**♻️ Waste Classifier Using CNN**

**📌 Overview**

This project is a **deep learning-based waste classification system** that automatically categorizes waste images into different classes such as **plastic, metal, paper, glass, organic, and others**.  
It uses a **Convolutional Neural Network (CNN)** built with **TensorFlow/Keras** and trained on a custom dataset.

**🧠 Model Architecture**

The model is a **Sequential CNN** consisting of:

* **Conv2D Layers** for feature extraction
* **MaxPooling Layers** for spatial reduction
* **Dense Layers** for classification
* **Softmax output layer** for multi-class prediction (6 classes)

model = Sequential([

Conv2D(32, (3,3), activation='relu', input\_shape=(150,150,3)),

MaxPooling2D(2,2),

Conv2D(64, (3,3), activation='relu'),

MaxPooling2D(2,2),

Flatten(),

Dense(128, activation='relu'),

Dropout(0.5),

Dense(6, activation='softmax')

])

**🧩 Dataset**

The dataset is organized into 6 folders (each representing one class).  
The script automatically splits the dataset into **train**, **validation**, and **test** sets using this ratio:

* **70%** training
* **15%** validation
* **15%** testing

split\_data(source\_dir, train\_dir, val\_dir, test\_dir, split\_ratio=(0.7, 0.15, 0.15))

**⚙️ Training**

Training was performed with **ImageDataGenerator** for efficient image loading and normalization.

train\_datagen = ImageDataGenerator(rescale=1./255)

val\_datagen = ImageDataGenerator(rescale=1./255)

Model trained for **10 epochs** with:

model.fit(train\_gen, validation\_data=val\_gen, epochs=10)

**📈 Results**

The model achieved strong performance in validation accuracy and generalization.  
Final evaluation:

loss, acc = model.evaluate(val\_gen)

print(f"Validation Accuracy: {acc\*100:.2f}%")

**💾 Saved Model**

Trained model file: waste\_classifier.h5