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DietCoach: AI-Powered Personal Diet and Workout Recommender System

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Abstract **- Personalized healthcare and fitness guidance have become increasingly important due to the growing prevalence of unhealthy lifestyles and lifestyle-related diseases. This paper presents an AI-powered mobile application that generates customized diet and workout recommendations according to individual user characteristics such as age, gender, weight, height, activity level, dietary preferences, and fitness goals. The proposed system combines rule-based health metric analysis with a large language model (LLM)-based inference engine to deliver adaptive and context-aware recommendations in real time. The application is developed using Flutter to support cross-platform mobile deployment, while Firebase is utilized for cloud synchronization and local offline storage respectively. The system calculates important physiological parameters including Body Mass Index (BMI), Basal Metabolic Rate (BMR), and daily calorie requirements before generating personalized plans. In addition, external nutrition APIs are integrated to provide updated food and exercise information. Unlike conventional fitness applications that rely on static templates and generic suggestions, the proposed system provides interactive, scalable, and dynamically adjustable recommendations through AI-driven processing. Experimental evaluation demonstrates that the application can generate personalized responses with low latency while improving user engagement and accessibility. The proposed framework offers a practical and scalable solution for intelligent digital health and fitness management.**

Keywords – AI, Personalized Recommendation, Diet Planning, Workout Recommendation, Flutter, Firebase, Mobile Healthcare, LLM.

I. INTRODUCTION

The rapid growth of digital healthcare technologies has significantly transformed the way individuals manage their fitness and nutritional habits. In recent years, increasing health issues such as obesity, diabetes, cardiovascular disorders, and stress-related conditions have highlighted the importance of maintaining a balanced lifestyle. However, many people struggle to follow appropriate diet and exercise routines due to lack of personalized guidance, limited awareness, and busy daily schedules. As a result, there is a growing demand for intelligent systems capable of providing customized health recommendations according to individual requirements.

Traditional fitness and diet applications generally offer static plans that are designed for a broad audience rather than for specific users. These systems often fail to consider important personal factors such as age, body composition, activity level, dietary restrictions, and fitness goals.

Consequently, users may receive recommendations that are either ineffective or difficult to follow consistently. Moreover, many existing platforms lack adaptability and real-time interaction, reducing long-term user engagement and satisfaction.

Recent advancements in Artificial Intelligence (AI) and Machine Learning (ML) have enabled the development of intelligent healthcare applications with enhanced personalization capabilities. AI-driven recommendation systems can analyze user-specific information and generate context-aware suggestions for nutrition and physical activities. In addition, Large Language Model (LLM)-based technologies provide conversational interaction, enabling users to receive more natural, explainable, and adaptive guidance. These technologies have created new opportunities for developing scalable and user-friendly digital fitness solutions.

The proposed AI-powered personal diet and workout recommender system is designed to provide personalized fitness and nutritional recommendations through a mobile application environment. The system collects user information such as age, height, weight, gender, activity level, dietary preferences, and fitness objectives. The processed information is then utilized by an AI-based inference engine to generate customized meal plans and workout routines.

The application is implemented using Flutter to support cross-platform mobile deployment and improved user accessibility. Firebase is used for cloud-based authentication and real-time data synchronization. The system also supports progress tracking, notification reminders, and dynamic recommendation updates to improve user consistency and engagement. By combining cloud and local storage mechanisms, the application ensures both performance efficiency and data availability under different network conditions.

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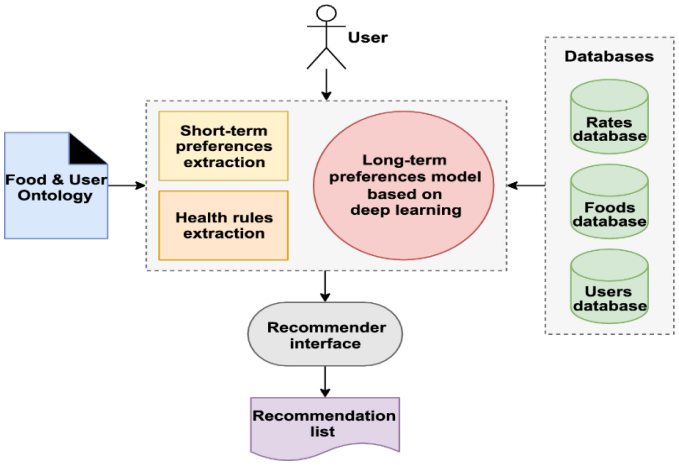

Fig. 1 AI-Powered Personal Diet and Workout Recommender System

The primary objective of the proposed system is to develop an intelligent, scalable, and adaptive healthcare assistant capable of delivering personalized diet and workout recommendations in real time. Unlike conventional fitness applications that rely on generalized templates, the proposed framework focuses on context-aware and user-centric guidance using AI technologies. The developed system aims to improve overall fitness management, encourage healthier lifestyle habits, and provide a practical solution for personalized digital healthcare applications.

II. LITERATURE SURVEY

Several researchers have explored the application of Artificial Intelligence, Natural Language Processing, and recommendation systems in healthcare, nutrition, and fitness management. Existing studies demonstrate significant progress in personalized health guidance; however, many limitations still remain in terms of integration, scalability, adaptability, and real-time implementation.

Yang et al. (2024) in Smart Health proposed ChatDiet, an LLM-powered chatbot framework that combines user-specific data with general nutritional knowledge to deliver personalized, explainable, and interactive diet recommendations. However, this study focuses solely on nutrition and does not extend to workout planning or mobile app deployment. Similarly, Zhou et al. (2022) in IEEE Reviews in Biomedical Engineering reviewed various Natural Language Processing (NLP)techniques rule-based, statistical, and deep learning approaches applied in healthcare for decision support, hospital management, and personal care. While informative, their work remains theoretical and lacks a real-time implementation for integrated diet or workout recommendations.

Al-Zaidi and Vagner (2020) in IEEE CogInfoCom introduced a smart sensor-based AI analyzer that collects biological data such as hormones, metabolism, and glucose levels to generate customized diet and workout plans. Despite its innovation, the system's dependence on specialized hardware sensors limits its scalability and accessibility for regular mobile users. Bhandari et al. (2025) developed an AI powered fitness and diet recommendation system leveraging generative models to create personalized workout and meal plans. Although effective, this approach relies on static templates, which can restrict the depth of personalization.

A systematic review published in the Nutrients journal (2025) by multiple authors explored various machine learning and deep learning techniques in AI-based diet IJIRT 186139 recommender systems, highlighting data sources such as blood, stool, and self-reports. However, the study identified a gap in real-time, comprehensive solutions that integrate both diet and workout functionalities. Liu et al. (2022) proposed the Privacy-Preserving Personalized Fitness Recommender System (P3FitRec), which applies deep learning on wearable data to provide exercise distance, speed, and heart-rate guidance while maintaining user privacy. Although it protects personal identifiable information (PII), it offers limited dietary recommendations.

Toledo et al. (2019) designed a Food Recommender System featuring a multi-layer architecture that captures user preferences and nutritional data to suggest meals. Nonetheless, it lacks adaptive AI driven personalization and does not dynamically update over time. Finally, Carl Anderson (2018) provided a comprehensive survey of food recommender systems, discussing types such as content-based and collaborative filtering models, along with their applications and data sources. However, this study remains broad and does not specifically address the integration of diet and fitness recommendations within a unified AI-based framework.

From the reviewed literature, it is evident that existing systems provide valuable contributions in isolated areas of healthcare recommendation. Nevertheless, there remains a significant research gap in developing a scalable, mobile-based, AI-powered framework capable of delivering integrated, real-time, personalized diet and workout recommendations through an interactive and user-friendly environment.

III. RESEARCH GAP AND PROBLEM IDENTIFICATION

Existing diet and fitness recommendation systems mainly focus on either nutrition planning or workout guidance separately. Many applications provide static and generalized recommendations that lack real-time personalization and adaptability. Some systems also depend on wearable sensors, limiting accessibility for regular mobile users.

Additionally, most existing solutions do not integrate conversational AI, offline accessibility, and cross-platform mobile support within a single framework. Therefore, there is a need for an intelligent and scalable system capable of generating personalized diet and workout recommendations in real time.

The proposed system addresses these limitations by integrating AI-based recommendation techniques with Flutter, Firebase to provide adaptive, user-friendly, and mobile-based health guidance.

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IV. PROPOSED SYSTEM

The proposed AI-powered personal diet and workout recommender system is developed to provide intelligent and personalized health guidance through a mobile application platform. The system generates customized diet and workout recommendations based on user-specific parameters such as age, gender, height, weight, activity level, dietary preferences, and fitness objectives.

The framework integrates AI-based recommendation techniques with rule-based physiological calculations including BMI, BMR, and calorie requirement estimation to generate adaptive and context-aware suggestions. The application is implemented using Flutter for cross-platform mobile support, while Firebase is utilized for cloud synchronization and local offline storage respectively.

Unlike conventional fitness applications that provide static recommendations, the proposed system offers real-time personalized guidance, conversational interaction, progress tracking, and notification support. The integration of AI-driven recommendation mechanisms improves user engagement and enhances the overall effectiveness of fitness and nutrition management.

The proposed framework addresses the limitations identified in previous research works by combining personalized diet planning, workout recommendation, mobile accessibility, and intelligent recommendation generation within a unified platform.

1. ARCHITECTURE

The architecture of the proposed system is designed to provide real-time personalized diet and workout recommendations through an intelligent mobile-based platform. The system consists of multiple interconnected modules that work together to collect user data, process health parameters, generate AI-based recommendations, and display results through a user-friendly interface.

The process begins with the user authentication and profile module, where users register and provide personal information such as age, gender, height, weight, activity level, dietary preferences, and fitness goals. The collected information is processed by the data analysis module to calculate important physiological metrics including Body Mass Index (BMI), Basal Metabolic Rate (BMR), and daily calorie requirements.

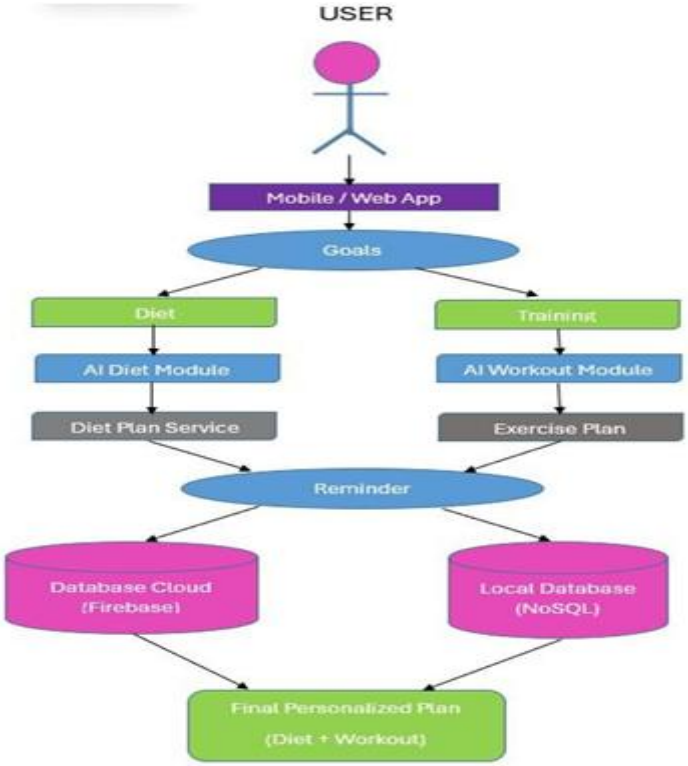

Fig. 2 Proposed Architecture

The processed user data is then passed to the AI-based recommendation engine, which generates personalized diet plans and workout routines using intelligent inference techniques. External nutrition and exercise APIs are integrated to provide updated food and fitness-related information. The generated recommendations are stored using Firebase cloud services local storage to ensure both real-time synchronization and offline accessibility.

Finally, the application displays personalized recommendations, progress tracking information, and notification reminders through the Flutter-based mobile interface. The modular architecture improves scalability, flexibility, and overall system performance while ensuring an interactive and user-friendly healthcare experience.

2. METHODOLOGY

The proposed system follows a structured methodology for generating personalized diet and workout recommendations using AI-driven techniques. The workflow begins with user registration and profile creation, where personal and health-related information such as age, gender, height, weight, dietary preferences, activity level, and fitness goals are collected through the mobile application.

After data collection, the system performs preprocessing and health metric calculations including Body Mass Index (BMI), Basal Metabolic Rate (BMR), and daily calorie requirement estimation. These calculated parameters are used to understand the user's physical condition and fitness objectives.

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The processed data is then converted into structured input for the AI-based recommendation engine. The inference engine analyzes user-specific information and generates personalized diet plans, workout schedules, and fitness guidance. External nutrition and workout APIs are integrated to improve recommendation accuracy and provide updated information.

The generated recommendations are stored using Firebase cloud services and local storage for real-time synchronization and offline accessibility. Finally, the recommendations, progress tracking details, and notification reminders are displayed through the Flutter-based mobile interface to ensure an interactive and user-friendly experience.

3. IMPLEMENTATION

The proposed AI-powered personal diet and workout recommender system is implemented as a cross-platform mobile application using Flutter. The application interface is designed to provide simple and user-friendly interaction for health data collection, recommendation visualization, and progress tracking.

Firebase is integrated for user authentication, cloud data storage, and real-time synchronization, while Hive is utilized as a lightweight local database for offline accessibility and faster data retrieval. The system stores user profiles, recommendation history, and progress-related information securely.

The application collects user-specific parameters such as age, weight, height, activity level, dietary preferences, and fitness goals. Based on these inputs, the system calculates daily calorie requirements. The processed data is then passed to the AI-based inference engine for generating personalized recommendations.

External nutrition and exercise APIs are integrated to provide updated food details, calorie information, and workout suggestions. The generated diet and workout plans are displayed through the mobile interface along with progress tracking and notification reminders.

The implemented system successfully generates real-time personalized recommendations with low response latency while maintaining scalability, accessibility, and efficient performance across different mobile platforms.

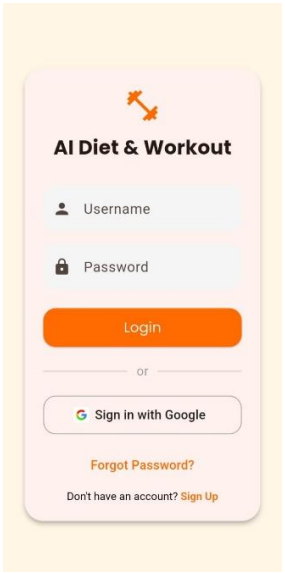
V. RESULTS AND APPLICATION SCREENSHOTS

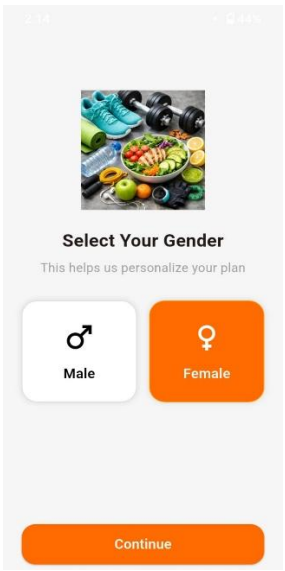
The implemented AI-powered personal diet and workout recommender system successfully generates personalized recommendations based on user-specific health parameters and fitness goals. The application was tested using multiple user profiles with different age groups, activity levels, dietary preferences, and fitness objectives to evaluate system performance and adaptability.

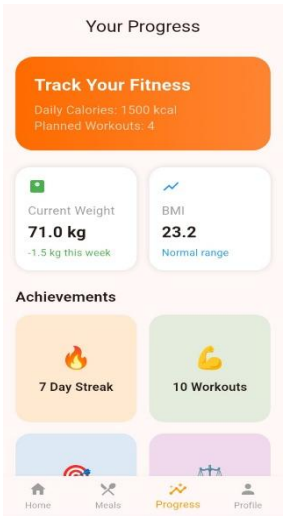
The developed system effectively calculates important daily calorie requirements before generating customized diet and workout plans. The AI-based recommendation engine provides context-aware suggestions in real time, improving personalization compared to conventional static fitness applications.

The integration of Firebase enables efficient cloud synchronization and offline accessibility, ensuring smooth application performance under different network conditions. In addition, the Flutter-based mobile interface provides responsive navigation and user-friendly interaction for recommendation viewing, progress tracking, and notification management.

Experimental evaluation indicates that the system generates recommendations within a low response time while maintaining scalability and usability. The proposed framework demonstrates improved adaptability, accessibility, and user engagement, making it suitable for practical healthcare and fitness management applications.







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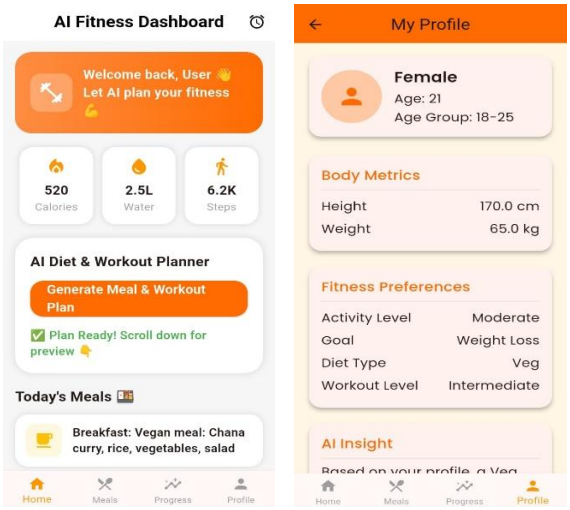

VI. CONCLUSION

An AI-powered personal diet and workout recommender system has been presented to provide intelligent and personalized healthcare guidance through a mobile application. The proposed system analyzes user-specific information such as age, height, weight, activity level, dietary preferences, and fitness goals to generate customized diet plans and workout recommendations. The developed application integrates AI-based recommendation techniques with physiological health parameter calculations including calorie estimation to improve recommendation accuracy and personalization. The use of Flutter enables cross-platform mobile accessibility, while Firebase provide cloud synchronization and offline data storage support for efficient application performance. The proposed system successfully overcomes the limitations of conventional fitness applications by providing adaptive recommendations, progress tracking, notification reminders, and real-time user interaction within a unified platform. Experimental analysis indicates that the application delivers scalable, responsive, and user-friendly healthcare support suitable for practical fitness and nutrition management. Therefore, the proposed framework provides an effective solution for intelligent digital healthcare systems and contributes toward improving personalized fitness guidance using AI-driven technologies.

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