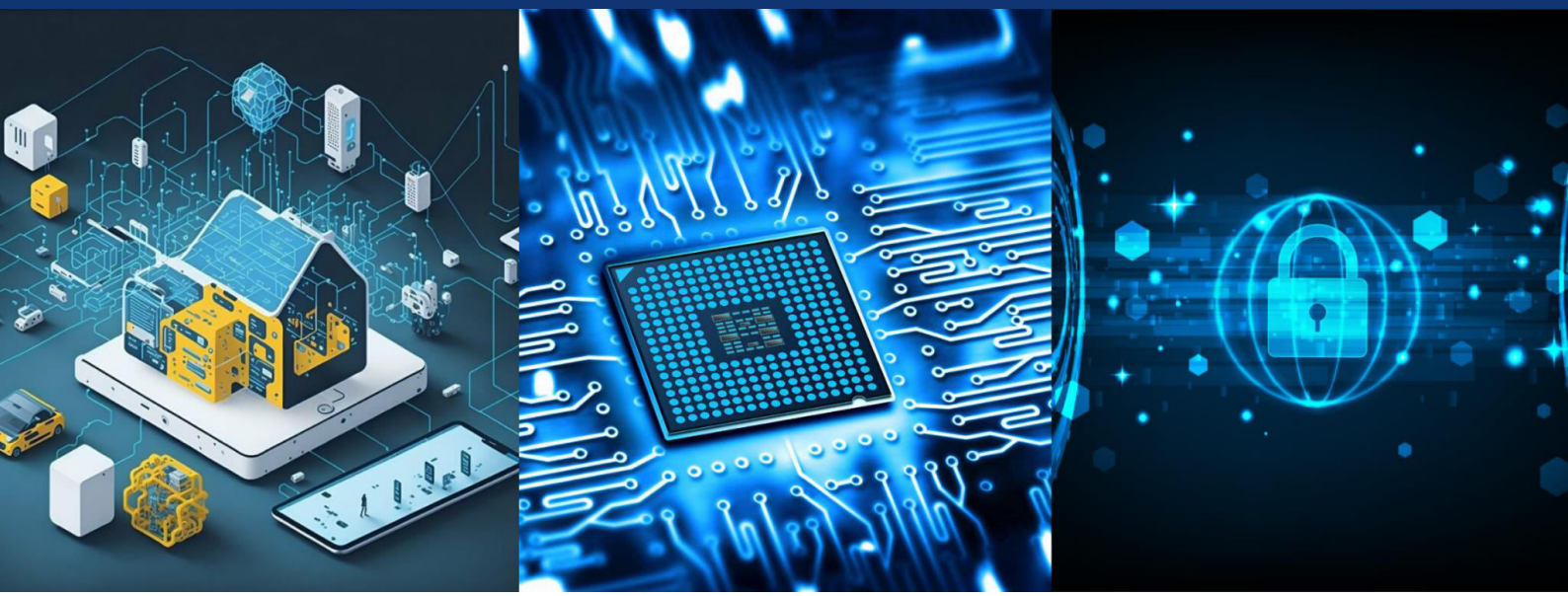
IJIRCCE

ISSN(O): 2320-9801

ISSN(P): 2320-9798



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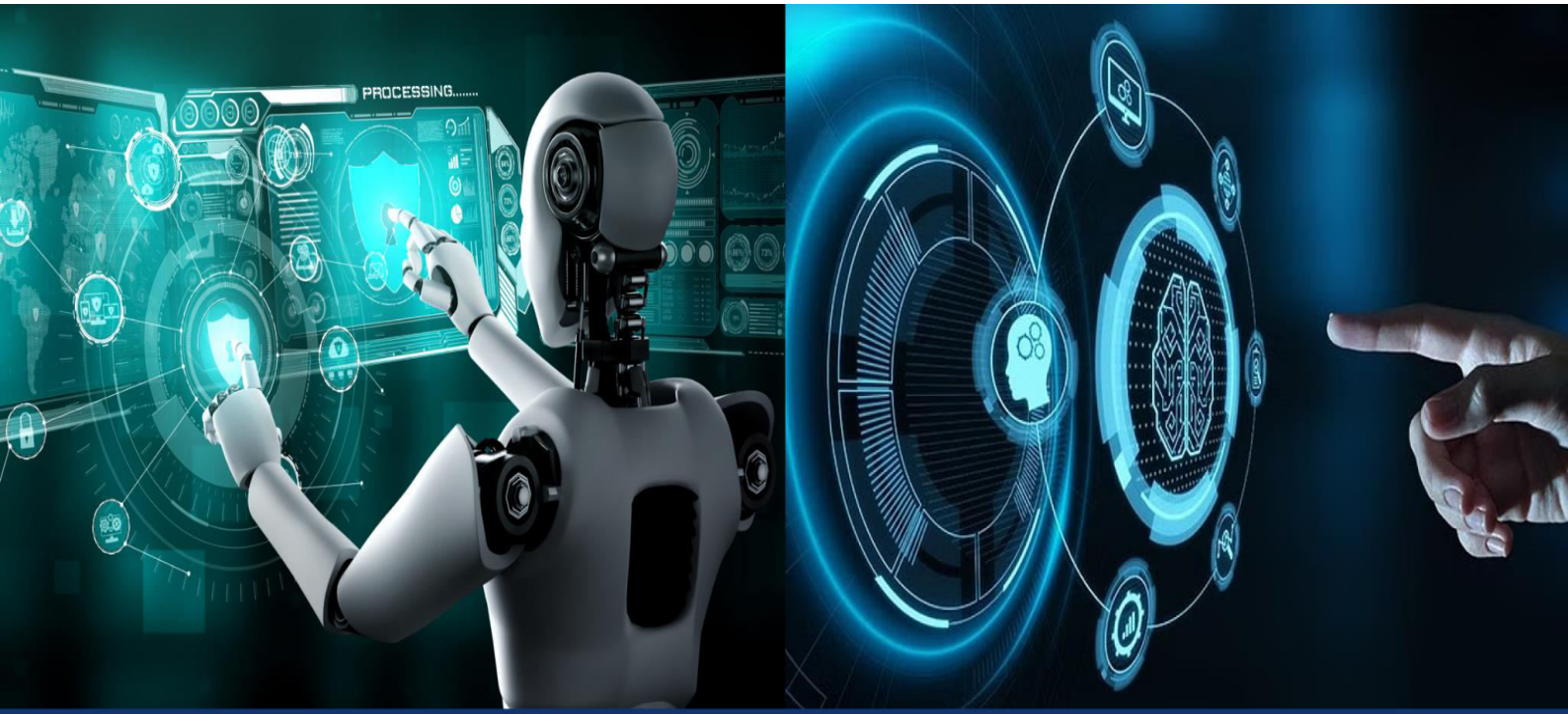

Impact Factor: 9.927

Volume 14, Issue 6, June 2026

© 2026 IJIRCCE | Volume 14, Issue 6, June 2026 DOI: 10.15680/IJIRCCE.2026.1406041

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 9.927| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Personalized Diet and Grocery Planner with AI Integration

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ABSTRACT: Personalized nutrition planning is essential for maintaining healthy lifestyles, managing weight, and improving overall well-being. However, generic diet recommendations often fail to consider individual nutritional needs, dietary preferences, regional food habits, and practical implementation. To address these challenges, NutriPlan is proposed as an intelligent personalized Indian diet and grocery planning system. The application utilizes a structured dataset of Indian meals containing nutritional values, dietary tags, regional categories, and ingredient information to generate customized recommendations. Using a rule-based and AI-inspired framework, the system combines profile-based filtering, fuzzy nutritional scoring, and TOPSIS-based multi-criteria ranking to recommend suitable meals. Based on user goals and preferences, NutriPlan creates a seven-day meal schedule covering breakfast, lunch, snacks, and dinner. The system also generates consolidated grocery lists, tracks progress, and evaluates plan effectiveness through macro-nutrient summaries, consistency scores, weekly trends, and achievement indicators. By providing transparent, scalable, and explainable recommendations, NutriPlan offers a practical solution for real-world personalized nutrition and diet management.

KEYWORDS: Personalized Nutrition, Meal Recommendation, Indian Diet, Fuzzy Logic, TOPSIS, Grocery Planning, Progress Tracking, Rule-Based System.

I. INTRODUCTION

The growing awareness of health, nutrition, and lifestyle-related challenges has increased the demand for personalized meal planning systems that help individuals maintain balanced eating habits. In today's fast-paced environment, many people struggle to design meal plans that align with their health goals, dietary restrictions, and regional food preferences. This challenge is particularly significant in India, where food habits vary widely across regions, cultures, and communities. Traditional diet planning methods, such as static diet charts, generic online recommendations, and manual consultations, often provide broad guidance but fail to address individual requirements. Factors such as age, gender, body measurements, activity level, food preferences, and health objectives are rarely considered comprehensively. As a result, users often find it difficult to follow and sustain such plans in their daily lives. Therefore, there is a growing need for intelligent, user-centric solutions that can generate personalized, practical, and culturally relevant dietary recommendations.

To address these limitations, this project proposes NutriPlan, an intelligent personalized Indian diet and grocery planning system that generates customized weekly meal plans based on individual user profiles. The application utilizes a structured dataset of Indian meals containing nutritional information such as calories, protein, carbohydrates, fats, ingredients, dietary tags, and regional classifications. The recommendation process combines rule-based filtering with AI-inspired decision-making techniques, including fuzzy nutritional scoring and TOPSIS-based multi-criteria ranking, to identify meals that best match user requirements. Based on inputs such as age, gender, anthropometric data, activity level, dietary preference, regional cuisine, and health goals, the system recommends suitable breakfast, lunch, snack, and dinner options for a seven-day period. In addition, NutriPlan automatically generates grocery lists and monitors user progress through macro-nutrient summaries, weekly trends, consistency scores, and achievement indicators, making nutrition management more practical, transparent, and effective.

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II. RELATED WORK

Personalized nutrition planning systems have been increasingly explored to address individual dietary needs, health concerns, and lifestyle constraints. Amiri, Li, and Hasan [1] proposed a flexible meal planning framework for individuals with diet-related health concerns, focusing on nutritionally appropriate and adaptable plans that consider user preferences and medical needs. The study improved practical adherence compared to generic diet charts; however, it emphasized feasibility and structured constraint handling more than intelligent multi-criteria meal ranking or integrated grocery and progress support.

Fuzzy-logic-based nutrition recommendation approaches have shown strong potential in handling uncertain and multi-dimensional dietary conditions. Salloum and Tekli [2] developed an automated framework for nutrition health assessment, recommendation, and progress evaluation using fuzzy reasoning. The system improved interpretability and adaptability in nutritional assessment, especially in complex health-related situations. However, the approach mainly focused on fuzzy reasoning and progress evaluation, with less emphasis on integrating flexible weekly meal-plan generation, meal variety, and practical grocery planning in a single user-centered application.

Optimization-based meal planning approaches have also demonstrated improved relevance in personalized recommendation. Salloum and Tekli [3] proposed a multi-factor meal plan generation model based on an adaptation of the transportation problem, where candidate meals were evaluated using structured relevance scoring. The study showed that considering multiple constraints improves recommendation quality and consistency. Nevertheless, the framework introduced increased model complexity and required careful balancing of multiple factors, and it did not directly focus on lightweight, explainable implementation for routine weekly meal planning with integrated dashboard, grocery, and progress features.

Overall, existing research mainly focuses on either flexible personalized planning, fuzzy nutritional reasoning, or optimization-based meal relevance scoring as separate directions. Limited work integrates profile-based filtering, fuzzy nutritional scoring, multi-criteria ranking, grocery generation, and progress tracking within a single Indian diet planning framework. The proposed work addresses this gap by combining structured meal data, fuzzy logic, and TOPSIS-based recommendation to improve personalization, nutritional relevance, and practical usability in weekly meal planning.

III. PROPOSED SYSTEM

By integrating profile-based filtering, nutritional scoring, and integrated support elements, the suggested system presents an intelligent tailored Indian diet and grocery planner that enhances the quality and usability of meal recommendations. In contrast to conventional methods, this method creates a customized seven-day meal plan using structured user inputs and meal properties. The method recommends appropriate meals for breakfast, lunch, snack, and dinner based on factors such as age, gender, weight, height, activity level, diet type, geographical preference, and health goal.

Indian meals with characteristics including calories, protein, carbs, fats, diet tags, ingredients, and location labels are included in a structured meal dataset used by the program. To enhance personalization, nutritional relevance, and diversity, the recommendation logic uses meal filtering, fuzzy nutritional scoring, and TOPSIS-based multi-criteria ranking. The system not only generates meal plans but also aggregates grocery lists from items and tracks progress using achievement indicators, weekly trends, consistency scores, and macro summaries.

The functional and technological requirements are transformed into a structured framework during the system design phase, which directs the creation of the customized Indian diet and grocery planning system. The architecture, parts, and process of the suggested intelligent recommendation-based application are explained in this section. For precise meal recommendations and useful nutrition support, the architecture guarantees modularity, scalability, and effective processing of user profile and meal data.

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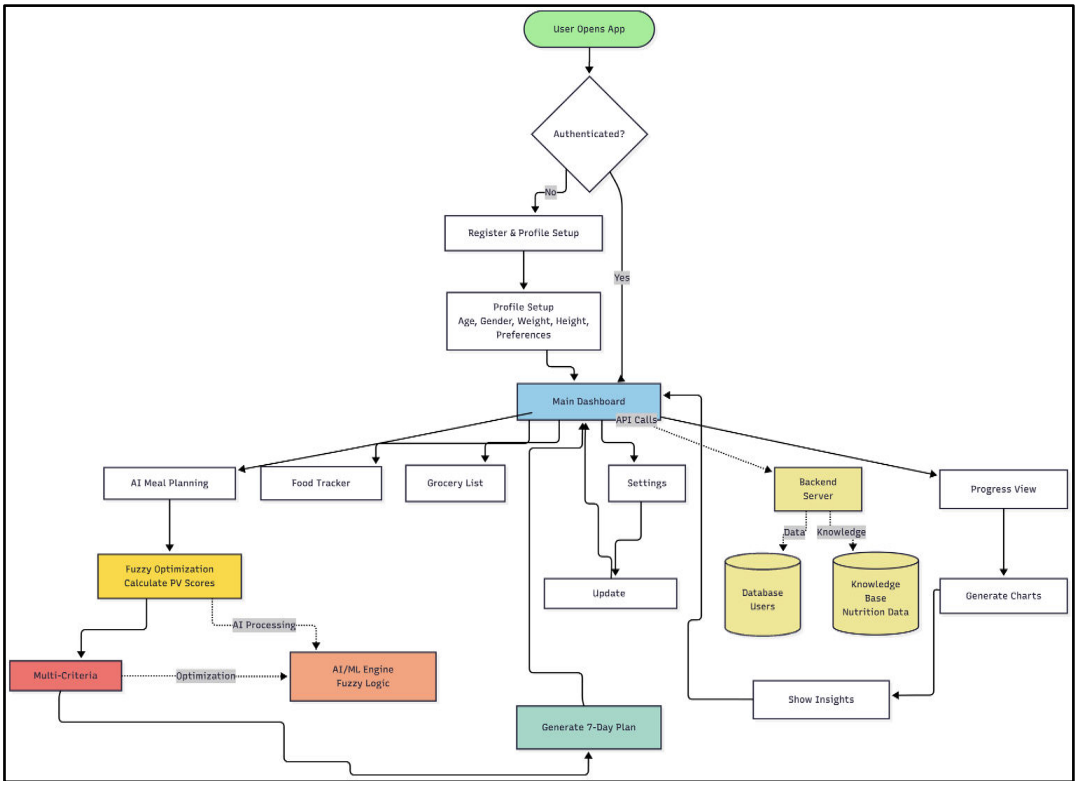

Fig.1. System Architecture

A. *User Profile Collection:*

User profile collection is the initial and one of the most important stages in the proposed personalized diet and grocery planning system. This module is responsible for gathering the essential personal, dietary, and lifestyle information required to generate meaningful meal recommendations. Since nutritional needs vary from one individual to another, collecting accurate user data is necessary for improving personalization and relevance. The profile setup process captures core attributes such as age, gender, height, weight, activity level, dietary preference, regional food preference, and primary health goal. These factors form the basis for estimating nutritional targets and selecting appropriate meals from the structured meal dataset. By using profile-driven inputs, the system is able to create a weekly meal plan that is personalized, practical, and better aligned with user requirements.

- In order to provide individualized meal recommendations, the system first gathers user-specific data.
- Age, gender, height, weight, exercise level, dietary preferences, regional food preferences, and primary health goals are all included in the input profile.
- Meals are filtered based on appropriateness and nutritional objectives are estimated using these inputs.
- A personalized seven-day meal plan is created using the profile that was gathered.

Total Number of Profile Inputs	8
Age	1
Gender	1
Body Measurements	2
Lifestyle Factor	1
Diet Preference	1
Region Preference	1
Health Goal	1

Table 1: Description of User Profile Inputs

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B. *Meal Data Processing:*

In order to provide the structured meal dataset for efficient recommendation, the meal data processing module is essential. Meal records must be loaded, parsed, validated, and arranged in order for the recommendation engine to use them. Indian meals with parameters such meal type, region, diet type, calories, protein, carbs, fats, tags, ingredients, and time are included in this project's CSV-formatted dataset.

- **Data loading:** The meal dataset is imported from a CSV file containing structured food records.
- **Data parsing:** Meal attributes are converted into valid application objects for use in the planner.
- **Data validation:** Invalid or incomplete meal records are ignored to improve recommendation consistency.
- **Attribute organization:** Important meal fields such as nutritional values, ingredients, and category labels are preserved for planning.
- **Duplicate handling:** Repeated or low-quality entries, if present, can be reduced to improve variety and reliability.
- **Dataset suitability:** The meal dataset is already organized by meal type and food characteristics, so no complex transformation is required.

C. *Meal Data Processing*

The meal recommendation and scoring module is responsible for selecting the most suitable meals based on user profile information and nutritional objectives. This module represents the core intelligence of the proposed personalized diet and grocery planning system, as it combines profile-based filtering, nutritional target estimation, fuzzy logic scoring, and TOPSIS-based multi-criteria ranking to improve personalization and practical usefulness. In the initial stage, meals are filtered according to dietary preference and regional suitability so that only valid candidate meals are considered. Daily nutritional targets are then estimated using user profile values such as age, weight, height, activity level, and health goal.

After filtering and target estimation, fuzzy logic is applied to measure how well each candidate meal fits the user's nutritional trajectory and daily balance. The fuzzy nutritional balance score is calculated as:

$$F_{score} = \begin{cases} 0.32(\mathrm{C_{fit}}) + 0.32(\mathrm{P_{fit}}) + 0.36(\mathrm{M_{fit}}), & \text{for dinner} \\ 0.48(\mathrm{C_{fit}}) + 0.42(\mathrm{P_{fit}}) + 0.10(\mathrm{M_{fit}}), & \text{for other meal slots} \end{cases} \quad (1)$$

Where $\mathrm{C_{fit}}$ represents calorie fitness, $\mathrm{P_{fit}}$ represents protein fitness, and $\mathrm{M_{fit}}$ represents macro-balance fitness. The fuzzy score ranges from 0 to 1, where a value closer to 1 indicates better nutritional suitability.

Following fuzzy evaluation, TOPSIS-based ranking is used to compare candidate meals across multiple criteria. The decision vector for each meal candidate is represented as:

$$X_i = [R_i, G_i, F_i, T_i, V_i, W_i] \quad (2)$$

Where R_i is region affinity, G_i is goal-fit score, F_i is fuzzy nutritional score, T_i is tag alignment, V_i is variety score, and W_i is weekly stability score.

The TOPSIS closeness score is calculated as:

$$T_{score} = \frac{S_I^-}{S_i^+ + S_i^-} \quad (3)$$

Where S_I^+ is the distance from the ideal best solution and S_I^- is the distance from the ideal worst solution.

The final rank of the candidate meals is determined by sorting the TOPSIS scores in descending order:

$$Final\ Rank = sort(T_{score})_{descending} \quad (4)$$

This combined scoring and ranking process enables the system to choose meals that are not only nutritionally appropriate but also aligned with user goals, regional preferences, variety requirements, and weekly balance. As a result, the application generates personalized and meaningful meal selections for the weekly plan.

D. *Grocery Generation and Progress Tracking*

Following the creation of the weekly meal plan, the system uses the chosen meal records to prepare groceries and assess progress. By integrating meal planning with implementation and monitoring, this module enhances the

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application's practical usability. While progress tracking is based on user-selected meals, grocery generation is carried out by combining ingredients utilized for each meal in the weekly plan.

- **Grocery Aggregation:** Ingredients from all meals are combined into a consolidated grocery list.
- **Quantity Approximation:** Ingredient frequency is used to estimate weekly grocery quantities.
- **Meal Selection Tracking:** Users can mark meals as selected or followed for each day.
- **Macro Summary:** The system calculates calories, protein, carbohydrates, and fats from selected meals. detection.
- **Progress Evaluation:** Weekly trends, consistency score, and achievement indicators are generated to provide performance insight.

IV. PSEUDO CODE

Step 1: Collect the user profile inputs such as age, gender, weight, height, activity level, diet preference, region preference, and health goal.
Step 2: Load the meal dataset and parse all valid meal records.
Step 3: Filter the meals according to the user's dietary preference and regional suitability.
Step 4: Estimate the daily nutritional targets such as calorie and protein requirements from the user profile.
Step 5: For each day of the week and for each meal slot, generate all possible candidate meals.
Step 6: Calculate the fuzzy nutritional score for each candidate meal using nutritional fitness and daily balance criteria.
Step 7: Compute the TOPSIS score for each candidate meal by combining fuzzy score, goal fit, region affinity, tag alignment, variety, and weekly stability.
Step 8: Select the highest-ranked meal for each meal slot and generate the 7-day meal plan.
Step 9: Aggregate the ingredients of the selected meals and generate the grocery list.
Step 10: Compute the progress summary including macros, weekly trends, consistency score, and achievements.
Step 11: Display the dashboard, meal planner, grocery list, and progress outputs.
Step 12: If the user regenerates the plan, repeat from Step 5; otherwise End.

V. SIMULATION RESULTS

A. *Web-Based System*

With a user-friendly interface for real-time meal recommendations, grocery creation, and progress tracking, the application is implemented as a web-based personalized nutrition planning system. First, users input personal and dietary data, including age, gender, height, weight, activity level, type of diet, preferred locale, and health objective. The algorithm creates a customized seven-day Indian food plan based on these inputs after processing the user profile through the recommendation engine. Additionally, the program shows grocery lists, weekly consistency scores, nutritional summaries, and progress insights, making the system useful and engaging for daily nutrition management.

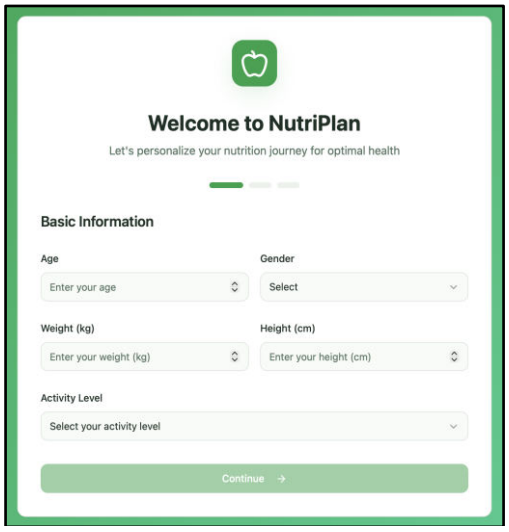

Fig. 2 User Profile Setup Screen

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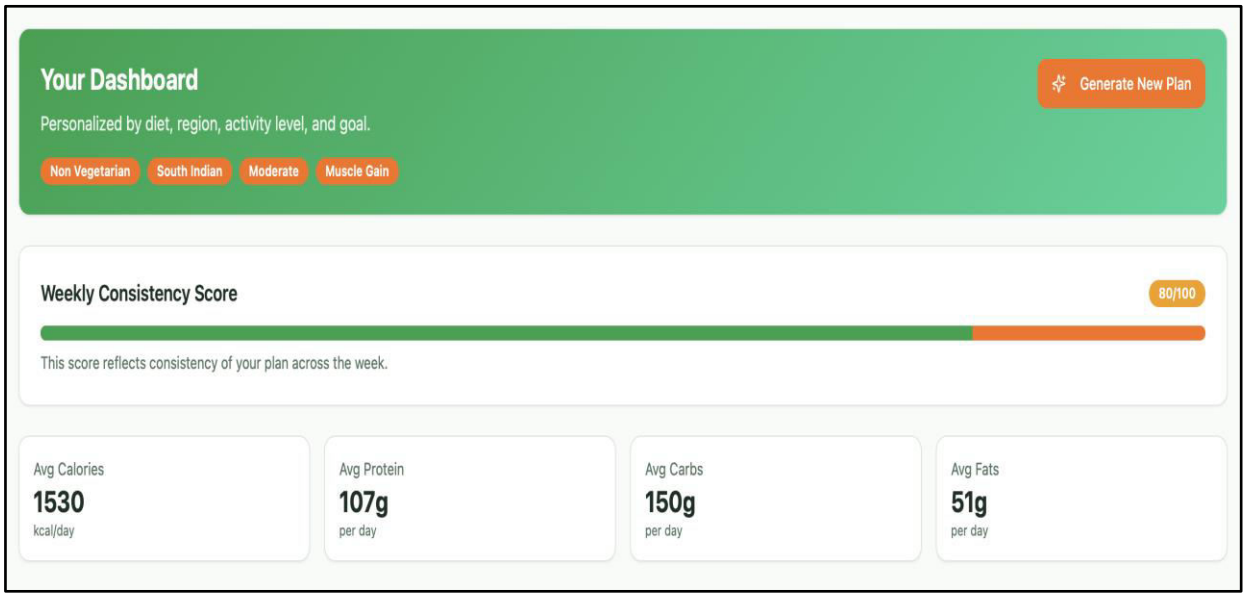

Fig. 3 Dashboard Screen with Weekly Consistency Score

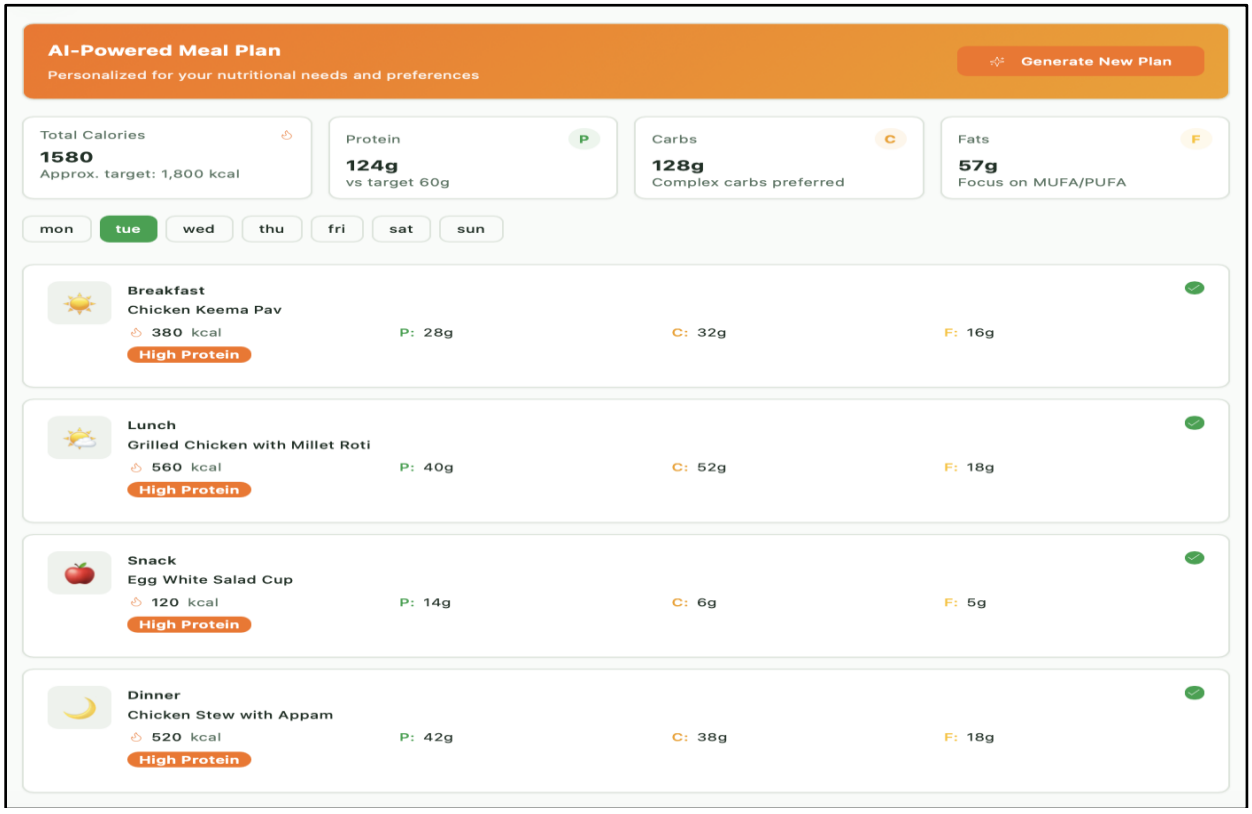

Fig. 4 AI-Powered Meal Plan Screen

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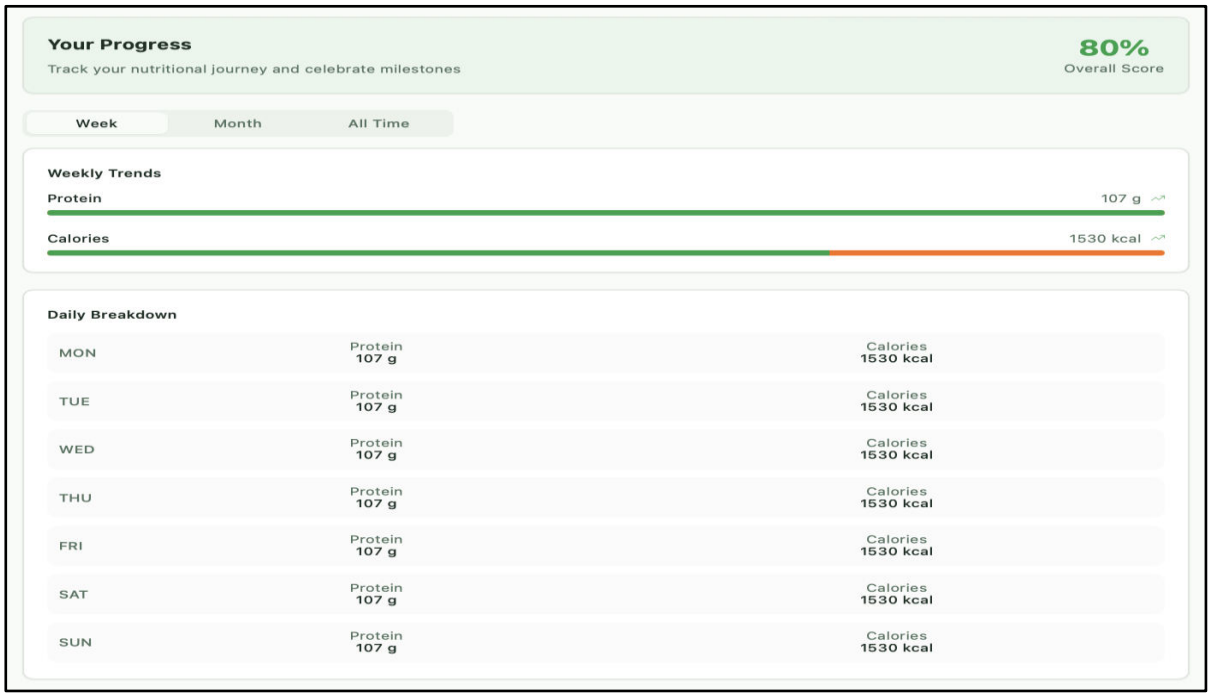

Fig. 5 Progress Tracking Screen - Weekly Trends and Daily Breakdown

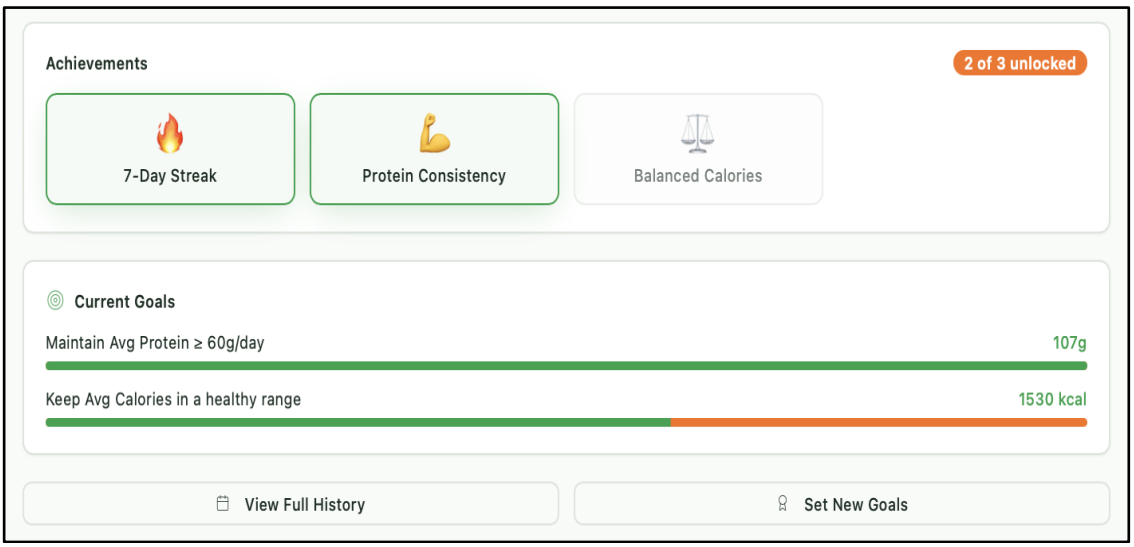

Fig. 6 Achievements and Goals Screen

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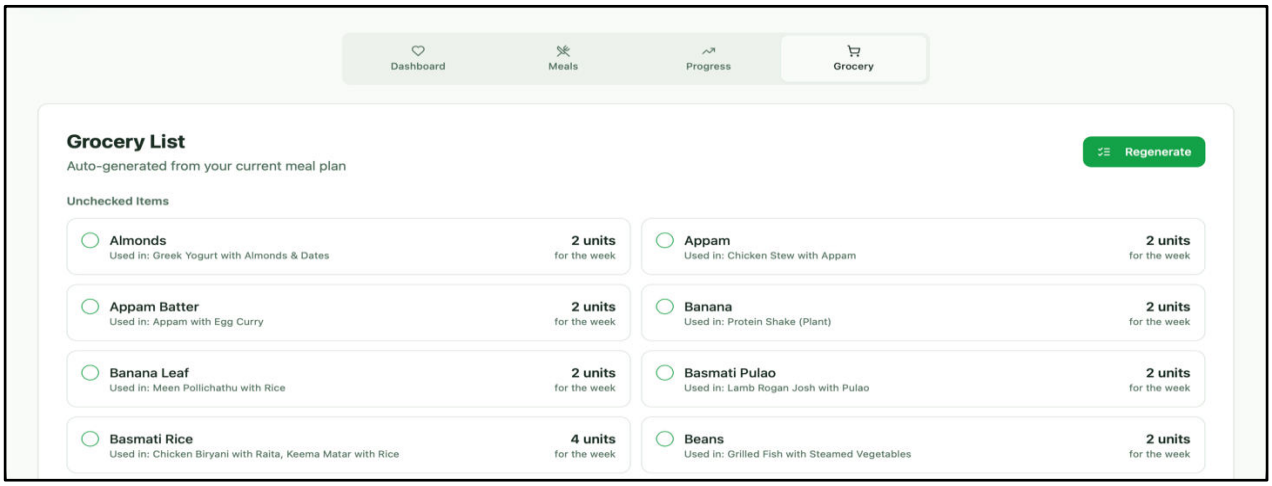

Fig. 7 Grocery List Screen

B. *Evaluation of User Meals*

Several output metrics that show how well meal recommendations, nutritional balance, and user progress tracking work are used to assess the suggested personalized nutrition planning system. This application is evaluated by useful planning outputs and intelligent scoring outcomes, in contrast to standard prediction systems that are evaluated using categorization metrics. The weekly consistency score, macro summary, weekly trends, achievement indicators, and fuzzy logic with TOPSIS-based meal selection are the main assessment indicators taken into account in this project.

Based on user profile inputs including age, gender, weight, height, activity level, diet type, geographical preference, and health goal, the program can build a comprehensive seven-day personalized meal plan, according to the given results. The progress module shows weekly trends, daily breakdown, and accomplishment status, while the dashboard shows average values for calories, protein, carbs, and fat. By automatically creating a combined weekly grocery list from the chosen meal plan, the grocery module enhances practical usability even more.

Candidate meals are assessed using TOPSIS-based multi-criteria ranking and fuzzy nutritional scoring in order to better examine the recommendation process. The TOPSIS score determines the final recommendation rank by combining the fuzzy logic score with other factors like region affinity and goal fit. The fuzzy logic score assesses how well a meal satisfies the user's nutritional requirements for a particular meal slot.

Meal Candidate	Fuzzy Logic Score	Region Affinity	Goal Fit	TOPSIS Score	Final Rank
Moong Dal Cheela with Paneer	0.83	0.88	0.84	0.86	1
Ragi Dosa with Sambar	0.79	1.00	0.76	0.84	2
Veg Poha with Peanuts	0.68	0.72	0.70	0.73	3
Oats Porridge with Fruits	0.64	0.95	0.66	0.71	4

Table 2: Evaluation Of User Meals

According to the above table, Moong Dal Cheela with Paneer was chosen as the best suggestion because it had the highest TOPSIS score of all the breakfast options that were assessed. This suggests that by taking into account several nutritional and contextual elements simultaneously rather than depending on a single rule, the combined fuzzy logic and TOPSIS approach enhances the quality of tailored meal selection.

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Overall, the trial results show that the suggested application effectively supports shopping preparation and progress tracking while creating meaningful, goal-oriented, and user-specific meal plans. The solution is appropriate for customized nutrition management in real-world use cases since the integrated recommendation framework offers a useful and understandable substitute for generic static diet charts.

VI. CONCLUSION AND FUTURE WORK

Personalized nutrition planning is increasingly important for maintaining balanced diets, achieving fitness goals, and supporting sustainable eating habits. This study addressed the limitations of generic and static diet planning methods by developing a personalized Indian diet and grocery planner that combines structured meal data with intelligent recommendation logic. The system integrates user profile collection, meal dataset processing, recommendation, grocery generation, progress evaluation, and an interactive user interface within a modular framework. By applying profile-based filtering, fuzzy nutritional scoring, and TOPSIS-based ranking, the application generates relevant, consistent, and goal-oriented weekly meal plans. The integrated grocery and progress modules further improve practical usability. Overall, the study demonstrates that intelligent personalized nutrition systems can enhance planning efficiency, reduce user effort, and support meaningful dietary guidance.

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