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NutriFit: An AI-Based Personalized Nutrition Recommendation System Using BMI Analysis

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Abstract: *Personalized nutrition plays a critical role in maintaining overall health and preventing lifestyle-related disorders. Traditional diet recommendation systems often rely on static guidelines and fail to adapt to individual health parameters. This paper presents NutriFit, an AI- based personalized nutrition recommendation system that utilizes Body Mass Index (BMI) analysis and large language models to generate customized dietary guidance. The proposed system collects user-specific health attributes such as height, weight, age, gender, and activity level, and computes BMI to classify users into predefined health categories. Based on this classification, a dynamically generated prompt is constructed and processed using an AI-driven language model to produce personalized diet recommendations. The system is implemented as a web-based application using a modular architecture that integrates data processing, health analysis, and AI-assisted decision support. Unlike conventional rule-based systems, NutriFit provides adaptive and context- aware recommendations without relying on predefined diet charts. The proposed approach demonstrates the potential of integrating artificial intelligence with healthcare applications to enhance personalization, scalability, and decision accuracy in nutrition planning*

Keywords: *Personalized nutrition*

I. INTRODUCTION

In recent years, the growing prevalence of lifestyle- related health issues has increased the demand for intelligent healthcare support systems. Nutrition plays a vital role in maintaining physical well-being; however, dietary requirements vary significantly among individuals based on factors such as body composition, age, gender, and activity level. Conventional diet planning approaches generally rely on static charts or generalized nutritional guidelines, which often fail to address individual health variations. As a result, users may receive recommendations that are ineffective or unsuitable for their specific conditions.

Body Mass Index (BMI) is a widely accepted metric used to assess an individual's health status by correlating height and weight. Although BMI alone does not provide a complete health assessment, it serves as a fundamental indicator for categorizing individuals into health groups such as underweight, normal, overweight, and obese. Integrating BMI analysis with intelligent systems can enhance the accuracy and relevance of dietary recommendations.

Advancements in artificial intelligence, particularly large language models, have enabled the development of adaptive decision-support systems capable of generating context-aware recommendations. In this paper, we propose NutriFit, an AI-based personalized nutrition recommendation system that combines BMI-based health classification with AI-driven diet generation. The system is designed to provide customized nutrition guidance through a scalable web-based platform, thereby improving personalization and accessibility in digital healthcare applications.

II. LITERATURE SURVEY

Recent research in the domain of healthcare and nutrition has emphasized the importance of intelligent systems for personalized health management. Traditional nutrition recommendation approaches primarily rely on predefined dietary

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charts and expert-driven guidelines, which lack adaptability to individual health variations. Several studies have attempted to address this limitation by incorporating computational techniques and data-driven models.

Body Mass Index (BMI) has been extensively used as a primary indicator for assessing health status and categorizing individuals into different weight classes. Previous works have utilized BMI-based classification to recommend general dietary and fitness guidelines; however, these systems are mostly rule-based and do not dynamically adapt to changing user parameters. Such approaches often fail to provide comprehensive personalization and scalability.

With the advancement of artificial intelligence, recommendation systems have increasingly adopted machine learning techniques to improve decision-making accuracy. Research on healthcare decision-support systems highlights the effectiveness of AI models in analyzing user data and generating personalized recommendations. Machine learning-based nutrition systems have demonstrated improved adaptability compared to static models, but they require large, labeled datasets and complex training processes.

More recently, large language models have gained attention for their ability to generate human-like, context- aware responses without extensive task-specific training. Studies indicate that language models can be effectively utilized for personalized content generation in healthcare applications. However, limited research has explored the integration of BMI-based health analysis with large language models for dynamic diet recommendation systems.

Based on the reviewed literature, there exists a research gap in developing a scalable, AI-driven nutrition recommendation system that combines BMI analysis with large language model capabilities. The proposed NutriFit system aims to address this gap by providing adaptive and personalized dietary recommendations through an AI-assisted framework.

III. METHODOLOGY

The proposed NutriFit system follows a structured methodology to generate personalized nutrition recommendations using BMI analysis and artificial intelligence. The overall workflow is divided into multiple sequential stages, ensuring accurate data processing and adaptive recommendation generation.

Initially, user-specific health data is collected through a web- based interface. The input parameters include height, weight, age, gender, and activity level. These inputs are validated at the application layer to ensure data consistency and reliability before further processing.

In the next stage, Body Mass Index (BMI) is calculated using the standard mathematical formula, where weight is measured in kilograms and height in meters. Based on the computed BMI value, users are classified into predefined health categories such as underweight, normal, overweight, or obese. This classification serves as a core decision parameter for subsequent recommendation generation.

Following BMI classification, a dynamic prompt is constructed by combining the user's health parameters, BMI value, and health category. This prompt is then transmitted to an AI-based large language model through an application programming interface. The language model processes the contextual information and generates a personalized diet recommendation tailored to the user's health status.

The generated output is parsed and structured before being presented to the user via the application dashboard. The system also supports optional storage of generated recommendations for future reference. This methodology enables real-time, adaptive nutrition guidance without relying on static rule-based diet plans, thereby enhancing personalization and scalability.

IV. SYSTEM ARCHITECTURE

The NutriFit system is designed using a modular, layered architecture to ensure scalability, maintainability, and efficient integration of artificial intelligence components. The architecture follows a client–server model and is implemented using a web-based framework.

At the client layer, users interact with the system through a browser-based interface that allows them to enter health-related information and view personalized diet recommendations. This layer is responsible for data input, basic validation, and result visualization.

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The application layer forms the core of the system and is developed using a backend web framework. It manages user authentication, input processing, BMI calculation, and health category classification. This layer also handles the construction of AI prompts by combining user health parameters with computed BMI values.

An AI integration layer is incorporated within the application layer to enable communication with a large language model through secure API calls. This layer processes incoming requests, transmits structured prompts to the AI model, and receives generated nutrition recommendations. The responses are further formatted for consistency and readability.

The data layer consists of a relational database used to store user profiles, health parameters, BMI records, and generated recommendations. Secure access mechanisms ensure data integrity and controlled access. The separation of concerns across architectural layers enables efficient system operation and allows future expansion of the NutriFit platform.

V. UNDERSTANDING DATASET

The proposed NutriFit system does not rely on traditional image or sensor-based datasets. Instead, it utilizes a structured dataset composed of user-provided health parameters. The dataset is dynamically generated through user interactions with the system and serves as the primary input for health analysis and AI-based recommendation generation.

The dataset includes attributes such as height, weight, age, gender, and activity level. These parameters are collected through a standardized input form and undergo validation to ensure accuracy and consistency. Based on height and weight values, the Body Mass Index (BMI) is computed and stored as a derived attribute within the dataset. Each record is further associated with a corresponding health category derived from BMI classification.

In addition to numerical and categorical data, the system generates unstructured textual data in the form of AI-produced diet recommendations. These outputs are context-aware and vary dynamically according to user- specific inputs. The dataset structure supports both structured health metrics and generated recommendation data, enabling traceability and future analysis.

This dynamic dataset design eliminates the need for large pre-labeled datasets while allowing real-time personalization. The collected data can be expanded in future versions to include additional health indicators, thereby enhancing the accuracy and depth of nutrition recommendations.

VI. FUTURE SCOPE

The proposed NutriFit system can be extended in several directions to enhance its intelligence, accuracy, and applicability in real-world healthcare scenarios. One potential extension is the integration of additional health parameters such as blood pressure, blood sugar levels, and cholesterol metrics to enable more comprehensive health analysis. Incorporating data from wearable devices and fitness trackers can further improve the precision of activity monitoring and calorie estimation.

The system can also be expanded by integrating predictive analytics to identify potential health risks based on historical user data. Advanced AI models may be employed to provide long-term dietary planning and lifestyle recommendations. Multilingual support can be added to improve accessibility for users from diverse linguistic backgrounds.

Furthermore, the platform can be deployed as a mobile application to increase usability and reach. Integration with electronic health record systems may allow secure sharing of nutrition recommendations with healthcare professionals. These enhancements would transform NutriFit into a more robust and intelligent healthcare decision-support system.

VII. CONCLUSION

This paper presented NutriFit, an AI-based personalized nutrition recommendation system that integrates BMI- driven health analysis with large language model capabilities. The system utilizes user-specific health parameters to compute BMI and classify individuals into predefined health categories, which serve as the foundation for generating customized dietary recommendations. Unlike traditional rule-based nutrition systems, the proposed approach leverages artificial intelligence to produce adaptive and context-aware recommendations without relying on static diet charts.

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The modular system architecture enables efficient data processing, secure user interaction, and seamless AI integration. By combining conventional health assessment metrics with modern AI-driven decision support, NutriFit demonstrates an effective approach for personalized nutrition planning in digital healthcare environments. The proposed system highlights the potential of large language models in enhancing personalization, scalability, and usability of nutrition recommendation systems. Overall, NutriFit serves as a practical and extensible framework for AI-assisted healthcare applications.

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