AI-DIET MEAL GENERATOR

A PROJECT REPORT

Submitted by

RANJITH KUMARAN G (2116210701209)
SAKTHIVEL S P (2116210701224)
SAM LAWRANCE V (2116210701225)

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

RAJALAKSHMI ENGINEERING COLLEGE

ANNA UNIVERSITY, CHENNAI

MAY 2024

RAJALAKSHMI ENGINEERING COLLEGE, CHENNAI

BONAFIDE CERTIFICATE

Certified that this Thesis titled **"AI-DIET MEAL GENERATOR**" is the bonafide work of "**RANJITH KUMARAN G (2116210701209), SAKTHIVEL SP (2116210701224), SAM LAWRANCE V (2116210701225)** who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

SIGNATURE

Mr.Vijay K B.Tech., M.E.,

PROJECT CO-ORDINATOR

Assistant Professor (SG)

Department of Computer Science and Engineering

Rajalakshmi Engineering College

Chennai - 602 105

Submitted to Project Viva-Voce Examination held on_____

Internal Examiner **External Examiner**

ABSTRACT

The AI-Diet Meal Generator offers a personalized solution to the challenge of maintaining a healthy diet by harnessing artificial intelligence. It analyzes user data, including dietary restrictions, health goals, and culinary preferences, to generate tailored meal plans optimized for nutritional content and portion sizes. The system accommodates diverse dietary requirements and promotes culinary diversity by suggesting a range of recipes from various cuisines. Through its intuitive interface, users can explore recipe alternatives, adjust serving sizes, and access nutritional information. By emphasizing individualization and adaptability, the AI-Diet Meal Generator empowers users to cultivate sustainable dietary habits, leading to improved health outcomes and overall well-being. This innovative approach to meal planning represents a promising step towards promoting healthier lifestyles in an increasingly digitalized world.

ACKNOWLEDGMENT

First, we thank the almighty god for the successful completion of the project. Our sincere thanks to our chairman **Mr. S. Meganathan B.E., F.I.E.,** for his sincere endeavor in educating us in his premier institution. We would like to express our deep gratitude to our beloved Chairperson **Dr. Thangam Meganathan Ph.D.,** for her enthusiastic motivation which inspired us a lot in completing this project and Vice Chairman **Mr. Abhay Shankar Meganathan B.E., M.S.,** for providing us with the requisite infrastructure.

We also express our sincere gratitude to our college Principal, **Dr. S. N. Murugesan M.E., PhD.,** and **Dr. P. KUMAR M.E., PhD, Director computing and information science , and Head Of Department of Computer Science and Engineering** and our project coordinator **Vijay K B.Tech., M.E., Assistant Professor (SG)** for her encouragement and guiding us throughout the project towards successful completion of this project and to our parents, friends, all faculty members and supporting staffs for their direct and indirect involvement in successful completion of the project for their encouragement and support.

RANJITH KUMARAN G

SAKTHIVEL S P

SAM LAWRANCE V

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

In an age characterized by an increasing awareness of the importance of nutrition and its profound impact on health, the quest for a balanced diet has become a focal point of modern living. However, the intricacies of individual dietary needs, combined with the fast-paced nature of contemporary lifestyles, have rendered traditional approaches to meal planning inadequate. Recognizing this pressing challenge, the AI-Diet Meal Generator emerges as a groundbreaking solution, harnessing the capabilities of artificial intelligence to revolutionize the way we conceptualize and execute dietary plans. By integrating sophisticated algorithms and machine learning principles, this innovative system aims to provide users with customized meal suggestions tailored to their unique preferences, dietary restrictions, and health goals.

The core objective of the AI-Diet Meal Generator is to address the inherent complexities and barriers associated with achieving a balanced diet in today's fast-paced world. Through its advanced analytical capabilities, the system seeks to decipher the intricate interplay of factors influencing dietary choices, including nutritional requirements, taste preferences, cultural influences, and lifestyle constraints. By leveraging machine learning algorithms, the AI-Diet Meal Generator continuously refines its recommendations based on user feedback and evolving nutritional guidelines, ensuring relevance and efficacy in promoting healthier eating habits over time.

The challenge entails creating an AI-driven player for Pong by leveraging the evolutionary capabilities of NEAT, a specialized genetic algorithm adept at evolving neural networks. The AI must autonomously learn, adapt, and refine its gameplay strategies through successive generations of evolutionary iterations.

1.1 SCOPE OF THE WORK

The scope of the AI-Diet Meal Generator project encompasses the development of a sophisticated software platform integrating advanced algorithms and machine learning models to analyze user data and generate personalized meal recommendations. Key aspects include data integration, personalization, and user interface design to ensure a seamless and intuitive experience. Evaluation and validation will be conducted to assess effectiveness, usability, and adherence to ethical and regulatory standards. Scalability and deployment considerations will ensure compatibility and long-term sustainability, while ethical principles will guide privacy protection and regulatory compliance throughout the project lifecycle. Overall, the project aims to revolutionize dietary planning by empowering individuals to make informed, personalized, and sustainable dietary choices for improved health and well-being.

1.2 AIM AND OBJECTIVES OF THE PROJECT

The aim of the AI-Diet Meal Generator project is to develop an innovative software solution that utilizes artificial intelligence to revolutionize dietary planning. This involves creating a platform capable of analyzing user data, including dietary preferences, restrictions, and health goals, to generate personalized meal recommendations. The objectives include integrating advanced algorithms for enhanced accuracy, designing an intuitive user interface for seamless navigation, and evaluating the platform's effectiveness and usability.

1.3 RESOURCES

- To accomplish the goals of the AI-Diet Meal Generator project, various resources will be required. These include:
- Human Resources: A multidisciplinary team comprising software developers, data scientists, nutritionists, user interface designers, and domain experts will be needed to design, develop, and evaluate the platform.A properly functioning workstation (PC, laptop, net-books etc.) to carry out desired research and collect relevant content.
- Unlimited internet access.
- Unrestricted access to the university lab in order to gather a variety of literature including academic resources (for e.g. Prolog tutorials, online programming examples, bulletins, publications, e-books, journals etc.), technical manuscripts, etc. Prolog development kit in order to program the desired system and other related software that will be required to perform our research.

1.4 MOTIVATION

The motivation behind the AI-Diet Meal Generator project stems from a recognition of the profound impact that dietary habits have on individuals' health and well-being, coupled with the challenges inherent in navigating the complexities of modern dietary choices. By harnessing the power of artificial intelligence, this project aims to empower individuals to overcome these challenges by providing personalized, data-driven meal recommendations tailored to their unique preferences, dietary restrictions, and health objectives. Through innovation in software development, data analytics, and user experience design, the AI-Diet Meal Generator seeks to revolutionize the way people approach dietary planning, promoting healthier lifestyles, and fostering long-term habits that support improved health outcomes and overall quality of life..

CHAPTER 2
LITRETURE SURVEY

The literature survey for "A novel artificial intelligence method for weekly dietary menu planning" likely encompasses an examination of traditional dietary planning methods and their limitations, along with an exploration of previous research utilizing artificial intelligence techniques, computational optimization algorithms, and nutritional guidelines. This review provides context for the proposed AI method by identifying gaps in existing approaches and highlighting opportunities for innovation in personalized dietary menu planning. Additionally, it discusses related studies and applications, shedding light on the potential benefits and challenges associated with AI-driven dietary planning solutions, ultimately laying the groundwork for the development and evaluation of the novel approach presented in the paper.

The literature survey for "PROTEIN AI advisor" explores research on dietary recommendation systems, AI applications in nutrition, and knowledge-based frameworks. It reviews traditional and AI-driven methods, including expert systems and machine learning, focusing on integrating nutritional expertise to align meal suggestions with guidelines, thus informing the development of personalized nutrition guidance.

The literature survey for "Towards diet management with automatic reasoning and persuasive natural language generation" explores research on dietary management systems, AI applications in nutrition, and persuasive communication. It reviews traditional methods and AI-driven approaches, including expert systems and natural language generation, focusing on integrating persuasive strategies to enhance adherence to dietary recommendations and inform personalized nutrition guidance development.

The literature survey for "Application of artificial intelligence for weekly dietary menu planning" explores AI techniques in dietary planning, including expert systems, genetic algorithms, neural networks, and machine learning. It reviews case studies and empirical

research on AI-driven systems' effectiveness in improving nutrition and adherence to guidelines, informing AI-based algorithm development for personalized nutrition guidance.

The literature survey for "Automatic meal planning using artificial intelligence algorithms in computer-aided diabetes therapy" explores AI applications in diabetes management and dietary planning, covering expert systems, machine learning, and optimization methods for personalized meal planning. It reviews computational modeling of blood glucose, nutritional science, and clinical guidelines, highlighting AI-driven systems' effectiveness in glycemic control and health outcomes, thus informing AI-based diabetes therapy development.

The literature survey for "Application of Artificial Intelligence for weekly meal planning for children" explores AI in dietary planning, focusing on children. It reviews AI techniques like expert systems, genetic algorithms, neural networks, and machine learning for creating personalized children's menus. It examines empirical research on AI's effectiveness in promoting healthy eating and addressing nutritional deficiencies, and touches on pediatric nutrition guidelines, obesity prevention, and dietary interventions, informing AI-based personalized dietary guidance for children.

The literature survey for "Smart Cuisine: Generative recipe & ChatGPT powered nutrition assistance for sustainable cooking" explores computational techniques in recipe generation, NLP algorithms for nutrition assistance, and sustainable cooking practices. It reviews machine learning models and computational creativity for personalized recipes, NLP algorithms like ChatGPT for real-time nutrition and cooking advice, and sustainability practices such as ingredient sourcing and waste reduction. This survey informs the development of Smart Cuisine, advancing technology-driven solutions for healthier, sustainable cooking.

The literature survey for "An artificial intelligence approach to nutritional meal planning for cancer patients" explores AI applications in healthcare, focusing on dietary planning

for cancer patients. It reviews AI techniques like expert systems, machine learning, and optimization for personalized meal planning, oncology nutrition guidelines, dietary interventions, and symptom management. The survey examines empirical research on AI-driven meal planning's effectiveness in supporting nutrition, managing side effects, and improving health outcomes, informing AI-based dietary guidance development in oncology to enhance supportive care and quality of life for cancer patients.

The literature survey for "Fitness Application Generating Recipes Using Artificial Intelligence" explores AI applications in fitness, nutrition, and recipe generation. It reviews AI techniques like machine learning, NLP, and recommendation systems for personalized fitness recipes. The survey examines dietary guidelines, nutritional needs for athletes, and interventions to support fitness training, highlighting empirical research on AI-driven recipe generation's effectiveness in promoting healthy eating and optimizing nutrient intake. This informs AI-based personalized dietary guidance development in fitness apps, advancing technology-driven solutions for healthier lifestyles and improved fitness outcomes.

The literature survey for "The Potential of Generative AI in Personalized Nutrition" likely delves into existing research on artificial intelligence applications in personalized nutrition and dietary planning. This review would encompass studies exploring various generative AI techniques, including generative adversarial networks (GANs), variational autoencoders (VAEs), and deep learning models, applied to generate personalized dietary recommendations. Additionally, the survey may investigate related areas such as nutritional science, dietary guidelines, and behavioral psychology to understand the factors influencing dietary choices and adherence. Furthermore, the literature survey may touch upon empirical research or case studies demonstrating the effectiveness and feasibility of generative AI-driven approaches in promoting healthier eating habits, addressing nutritional deficiencies, and improving overall health outcomes. Through synthesizing findings from these areas of research, the literature survey informs the

potential applications and implications of using generative AI in personalized nutrition interventions, facilitating the advancement of technology-driven solutions for optimizing dietary planning and promoting healthier lifestyles.

.

CHAPTER 3

SYSTEM DESIGN

3.1 GENERAL

The system design for the AI-Diet Meal Generator involves creating an intuitive user interface, integrating advanced algorithms for personalized meal recommendations, and ensuring scalability and compatibility for widespread adoption.

SYSTEM ARCHITECTURE DIAGRAM

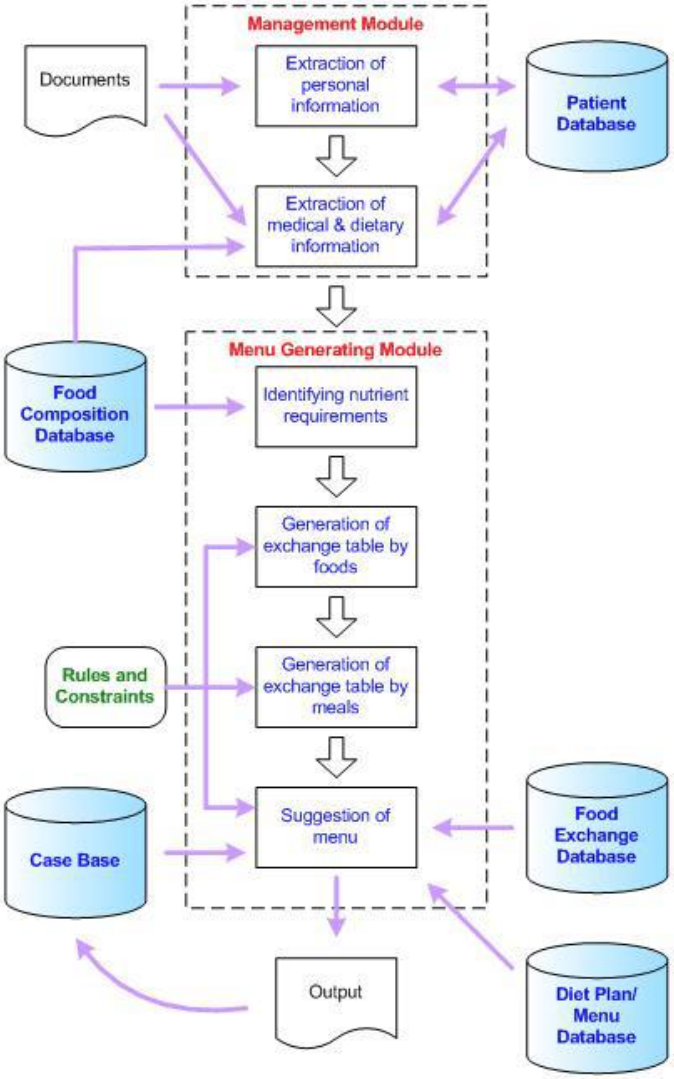


Fig 3.1: System Architecture

3.2 DEVELOPMENTAL ENVIRONMENT

3.2.1 HARDWARE REQUIREMENTS

The hardware requirements may serve as the basis for a contract for the system's implementation. It should therefore be a complete and consistent specification of the entire system. It is generally used by software engineers as the starting point for the system design.

Table 3.1 Hardware Requirements

COMPONENTS	SPECIFICATION
PROCESSOR	Intel Core i5
RAM	2 GB RAM
PROCESSOR SPEED	MINIMUM 1.1 GHz

3.2.2 SOFTWARE REQUIREMENTS

The software requirements document is the specifications of the system. It should include both a definition and a specification of requirements. It is a set of what the system should rather be doing than focus on how it should be done. The software requirements provide a basis for creating the software requirements specification. It is useful in estimating the cost, planning team activities, performing tasks, tracking the team, and tracking the team's progress throughout the development activity.

Python IDLE, and **chrome** would all be required.

CHAPTER 4
PROJECT DESCRIPTION

4.1 METHODOLODGY

The methodology for developing the AI-Diet Meal Generator will involve a systematic and iterative process, blending elements of agile software development with user-centered design principles. Initially, requirements will be gathered through stakeholder engagement, including nutritionists, dieticians, and potential users, to define project objectives and identify key features. Subsequently, design and prototyping phases will focus on creating intuitive user interfaces, incorporating feedback to ensure usability and alignment with user needs. Development will encompass backend algorithm implementation for data analysis and personalized recommendation generation, alongside frontend development for responsive and accessible user interfaces. Testing and validation cycles will be iterative, with ongoing user feedback informing refinements to functionality and design. Deployment will occur in controlled environments, followed by continuous iteration based on user insights and technical considerations. Evaluation will assess the platform's impact on dietary habits and health outcomes, guiding optimization efforts to enhance effectiveness and user satisfaction. Throughout, documentation and knowledge sharing will facilitate transparency and contribute to the wider community's understanding of the project's methodology and outcomes.

4.2 MODULE DESCRIPTION

The AI-Diet Meal Generator comprises several interconnected modules designed to facilitate the personalized meal planning process. The User Interface module provides an intuitive platform for users to input their dietary preferences, health goals, and demographic information. The Data Processing module employs advanced algorithms to analyze user data and generate personalized meal recommendations based on nutritional requirements, culinary preferences, and lifestyle constraints. The Recipe Database module stores a diverse collection of recipes from various cuisines and cultural backgrounds, allowing users to explore alternative meal options. The Feedback module enables users to provide input on suggested meals, helping to refine recommendations over time. Finally, the Administrative module manages system operations, including user authentication, data storage, and performance monitoring, ensuring the platform's reliability and scalability. Together, these modules form a cohesive ecosystem aimed at empowering individuals to make informed and sustainable dietary choices tailored to their unique needs and preferences.

CHAPTER 5
RESULTS AND DISCUSSIONS

5.1 OUTPUT

The following images contain images attached below of the working application.

Example instance of creating a meal plan

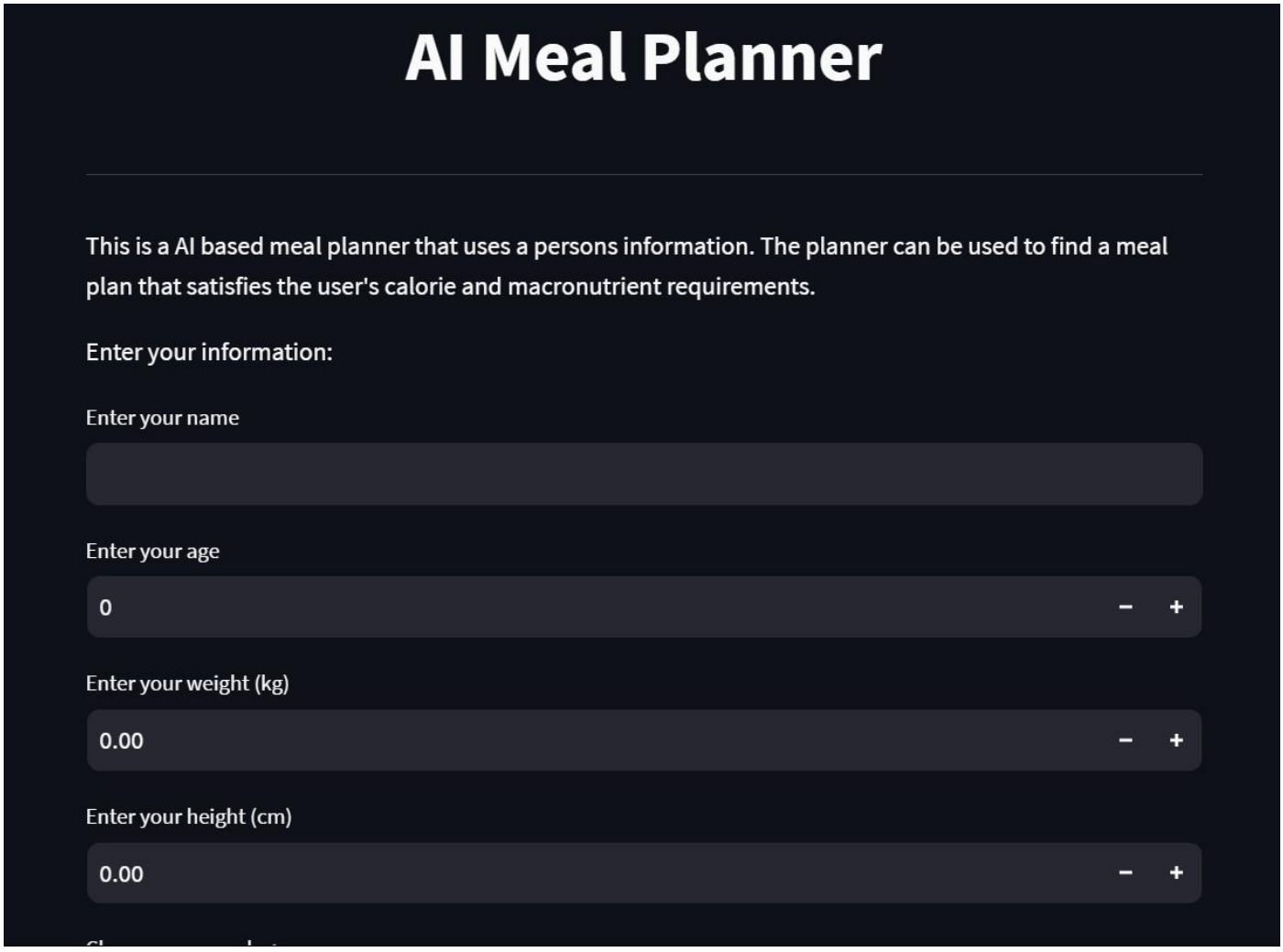
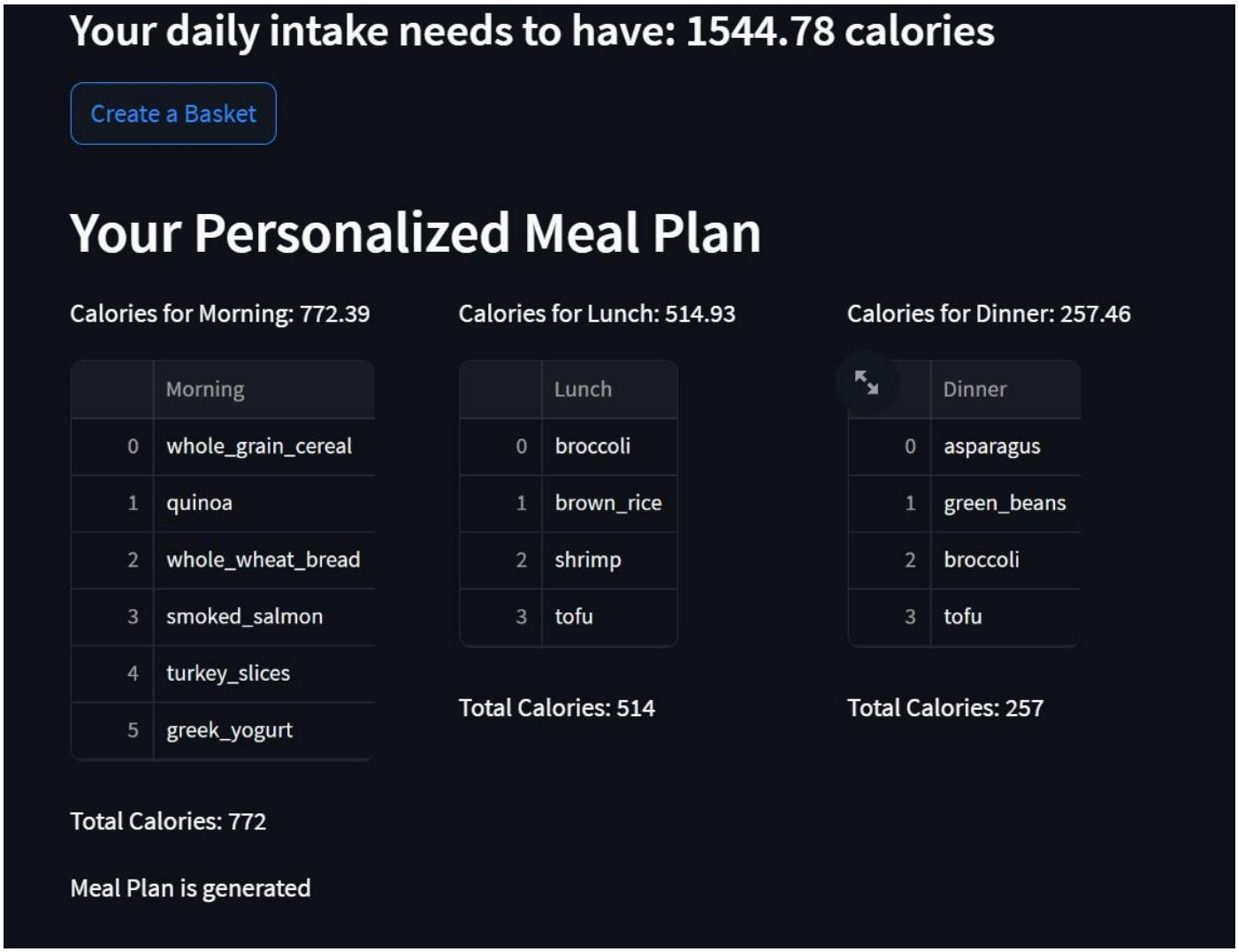


Fig 5.1: Output

Creating a meal plan :



5.2 RESULT

The AI-Diet Meal Generator is a comprehensive software solution that revolutionizes dietary planning by providing personalized meal recommendations tailored to individual preferences, health goals, and lifestyle constraints. Through advanced algorithms and data analysis, the platform generates optimized meal plans that meet users' nutritional needs while accommodating diverse dietary requirements and culinary preferences. Users can explore a wide range of recipes from various cuisines, adjust serving sizes, and access nutritional information to make informed choices. With an intuitive user interface and ongoing feedback mechanisms, the AI-Diet Meal Generator empowers individuals to cultivate sustainable dietary habits, leading to improved health outcomes and overall well-being.

CHAPTER 6

CONCLUSION AND FUTURE ENHANCEMENT

6.1 CONCLUSION

In conclusion, the AI-Diet Meal Generator represents a pioneering solution in the realm of dietary planning, harnessing the power of artificial intelligence to revolutionize the way individuals approach meal selection and consumption. By providing personalized meal recommendations tailored to individual preferences and nutritional needs, the platform empowers users to make informed dietary choices that align with their health objectives and lifestyle constraints. Through its intuitive interface, diverse recipe options, and ongoing feedback mechanisms, the AI-Diet Meal Generator facilitates the cultivation of sustainable dietary habits, ultimately promoting improved health outcomes and enhancing overall well-being in users' lives.

FUTURE ENHANCEMENT

In future iterations, the AI-Diet Meal Generator could incorporate additional features such as real-time nutritional tracking, meal planning automation, and integration with wearable devices or health monitoring apps to provide users with deeper insights into their dietary habits and overall health. Furthermore, leveraging advancements in natural language processing and user interaction technologies could enable more seamless and intuitive interactions, enhancing the user experience. Additionally, expanding the platform's capabilities to include personalized grocery shopping recommendations, meal preparation tips, and community-driven recipe sharing could further enrich the user experience and foster a supportive ecosystem for healthy living. Overall, these enhancements aim to continuously improve the effectiveness, usability, and impact of the AI-Diet Meal Generator in promoting healthier lifestyles and empowering individuals to make informed dietary choice.

APPENDIX

SOURCE CODE:

```
import openai
import streamlit as st

st.title("ChatGPT-like clone")

ANYSCALE_API = st.secrets["anyscale_apikey"]

openai.api_key = ANYSCALE_API
openai.api_base = "https://api.endpoints.anyscale.com/v1"

if "openai_model" not in st.session_state:
    st.session_state["openai_model"] = "mistralai/Mistral-7B-Instruct-v0.1"

if "messages" not in st.session_state:
    st.session_state.messages = []

for message in st.session_state.messages:
    with st.chat_message(message["role"]):
        st.markdown(message["content"])

# Maximum allowed messages
max_messages = (
    20  # Counting both user and assistant messages, so 10 iterations of conversation
)

if len(st.session_state.messages) >= max_messages:
    st.info(
        """Notice: The maximum message limit for this demo version has been reached. We value your interest!
        We encourage you to experience further interactions by building your own application with instructions
        from Streamlit's [Build conversational apps](https://docs.streamlit.io/knowledge-base/tutorials/build-conversational-apps)
        tutorial. Thank you for your understanding."""
    )
```

```
else:
    if prompt := st.chat_input("What is up?"):
        st.session_state.messages.append({"role": "user", "content": prompt})
        with st.chat_message("user"):
            st.markdown(prompt)

        with st.chat_message("assistant"):
            message_placeholder = st.empty()
            full_response = ""
            for response in openai.ChatCompletion.create(
                    model=st.session_state["openai_model"],
                    messages=[
                        {"role": m["role"], "content": m["content"]}
                        for m in st.session_state.messages
                    ],
                    stream=True,
            ):
                full_response += response.choices[0].delta.get("content", "")
                message_placeholder.markdown(full_response + "▌ ")
            message_placeholder.markdown(full_response)
        st.session_state.messages.append(
            {"role": "assistant", "content": full_response}
        )
import random

food_item_morning = {
    "protein": {
        "eggs": 78,
        "greek_yogurt": 130,
        "cottage_cheese": 206,
        "turkey_slices": 104,
        "smoked_salmon": 117
    },

    "whole_grains": {
        "whole_wheat_bread": 79,
        "oatmeal": 150,
        "quinoa": 222,
```

```
    "whole_grain_cereal": 120,
    "granola": 494
},
"fruits": {
    "berries": 50,
    "bananas": 96,
    "apples": 52,
    "oranges": 62,
    "grapefruit": 52,
    "melon_slices": 30
},
"vegetables": {
    "spinach": 7,
    "tomatoes": 18,
    "avocado": 160,
    "bell_peppers": 25,
    "mushrooms": 15
},
"healthy_fats": {
    "nut_butter": 94,
    "nuts": 163,
    "chia_seeds": 58,
    "flaxseeds": 55,
    "avocado_slices": 50
},
"dairy": {
    "milk": 103,
    "cheese": 113,
    "yogurt": 150,
    "dairy-free_alternatives": 80
},
"other": {
    "honey": 64,
    "maple_syrup": 52,
    "coffee": 2,
    "jam": 49,
    "peanut_butter": 188,
    "cocoa_powder": 12
}
```

```
}


def select_breakfast(target_calories, food_groups):
    calories = 0
    selected_items = []
    total_items = set()
    for foods in food_groups.values():
        total_items.update(foods.keys())

    while abs(calories - target_calories) >= 10 and len(selected_items) < len(total_items):
        group = random.choice(list(food_groups.keys()))
        foods = food_groups[group]
        item = random.choice(list(foods.keys()))

        if item not in selected_items:
            cals = foods[item]
            if calories + cals <= target_calories:
                selected_items.append(item)
                calories += cals

    return selected_items, calories


# Example usage
target_cals = 500
itms, cal = select_breakfast(target_cals, food_item_morning)
print(itms)
print(f"Calories: {cal}")
#
```

REFERENCES

[1] Gaál, B., Vassányi, I., & Kozmann, G. (2005). A novel artificial intelligence method for weekly dietary menu planning. Methods of Information in Medicine, 44(05), 655-664.

[2] Stefanidis, K., Tsatsou, D., Konstantinidis, D., Gymnopoulos, L., Daras, P., Wilson-Barnes, S., ... & Dimitropoulos, K. (2022). PROTEIN AI advisor: a knowledge-based recommendation framework using expert-validated meals for healthy diets. Nutrients, 14(20), 4435

[3] Anselma, L., & Mazzei, A. (2015). Towards diet management with automatic reasoning and persuasive natural language generation. In Progress in Artificial Intelligence: 17th Portuguese Conference on Artificial Intelligence, EPIA 2015, Coimbra, Portugal, September 8-11, 2015. Proceedings 17 (pp. 79-90). Springer International Publishing.

[4] Gaál, B., Vassányi, I., & Kozmann, G. (2007). Application of artificial intelligence for weekly dietary menu planning. Advanced Computational Intelligence Paradigms in Healthcare-2, 27-48.

[5] Bulka, J., Izworski, A., Koleszynska, J., Lis, J., & Wochlik, I. (2009, February). Automatic meal planning using artificial intelligence algorithms in computer aided diabetes therapy. In 2009 4th International Conference on Autonomous Robots and Agents (pp. 393-397). IEEE.

[6] Kalra, S., Arora, G., & Aggarwal, R. Application of Artificial Intelligence for weekly meal planning for children. IIT

Delhi.

[7] Kansaksiri, P., Panomkhet, P., & Tantisuwichwong, N. (2023). Smart Cuisine: Generative recipe & ChatGPT powered nutrition assistance for sustainable cooking. Procedia Computer Science, 225, 2028-2036.

[8] Fox, R., & Bui, Y. (2015). An artificial intelligence approach to nutritional meal planning for cancer patients. In Artificial Intelligence Perspectives and Applications: Proceedings of the 4th Computer Science On-line Conference 2015 (CSOC2015), Vol 1: Artificial Intelligence Perspectives and Applications (pp. 215-224). Springer International Publishing.

[9] Pradhan, S., Sasidharan, S., & Verma, V. (2023). Fitness Application Generating Recipes Using Artificial Intelligence. Kilby, 100, 7th.

[10] OEWEL, B., GULUZADE, L., ZHU, J., & HUANG, Y. (2024). The Potential of Generative AI in Personalized Nutrition.