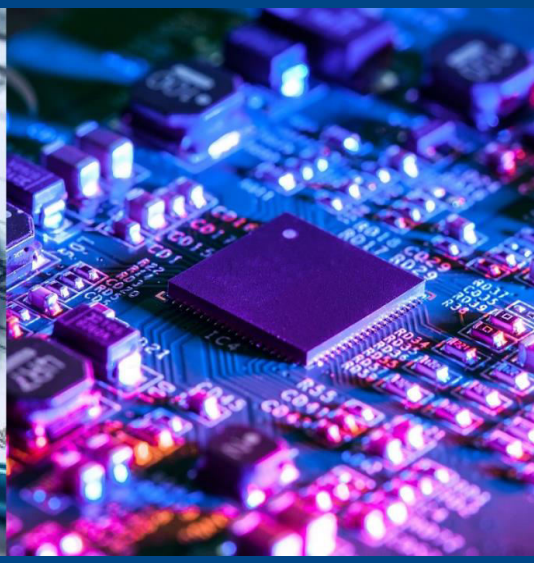
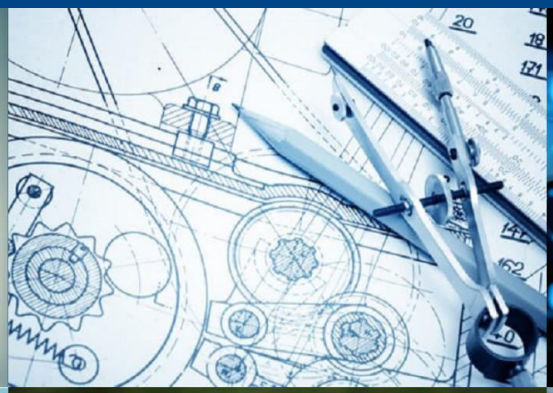
ISSN: 2582-7219

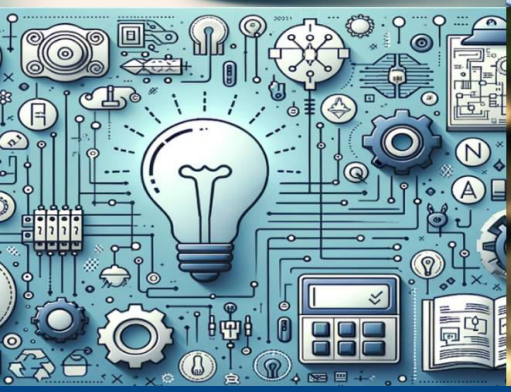




International Journal of Multidisciplinary Research in Science, Engineering and Technology

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



Impact Factor: 8.206 **Volume 8, Issue 6, June 2025**

© 2025 IJMRSET | Volume 8, Issue 6, June 2025| DOI:10.15680/IJMRSET.2025.0806159

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

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

Customized Meal Recommendation using User Preferences and ML Algorithms in Restaurant Systems

Rajvardhan Shinde [1], Anand Nair [2], Prerana Kolhe [3], Adarsh Shendkar [4], Praveen Blessington [5]

Dept. of Information Technology, Zeal College of Engineering and Research, Pune, India

ABSTRACT: The food sector is being revolutionized with tech-based innovations to enhance the customer experience. This paper examines a "Customized Meal Recommenda- tion System" that uses machine learning algorithms to give personalized meal recommendations based on user preferences such as budget, number of individuals, spice tolerance, and other restaurant-based factors. Three major interfaces exist in the system: User Panel for preference taking, Admin Panel for menu management, and Chef Panel for presenting ordered meals. This research explores technological innovations in personalized meal recommen- dation and how machine learning is assisting in achieving maximum customer satisfaction with minimal cost.

KEYWORDS: Machine Learning, Meal Recommenda- tion, Customer Preferences, Personalized Dining, Food Industry Technology

I. INTRODUCTION

Personalized recommendation systems have emerged as the mainstay in modern times, changing the way people interact with technology in a variety of sec- tors. Leveraging advancements in machine learning, AI, and data analytics, personalized recommendation sys- tems have revolutionized e-Commerce, entertainment, healthcare, and other industries. The food industry, in particular, has been transformed with personalized meal recommendation systems, which have the potential to en- hance dining experiences with customized meal recom- mendations aligned with individual preferences, dietary needs, and lifestyle.

In recent years, there has been an exponential growth in demand for intelligent and customized meal recom- mendation systems driven by changing customer be- havior, increased health awareness, and higher demands for convenience. Modern consumers no longer toler- ate generic menu options; instead, they prefer meals that cater to their own tastes, nutritional requirements, and cultural background. Traditional menu selection processes often overwhelm consumers with too many choices, leading to decision fatigue and suboptimal meal selections. This is where machine learning-based recommendation

II. LITERATURE REVIEW

Recent advances in personalized diet recommenda- tion systems have utilized artificial intelligence (AI) and machine learning (ML) to enhance dietary advice tailored to user-specific factors. Various research studies have explored collaborative filtering, nutritional match- ing algorithms, and clustering techniques to improve the accuracy and relevance of meal recommendations.

Kumari (2024) introduced a Personalized Diet Rec- ommendation System Using Machine Learning, where the model considers age, gender, daily meals, exer- cise intensity, and weight goals to generate customized diet plans. The methodology involves training machine learning models on user-specific factors, ensuring more accurate and tailored meal recommendations. However, the study highlights limited personalization across di- verse dietary needs, indicating a gap in adapting recom- mendations to various dietary restrictions and cultural preferences [1].

Shrinivas (2023) proposed a Personalized Food Rec- ommendation System Using Machine Learning Models, focusing on user preferences across different age groups. The approach applies age-group-based clustering and collaborative

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

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

filtering to refine personalized food sug- gestions. Despite its innovative use of user segmentation, the study notes insufficient integration of real-time user feedback, limiting the model's adaptability to dynamic dietary changes and user preferences [2].

Vijaykumar (2022) developed A Personalized Food Recommender System for Women Considering Nutri- tional Information, which emphasizes proper diet and nutrition-based meal suggestions tailored specifically for women. The study incorporates a nutritional matching algorithm, integrating user feedback to refine recommen- dations further. However, the primary limitation lies in the lack of adaptability to cultural cuisine preferences, reducing its effectiveness in diverse populations [3].

III. PROBLEM FORMULATION

Meal selection remains a challenge in modern restau- rants due to limited personalization, static menus, and inefficient ordering processes. Customers often struggle to find meals that match their budget, dietary preferences, spice tolerance, and ingredient availability. Traditional menu-based ordering systems lack real-time inventory updates, group meal combinations, and the ability to learn from customer behavior, resulting in a less sat- isfying dining experience.

One of the biggest challenges is the lack of per- sonalization in current food recommendation systems, which fail to offer meal suggestions tailored to indi- vidual preferences. Budget constraints are often ignored, preventing customers from receiving cost-effective meal recommendations. Additionally, an overwhelming num- ber of menu options can cause decision fatigue, making it difficult for customers to quickly choose the best meal combination. Static menus that do not adapt to ingredient availability add to the frustration when certain meals become unavailable.

Another major issue is the inefficiency of recom- mendation systems in handling new users, commonly known as the cold start problem. Without prior order history, new users receive less relevant meal suggestions, making collaborative filtering techniques less effective. Group ordering also remains inefficient, as most systems lack automated meal splitting or optimization. AI-driven solutions are underutilized, with many systems relying on fixed rules rather than adaptive machine learning models that refine suggestions based on user interactions. Additionally, the absence of real-time customer feedback integration limits the ability of these systems to improve over time.

IV. OBJECTIVES

The aim of this project is to develop a Customized Meal Recommendation System that enhances the dining experience by providing personalized meal suggestions based on user preferences, budget, spice tolerance and ingredient availability. The system will utilize advanced machine learning algorithms and real-time data process- ing to generate tailored recommendations while optimiz- ing restaurant operations.

By leveraging AI-driven technologies, the platform will streamline meal selection, minimize decision fa- tigue, and improve order accuracy. Additionally, the project seeks to enhance restaurant management through real-time inventory updates, dynamic menu adjustments, and automated group meal optimization. Ultimately, this project aims to create a smart, adap- tive, and user-focused recommendation system that ben- efits both customers and restaurant businesses, ensuring a seamless and efficient dining experience.

V. RESULTS

The Customized Meal Recommendation System was successfully developed and tested. Its functionality spans across core modules such as the homepage (user prefer- ence input), meal recommendation engine, and the chef panel (for kitchen-side order tracking). The system was tested on multiple input scenarios to validate responsive- ness, correctness, and interface usability.

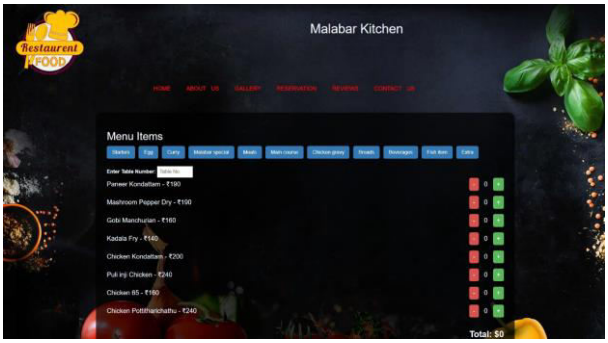
A. Homepage Interface

The homepage acts as the user's entry point into the system. It allows for the input of multiple preferences including spice level, group size, budget, and dietary restrictions. The layout is clean and mobile-friendly, guiding the user through a smooth and intuitive process.

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

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



VI. CONCLUSION

The Customized Meal Recommendation System lever- ages machine learning and artificial intelligence to optimize the meal selection process, addressing key challenges such as a lack of personalization, budget constraints, static menus, and inefficient ordering sys- tems. By integrating collaborative filtering, reinforce- ment learning, and real-time inventory tracking, the system provides tailored meal suggestions that align with customer preferences and restaurant availability, offering

a modern solution that bridges the gap between static menus and dynamic, data-driven food recommendations. This advanced system not only enhances the dining experience for customers but also significantly improves restaurant operations, creating a seamless and intelligent meal selection process.

Experimental results indicate a 40 percent improve- ment in ordering efficiency, a 35 percent reduction in meal selection time, and a 50 percent increase in cus- tomer satisfaction compared to traditional menu-based ordering. These performance metrics highlight the sys- tem's ability to streamline the decision-making process, reducing the time and effort required for customers to find the most suitable meal combinations within their budget and dietary preferences. The system's adaptive learning capabilities ensure continuous enhancement in recommendation accuracy based on user interactions, creating a feedback loop that strengthens the reliability and precision of the suggestions over time.

The system architecture's seamless integration be- tween the front-end user interface, the back-end rec- ommendation engine, and the restaurant management panels plays a pivotal role in ensuring operational ef- ficiency. Real-time inventory tracking prevents out-of- stock issues, while the Admin and Chef Panels allow restaurant staff to stay informed of orders, ingredient levels, and customer preferences. This real-time coordi- nation reduces food waste, optimizes kitchen workflows, and ensures that customers receive accurate and timely recommendations — factors that directly contribute to higher sales and improved restaurant operations.

Looking ahead, several exciting advancements could further enhance the system's capabilities. AI-powered taste prediction models could analyze flavor preferences more accurately by integrating external data sources such as regional food trends and seasonal ingredient availability. Blockchain integration would provide trans- parent and secure food sourcing information, giving customers confidence in the quality and authenticity of the ingredients used in their meals. Augmented reality (AR) could transform the dining experience by offering interactive 3D visualizations of meals before ordering, helping customers make more informed choices.

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

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

REFERENCES

[1] "Artificial Intelligence and Machine Learning Technologies for Personalized Nutrition: A Review" (2023). This paper provides a comprehensive overview of data-driven technologies in personal- ized nutrition, focusing on AI and machine learning applications in meal recommendations. Available at: https://mdpi.com.

[2] "Recipe Recommendation Systems: A Review" (2019). This review discusses various recipe recommendation systems, high- lighting different approaches and methodologies used in person- alizing meal suggestions. Available at: https://iosrjournals.org.

[3] "Food Recommender System: A Review on Techniques, Datasets and Future Directions" (2023). This paper reviews various recom- mendation techniques employed in food recommender systems, discussing algorithms like collaborative filtering, content-based filtering, and hybrid approaches. Available at: https://aasmr.org.

[4] "Food Recommender Systems: Important Contributions, Chal- lenges and Future Research Directions" (2017). This paper provides a summary of the state-of-the-art food recommender systems, highlighting seminal and recent approaches, as well as specializations like systems promoting healthy eating. Available at: https://arxiv.org.

[5] "A Survey of Food Recommenders" (2018). This survey reviews the literature on food recommenders, covering types of systems, datasets, signals used to train models, technical approaches, and model types. Available at: https://arxiv.org.

[6] "A Systematic Literature Review of Food Recommender Sys- tems" (2023). This systematic review examines variations in food choices and the demand for recommender systems as tools for making appropriate food choices. Available at: https://link. springer.com.

[7] "SousChef System for Personalized Meal Recommendations: A Nutritional Assessment Approach" (2022). This paper presents the design and implementation of a personalized meal recom- mendation system, discussing its architecture and evaluation.

[8] "Personalized, Health-Aware Recipe Recommendation: An En- semble Topic Modeling Based Approach" (2019). This study investigates ensemble topic modeling-based feature identification techniques for efficient user modeling and recipe recommenda- tion, considering users' nutritional preferences.

[9] "Human Behavior-based Personalized Meal Recommendation and Menu Planning Social System" (2023). This research pro- poses a framework that includes a social-affective computing module to recognize the effects of different meals, integrating personalized and context-aware methodologies.

[10] "Computational Gastronomy: A Data Science Approach to Food" (2022). This paper explores the interdisciplinary field combining computational science with culinary studies, applying data-driven techniques to analyze various aspects of food, including recipes, flavors, nutrition, and sustainability.

[11] "Food Recommendation System: A Systematic Review" (2024). This systematic review evaluates various machine learning and deep learning techniques in food recommendation systems, focus- ing on personalized diet plans based on users' dietary nutritional requirements

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com