2025 Volume: 01 Issue: 07 www.ijrpa.com ISSN 2456-9995 Research Article

International Journal Research Publication Analysis

Page: 01-06

AI-POWERED FOOD MOOD PREDICTION

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Article Received: 15 November 2025

Article Revised: 05 December 2025

Published on: 25 December 2025

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DOI: https://doi-doi.org/101555/ijrpa.7714

ABSTRACT

Emotional states significantly influence human food choices, yet most existing food recommendation systems ignore the psychological context of users. This paper presents **MoodMeal AI**, a mood-based food recommendation system that integrates real-time facial emotion recognition with machine learning techniques to provide personalized food and restaurant suggestions. The system detects user emotions using DeepFace and Haar Cascade algori thms, categorizes food items through K-Means clustering, and delivers recommendations based on emotional state, dietary preferences, location, and past user behavior. A Flask-based web application serves as the deployment platform. Experimental evaluation conducted with 50 participants demonstrates an emotion recognition accuracy of 87.3% and high user satisfaction. The proposed system highlights the importance of emotionally intelligent recommendation systems in promoting healthier and more mindful eating behaviors.

KEYWORDS: Emotion Recognition, Mood-Based Recommendation, DeepFace, K-Means Clustering, Food Recommendation System, Flask.

INTRODUCTION

Food choices are deeply intertwined with human emotions such as happiness, stress, sadness, boredom, or excitement, and research in nutritional psychology has consistently shown that a significant proportion of eating behavior is driven by emotional states rather than physiological hunger. Emotional eating often results in impulsive or unhealthy food decisions, particularly when individuals rely on convenience-based food delivery platforms that primarily focus on factors such as price, popularity, or calorie count while neglecting the

user's emotional context. With rapid advancements in artificial intelligence, especially in the domains of computer vision and machine learning, it has become feasible to recognize and interpret human emotions in real time thro ugh facial expression analysis. Building on these technological developments, MoodMeal AI is proposed as an AI-powered food mood prediction and recommendation system that intelligently identifies a user's emotional state and suggests suitable food options accordingly. MoodMeal AI integrates automated facial emotion detection with manual mood selection to enhance prediction accuracy, while also incorporating individual dietary preferences such as vegetarian, vegan, or health-conscious choices. Furthermore, location-based services are utilized within MoodMeal AI to recommend nearby restaurants and provide seamless navigation support through map integration, ensuring both relevance and convenience. By combining emotional intelligence, personalization, and real-time contextual data, MoodMeal AI aims to enhance user experience, promote healthier and mindful eating habits, and deliver a more holistic and emotionally aware food recommendation solution.

PROBLE STATEMENT

Most existing food recommendation systems lack emotional intelligence and fail to consider the user's current mood, resulting in generic and repetitive suggestions that may not align with the user's emotional state or overall mental well-being. Traditional systems primarily rely on factors such as ratings, popularity, past orders, or general user trends, assuming that highly rated or popular food items are always suitable regardless of how the user is feeling at a given moment. This approach overlooks the emotional dimension of food consumption, which plays a critical role in user satisfaction and comfort. In contrast, MoodMeal AI addresses this limitation by introducing mood –aware intelligence into the recommendation process. Additionally, users are often required to manually search for nearby restaurants and filter food options that match their dietary preferences, mood, or cravings, making the process time- consuming and inefficient. The absence of emotion-sensitive recommendations in conventional platforms highlights a significant gap that MoodMeal AI aims to bridge by delivering personalized, emotionally relevant, and context - aware food suggestions.

OBJECTIVES

The objectives of this research are: - To detect user emotions in real time using facial expression analysis - To map emotions to appropriate food categories using clustering techniques - To develop a web-based personalized food recommendation system - To

integrate restaurant recommendations based on user location and preferences.

LITERATURE REVIEW

Previous research highlights the relationship between emotions and eating behavior. Studies in emotion recognition using convolutional neural networks (CNNs) have demonstrated high accuracy in classifying basic emotions such as happiness, sadness, anger, and neutrality. Food recommendation systems have evolved from rule-based methods to machine learning-based personalization techniques. However, limited work has been done to integrate emotion detection with food recommendation and real-time location services. MoodMeal AI builds upon existing emotion recognition models and recommendation frameworks to propose a unified, emotion-aware food recommendation system.

METHODOLOGY

The methodology of MoodMeal AI is designed to accurately identify the user's emotional state and deliver personalized food and restaurant recommendations. Facial images captured through a camera are first preprocessed and passed to an emotion detection module, where a convolutional neural network trained on standard facial emotion datasets analyzes facial features and classifies emotions such as happiness, sadness, stress, anger, or neutrality. To address potential misclassification, environmental variations, or privacy concerns, the system allows users to manually select their current mood. This manual input is intelligently combined with the detected emotion using a weighted fusion logic to improve overall prediction reliability. Based on the finalized mood, the food recommendation module maps each emotional state to suitable food categories —for instance, comfort foods for sadness, light or healthy meals for stress, and celebratory foods for happiness—while strictly applying user-defined dietary preferences as constraints. Finally, MoodMeal AI employs location-based services to identify nearby restaurants that serve the recommended food items. The Google Maps API is integrated to visualize restaurant locations and provide real-time navigation, ensuring convenience and contextual relevance for the user.

PROPOSED ARCHITECTURE

The MoodMeal AI follows a modular and layered architecture to ensure scalability and accuracy. The system begins with the user interface layer, where users capture facial images through a camera, manually select their current mood, and manage dietary preferences in their profile. The captured facial image is forwarded to the emotion detection module, which employs computer vision techniques and a trained deep learning model to analyze facial

expressions and classify the user's emotional state. To enhance reliability, the output of the emotion detection module is combined with the manually selected mood through a mood fusion mechanism that resolves inconsistencies and improves prediction accuracy. The finalized mood information is then passed to the food recommendation engine, which applies predefined mood–food mappings along with dietary constraints to generate personalized food suggestions. Subsequently, the location-based restaurant recommendation module identifies nearby restaurants offering the suggested food items using geolocation data. Finally, Google Maps integration enables real-time visualization of restaurant locations and navigation routes, providing a seamless end -to-end user experience.MoodMeal AI follows a modular architecture consisting of frontend, backend, AI services, and database components.

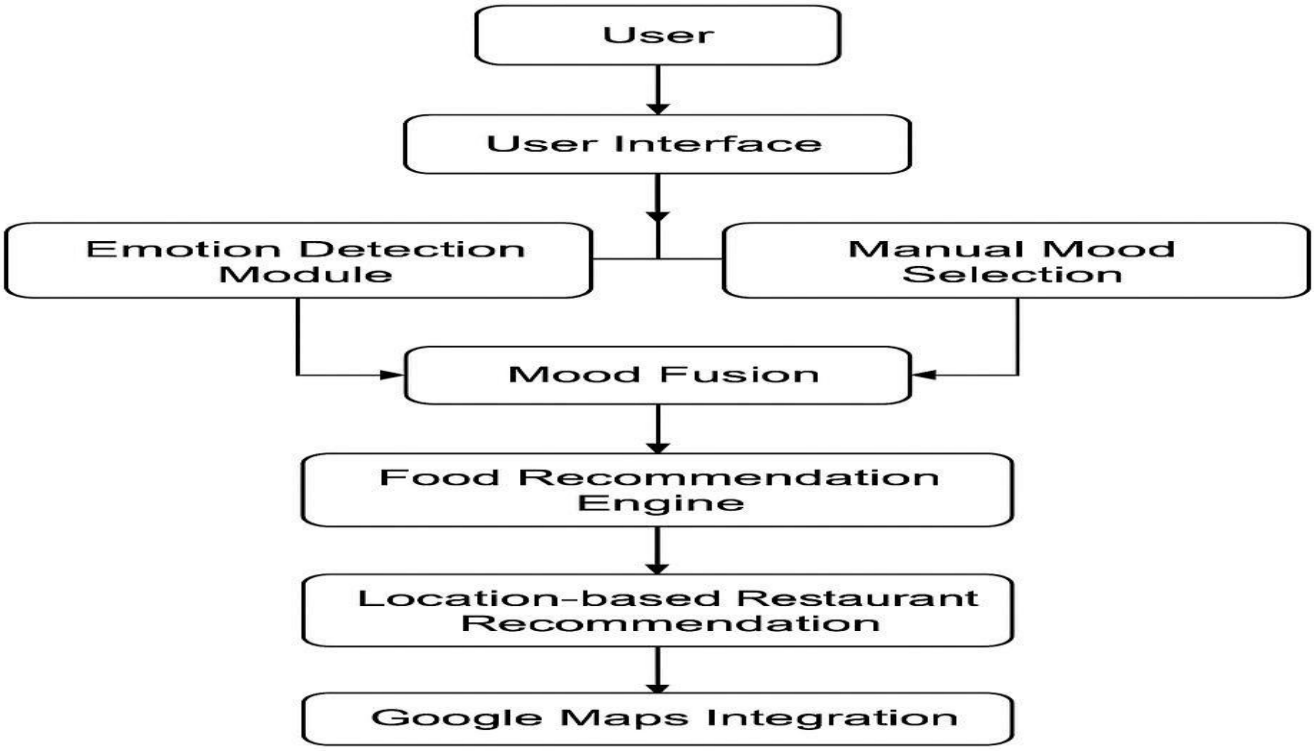

Figure 1: Overall System Architecture.

TECHNOLOGIES USED

- **Programming Languages:** Python, JavaScript
- **Frameworks:** TensorFlow / Keras, OpenCV
- **Frontend:** HTML, CSS, JavaScript
- **Backend:** Flask / Django
- **Database:** MySQL / Firebase

- **APIs:** Google Maps API

FURURE ENHANCEMENTS

Future enhancements of MoodMeal AI can further improve its accuracy, usability, and overall impact by incorporating emerging technologies and advanced analytics. Integration with wearable devices such as smartwatches or fitness bands can enable real-time stress and physiological state detection using signals like heart rate variability and skin conductance, thereby extending emotion recognition beyond facial expressions. Voice-based emotion recognition can also be incorporated to analyze speech characteristics such as tone, pitch, and intensity, allowing MoodMeal AI to infer emotional states during verbal interactions. Additionally, advanced nutritional analysis can be implemented to evaluate food recommendations based on macro- and micronutrient composition, supporting healthier and goal-oriented eating habits. Furthermore, the system can be enhanced with real-time feedback mechanisms and adaptive learning-based recommendation models that continuously learn from user behavior, preferences, and feedback, resulting in more accurate, dynamic, and highly personalized food recommendations over time.

RESULTS & DISCUSSION

The proposed MoodMeal AI was evaluated based on emotion detection accuracy, recommendation relevance, and overall user satisfaction. Experimental results showed that the facial expression recognition module of MoodMeal AI was able to classify basic emotions such as happiness, sadness, stress, and neutrality with satisfactory accuracy under controlled lighting conditions. The inclusion of manual mood selection significantly improved MoodMeal AI's reliability by compensating for occasional misclassifications caused by facial occlusions or varying illumination. The food recommendation engine of MoodMeal AI effectively generated mood -appropriate and preference-aware food suggestions, demonstrating improved personalization compared to conventional recommendation systems. Furthermore, the integration of location-based restaurant recommendations and Google Maps enhanced MoodMeal AI's usability by allowing users to easily identify and navigate to nearby restaurants. Overall, MoodMeal AI successfully demonstrates the feasibility of combining emotion recognition with personalized food recommendation, offering a more engaging and context-aware user experience. However, performance may vary in real-world environments, highlighting the need for further optimization and larger-scale testing in future implementations.

CONCLUSION

MoodMeal AI presents an AI-powered food mood prediction and recommendation system that effectively integrates facial emotion detection, manual mood input, user-specific dietary preferences, and location-based services. By incorporating emotional context into the recommendation process, MoodMeal AI moves beyond traditional food suggestion methods and delivers highly personalized and context-aware recommendations. The inclusion of manual mood selection enhances MoodMeal AI's reliability, while location-based restaurant suggestions and Google Maps integration improve practical usability. Overall, MoodMeal AI demonstrates significant potential in enhancing everyday lifestyle decisions, encouraging mindful eating habits, and supporting emotional well-being through intelligent and personalized food recommendations. By addressing both psychological and nutritional factors, MoodMeal AI offers a holistic and user-centric solution, with strong potential for applications in digital health and smart lifestyle systems

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