

An AI-Driven Context-Aware Dynamic Diet Recommendation System using Rule-Based Reasoning

SURESHBABU. R

PG Student,

Department of Computer Science and Information Technology

Vels Institute of Science, Technology and Advanced Studies, (VISTAS)

surehsbabu29@gmail.com

V. POORNIMA

Associate Professor,

Department of Computer Science and Information Technology


Vels Institute of Science, Technology and Advanced Studies, (VISTAS)

poornimasudhaagar@gmail.com



<https://doi.org/10.55041/ijstmt.v2i4.625>

Cite this Article: R, S. (2026). An AI-Driven Context-Aware Dynamic Diet Recommendation System using Rule-Based Reasoning. International Journal of Science, Strategic Management and Technology, 02(04). <https://doi.org/10.55041/ijstmt.v2i4.625>

License:  This article is published under the Creative Commons Attribution 4.0 International License (CC BY 4.0), permitting use, distribution, and reproduction in any medium, provided the original author(s) and source are properly credited.

ABSTRACT

The growing importance of health awareness and personalized nutrition has led to the development of intelligent diet recommendation systems. This project presents an AI-driven context-aware dynamic diet recommendation system using knowledge-based reasoning to provide personalized dietary suggestions. The system collects user-specific data such as age, gender, height, weight, and activity levels to compute important health metrics including Body Mass Index (BMI) and Basal Metabolic Rate (BMR). Based on these calculations, the system estimates daily calorie requirements and distributes macronutrients accordingly.

Unlike traditional static diet plans, the proposed system dynamically adapts recommendations based on user activities and lifestyle patterns. It integrates activity tracking with calorie expenditure calculations using MET values, ensuring that diet suggestions are aligned with real-world energy usage. The system is implemented as a web-based application using modern technologies such as HTML, CSS, JavaScript, Node.js, Express.js, and SQLite.

A diet planner module allows users to select food items and organize them into structured meal plans categorized as breakfast, lunch, dinner, and snacks. Additionally, the system provides a feature to export the diet plan as a PDF document for offline use. The proposed solution enhances usability, accuracy, and accessibility of diet planning. Overall, the system provides a scalable and efficient approach to personalized nutrition management using intelligent techniques.

KEYWORDS

AI Diet System, Context-Aware, BMI, BMR, Nutrition, Recommendation System, SQLite

I. INTRODUCTION

In recent years, there has been a significant increase in awareness regarding health and nutrition among individuals. Maintaining a balanced diet is essential for leading a healthy lifestyle, yet many people struggle to achieve this due to busy schedules, lack of proper guidance, and limited access to professional nutritionists. Traditional diet plans are often generalized and fail to consider individual differences such as body composition, metabolism, and physical activity levels. This highlights the need for a personalized diet recommendation system that can adapt to individual requirements.

Advancements in artificial intelligence and web technologies have enabled the development of intelligent systems capable of analyzing user data and generating meaningful insights. In the field of healthcare, AI-based systems are increasingly being used to provide personalized recommendations. However, many existing diet recommendation systems lack context-awareness and do not dynamically adjust recommendations based on user activities.

The proposed project aims to overcome these limitations by developing an AI-driven context-aware dynamic diet recommendation system. The system collects user data such as age, gender, height, and weight to calculate BMI and BMR. It also considers user activity levels to estimate calorie expenditure and adjust dietary recommendations accordingly. This ensures that the recommendations are both personalized and adaptive.

The system is implemented as a web-based application using a client-server architecture. The frontend provides an interactive interface for user input and visualization, while the backend processes data and generates recommendations. SQLite is used as the database to store user profiles, activity logs, and food data. The system also includes a diet planner and PDF export feature, making it user-friendly and practical for real-world use.

II. LITERATURE SURVEY

Various research studies have focused on improving diet recommendation systems through artificial intelligence and data-driven approaches. Smith and Brown proposed an AI-based nutrition recommendation system that uses machine learning algorithms to analyze user data and generate personalized meal plans. Their findings indicated that personalized recommendations improve dietary adherence and user satisfaction [1].

Johnson and Davis developed a knowledge-based expert system for diet planning using predefined rules and inference mechanisms. The system utilized forward chaining techniques to simulate expert-level recommendations. Their research demonstrated that knowledge-based systems can effectively provide reliable dietary guidance without continuous human intervention [2].

Williams and Clark introduced a context-aware food recommendation system that incorporates user activity data into the recommendation process. By calculating calorie expenditure using MET values, the system dynamically adjusts food suggestions based on daily activity levels. Their study highlighted the importance of context-awareness in improving recommendation accuracy [3].

Kumar and Sharma designed a web-based diet management system that allows users to track BMI and generate diet plans. Their work showed that web technologies combined with database systems can provide an efficient platform for health monitoring and diet planning [4].

These studies emphasize the importance of personalization, knowledge-based reasoning, and context-awareness. The proposed system integrates all these aspects into a unified solution.

2.1 EXISTING SYSTEM

The existing systems for diet planning are mostly static and generalized. Many applications provide fixed diet charts that do not consider individual user differences. These systems lack personalization and fail to adapt to user-specific parameters such as metabolism, activity levels, and health conditions.

Some systems offer basic calorie tracking features but do not provide intelligent recommendations. Others rely heavily on manual input and lack automation, making them less efficient and time-consuming. Additionally, many existing systems do not integrate activity-based calorie calculations, leading to inaccurate dietary suggestions.

Overall, the limitations of existing systems include lack of personalization, absence of context-awareness, and limited adaptability. These drawbacks reduce their effectiveness in providing meaningful diet recommendations.

III. PROPOSED SYSTEM: AI-DRIVEN CONTEXT-AWARE DYNAMIC DIET RECOMMENDATION SYSTEM USING RULE-BASED REASONING

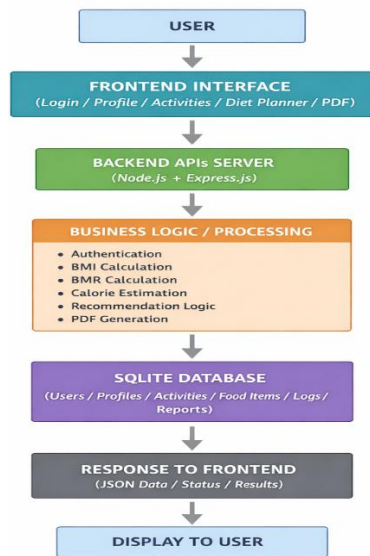


Fig 1: System Architecture of Proposed Diet Recommendation System

The proposed system aims to provide a dynamic and personalized diet recommendation solution using knowledge-based reasoning. It collects user data such as age, gender, height, and weight to calculate BMI and BMR. Based on these values, the system determines daily calorie requirements and distributes macronutrients accordingly.

A key feature of the system is its context-awareness. It incorporates user activity data and calculates calorie expenditure using MET values. This allows the system to dynamically adjust diet recommendations based on real-time activity levels.

The system includes a diet planner module where users can select food items and organize them into meal categories such as breakfast, lunch, dinner, and snacks. The selected diet plan can be exported as a PDF document for convenience.



Fig 2: Level 0 Data Flow Diagram

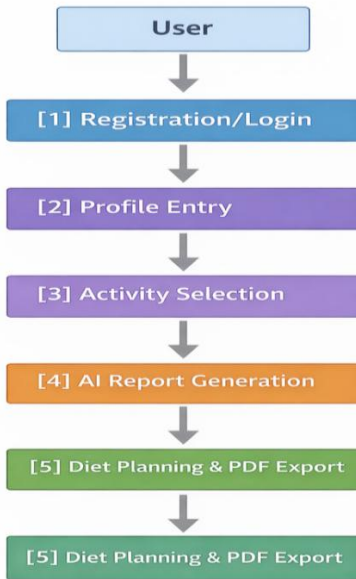


Fig 3: Level 1 Data Flow Diagram

The system is implemented using HTML, CSS, JavaScript for the frontend, and Node.js with Express.js for the backend. SQLite is used as the database. The modular design ensures scalability, efficiency, and ease of use.

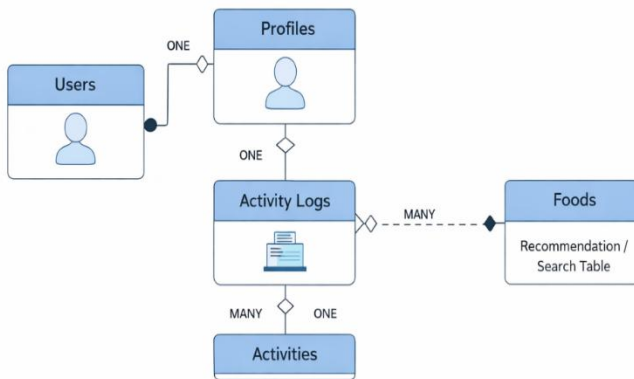


Fig 4: Entity Relationship Diagram

IV. RESULT & DISCUSSION

The developed system successfully provides personalized diet recommendations based on user input and activity data. The integration of BMI, BMR, and activity-based calorie calculations ensures accurate and meaningful results. Users can easily interact with the system through a simple interface and generate diet plans tailored to their needs.

The diet planner module allows users to organize meals effectively, and the PDF export feature enhances usability by providing a portable format. The system demonstrates improved accuracy and flexibility compared to traditional diet planning methods.

The results indicate that incorporating context-awareness significantly enhances the effectiveness of diet recommendations. The system performs efficiently and meets user requirements, making it suitable for real-world applications.

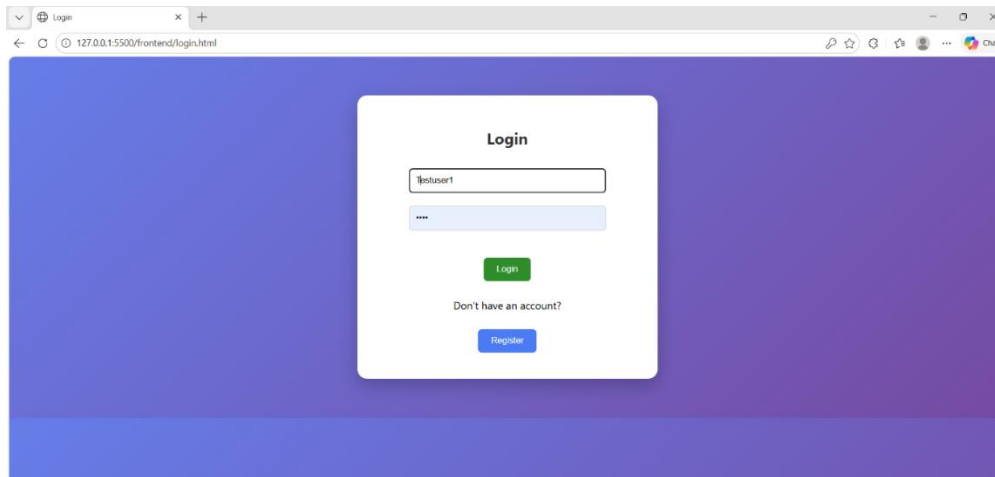


Fig 5: User Login Interface

V. CONCLUSION

The project successfully implements an AI-driven context-aware diet recommendation system that provides personalized and dynamic dietary suggestions. By integrating user profile data, activity tracking, and knowledge-based reasoning, the system offers an effective solution for modern diet planning.

The system improves user awareness, simplifies the diet planning process, and provides accurate recommendations. It demonstrates the potential of combining artificial intelligence with web technologies in healthcare applications.

REFERENCES

- [1] J. Smith and R. Brown, "Personalized Nutrition Recommendation Systems Using Artificial Intelligence," 2021.
- [2] M. Johnson and L. Davis, "Knowledge-Based Expert System for Healthy Diet Planning," 2020.
- [3] S. Williams and P. Clark, "Context-Aware Food Recommendation Using Activity Data," 2022.
- [4] A. Kumar and R. Sharma, "Web-Based Diet Management System," 2019.