Waste Classification System

CMPT 310 - Group 29

Machine learning waste classification using CNN and KNN models with a React/Flask web application.

Live Demo: https://waste-classifier-theta.vercel.app/

Setup

Install Dependencies

```
# CNN Model
cd CNN_model
pip install -r requirements.txt

# KNN Model
cd KNN_model
pip install -r requirements.txt

# Web App
cd backend
pip install -r requirements.txt
```

Dataset Setup

1. Download `db/` folder from OneDrive
2. Place `db/` at root directory

CNN Preprocessing:

```
cd CNN_model/src
python get_labels.py
```

Generates: `labels.csv`, `train.csv`, `validation.csv`, `test.csv` in `labels/`

KNN Preprocessing:

```
cd KNN_model/src
python data_to_csv.py
```

Generates feature vector CSV with 836 features.

Training

CNN Model

```
cd CNN_model/src
python inspect_dataset.py  # Validate dataset
python train.py            # Train all configurations
```

Models saved to `results/models/`, curves to `results/training_curves/`

Evaluation

CNN Model

```
cd CNN_model/src
python evaluate.py  # Generate evaluation results
python test.py      # Analyze best parameters
```

KNN Model

```
cd KNN_model/src
python knn_model_analysis.py
```

Uncomment code segments for specific tests:

```
# Weight testing
classifier_uniform = KNN(k=K_VALUE, weight='uniform')
classifier_distance = KNN(k=K_VALUE, weight='distance')
testing_weight(classifier_distance)
testing_weight(classifier_uniform)

# K-value testing
K_VALUE_TEST = [3,4,5,6,7,8,9,10,15]
evaluate_multiple_k(K_VALUE_TEST,'distance')
evaluate_multiple_k(K_VALUE_TEST,'uniform')
```

Web Application

```
# Start backend
cd backend
python waste_app.py

# Start frontend (new terminal)
cd frontend
npm install
npm start
```

Access at `http://localhost:5173`

Links

- **Live Web App:** https://waste-classifier-theta.vercel.app/
- **Dataset:** OneDrive - CMPT 310 Group 29 Dataset