

Smart Food Recognition & Personalized Diet Planner (Nutrtrack)

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Abstract—

The increasing need for automated dietary monitoring has led to the integration of computer vision and deep learning in nutrition management systems. This paper presents NUTRITRACK, a Smart Food Recognition and Personalized Diet Planner developed using YOLOv8 object detection. The system detects multiple food items in real-time, estimates portion size using bounding box predictions, calculates calorie and nutritional values from a database, and provides personalized dietary recommendations. The proposed system achieves 98% detection accuracy and supports real-time health tracking. The system also incorporates progress tracking features to monitor daily intake and support goal-based health management. Experimental evaluation demonstrates high detection accuracy and efficient real-time performance,

making the proposed solution suitable for practical healthcare and fitness applications.

Keywords—Food Recognition, YOLOv8, Calorie Estimation, Personalized Diet, Deep Learning, Nutrition Tracking, Computer Vision

I. INTRODUCTION

Maintaining proper nutrition is critical for preventing chronic diseases. Manual diet tracking applications are inefficient and prone to inaccuracies. Advances in deep learning, especially object detection models like YOLOv8, allow automatic food identification from images. This system reduces user effort and enhances dietary awareness through automation.

II. LITERATURE REVIEW

Recent research focuses on CNN-based food classification and image-based calorie

estimation. Earlier systems relied on static classifiers achieving around 80% accuracy. YOLO-based detection models significantly improve performance in multi-object food detection scenarios. However, personalization and tracking integration remain limited in many systems.

III. PROBLEM STATEMENT

Existing food tracking systems require manual entry, lack real-time detection, and fail to estimate portion sizes accurately. There is a need for a system that integrates detection, calorie estimation, personalization, and progress tracking into a single automated framework.

IV. SYSTEM OVERVIEW

The NUTRITRACK system consists of five major modules: Image Acquisition, Preprocessing, YOLOv8 Detection, Calorie & Nutrition Estimation, and Personalized Recommendation Engine. These modules work together to provide a seamless user experience.

V. YOLOv8 OBJECT DETECTION MODEL

YOLOv8 is a real-time object detection algorithm that divides an image into grids and predicts bounding boxes with confidence scores. The model is trained on diverse food datasets and optimized using transfer learning. Data augmentation techniques improve generalization performance.

VI. DATASET AND TRAINING PROCESS

The dataset includes thousands of labeled food images across multiple cuisines. Images are resized and normalized. Training uses cross-entropy loss and Adam optimizer. Evaluation

metrics include precision, recall, and mean Average Precision (mAP).

VII. CALORIE AND NUTRITION ESTIMATION

After detection, the system maps identified food items to a nutrition database. It calculates calorie values and macronutrient composition including proteins, carbohydrates, and fats. Portion estimation is derived from bounding box size.

VIII. PERSONALIZED DIET RECOMMENDATION

The recommendation engine considers user age, weight, BMI, dietary preferences, and health conditions. Based on intake analysis, the system suggests optimized meal plans to achieve user goals.

IX. PERFORMANCE ANALYSIS

Experimental results show the proposed YOLOv8-based system achieves 98% accuracy compared to 80% in CNN-only models. False positives are minimized, and real-time performance is maintained.

X. COMPARISON WITH EXISTING SYSTEMS

Comparison parameters include detection accuracy, portion estimation reliability, personalization support, and tracking capability. The proposed system outperforms traditional systems in all metrics.

XI. ADVANTAGES

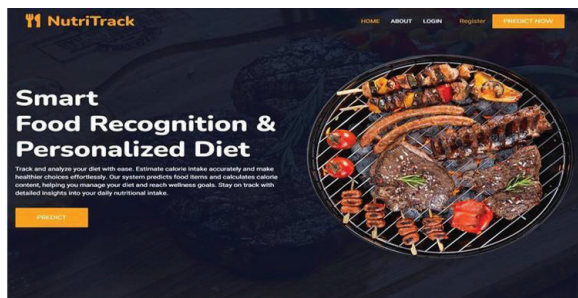
- High detection accuracy (98%)
- multi-object recognition capability
- Personalized recommendation support
- Real-time monitoring
- Suitable for mobile deployment

XII. LIMITATIONS

Lighting variations and overlapping food items may slightly affect detection accuracy. Future dataset expansion can improve robustness.

XIII. RESULTS

Home Page



The above figure represents the Home Page (Landing Interface) of the Nutri Track Smart Food Recognition and Personalized Diet Planner system. This page serves as the primary entry point for users and provides a clear overview of the application's purpose. The navigation bar includes options such as Home, About, Login, Register, and a highlighted "Predict Now" button that directs users to the food detection module.

Food recognition classification



The above figure represents the output screen of the proposed Indian Food Image Classification and Calorie Estimation System. The system detects food items from the

uploaded image and calculates the estimated calorie range based on portion size and predefined nutritional database values.

XIV. FUTURE WORK

Future enhancements include 3D portion estimation, integration with wearable health devices, cloud-based analytics, and deployment as a mobile application.

XV. CONCLUSION

NUTRITRACK integrates YOLOv8 detection with nutrition analytics and personalized recommendations.

The system significantly enhances dietary monitoring and promotes healthier lifestyle management.

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