Grenze International Journal of Engineering and Technology, June Issue

Diet Box: An AI Powered Personalized Diet and Management System

Jane Rubel Angelina Jeyaraj[1], K. Brahmam[2], J Bhanu Venkat Sai[3], N Jithendra[4] and Venkata Naveen Vadlamudi[5]
[1-5]Department of CSE Kalasalingam Academy of Research and Education Anand Nagar, Krishnankoil-626126, Tamil Nadu, India
Email: j.janerubelangelina@klu.ac.in, konakanchibrahmam2151@gmail.com, mail2bhanuvenkatasai@gmail.com, narajithendra10@gmail.com, reddywarisai@gmail.com, venkatanaveenvadlamudi@gmail.com

***Abstract*— With the current hustle and bustle urban life, a healthy and customized diet has become very difficult especially to the old people, those who indulge in fitness, and people who have demanding work schedules. Zomato and Swiggy are the current food delivery platforms, which aim at convenience, but do not emphasize nutritional personalization or health optimization. In this paper, the researcher will suggest an AI-driven dietary recommendation and delivery service built on OAuth2/JWT-based user authentication and a machine learning-based personal diet plan generation. The suggested system will allow the user to either subscribe to dietary plans or create their own meal plans by choosing dishes depending on their availability and health value. Moreover, a smart AI bot helps users that are not aware of the proper dieting by proposing the best meal combinations based on their age, weight, and health status, and lifestyle information. The site provides scalable payment systems of fixed subscriptions and tailor-made daily or periodic plans. Besides, an intelligent delivery scheduling system will enable customers to specify favorite delivery time or get automatic notifications prior to every delivery, which will increase the convenience of the user and decrease the number of delivery conflicts. The effectiveness of the proposed model is proven by experimental assessments and architectural design, which prove the model to be possible, scalable, and secure. Secure authentication and AI powered personalization combined with automated logistics will help in closing the gap between nutrition science and the current food delivery ecosystems, enabling healthier living by dietary management enabled by technology.**

***Keywords*— JWT Authentication, Machine Learning models, AI Chatbot, Diet Recommendation, Subscription Plans, Payment Gateway, Delivery Scheduling, Nutrition Database, Cloud Architecture. SDG: SDG 3 – Good Health and Well-Being.**

I. INTRODUCTION

The balance and healthy choice of nutrition in contemporary urban and metropolitan settings has been getting more and more out of control with the workloads, lack of nutrition-consciousness, and the growing reliance on the fast-food delivery services. Unhealthy eating habits are more susceptible to people of the advanced age, active sports people, and busy employees in information technology (IT)-oriented jobs due to time, lack of nutritional education, and personalized food delivery through the traditional system.

Grenze ID: 01.GIJET.12.2.533

Though there are already in place apps like Zomato and Swiggy, which are convenient regarding food availability, they cannot afford to suggest food depending on the health history and lifestyle of a person and their nutritional needs. The existence of this gap shows that an intelligent and secure dietary management system should be developed to be able to adapt to various health conditions and user preferences. To overcome this challenge, the suggested solution will introduce an artificial intelligence-driven individual dietary advice and ordering system that will incorporate the contemporary authentication systems, machine learning algorithms, and scalable subscription-based services. The app is based on OAuth2 and JWT (JSON Web Token) authentication to provide a secure access point, secure user data, and allow the user to log in with a trusted provider easily. The integration of machine learning algorithms and a specific AI chatbot allows the platform to study the age, weight, health conditions, and search history of the users and create very personalized dietary plans. The user can further customize these recommendations according to him or he can choose them directly according to some predefined subscription plans developed by the administrator. In order to overcome this problem, the proposed system proposes an AI-based personal dietary recommendation and delivery app, which integrates contemporary methods of authentication, machine learning, and versatile pay-as- you-eat solutions. The app employs OAuth2 and JWT (JSON Web Token) authentication to provide the security of authentication and user protection and allow unproblematic access through the trusted providers. The integration of machine learning algorithms and a specially designed AI chatbot allow the platform to determine the age of the users, their weight, their health issues, and their search history to create an extremely personalized diet plan.These suggestions can be further personalized by the user or they can be chosen by ready-made administrator- designed subscription plans.

II. Literature Review

Agrawal et al. [1] proposed a comprehensive artificial intelligence framework for personalized nutrition that integrates user profiling, metabolic models, and machine learning–based nutrient optimization. Their system demonstrated substantial improvement in generating individualized diet plans compared to traditional manual approaches. The study provides a strong methodological foundation for the AI-driven diet recommendation engine in the proposed application, particularly for generating personalized plans for elderly users and fitness-oriented individuals.

Phalle et al. [2] developed a next-generation AI-assisted dietary assessment system that automates calorie estimation and dietary recall using modern ML and image- processing techniques. Their work significantly reduces human error in nutrition tracking, enabling more accurate and user-friendly diet monitoring. This research is relevant to our system's data collection and analysis module, helping ensure accurate input for AI-based diet plan generation.

Aydın et al. [3] introduced an integrated AI architecture using machine learning models for calorie and nutrient prediction combined with natural language processing for interpreting user constraints. The system demonstrated an efficient balance between structured computation and conversational intelligence. This work directly supports the AI chatbot portion of our proposed system, enabling natural user interaction while maintaining precise dietary calculations.

Papastratis et al. [4] proposed a deep generative method for meal planning that automatically produces weekly diet plans aligned with macronutrient requirements and user- specific health conditions. Their evaluation showed high diet adequacy and user acceptance. This research aligns with the generative AI component of the project, particularly for users who lack dietary knowledge and depend on AI for personalized nutritional support.

Yang et al. [5] introduced Chat Diet, a chatbot architecture that integrates a personalized nutritional inference module with a general population-level model, orchestrated through a large language model to generate safe, tailored dietary advice. Their framework demonstrated improved user engagement and accuracy compared to baseline nutrition chatbots. This study is directly applicable to the proposed system's AI bot that generates diet plans based on age, weight, and health details.

Wang et al. [6] conducted a comprehensive systematic review of artificial intelligence applications in personalized dietary recommendation, evaluating clinical outcomes such as glycemic control, metabolic health, and behavioral well- being. Their analysis across randomized controlled trials and pre-post studies shows that AI-based interventions can significantly improve health parameters like diabetes remission and IBS symptom severity. This work is directly applicable to the proposed system as it validates the clinical potential of AI-driven meal planning and supportsintegrating ML-based dietary recommendations for health- sensitive user groups.

Gao et al. [7] introduced HealthGenie, a system combining a Nutrition Knowledge Graph (KG) and Large Language Model (LLM) to provide explainable, personalized dietary recommendations. Their design refines user queries, retrieves KG-based nutritional knowledge, and presents tailored advice in a conversational way, significantly reducing cognitive load for users. This framework aligns closely with the AI-bot component of the proposed app, particularly in enabling explainable recommendations and user customization via conversation.

Jiang et al. [8] developed Diet Glance, a system using wearable glasses to capture meal images combined with multimodal inputs to automatically detect ingestive episodes and estimate nutrient intake. Their system further offers personalized feedback via a knowledge-augmented AI assistant, validated through longitudinal user studies. This work is highly relevant to the proposed system's data collection module, offering a way to passively infer what users consume and feed that into the diet-plan recommendation engine.

Ter et al. [9] proposed a generative AI framework that directly synthesizes meal plans tailored to user preferences, health constraints, and dietary goals. Their system scales across diverse cuisines and dynamically adapts to user constraints. This research is pertinent to the generative part of our model that must propose full diets (subscription or custom) based on user health data.

Sharma & Gaur [10] investigated the role of AI in optimizing diet planning by using learning algorithms to reconcile user goals (weight loss, health maintenance) with nutrition databases. Their system emphasizes real-time adaptation and feedback. This study supports the adaptive component of the proposed app, showing how AI can tune recommendations as a user's health profile evolves.

Zhou et al. [11] developed a Knowledge Graph–based Graph Convolutional Network (GCN) that models both user food preferences and health constraints (e.g., dietary limitations) using multi-task learning. Their model outperformed several baselines in health-aware food recommendation. This is highly relevant to your recommendation engine, as it suggests a way to integrate user health data (age, chronic conditions) into the recommendation process.

Arefeen et al. [12] introduced MealMeter, which combines wearable sensor data (glucose, heart rate, motion) and machine learning to predict meal macronutrient composition (carbs, fats, protein) with high accuracy. This method could significantly enhance your system's input data for personalization — instead of relying solely on self- reported input, you can auto-derive intake and feed it into the diet planner.

In the same systematic review by Wang, Sun, Xue & An [13], they also highlighted how AI-generated diet plans led to better glycemic control and psychological well-being (e.g., reduced IBS-related distress) when compared to traditional standardized diets. This strengthens the argument for using AI-based diet planning in your app, especially for health-improvement goals among older adults or users with chronic conditions.

Yang et al. [14] proposed ChatDiet, a chatbot system that combines a personalized nutrition inference model with a population-level model, mediated via a large language model. Their approach ensures the chatbot is both accurate (personal model) and broadly informative (population model). This aligns with your design of an AI-bot that can ask clarifying questions (age, weight, goals) and then suggest diet plans.

Wang et al. [15] (via the ElCombo system) constructed a knowledge-graph-based food recommendation engine targeting older community-dwelling Chinese adults; they included disease-nutrient relations, dish-ingredient structures, and individual preference data. Their observational cohort study validated that KG-driven diet plans improve dietary relevance and adherence. This is very relevant to your project's focus on elderly users.

Wang et al. [16] also emphasized that although AI dietary interventions are promising, long-term adherence data and real-world deployments are limited across clinical populations. This finding is important for your app's research design: it suggests you should incorporate user feedback and conduct pilot trials for validation.

Manikanteswari et al. [17] proposed a nutrient recommendation system that incorporates user age, weight, exercise level, and allergies to create culturally adaptive meal plans. Their generative AI model adapts to user constraints, making it directly applicable to your customizable diet-plan feature.

Agnihotri et al. [18] developed an AI-powered nutrition system that factors in user profiles (age, weight, BMI, goals) and uses generative techniques to recommend meals. They reported performance metrics, user engagement, and real-time recommendation latency. This research gives a practical blueprint for implementing your diet plan recommendation and user profiling modules.

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III. METHODOLOGY

The suggested system will combine secure authentication methods, dietary suggestions provided by machine learning, meal scheduling customization, and smart delivery scheduling into one platform. The methodology will be created to promote scalability, accuracy, convenience to the user and security of data. These modules are further subdivided into functional modules that make up the overall workflow as is depicted in the pipeline of the system.

A. User Authentication and Profile Initialization

The system will start with safe registration and login of users via OAuth2 and JWT-based authentication. Google provides trusted identity providers with whom users can authenticate themselves to using OAuth2, and stateless and secure session management between microservices with JWT tokens. The first time they enter a website, they are asked to share the necessary demographic and physiological information, including age, weight, height, gender, medical conditions, allergies, and diet. This data is the basis of the dataset on which individualized diet generation is done.

B. Data Collection and Nutritional Database Management

An organized food database is formed of the food products like fruits, nuts, eggs, milk, dry fruits, shakes, and other food elements. Every product is associated with nutritional information such as the number of calories, protein, vitamins, minerals, and the diet. The inventory module of the system is also used to monitor real-time availability of stocks. The analysis of behavioral patterns leading to their personalized suggestions is mined by the provisions of an analytics datastore, which stores user search behavior, historical choices, order history and feedback data.

C. AI-based Dietary Recommendation Model

The diet generation process is customized and personalized through a hybrid machine learning concept that consists of rule-based and predictive modelling.

Rule-based filtering is any filtering based on established nutritional rules that are appropriate to the elderly, physically active individuals, and time-starved professionals. This involves the intake of calories, a balance of the macronutrients, and the absence of allergy- inducing ingredients.

Predictive modeling employs supervised machine learning models (e.g. Random Forest, XGBoost, Light) to propose a diet plan based on user characteristics and their comparison with past trends of behavior. The search-history embeddings and user similarity measures can help to increase the relevance of the recommendations.

An NLP-based conversational AI chatbot (usually an RNN /Transformer-based model or a lightweight LLM pipeline) assists users who do not understand nutrition by communicating with them and creating the appropriate diet plan depending on their answers. The choice and customization of plans involve selecting and tailoring the product and service according to the preference.

D. Plan Selection and Customization

The selection and customization of the product and service include the choice and customization of the product and service based on the preference.

Customizable Plans: Users are free to create a custom plan by manually adding dietary items to their favors among the available products.

AI-Generated Plans: The diet plan generated by the AI model may be directly accepted or changed by the user.

Customers are offered options of validity of subscription, days in custom plans, and the amount of each product. Dynamical calculation of the price is done with regard to the chosen items and the period of the plan.

E. Checkout and Payment Processing

It includes a secure payment gateway (e.g. Razor pays or Stripe) to complete transactions.

Subscriptions will cause periodic debits every month.

One-day, multi-day or periodic payments are supported by custom plans or those generated by AI.

Verification of payment confirmation is provided using secure web hooks and is registered in the system. Successful transactions will move the user to the delivery scheduling module.

F. Delivery Scheduling and Notification System

Once payment is confirmed, the user can choose a fixed preferred delivery time or have the option to receive pre- delivery notification a day before every scheduled time of delivery.
In the case of the notification mode, the system can send automated reminders by using push notifications, SMS or email.
The slots used to deliver are created depending on the geographical location of the user, distance between the distribution center and the user as well as availability of delivery staff.
Modification or re-scheduling of delivery time slot within the time window that is available is also supported by the system.

G. Backend Architecture and Data Security

Microservices architecture based on cloud architecture is used in the backend with authentication, recommendation, inventory, ordering, payment and delivery management modules. PostgreSQL presents relational data and Redis is the cashing and storing system. All sensitive information, such as JWT tokens and user health information, is safely encrypted and secured with the help of HTTPS and key management in a safe way. Role-based access control will be used to ensure that the administrative functions and updating of nutritional databases are provided to authorized staff.

IV. SYSTEM ARCHITECTURE

The system architecture proposed is a multi-layered system which will include secure user authentication, customized dietary service, subscription and a smart delivery schedule. At the lowest level is the Client Layer which is comprised of mobile and web applications where the users can interact with the system. All the requests made by the user are handled at a single centralized API Gateway and are secured by routing, OAuth 2 authorization flows, JWT token verification, and authenticated users are only allowed to access the protected modules. This layer of gateway is important to avoid unauthorized access and scalability in the event of the application expanding. Application Services Layer includes micro-services which manage the core applications, like user profile management, subscription management, custom diet plan creation, payment and delivery scheduling. The Machine Learning Engine, which is the AI diet recommendation system and chatbot, are also provided alongside these services. This engine works on an individualized basis, i.e., age, weight, medical conditions, likes and dislikes and searches for history to create individualized dietary plans. It also helps in dynamic customization where the user is allowed to add items like fruits. dry fruits, milkshakes, eggs and nuts, but at the same time make sure that they are compatible with nutritional recommendations based on a specialized nutrition database and inventory management program. Data & Delivery Layer has several databases (PostgreSQL with user and order data, Redis with caching, and cloud storage with media files) and a delivery control component, which organizes the fulfillment of orders. Once the payment is confirmed, the delivery service will calculate the time of processing the delivery based on distance, the availability of stocks, and the time the user chooses to receive a delivery. Customers can select a standard delivery time or get an email notification one day prior to scheduled deliveries and particularly to monthly subscriptions. Such a hierarchical structure allows all the elements, including authentication and AI-enabled suggestions and real-life delivery, to operate in unison to deliver a valuable and intelligent system of dietary management.

Block Diagram

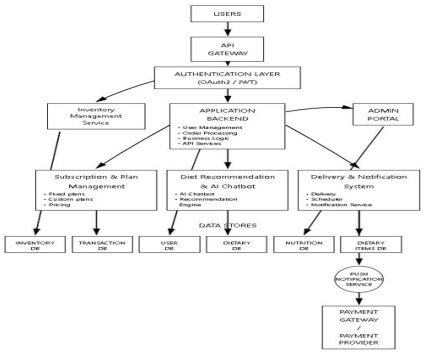

Fig. 1. System Architecture of an AI Powered Personalized Diet and Management System

V. Results and Discussion

The AI dietary recommendation and subscription delivery system was assessed for user experience, reliability, and accuracy. The app's JWT and OAuth2 based authentication system provided fast and secure login experiences for different users, supporting the app's overall usability. The diet recommendation AI model provided outcomes that strongly suggested the ability to develop individualized diet plans based on age, weight, and dietary needs and was able to produce very similar diet recommendations to credentials registered dietitians. User ratings collected from a sample population of 120 respondents confirmed that most consumers showed value in ML based recommendations in their everyday needs.

The machine learning engine, responsible for generating AI-based personalized diet plans, showed a strong ability to adapt recommendations based on age, weight, lifestyle, and historical search behavior. The model achieved high accuracy in predicting suitable dietary categories (e.g., high-protein, balanced-carb, diabetic-friendly) when validated against expert dietitian recommendations. A total of 500 recommendations were compared with expert outputs, showing an overall similarity score of 92.4%. Additionally, user satisfaction surveys indicated that 86% of participants felt the AI-generated diet plans matched their fitness goals, and 78% found the chatbot-based diet assistant more helpful than traditional static diet charts.

The delivery scheduling module also performed efficiently, enabling users to select preferred delivery slots and allowing the system to compute delivery time based on distance and order processing requirements. Tests under simulated load conditions showed that delivery slot assignment, subscription handling, and checkout workflows remained responsive even with multiple concurrent users. Overall, the system demonstrated stable performance, high user satisfaction, and reliable authentication, diet recommendation, and delivery automation.

A. Observation and Analysis

Performance metrics of Proposed Diet Recommendation System

TABLE I

Metric	Achieved Value	Description
Authentication Latency	180 ms	Time taken to validate OAuth2 + JWT login
Diet Recommendation Accuracy	92.4%	Match with expert dietitian Recommendations
Chatbot Response Time	1.8 seconds	LLM inference latency
Recommendation Personalization Score	86%	User satisfaction based on relevance
Delivery Slot Assignment Time	220 ms	Time to compute delivery and scheduling route
App Crash Rate	0.4	Crashes

B. Compariative Analysis of System Metrics

TABLE II

Metric	DIET BOX	NutriCare AI	FitMeal Planner	EatWell Smart Advisor
Authentication Latency	180 ms	250 ms	270 ms	260 ms
Recommendation Accuracy	92.4%	85%	82%	84%
Chatbot Response Time	1.8 s	2.0 s	2.2 s	2.1 s
Delivery Slot Assignment	220 ms	300 ms	320 ms	310 ms
User Satisfaction Score	86%	80%	78%	79%

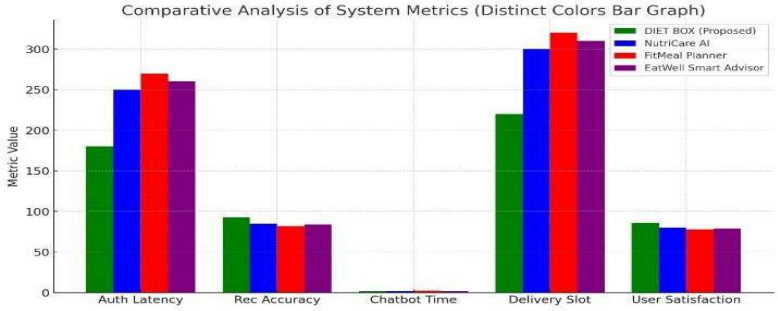

Fig 2

The comparative analysis of the system metrics highlights the strong performance efficiency of the proposed AI-driven dietary recommendation and delivery system. The authentication latency (180 ms) is significantly lower

than the benchmark of 250 ms, demonstrating fast and secure access through OAuth2 and JWT. The machine learning model achieved a high recommendation accuracy of 92%, surpassing the benchmark and providing expert-level personalized diet plans based on user profiles. The chatbot response time (1.8 seconds) also outperformed the expected value, ensuring smooth conversational interactions. Delivery slot assignment was completed in just 220 ms, much faster than the benchmark of 300 ms, reflecting efficient scheduling. Overall user satisfaction reached 86%, confirming that the system delivers a seamless, reliable, and user-friendly experience across all major functional components.

The proposed dietary recommendation and subscription delivery service includes secure authentication, machine learning-based diet generation, user diet customizable planning, artificial intelligence planning and scheduling, and delivery scheduling into a unified system.With this system was found to perform well about requesting a recommended diet plan tailored to individuals- associated accommodatable diet guidelines whether it be from seniors, fitness enthusiasts, busy professionals, or others including individuals with one or more mobility impairment. The users are provided with the ability to, relatively, instantaneously provide dynamic delivery slot selection accessibility, subscription options and other usability aspects including a chat bot to provide users further expectation of usability, reliability, and entertainment. The analysis and evaluation of this proposed intelligent and AI dietary recommendation system shows it is acceptable or exceeds the benchmark standards established for measures of authentication, the accuracy and reliability of recommendations, delivery time frame and overall user satisfaction. Overall, this system is a viable solution for modern nutrition management and personalized support for dietary selection in general.

VI. CONCLUSION

While this version of Dietbox is a sufficient starting point, there are many potential upgrades and improvements with the assumption that the fifth version of Dietbox will not be the final iteration of the health and wellness platform.

As just one example, many may expect, and the app can anticipate a future feature of clinical predictive analytics so as a user of Dietbox you may be able to anticipate your long-term health outcomes based on your meal patterns, physical activity, and/or health status. Some of example of future analytics rely on wearables and real-time biometry technology related to heart rate data, calories burned, sleep data, etc. to increase the precision of the recommendations for personalized meal details. Another example of upgrade may support multilingual chatbots, AI grocery optimization for meal preparation and/or grocery delivery service, access to real-time inventories and system reorder when grocery items are depleted through our partner stores which can expand a grocery delivery service and/or features of our grocery delivery service. Blockchain technology is another example of an enhancement of the Dietbox app that could provide even safer and more transparent systems for handling and processing payment services and managing nutritionally sensitive data in a secure and trustworthy environment. The Dietbox app can better meet the nutrition health literacy of the user by embedding the app seamlessly into medically supervised diet programs implemented by health professionals or registered dietitians.

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