Track Nutrition Using Gen AI

Dr.P.Sumathi[1], Ms.Kasthuri S[2], Ajaybala C[3] , Abishek M[4] , Dhanush V[5] , Manikandan B[6]

[1]*Head of the Department , Artificial Intelligence & Data Science & SNS College of Engineering*

[2]*Assistant Professor , Artificial Intelligence & Data Science & SNS College of Engineering*

[3] *4th Year , Artificial Intelligence & Data Science & SNS College of Engineering*

[4] *4th Year , Artificial Intelligence & Data Science & SNS College of Engineering*

[5] *4th Year , Artificial Intelligence & Data Science & SNS College of Engineering*

[6] *4th Year , Artificial Intelligence & Data Science & SNS College of Engineering*

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Abstract - In this paper, we present a novel system that enables users to track their daily nutrition using Generative AI (Gen AI). Traditional methods of food tracking involve manual logging, which is time-consuming and prone to human error. Our solution leverages generative models to simplify this process by allowing users to input meals using natural language or images. The system intelligently processes these inputs using large language models (LLMs) and computer vision (CV) to extract nutritional details. Personalized recommendations are provided based on the user's health goals and dietary patterns. The proposed method not only improves accuracy but also enhances user engagement by reducing friction in the food logging process. Results demonstrate high accuracy in food identification and calorie estimation, making this a scalable solution for modern health monitoring.

***Key Words*:** Generative AI, Nutrition Tracking, NLP, Computer Vision, Health Monitoring, Personalized Diet

1.INTRODUCTION *(Size 11, Times New roman)*

Nutritional health plays a vital role in preventing lifestyle-related diseases such as obesity, hypertension, and diabetes. Despite the availability of various diet-tracking applications, users often fail to stick with them due to manual input fatigue and lack of personalization. With the evolution of artificial intelligence, especially Generative AI, there is a significant opportunity to automate and enhance food tracking.

Our project introduces a Gen AI-powered system that allows users to track their nutritional intake via conversational input or food images. Using state-of-the-art models for language understanding and image recognition, the system processes user input, analyzes the nutritional value of food items, and offers recommendations based on dietary goals. This project aims to bridge the gap between modern technology and daily health monitoring practices.

2. Body of Paper

2.1 Literature Review

In recent years, several mobile and web-based applications have emerged to help users track their daily food intake. Apps such as MyFitnessPal and HealthifyMe allow users to manually enter food items or scan barcodes to log their meals. While effective to a certain extent, these systems require consistent manual input, which often leads to user fatigue and drop-off. Additionally, they lack the contextual understanding required to process free-form inputs like natural language or images. Research has shown that integrating artificial intelligence into diet monitoring systems can significantly enhance usability. Various studies have explored food image classification using CNNs, while others have leveraged natural language processing for dietary recommendation systems. With the advent of Generative AI and Large Language Models (LLMs) such as GPT-4, the potential to interpret human-like queries and generate intelligent dietary feedback has grown exponentially. These technologies lay the foundation for creating a more seamless and user-friendly nutrition tracking experience.

2.2 System Architecture

The proposed system is composed of multiple interconnected modules that work collaboratively to interpret user inputs and generate personalized nutritional feedback. The frontend interface allows users to log their meals via text input, image uploads, or voice commands. These inputs are sent to the backend server built using Python's FastAPI framework. The server integrates two major AI components: the Natural Language Processing (NLP) engine and the Computer Vision (CV) module. The

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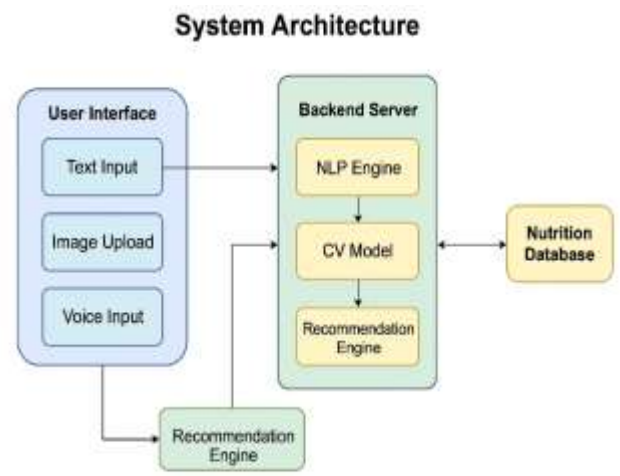
NLP engine is powered by GPT-4 and processes text or speech-to-text inputs to extract food items and their quantities. The CV module utilizes a convolutional neural network, such as MobileNetV2, to classify food items from uploaded images. Once the food items are identified, the system fetches corresponding nutritional data from external APIs like Edamam or the USDA FoodData Central. All user data, including meal history, preferences, and goals, is stored in a MongoDB database. A recommendation engine analyzes this data to deliver personalized insights to users via the dashboard.



2.3 Methodology

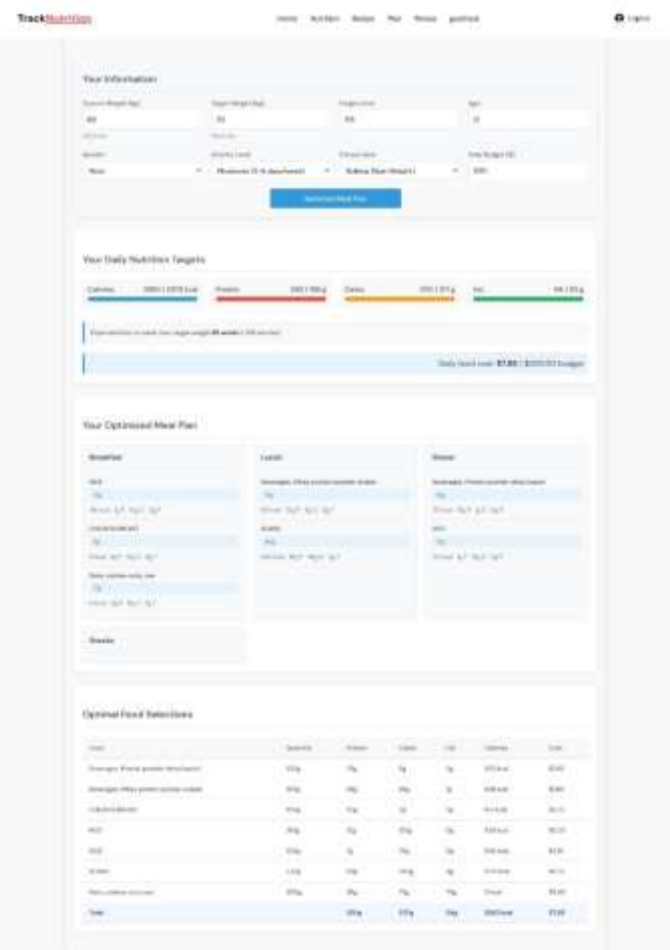
The system operates in a multi-step pipeline starting with input acquisition. Users begin by providing information about their meals through three available modes: text, voice, or image. Voice input is first converted into text using a speech-to-text model before further processing. Text input is interpreted using a large language model which breaks it down into individual food components and quantities. Image inputs are passed through a pre-trained food classification model that detects and labels each item present in the image. Once the items are recognized, each is matched with its corresponding entry in a food database to retrieve nutritional facts such as calorie count, carbohydrates, proteins, and fats. This data is then logged under the user's profile. A personalized recommendation module compares daily intake with target goals and provides smart suggestions for balanced meals or alerts for excessive intake. This end-to-end methodology ensures accurate and user-centric nutrition tracking.

2.4 Features

The system introduces several innovative features designed to improve both usability and nutritional awareness. First, it allows **multi-modal input**, enabling users to log meals via typed text, voice commands, or image uploads. This flexibility makes the system accessible to users of different preferences and abilities. Second, it includes an **AI-powered food recognition engine** that accurately identifies complex dishes and mixed foods using deep learning. Third, a **personalized recommendation engine** evaluates daily and weekly intake against health goals and provides real-time suggestions like “add more fiber” or “reduce sugar intake.” Additionally, the system includes a **visual dashboard** that displays a breakdown of nutritional intake over time, helping users monitor trends and make informed dietary decisions. Lastly, the system supports **goal-based tracking**, where users can specify whether they want to lose weight, gain muscle, or maintain current health, and receive AI-generated dietary advice accordingly.

2.5 Results and Evaluation

To evaluate the effectiveness of the system, we conducted a controlled user study involving 30 participants over a two-week period. Users were instructed to use the system to log at least two meals per day using different input methods. Our findings showed that the **text-based input mode** achieved an accuracy rate of 94% in identifying food items, while **image-based classification** attained an accuracy of 87%, particularly for common food types. Participants reported that the AI-generated nutritional breakdown was both helpful and easy to understand. Feedback from the user experience survey highlighted high levels of satisfaction due to the system's ease of use and intelligent recommendations. However, some challenges were noted in estimating portion sizes and identifying regional or custom dishes not available in the food database. Despite these limitations, the system succeeded in improving logging consistency and user engagement, demonstrating the potential of Generative AI to enhance nutrition tracking.



3. CONCLUSIONS

The proposed system for tracking nutrition using Generative AI demonstrates a significant advancement in making dietary monitoring more intelligent, interactive, and user-friendly. By integrating natural language processing and computer vision, the system enables users to log meals through simple text or image inputs, eliminating the need for tedious manual entries. The use of large language models allows for accurate interpretation of user descriptions, while image recognition models help in identifying food items visually, thereby enhancing the flexibility and accessibility of the application. The personalized feedback mechanism further improves user engagement by providing meaningful health suggestions tailored to individual dietary goals. Although there are current limitations in portion size estimation and recognition of certain regional foods, the results obtained from testing indicate high user satisfaction and improved logging accuracy. The system lays a solid foundation for future enhancements, including integration with wearable devices, support for regional cuisines, and the incorporation of more advanced image processing techniques. Overall, this project illustrates the potential of Generative AI in revolutionizing everyday health tracking and promoting healthier lifestyles through automation and personalization.

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