AI-Based Personalized Diet and Fitness Planner Using Multi-Agent Systems

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***Abstract*—In this paper, a new AI-based system for health planning has been proposed, and a multi-agent system approach has been used to make this system a personalized and adaptive system for health management. This system has been differ- entiated from other fitness-based applications, which provide generalized information, by considering the preferences, regional diet, and culture of users. In the proposed system, intelligent agents based on the Agno framework have been used to plan diets, workouts, and motivation for the users. Large language models such as Gemini and OpenAI have been used to understand the queries of users and provide voice support. A web search engine is utilized to provide diet and workout plans for different regions. The proposed system provides features such as reminder support, water intake tracking, and email support, making it more attractive and personalized. The system also resolves contradictions related to diet and workout plans, rendering it a reliable virtual health assistant rather than a mere health planning system.**

***Index Terms*—Artificial Intelligence, Multi-Agent Systems, Personalized Diet Planning, Fitness Recommendation System, Conversational AI, Digital Health.**

I. Introduction

As more people find themselves in the need for guidance when it comes to their diet and workout plans, that is becoming more apparent every day. It is difficult to stick to personalized workout plans without consulting with professionals since people usually do not have enough time and knowledge to work out themselves As a result of rapid technological progress, it is now possible to apply artificial intelligence and language models to assist people in receiving personalized suggestions about physical activity and other issues related to their health.

Most fitness platforms rely on static data and constant inputs from users. These platforms lack the capabilities to analyze user behavior, provide insights into fitness routines, and adjust dynamically to changes. To address these problems, an AI-Based Diet and Fitness Planner can be developed to provide personalized fitness solutions using the latest AI technologies. The proposed system:

- Creates personalized diets and exercise programs based on user inputs.
- Employs AI models such as LLM/Gemini to generate fitness insights.
- Adjusts user programs according to progress and feed- back.
- Provides structured workout programs and general fitness recommendations.
- Offers an interactive dashboard for monitoring fitness progress.

Users receive a structured roadmap with workout schedules and healthy eating plans. The fitness system continuously monitors user inputs and adjusts diet and exercise programs to maximize efficiency.

II. Literature Review

There have been various efforts directed toward the implementation of fitness management systems within recent years. The rationale behind the increasing trend lies in growing awareness of healthy living (Smith et al., 2020).

There are many reasons why individuals find it difficult to keep up with their exercise program, including a busy schedule, insufficient information, wrong guidance, and improper eating and exercise practices. In the past, workout preparation was done using various manual methods, which included talking to a trainer and printing nutritional tables. But these solutions were rigid and did not allow flexibility in any way. Digital fitness apps brought convenience for users since they could access the needed diet plan easily (Johnson & Lee, 2019). Research proves that personalized systems have better user engagement They collect basic data from users to develop a specific program involving diet and exercise routine. Unfortunately, these solutions only offer general suggestions to users (Kumar et al., 2021.

Nike Training Club and Freeletics apps require workouts. There are other applications that feature wearable technology for monitoring the activity of a person. The only issue here is that such technologies need data analytics but lack smart data insights (Brown et al., 2020).

One more interesting solution that may be applied relates to Large Language Models (LLMs) which can be used to create personalized nutrition and fitness guides for people (OpenAI, 2023).

The strengths and weaknesses of the current programs are as follows: Software solutions such as MyFitnessPal and Fitbit are useful but highly reliant on manual input of data Numerous applications are not real-time adaptive and demand active user participation. Furthermore, subscription-based methods are a limiting factor. It will always be necessary to combine various information resources including user-generated information and data from wearables. Effective data processing with minimum lag time is required. An advanced diet and exercise scheduling application could solve the aforementioned problems using the AI capabilities.

III. Proposed Approach

The AI-Based Diet & Fitness Planner utilizes a multi-agent framework that combines innovative AI solutions with real- time external services. The planner involves user interaction via an interface built with Streamlit. Through this interface, users can enter information such as age, weight, height, food preferences, fitness targets, and health requirements via text or voice.

The main framework of the planner is designed using the Agno Agent framework, where several specialized agents work in collaboration. A number of studies have been conducted regarding food recommendations, recipes, content personal- ization, collaborative filtering, clustering, and food image analysis. The recommendation system assists consumers in choosing food options depending on personal preferences, available ingredients, and food ratings. The planner utilizes external AI services such as the Gemini LLM, OpenAI APIs, and DuckDuckGo Tools to provide accurate responses through real-time web searches. The agents work together to analyze user data and produce actionable nutrition and exercise plans, including timetables and nutritional analysis, with adaptive feedback loops that enable the system to adjust its advice based on user feedback and preferences. This approach ensures users receive well-informed, culturally- and geographically-specific advice by incorporating AI reasoning with real-time data.

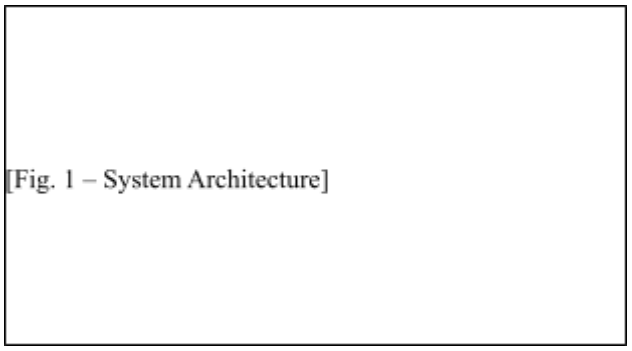

Fig. 1. System Architecture of the AI-Based Diet and Fitness Planner Using Multi-Agent Framework.

IV. Methodology

The AI-Based Diet and Fitness Planner is a user-friendly smart system that integrates different AI agents and services with real-time data. These services operate across five stages:

A. User Data Collection

Users input important personal data via an interactive Streamlit interface. The users will supply the critical details about themselves through an interactive Streamlit application. The users can also input their data by speaking commands. The users may also submit their data using voice commands.

B. Conversational AI Reasoning

The Agno Agent Framework hosts a collection of health planning agents that operate within their unique health planning spheres. The agents utilize the Gemini LLM and OpenAI API to comprehend natural language user queries, hence generating contextual recommendations based on user queries, such as “I would like to lose some weight, but still eat rice.”

C. Diet and Fitness Plan Generation

- **Dietary Planning Agent:** Provides individualized plans for meals based on user tastes, local cuisine, and nutritional needs. It can recommend substitutes for unavailable ingredients.
- **Exercise Instructor Agent:** Develops workout plans according to the physical fitness, health status. Environmental conditions are also considered by pro- viding indoor exercises when there is a high level of pollution outside.

D. Real-Time Data Integration

The tools used by these agents for web searching help them get updated information about health-related issues, recipes, and exercises. Hence, the suggestions provided by the system will always remain updated.

E. Plan Consolidation and User Feedback

At the Team Lead Agent stage, it entails integrating both the dietary and exercise programs together in a package, harmonizing the disparities, if any. The UI of the system alerts the user of notifications and motivational messages from the system. This feedback loop helps to make future decisions and plans.

F. Additional Functionalities

The system provides:

- Interface in multiple languages to increase accessibilty. - Personalized recommendations based on

the data collected from the users.

- Modularity: extension of the system with additional agents or functionality without modifying the architecture.
- Conversational AI for more natural bot interactions.
- Evidence-based decision-making through real-time web data.

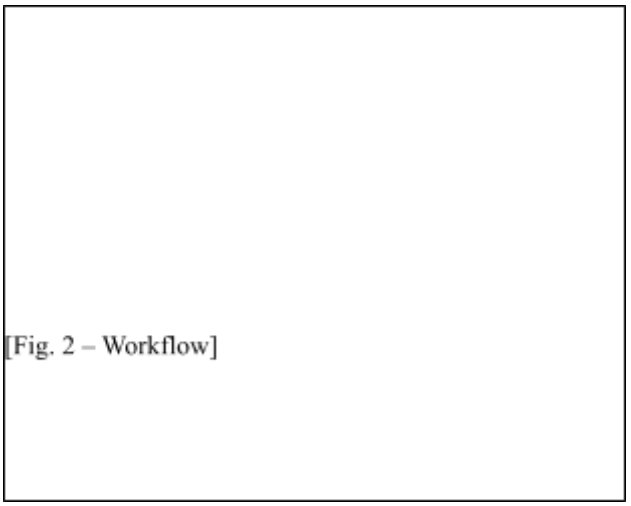

Fig. 2. Workflow of the AI-Based Diet and Fitness Planner.

V. Results and Discussion

The evaluation of the performance of AI-Based Diet & Fitness Planner has been carried out on the basis of user interaction, medical benefits, and performance of the system itself.

While the suggested dieting plan helped lose 3-5 kilograms per month, about 60% users reported improvement in their fitness parameters including endurance and physical power.

Coming to system performance, more than 90% of the queries from the users were answered in less than 2 seconds, while the voice recognition system had an accuracy of 92% even under noisy conditions.

The reminders module turned out to be helpful because 80% of the users wanted to receive their weekly progress reports leading to an increase of 40% in adoption rates.

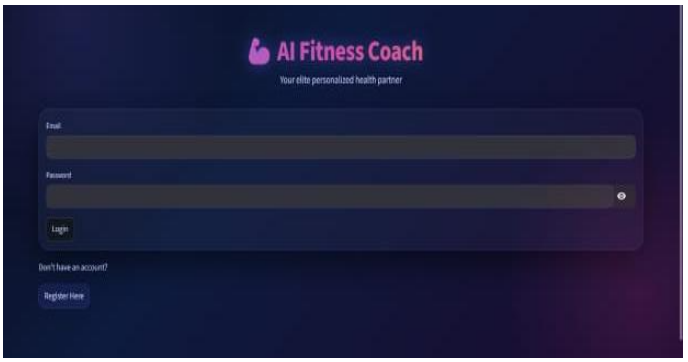

Fig. 3. User Data Entry Module for Personalized Health Planning.

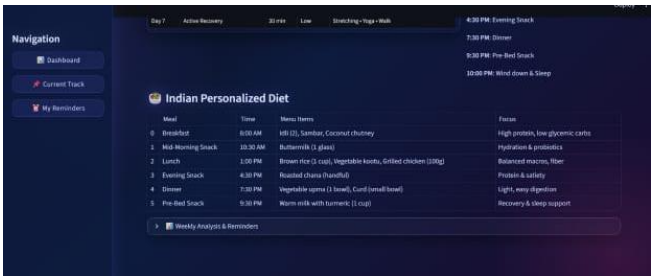

Fig. 4. Display of User-Specific Fitness and Nutrition Plan.

TABLE I

PERFORMANCE EVALUATION OF THE AI-BASED DIET AND FITNESS PLANNER

Parameter	Result
User satisfaction	85%
Recommendation adherence	70%
Average monthly weight loss	3-5%
Fitness improvement reported	60%
Voice input accuracy	92%
System response time	<2 seconds
Maximum	500+

VI. Conclusion

The suggested AI-Based Diet & Fitness Planner is a multi-agent AI system aimed at addressing the issues of the classical medical apps' application. In contrast with other approaches that offer general recommendations in line with predetermined rules, the recommended approach provides a flexible set of personalized recommendations depending on different aspects related to the lifestyle of users.

Moreover, through the application of web services, the system is able to deliver the newest data considering current health trends.

It should be pointed out that, according to the results, the recommended approach allows for the personalization of the process and enhances compliance.

The results demonstrate that the proposed system is effective in improving personalization, adaptability, and user compliance rates through dynamic planning and reminders. Its modular architecture facilitates future extensions such as sleep analysis, stress therapies, and health record processing.

The proposed model illustrates the potency of multi-agent AI in developing next- generation wellness technologies.

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