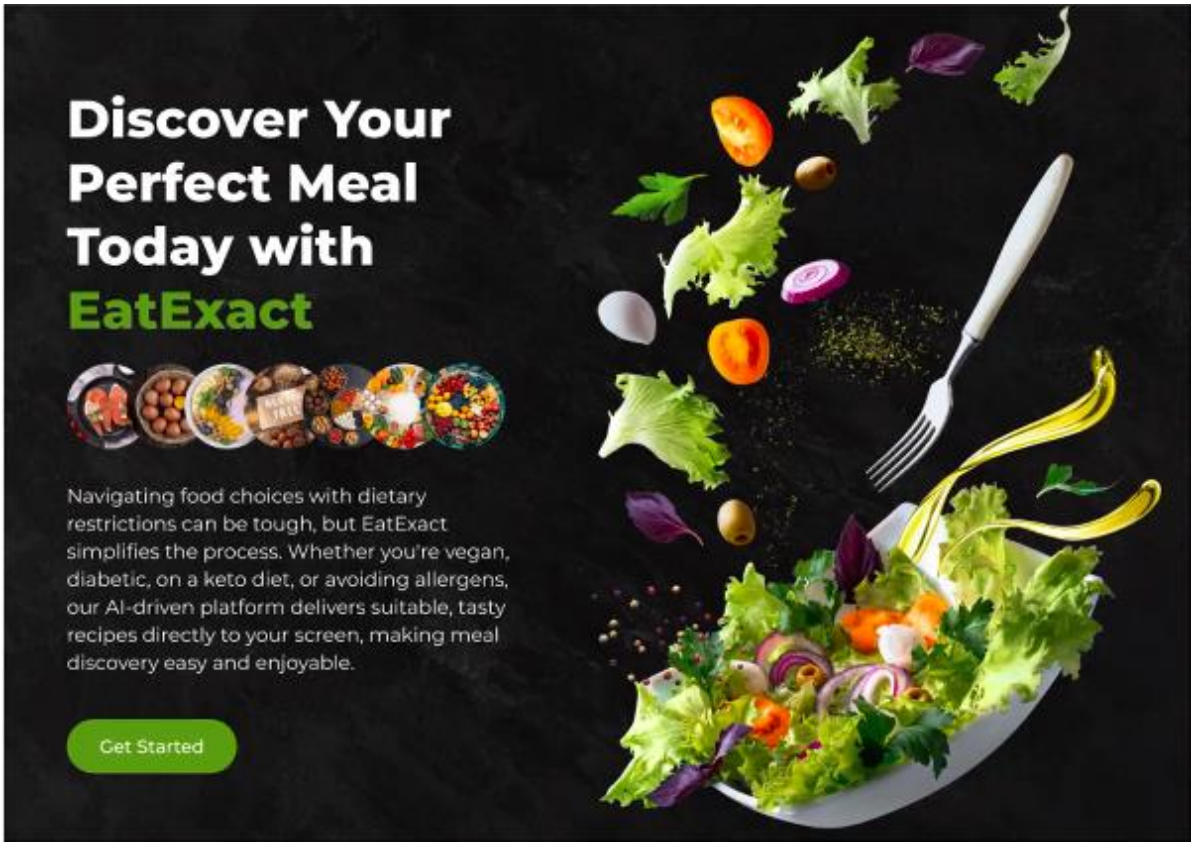


4.2.3. System Architecture Diagram

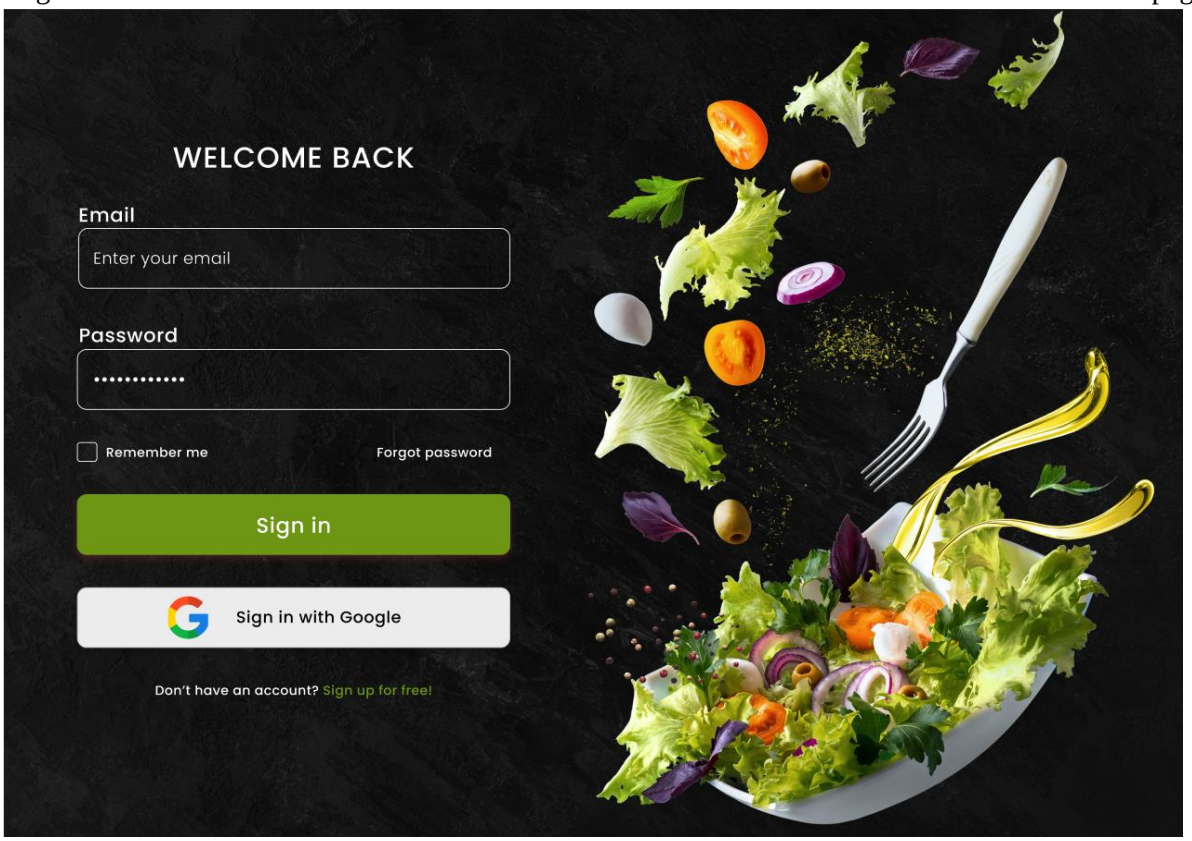


4.2.4. **User Interface**

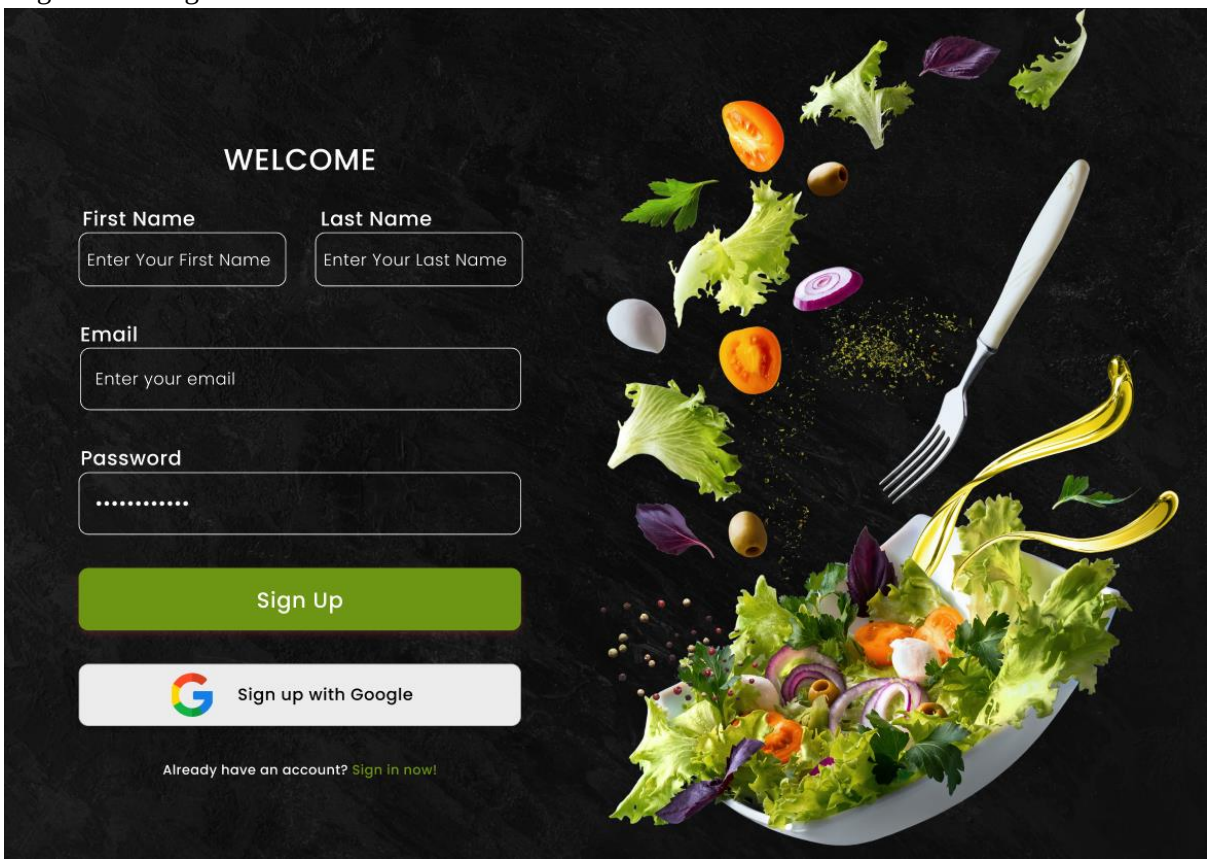
landing page



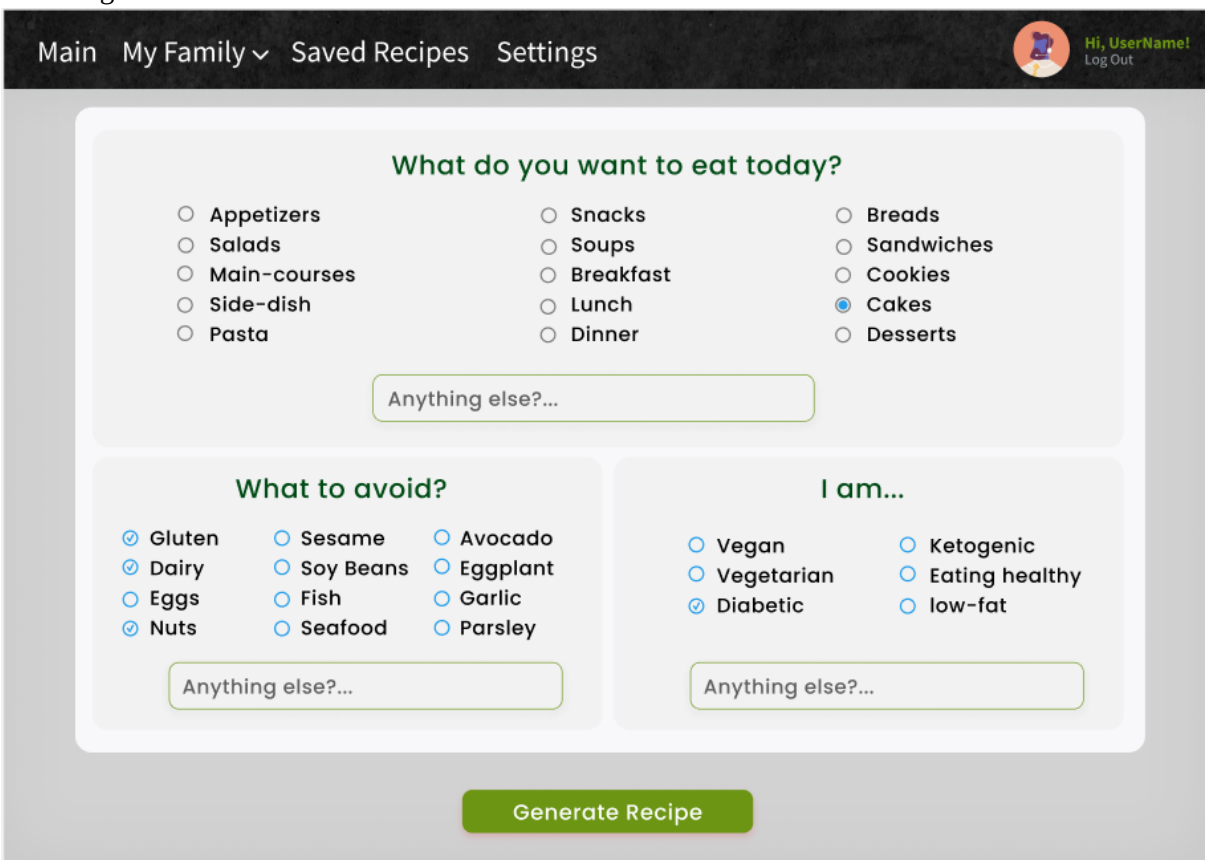
Login page



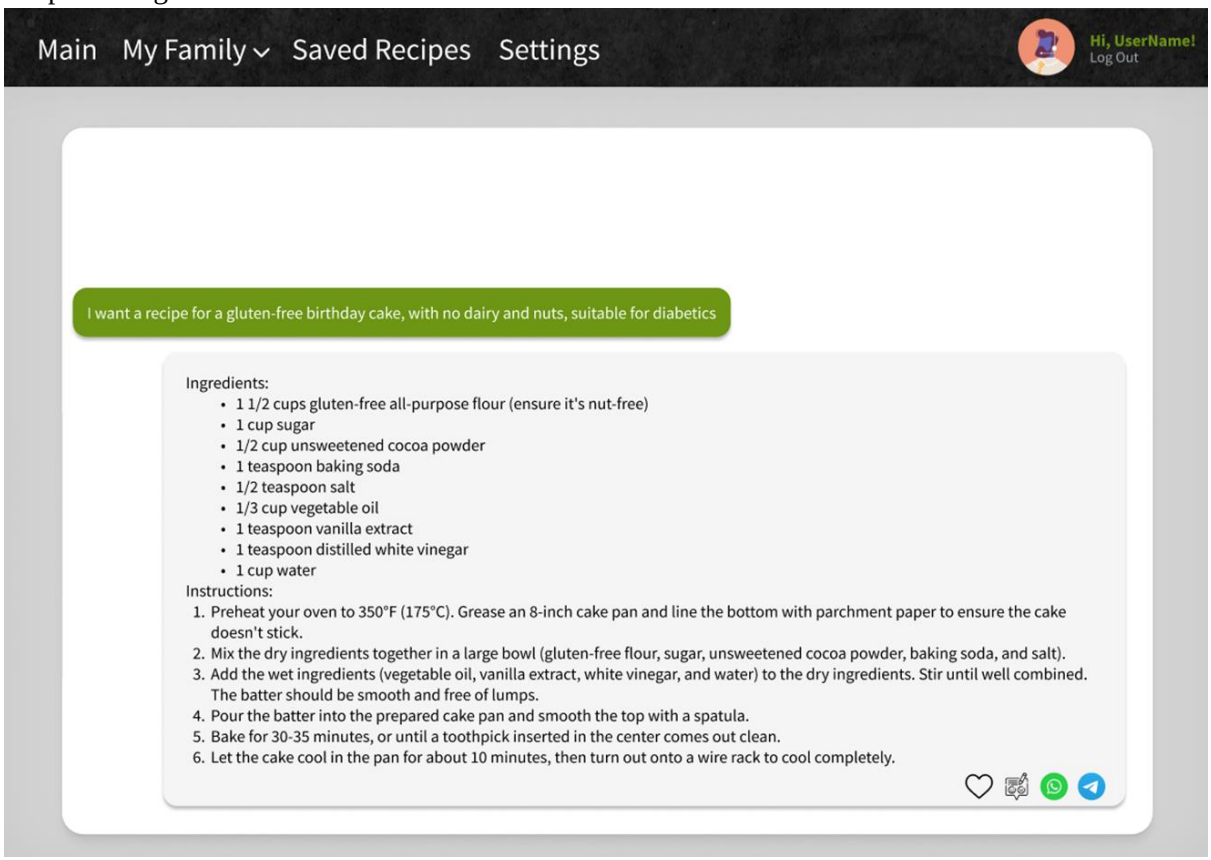
Registration Page



Main Page



Response Page



5. Testing Plan

Login		
#	**Test Subject**	**Expected Result**
1	Username is empty	“Enter username” message on the screen
2	Empty or incorrect password for username	“Wrong password” message on the screen
3	Username does not exist	“Username does not exist in the system” message on the screen
4	Google sign-in	Display main page

Registration		
#	**Test Subject**	**Expected Result**
1	Firstname, last name, email or password fields are empty	“Mandatory field” message on the screen
2	Enter email address with no “@” to email field	“Include ‘@’ to email” message on the screen

3	Enter email address that is already in use by another user	“Email already in use” message on the screen
4	Enter weak password to password field	“Password is not strong enough” message on the screen
5	Google sign-up	Display main page

Recipe Search		
#	**Test Subject**	**Expected Result**
1	Click on “Generate Recipe” button on the main page without selecting recipe category	“Please choose recipe category” message on the screen
2	Click on heart icon near the generated recipe	Heart icon is colored and recipe is added to “Saved Recipes” page
3	Second click on heart icon near the generated recipe	Color of heart icon is removed and recipe is removed from“Saved Recipes” page
4	Click on “WhatsApp Share” icon near the generated recipe	A new web tab is opened with WhatsApp page
5	Click on “Telegram Share” icon near the generated recipe	A new web tab is opened with Telegram page
6	Click on pencil icon near a saved recipe on the “Saved Recipes” page	The edited recipe is updated

User Preferences			
#	**Assumption**	**Test Subject**	**Expected Result**
1	Logged in as “parent”	Click on “Add Family Member”, type its name and press enter	The typed in name is added to list of children
2	Logged in as “parent”	Click on “Edit Family Member”, change its name and press enter	The child’s name is updated
3	Logged in as “parent”	Click on “Delete Family Member”	The child’s name is removed
4	Logged in as “Dietary Caregivers”	Click on “Add Menu Category”, type menu category and press enter	The typed in menu category is added to list of categories

5	Logged in as “Dietary Caregivers”	Click on “Edit Menu Category”, change its name and press enter	The menu category’s name is updated
6	Logged in as “Dietary Caregivers”	Click on “Delete Menu Category”	The menu category’s name is removed
7	Logged in as “Dietitian”	Click on “Add Patient”, type patient’s name and press enter	The typed in name is added to list of patients
8	Logged in as “Dietitian”	Click on “Edit Patient Details”, change any detail and press enter	The patient’s details are updated
9	Logged in as “Dietitian”	Click on “Delete Patient”	The patient’s name is removed

Sorting And Filtering			
#	**Assumption**	**Test Subject**	**Expected Result**
1	None	Click on sort by A-Z on “Saved Recipes” page	Recipes are sorted by A-Z
2	None	Click on sort by Z-A on “Saved Recipes” page	Recipes are sorted by Z-A
3	None	Click on sort by ascending creation date on “Saved Recipes” page	Recipes are sorted by ascending creation date
4	None	Click on sort by descending creation date on “Saved Recipes” page	Recipes are sorted by descending creation date
5	Logged in as “Dietitian”	Click on filter, and select an age in the age section on “Saved Recipes” page	Recipes of patients with selected age are displayed
6	Logged in as “Dietitian”	Click on filter, and select a gender in the gender section on “Saved Recipes” page	Recipes of patients with selected gender are displayed
7	Logged in as “Dietitian”	Click on filter, and select a dietary restriction in the dietary restriction section on “Saved Recipes” page	Recipes of patients with selected dietary restriction are displayed

6. AI Tools

6.1. AI Tools Used

6.1.1. Chat GPT 4

6.2. Prompts Used

6.2.1. Can you please write a paragraph (up to 10 lines) about:
What is food allergy?
IgE-mediated and non-IgE allergies
management of food allergies. Remember to include references.

6.2.2. what is MongoDB? write with a high level of speech. write as a seminar-writing expert. Remember to include references.

6.2.3. What is OpenAI's 'GPT-4' API ? write with a high level of speech. write as a seminar-writing expert. Remember to include references if there's any.

6.2.4. I'm a software engineering student, working currently on my final project. Here's the introduction section of it. After checking it, please suggest names for our web application: [Introduction part added].

6.2.5. what is LLaMA? write with a high level of speech. write as a seminar-writing expert. Remember to include references.

7. References

1. Ahmed, I., & Islam, R. (2024). Gemini-the most powerful LLM: Myth or Truth. Authorea Preprints.
2. Chandra, D. G., Prakash, R., & Lamdharia, S. (2012, November). A study on cloud database. In 2012 Fourth International Conference on Computational Intelligence and Communication Networks (pp. 513-519). IEEE.
3. Dormann, W. (2016, October). Google authentication risks on iOS. In Proceedings of the 1st International Workshop on Mobile Development (pp. 3-5).
4. Komarova, A., Menshchikov, A., Negols, A., Korobeynikov, A., Gatchin, Y., & Tishukova, N. (2018). Comparison of authentication methods on web resources. In Proceedings of the Second International Scientific Conference "Intelligent Information Technologies for Industry"(IITI'17) Volume 1 (pp. 104-113). Springer International Publishing.
5. Lee, C., Kim, S., Kim, J., Lim, C., & Jung, M. (2022). Challenges of diet planning for children using artificial intelligence. Nutrition Research and Practice, 16(6), 801.
6. Sicherer, S. H., & Sampson, H. A. (2010). Food allergy. Journal of allergy and clinical immunology, 125(2), S116-S125.
7. Steinman, H. (2010). Nutritional implications of food allergies. South African Journal of Clinical Nutrition, 23(1).
8. Touvron, H., Martin, L., Stone, K., Albert, P., Almahairi, A., Babaei, Y., ... & Scialom, T. (2023). Llama 2: Open foundation and fine-tuned chat models. arXiv preprint arXiv:2307.09288.
9. Wang, Y., & Zhao, Y. (2023). Gemini in reasoning: Unveiling commonsense in multimodal large language models. arXiv preprint arXiv:2312.17661.