Thai Food Detection and Classification

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*Abstract*—This project introduces an intelligent Thai food detection and classification system aimed at assisting health-conscious individuals in estimating their calorie intake from images. By integrating YOLOv11 for object detection and ResNet34 for image classification, the system can identify multiple Thai dishes from an uploaded image, classify them, and provide corresponding calorie estimates. This solution is designed for real-time application and enhances user convenience by automating food tracking.

Keywords—Thai food detection, YOLOv11, ResNet34, calorie estimation, object detection, image classification, deep learning.

# Introduction

In recent years, personal health monitoring has gained increasing attention, especially in diet and calorie tracking. Manual meal logging can be time-consuming and inaccurate. This project proposes a visual-based solution that allows users to upload an image of a meal and automatically receive food item classifications and estimated calorie counts. Key contributions include:

* An end-to-end pipeline that detects and classifies Thai food from images.
* Integration of YOLOv11 for object detection and ResNet34 for dish classification.
* Calorie estimation based on THFOOD-50 dataset labels.

# Methodology

## Dataset

*Two primary datasets were used in this project:*

* ***Platefood Dataset (Roboflow****): Annotated images of Thai food plates for YOLOv11 object detection.*
* ***THFOOD-50 Dataset****: Images labeled with 50 Thai dish categories for training the ResNet34 classifier.*

*Images were cleaned using a custom datasetcleaner.py script to eliminate corrupted files.*

## Model Development

* ***Object Detection (YOLOv11)***
  + *Variants: YOLOv11 (Models L, M, N)*
  + *Fine-tuning on Platefood dataset*
  + *Optimizer: AdamW, custom learning rate*
  + *Loss functions: Box loss, classification loss, DFL loss*
  + *Adjustments for underrepresented classes (e.g., plates)*
* ***Classification***
  + *Fully connected layer replaced with Dropout + Linear classifier*
  + *Data augmentation: Horizontal flips, random color jitter, random resized crop, Gaussian blur, normalization (ImageNet mean/std)*

# Results

## Experimental Setup

*All models were trained for 100 epochs with early stopping. Evaluated on GPU environment with precision-recall and F1-Confidence curves.*

## Performance Metrics

*The following metrics were used to evaluate both object detection and classification:*

* *mAP@0.5 and mAP@0.5:0.95: For measuring localization accuracy.*
* *Precision, Recall, F1 Score: For measuring classification quality.*
* *Confusion Matrix (Normalized): To visualize per-class performance.*

## Model Comparison

## Detection Models (YOLOv11)

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*Chosen Model: Model L was selected due to its optimal balance between high precision and recall, particularly its superior mAP@0.5 and stable validation loss trend, making it most suitable for accurate plate and dish detection in practical use.*

* *Classification Models (ResNet)*

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เนื้อหาที่สร้างโดย AI อาจไม่ถูกต้อง*Chosen Model: ResNet34 (\*with weight decay and transformer adjustments) was selected for its balanced accuracy, lowest train-validation loss difference, and stable performance, indicating strong generalization capabilities.*

# Conclusions

Successfully integrated YOLOv11 and ResNet34 to create an effective Thai food detection and calorie estimation system. Plate detection requires further improvements due to dataset imbalance. Future work includes employing focal loss, threshold tuning, and targeted data augmentation.

##### References

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