RAJALAKSHMI
ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

25 years
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Department of Computer Science and Engineering

Image-Based Food Calorie Estimation Using YOLOv8 with Adaptive Exercise Suggestion

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Problem Statement and Motivation

In today's health-conscious and fast-paced world, individuals often struggle to balance their dietary habits with effective workout routines. Manually tracking food intake and calculating the corresponding calorie burn through exercises is time-consuming, error-prone, and lacks personalization. Existing fitness applications often rely on user input or generic data, failing to account for individual variability and real-time dietary recognition.

To address this, we propose an automated system that:

- ✓ Detects and identifies food items from images using YOLOv8 object detection.
- ✓ Estimates quantity and caloric value using custom nutrition dataset.
- ✓ Recommends personalized exercises by leveraging a Random Forest Regressor.

Existing System

- **Calorie estimation lacks automation** and depends heavily on user knowledge and effort.
- Visual food recognition is **either absent or limited**, with minimal accuracy and no portion size estimation.
- **Exercise recommendations are generic**, not tailored to the user's body profile, calorie intake, or time availability.
- No unified system exists that **connects food detection with exercise planning** in a personalized and automated way.
- Users spend extra time **switching between apps** for tracking food, calculating calories, and planning workouts.
- Health management apps fail to provide **real-time, adaptive solutions** that combine nutrition awareness with actionable fitness guidance.

Objectives

- Automate food recognition using YOLOv8 to identify multiple food items from user-uploaded images.
- Estimate food quantity and caloric value using a custom nutrition dataset, providing more accurate results than manual logging.
- Predict user-specific exercise routines using a Random Forest Regressor trained on age, weight, gender, BMI, and available workout duration.
- Match calorie intake with suitable exercises that can efficiently burn the consumed calories within the user's specified time limit.
- Provide personalized fitness recommendations tailored to individual dietary habits and physical characteristics.

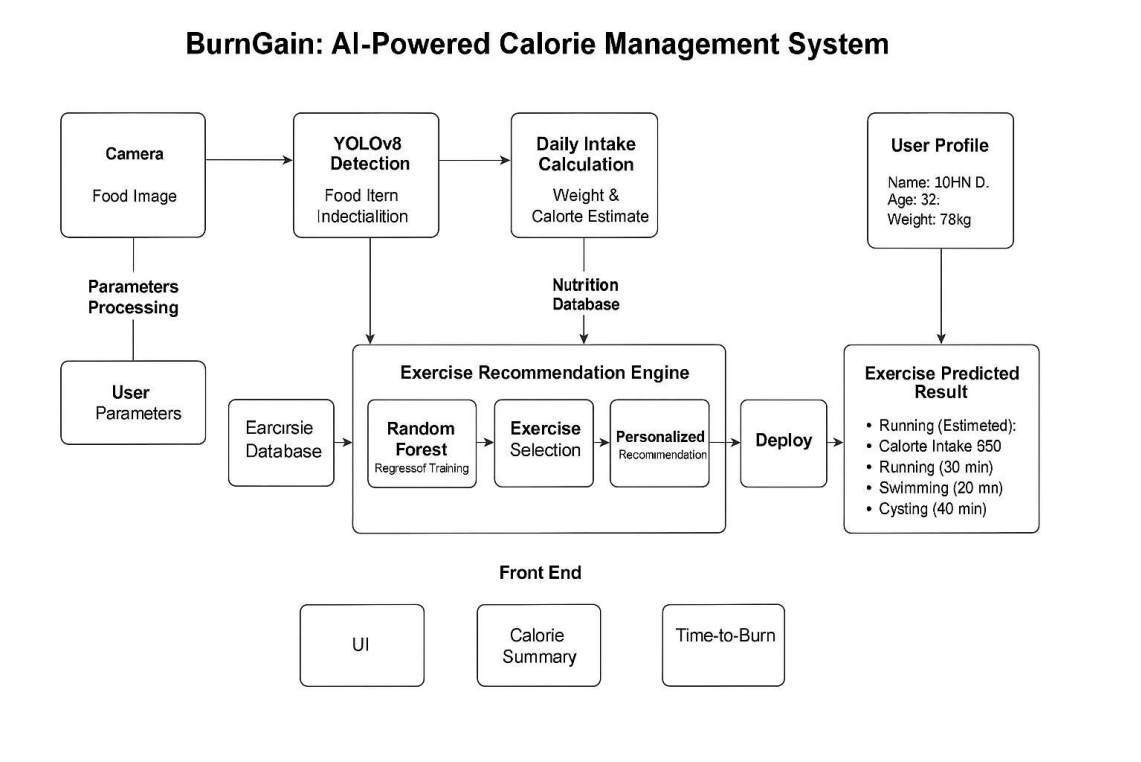
Abstract

BurnGain is an intelligent system designed to simplify calorie management and personalized fitness planning through the integration of computer vision and machine learning. It uses the YOLOv8 object detection model to recognize food items from images and estimate their weight and caloric value using a custom nutrition dataset. Based on the detected intake, a Random Forest Regressor recommends tailored exercise routines considering user attributes such as age, weight, gender, BMI, and available workout duration. BurnGain bridges the gap between nutrition awareness and physical activity by offering real-time, automated insights, empowering users to make informed decisions for healthier lifestyles.

Proposed System

- ✓ The system uses the YOLOv8 object detection model to detect and identify multiple food items from images uploaded by the user.
- ✓ It estimates the quantity and caloric value of each food item using a custom-built nutrition dataset that maps food types to average weights and calorie content.
- ✓ User data such as age, weight, gender, BMI, and available workout duration are collected to personalize recommendations.
- ✓ A Random Forest Regressor model is trained on a synthetic dataset containing various exercises, calorie burn rates, and user parameters.
- ✓ Based on the estimated calorie intake and user profile, the system recommends a set of exercises that can effectively burn the consumed calories within the user's specified time limit.

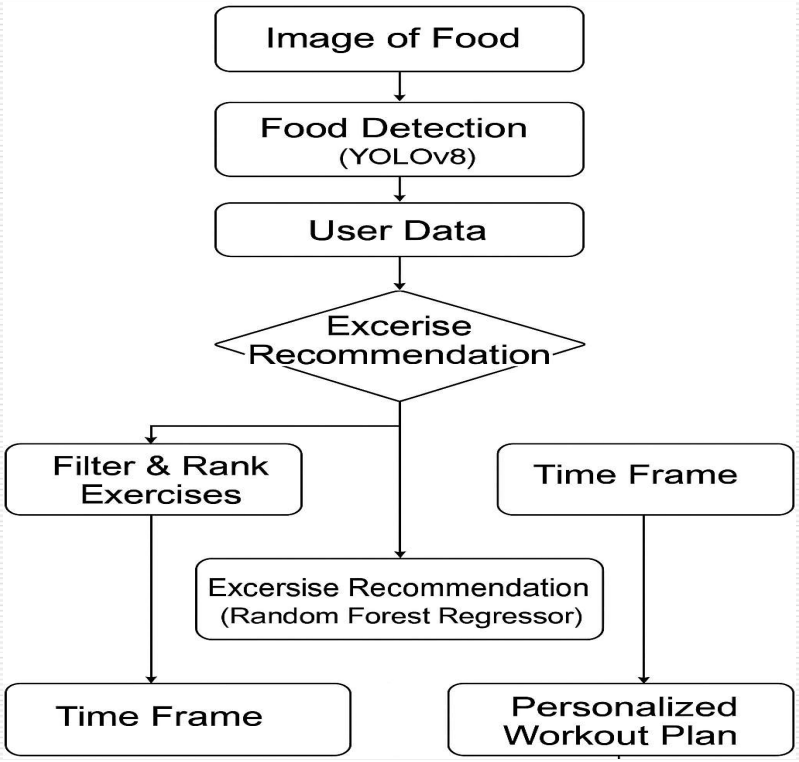
System Architecture



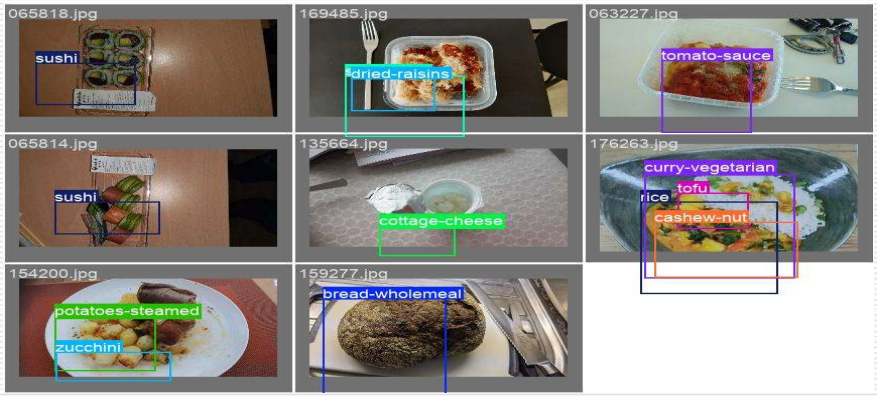
List of Modules

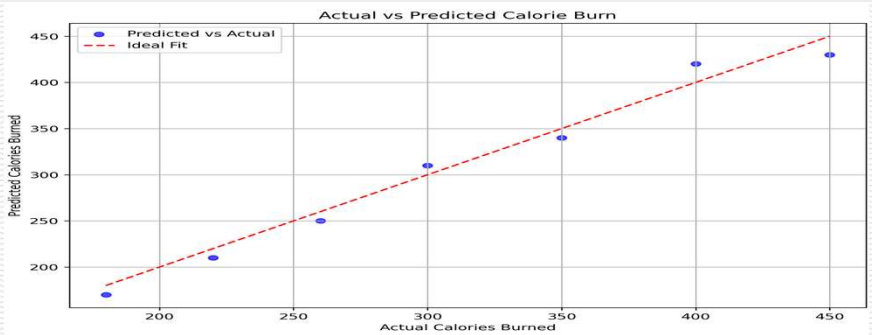
- Dataset Description
- Data Preprocessing
- Food Detection using YOLOv8
- Quantity Prediction and Calorie Estimation
- Exercise Recommendation using Random Forest Regressor
- System Integration and Testing

Functional Description for each modules with DFD and Activity Diagram



Implementation & Results of Module



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 Detected Foods and Calorie Estimates:
Food: apple
Estimated Grams: 114.5g
Estimated Calories: 59.8 kcal

Total Calories to Burn: 59.78 kcal
Enter your weight (kg): 64
Enter your age: 21
Enter your gender (Male/Female): Female
Enter your height (cm): 164
Maximum time you can exercise (in minutes): 15

Top 5 Exercises that can burn 59.8 kcal within 15.0 minutes:
Exercise        Calories Burn     Duration (mins)
Cycling         136.05            15
High Knees      136.05            15
Swimming        136.05            15
Jumping Jacks   136.05            15
Burpees         136.05            15

Fastest Option: Cycling in 15 minutes
It will take 6.59 minutes to burn 59.8 kcal with Cycling.
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Conclusion & Future Work

Conclusion:

BurnGain offers an innovative, automated approach to calorie tracking and fitness planning, combining AI-driven food recognition and personalized workout recommendations to promote healthier, more efficient lifestyle choices.

Future Work:

- Improve food recognition accuracy by integrating more diverse datasets and training models for specific cuisines.
- Expand the exercise recommendation engine to include a wider range of activities and intensity levels.
- Integrate wearable devices for real-time tracking of physical activity and calorie burn.

References

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Thank You