

Smart Trash Sorter

Midterm Project Proposal
ITAI 1378: Computer Vision and AI

Hieu Lu | Tier 2
October 30, 2025

The Problem

- Recycling centers and campuses struggle to keep trash properly sorted because people often place items in the wrong bins.
- Who cares: Facility managers, environmental departments, and schools promoting sustainability.
- Why important: Incorrect sorting increases waste contamination and disposal costs. Automating detection can support smarter recycling habits and cleaner waste streams.

Solution (Overview)

- A computer vision system that automatically identifies if an item is recyclable, compostable, or trash using a camera feed.
- Workflow:
- Camera captures image → Model classifies item type → Output LED or screen indicator shows correct bin (Recycle, Compost, Trash).

Technical Approach

- Technique: Image Classification
- Model: MobileNetV3 (lightweight, fast)
- Framework: TensorFlow Lite (for embedded deployment)
- Justification: MobileNet provides high accuracy and low latency for real-time use.

Data Plan

- Source: Public datasets (Roboflow's Waste Classification Dataset, Kaggle's TrashNet)
- Size: ~2,500 images
- Labels: Plastic, Paper, Metal, Glass, Compost, Trash
- Preparation: Clean mislabeled data, resize to 224×224, normalize, split 80/20.

System Diagram

- Starting: [Camera Input]
- → [Preprocessing (resize, normalize)]
- → [MobileNetV3 Classifier]
- → [Predicted Category]
- → [Display: Recycle / Compost / Trash]

Success Metrics

- Primary Metric: Accuracy $\geq 90\%$
- Secondary Metric: Inference Speed $\leq 0.5\text{s}/\text{image}$
- Tertiary Metric: User Feedback Accuracy $\geq 95\%$

Week-by-Week Plan

- Week 10: Gather dataset and preprocess
- Week 11: Train MobileNetV3
- Week 12: Evaluate & tune
- Week 13: Build demo (image upload → prediction)
- Week 14: Documentation & report
- Week 15: Presentation 

Challenges & Backup Plans

- Dataset imbalance → Apply augmentation (flip, rotate, brightness)
- Low accuracy → Use ResNet-18 or more epochs
- Hardware limits → Stay on Colab (skip embedded version)

Resources Needed

Compute: Google Colab GPU

Frameworks: TensorFlow, TensorFlow Lite

Datasets: Roboflow, Kaggle

Cost: \$0 (open-source datasets + Colab free tier)