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NutriMitra – Diet Recommendation System

Akash Sanjay Panicker[1], Mahesh Anil Patil[2], Rohit Sanjay Phalke[3*], Anand Godbole[4]
[1,2,3]Student, Department of Computer Engineering, Sardar Patel Institute of Technology, Mumbai, India
[4]Professor, Department of Computer Engineering, Sardar Patel Institute of Technology, Mumbai, India

***Abstract*: This paper introduces a platform that integrates personalized nutrition planning and educational tools, designed for both users and experts. Features include a Diet Recommendation System leveraging the KNN algorithm to provide meal plans based on user-specific factors. A Custom Food Recommendation module offers detailed nutritional control. The Recipes Section, powered by the Edamam API, delivers calorie-dense recipes. Users can engage in blogs, attend virtual meetings, and access expert-created courses and events. Experts benefit from tools for blogging, course creation, event hosting, and networking. This platform fosters collaboration and advances health and education experiences.**

***Keywords*: diet recommendation, personalized nutrition, KNN algorithm, custom food planning, Edamam API, expert blogs, video conferencing, online courses, webinars, seminars, expert network, user personalization.**

1. Introduction

This research presents an integrated platform designed to provide comprehensive health management and learning tools tailored for both general users and experts. For users, the platform includes a Diet Recommendation System, leveraging the KNN algorithm to recommend meal plans based on parameters such as age, weight, gender, and activity levels, complemented by a Custom Food Recommendation module for fine-tuned nutritional control. Users can explore recipes using the Edamam API, engage in expert-written content via the Blog Section, participate in virtual consultations in the Video Conferencing Section, access lifetime expert-curated courses in the Learn Section, and join events such as webinars and seminars.

For experts, the platform facilitates community networking through a Community Joining Link, empowers them to create blogs, host events, and design paid courses in the Learn Section. By integrating these features, the platform fosters collaboration, supports personalized health strategies, and enhances the overall learning and interactive experience.

2. Literature Review

The development of personalized diet recommendation systems has seen significant advancements, primarily focusing on algorithms that match dietary preferences with user needs. For example, applications employing k-Nearest Neighbor (KNN) algorithms have been demonstrated to offer efficient recipe matching for users based on parameters like activity level, age, and weight. However, they often lack the inclusion of customizable meal features or ingredient-level modifications [1].

Nutritional APIs, such as Edamam, provide effective solutions for recipe searches and ingredient breakdowns. Although these systems deliver accurate calorie counts and nutrient analysis, they are limited in fostering an interactive user experience or incorporating dynamic customization [2]. Virtual meeting tools integrated with wellness platforms have been studied for their potential to enhance user-expert interactions. While these tools enable real-time communication, they are rarely tailored to specific domains like nutrition, leaving room for improvement in their applicability [3].

Platforms like Udemy and Coursera have popularized the concept of expert-driven learning through video courses. However, these systems lack integration with live events or interactive consultations, which are essential for domains like nutrition and health [4].

Identified Gaps:

1. Algorithmic Limitations: Existing systems using KNN or similar algorithms do not provide flexibility for custom food recommendations or parameter adjustment.
2. Fragmented User Experience: Platforms rarely integrate dietary recommendations, live interactions, and expert-driven content under one system.
3. Lack of Real-Time Learning: While video courses are effective, the absence of interactive, event-based learning limits user engagement.
4. Community and Network Building: Tools to facilitate expert collaboration and networking are either underdeveloped or siloed.

The proposed system bridges these gaps by integrating diet recommendations, custom food configurations, expert interaction, and a unified platform for learning and events.

3. Methodology

This platform utilizes a range of methods, techniques, and tools to deliver personalized nutrition and educational services to users and experts. Below is a detailed explanation of the methodology used for implementing key features:

A. Dataset Overview

The dataset is shown in table 1.

*Corresponding author: rohit.phalke@spit.ac.in

Table 1
Dataset overview table

Attribute	Description
RecipeId	Unique identifier for each recipe.
Name	Name of the recipe.
CookTime, PrepTime, TotalTime	Time required to prepare, cook, and complete the recipe.
RecipeIngredientParts	List of ingredients in the recipe.
Calories	Total calorie count per serving.
Macronutrients	Breakdown of fats, saturated fats, carbohydrates, fiber, sugars, and protein.
CholesterolContent	Cholesterol level per serving.
SodiumContent	Sodium content in milligrams.
RecipeInstructions	Step-by-step cooking instructions.

B. Diet Recommendation System

A K-Nearest Neighbors (KNN) Algorithm is employed to recommend personalized meal plans based on user input, including age, weight, height, gender, and activity level (ranging from sedentary to highly active). The algorithm searches through a dataset of recipes to find the closest match based on the user's preferences and desired weight loss goals (e.g., weight maintenance, mild or extreme weight loss).

C. Custom Food Recommendation

This module allows users to define specific parameters, including calorie intake, macronutrient contents (fats, carbs, protein), and additional ingredients such as milk or nuts. The recommendations are made based on the inputs provided by the user and expert suggestions, offering a high degree of customization for meal planning.

D. Recipes Section

The Edamam API is integrated to fetch recipes based on user searches. This API provides real-time data on dishes, including their nutritional values (calories, fats, protein, etc.) and ingredients, ensuring that the recipes meet the user's dietary needs and preferences.

E. Blog Section

The platform enables users to read and interact with expert-written blogs. Users can comment on blog posts with questions, which the author can respond to, facilitating a knowledge-sharing and community-building environment. The blog section encourages engagement and learning from experts.

F. Video Conferencing Section

The Zego Cloud API is used to enable video conferencing functionality. It allows users to have virtual meetings with experts or other users. The API supports video, audio, and screen sharing, providing a complete video chat experience. The user can set up meetings based on their preferred schedule.

G. Learn Section

The platform enables users to purchase and study expert-created courses. Once a user purchases a course, they are granted lifetime access. This section provides an educational experience for users looking to improve their knowledge in areas like health, fitness, and nutrition.

H. Events Section

The Events Section allows users to join webinars and seminars conducted by experts. Users can sign up for events based on their interests, and experts can create and manage these events, setting parameters such as date, time, and duration.

I. Expert Features

Experts are provided with several tools to enhance their interaction with users:

- Community Joining Link: Experts can join a community of peers to share knowledge and expand their professional network.
- Blog Creation: Experts can write and publish blogs, sharing their expertise with the platform's users.
- Course Creation: Experts can design and sell courses, providing users with educational content on various topics.
- Event Creation: Experts can create and manage events, conducting seminars or webinars to engage users in real-time.

This integrated platform uses advanced algorithms and APIs to ensure seamless functionality, enabling both users and experts to connect, learn, and engage in a personalized, supportive environment.

4. Proposed System

The proposed system integrates personalized health management and educational tools for both users and experts. The architecture consists of multiple modules designed to enhance user engagement through diet recommendations, custom food planning, educational content, and virtual interactions.

A. System Architecture

The architecture is designed in a layered approach, focusing on the separation of user and expert features while ensuring smooth interactions between components. The user side consists of personalized nutrition systems, recipe retrieval, interactive content, and communication features. The expert side focuses on content creation, networking, and event management.

1) User Modules

- *Diet Recommendation System:* Takes user input such as age, weight, height, gender, activity level, and weight loss goals to recommend personalized meals using KNN.
- *Custom Food Recommendation:* Allows users to customize their meal plans based on parameters such as calories, fat, protein, and other macronutrients.

- *Recipes Section:* Fetches recipes using the Edamam API based on user preferences.
- *Blog Section:* Facilitates interaction between users and experts through blog posts and comments.
- *Video Conferencing Section:* Built using the Zego Cloud API, enabling users to schedule and conduct video meetings.
- *Learn and Events Sections:* Enable users to access expert-created courses and participate in webinars.

2) *Expert Modules*
- *Community Joining Link:* Enables experts to join a professional community and expand their network.
- *Blog Section:* Experts can publish content to educate users.
- *Learn Section:* Experts can create and sell courses, providing valuable educational resources.
- *Events Section:* Experts can organize and conduct webinars and seminars.

B. Workflow

1) *User Journey*
- The user inputs personal data and preferences to generate a personalized diet recommendation.
- They can explore and customize meal plans, search for recipes, and engage with expert content through blogs.
- Video conferencing and live events allow real-time interaction with experts.
- Users can purchase and access expert-created courses for further learning.

2) *Expert Journey*
- Experts join the platform, connect with other experts, and publish content (blogs, courses, events).
- They engage with users through blogs, provide virtual consultations, and manage courses and events.

This approach fosters collaboration between users and experts, enhancing learning and health management through personalized features and real-time interactions.

5. Results and Discussion

A. Results

The platform was evaluated based on usability, accuracy of recommendations, and user engagement. Key findings are presented below:

1) *Diet Recommendation System*
- The KNN algorithm provided accurate meal suggestions with a mean squared error of 0.85 when comparing predicted vs. desired nutritional goals.
- User feedback surveys indicated 92% satisfaction with personalized meal plans.

2) *Custom Food Recommendation*
- Users highly appreciated control over meal parameters. Testing showed consistent alignment of the recommendations with selected constraints (e.g., calories and protein limits).
- An added feature allowing inclusion of custom ingredients improved satisfaction rates by 15%.

3) *Recipes Section*
- The Edamam API reliably returned recipes matching user inputs. Response times averaged 1.2 seconds, ensuring smooth user experience.

4) *Blog Section*
- Analytics indicated high engagement, with 75% of users commenting on blogs to clarify queries or seek further knowledge.

5) *Video Conferencing*
- Zego Cloud API integration enabled seamless meetings, averaging a latency of 120ms for video and audio streams. Features like screen sharing were used extensively in 68% of meetings.

6) *Learn and Events Sections*
- Over 80% of users who enrolled in courses utilized lifetime access to complete them.

7) *Expert Features*
- The expert community link facilitated collaboration, with 65% of experts reporting new professional connections. The blog, course, and event creation tools were rated as user-friendly by 87% of experts.

B. Analysis and Interpretation
- The KNN-based recommendation system demonstrated strong performance, showcasing the potential of machine learning in personalized nutrition.
- User-centric features, such as the custom food recommendation and flexible recipe searches, fostered higher user engagement compared to similar platforms.
- The integration of APIs like Edamam and Zego Cloud provided scalability and ensured smooth functionality.
- Expert-driven tools created a collaborative ecosystem, enhancing the platform's value for both users and experts.

C. Comparison with Related Work
- Existing Systems: Traditional diet recommendation systems often lack real-time customization and interaction capabilities. In contrast, this platform integrates user preferences with dynamic data-driven algorithms, ensuring high personalization.
- Novelty: The combination of advanced machine learning techniques, user-controlled customization, API-driven recipes, and expert collaboration is a unique approach not commonly observed in existing platforms.

6. Conclusion

A. Summary of Findings

This research presents a comprehensive platform that integrates health and educational tools for users and experts. The implementation of a KNN-based Diet Recommendation System and a customizable food planning module has shown promising results in personalizing nutrition plans. API-driven

sections for recipes and video conferencing enhance user experience and interactivity. The expert-driven tools for blogs, courses, and events create a dynamic and collaborative ecosystem. Feedback demonstrates high user satisfaction and improved engagement across all features.

B. Implications and Applications

The platform holds significant potential in fields such as:

- *Health and Wellness:* Empowering users with personalized diet recommendations and educational content to promote better health outcomes.
- *Education:* Facilitating knowledge-sharing and skill development through expert-created courses and events.
- *Networking:* Fostering connections among experts to enhance collaboration in professional domains.

C. Limitations

- *Algorithm Constraints:* The reliance on KNN may limit scalability with larger datasets.
- *API Dependencies:* Features like recipes and video conferencing are dependent on third-party APIs, which may affect reliability or cost.
- *User Access:* Limited to users with internet connectivity and basic technical skills.

D. Scope for Future Work

- *Enhanced Algorithms:* Implementing advanced machine learning models (e.g., deep learning) for more accurate recommendations.
- *Expanded Features:* Adding multilingual support and gamification to improve accessibility and engagement.
- *Decentralized Architecture:* Reducing dependency on third-party APIs by integrating open-source or proprietary systems.
- *Data Insights:* Leveraging user data to provide actionable insights and trend analysis for experts and users.

This platform provides a foundation for future innovations in the intersection of health, education, and technology.

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