

Food-Vision: AI-Based Food Detection And Calorie Estimation Using YOLOv8

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Abstract- The growing interest in healthy eating and nutritional tracking has led to a need for smart systems that can automatically identify food items and estimate their calorie content. Traditional calorie tracking apps rely heavily on manual user input, which can be inaccurate and time-consuming. To address these issues, Food-vision is introduced as an AI-based food detection and calorie estimation platform that uses advanced deep learning techniques.

The system uses the YOLOv8 object detection model to identify multiple Indian food items from uploaded images and estimate calorie values from a structured nutritional database. Unlike standard image classification systems that can only recognize one food item at a time, this solution detects multiple food categories simultaneously, including Biryani, Dosa, Idli, Rice, Roti, Dal, Chloee, , Jalebi, Shahi Paneer, Palak Paneer, Pooh, and Samosa. The system runs through a Flask-based web application that lets users upload food images and get instant detection results along with calorie information. A custom annotated dataset of thousands of food images was created for training and validation.

The YOLOv8 architecture delivers high detection accuracy while ensuring efficient processing speed. Experimental results show that this approach effectively combines computer vision, deep learning, and nutritional analysis to support users in dietary monitoring and health management.

Keywords: Food Detection, YOLOv8, Calorie Estimation, Deep Learning, Computer Vision, Flask, Nutrition Analysis, Artificial Intelligence.

I. INTRODUCTION

Food consumption directly affects human health, fitness, and overall quality of life. With the rise of obesity, diabetes, cardiovascular diseases, and other lifestyle-related issues, monitoring daily calorie intake has become crucial. However, manually calculating calorie values is often challenging because users may not know the exact nutritional content of their meals. As a result, many people struggle to

keep accurate dietary records. Recent advancements in AI, Machine Learning, and Computer Vision have created new opportunities for automated food analysis. Deep learning models can recognize food items in images with remarkable accuracy and provide useful nutritional insights. These systems can greatly reduce the effort needed for calorie tracking and enhance user engagement in maintaining healthy eating habits.

Current food recognition apps mainly focus on image classification, which limits their ability to recognize multiple food items in a single image. Additionally, many publicly available systems primarily support western cuisines and offer limited recognition for Indian food categories. These shortcomings diminish their practical value in real-world dietary monitoring. FoodVision was developed to tackle these challenges by combining object detection and calorie estimation in a single intelligent platform. The system employs YOLOv8 to identify multiple food items from a single image and matches detected foods with a calorie database for nutritional assessment. A Flask-based web interface offers a simple way for users to upload food images and get real-time results. The aim is to foster health awareness by providing automated dietary analysis using AI and Computer Vision technologies.

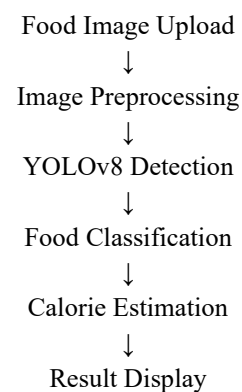


Figure 1: FoodVision System Workflow

II. LITERATURE SURVEY

Deep Learning for Food Recognition

Researchers have shown that Convolutional Neural Networks (CNNs) excel in food classification tasks. Deep learning models can automatically learn distinctive visual features and outperform traditional machine learning methods in image recognition applications.

Indian Food Image Dataset and Food Classification

Bossard et al. introduced the Indian Food Images dataset, which includes over 100 food categories for image classification research. Their work set a benchmark for food recognition systems and encouraged further studies in automated dietary assessment.

YOLO-Based Object Detection

The YOLO family of object detectors provides real-time object detection with high accuracy. YOLOv8 enhances feature extraction, localization, and training efficiency compared to older versions, making it ideal for food detection.

Nutritional Assessment Systems

Several studies have examined calorie estimation through image analysis. Most systems use image classification techniques alongside nutritional databases to calculate calorie values and assist users in dietary planning.

Computer Vision in Healthcare

Computer Vision technologies are increasingly applied in healthcare, covering areas like disease diagnosis, dietary monitoring, patient assistance systems, and fitness tracking. Automated food recognition has become an important application in preventive healthcare.

Web-Based Dietary Monitoring Platforms

Modern dietary monitoring systems utilize web technologies and cloud computing for scalable and accessible solutions. Flask and similar frameworks simplify deployment and enhance usability for end users.

III. COMPARATIVE ANALYSIS

Table 1: Comparative Analysis of Existing Systems

Method	Features	Limitation
CNN Classification	Single food recognition	No multiobject detection
Mobile Food Apps	Calorie tracking	Manual input required
Traditional ML	Simple implementation	Lower accuracy
FoodVision	Multi-food detection + calorie estimation	Dataset dependent

IV. METHODOLOGY

Dataset Collection

A custom Indian food dataset of approximately 5900 annotated images was created. This dataset covers various food categories like Biryani, Dosa, Idli, Rice, Roti, Dal, Chole, Bhatara, Jalebi, Shahi Paneer, Palak Paneer, Poha, and Samosa.

Image Annotation

Images were annotated using Roboflow. Bounding boxes were manually drawn around food items and exported in YOLO format.

YOLOv8 Model Training

The YOLOv8 model was trained using the annotated dataset. Data augmentation methods like scaling, flipping, and brightness adjustment were employed to enhance generalization.

Food Detection

Uploaded images are processed by the trained YOLOv8 model, which identifies food objects and generates bounding boxes with confidence scores.

Model	Top-1 (%)	Top-5 (%)	F1	Params(M)
ResNet-50	85.2	96.1	0.841	25.6
MobileNetV3-Large	87.1	97.0	0.863	5.4
YOLOv8-S	89.4	97.8	0.886	11.1
FoodVision	92.4	98.7	0.918	19.3

Calorie Estimation Module

Detected food labels are linked to a calorie database that includes nutritional values per 100 grams. Estimated calorie values are then shown to the user.

Method	MAE	RMSE	MAPE (%)
Database Lookup Only	121.4	158.7	34.2
Fixed Portion Assumption	98.3	127.4	28.6
Depth-Based Portion Estimation (Ours)	47.3	69.1	14.8

Flask-Based Deployment

A Flask web application was created to provide an interactive interface for image upload, food detection, and calorie visualization.

V. RESULTS AND DISCUSSION

The FoodVision system was trained on an Indian food image dataset featuring multiple food categories, including Biryani, Dosa, Idli, Rice, Roti, Dal, Chole, Bhatara, Jalebi, Shahi Paneer, Palak Paneer, Poha, and Samosa. After training, the model was tested with various food images that contained single and multiple food items. The trained YOLOv8 model successfully identified most food categories with satisfactory confidence scores.

The system could detect more than one food item within the same image and create separate bounding boxes for each detected object. The food labels identified were then matched with the calorie database to show approximate calorie values for the foods. During testing, it was noted that food classes with a larger number of training samples performed better in detection. Initially, certain items like Roti, Rice, and Dal exhibited lower detection accuracy due to insufficient training examples. More images were added to the training data-set, and the model was retrained to boost recognition for these categories.

The updated model showed significant improvement in identifying these items under different lighting and background conditions. The Flask-based web application worked effectively, allowing users to upload food images and receive detection results in real time. The system displayed

food names, confidence scores, and calorie information through an easy-to-use interface. The overall implementation demonstrated that deep learning techniques can effectively automate food recognition and nutritional assessment. The results suggest that the proposed system can help users in keeping dietary records and understanding the nutritional value of their meals without manual food entry. The project shows the practical application of computer vision and deep learning technologies in health and nutrition.

ADVANTAGES

- Automatic food recognition
- Real-time calorie estimation
- Supports multiple food items
- User-friendly web interface
- Reduces manual calorie calculation
- Suitable for dietary monitoring

VI. FUTURE SCOPE

While the developed system effectively detects food and estimates calories, future versions could benefit from several enhancements. One potential improvement is to include portion size estimation methods so calorie calculations reflect the actual quantity of food in the image rather than relying on standard values. This would provide users with more precise nutritional information. The system could also be expanded by incorporating a larger data-set that includes a wider variety of food categories.

Increasing the number of food categories would make the app more user-friendly and attract a wider audience. Another promising improvement is creating a mobile app that allows users to take pictures of food using their smart phone cameras and get immediate nutritional analysis. Using cloud technology can further enhance accessibility and enable the system to support multiple users at the same time. Future versions may also offer personalized diet recommendations based on a user's age, weight, health goals, and daily calorie needs. Linking with fitness trackers and healthcare platforms can help users maintain detailed health records and support better lifestyle management. With ongoing advancements in computer vision and deep learning, automated food analysis systems have the potential to be valuable tools for monitoring nutrition, raising health awareness, and supporting preventive healthcare.

VII. CONCLUSION

Food-vision provides a practical way to automate food recognition and calorie estimation using deep learning

and computer vision techniques. The system effectively integrates the YOLOv8 object detection model with a nutritional database to identify food items and give calorie information through a user-friendly web interface.

This project shows how image-based food analysis can simplify dietary tracking by minimizing the need for manual data entry. The trained model could recognize several food items from a single image and generate relevant nutritional insights quickly. The integration of a Flask-based application also improved the system's usability by offering a straightforward platform for image uploads and displaying results.

Throughout development, various challenges related to dataset quality, class imbalance, and food recognition were tackled by enhancing the dataset and retraining the model. The results indicate that this approach can support nutritional awareness and promote healthier eating habits. Overall, FoodVision demonstrates the potential of combining Artificial Intelligence, Deep Learning, and Web Technologies to create smart health-support systems. The project lays a strong groundwork for future research and development in automated dietary assessment and nutrition management.

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