



edunet  
foundation

# Waste Classification using CNN

## Learning Objectives

1. Understand Deep Learning in Image Classification – Learn how neural networks can classify waste images.
2. Implement Image Preprocessing – Resize and normalize images like `ImageDataGenerator`.
3. Deploy a Machine Learning Model – Use Streamlit for an interactive web application.
4. Enhance User Experience – Build an intuitive UI for seamless image uploads and predictions.
5. Work with TensorFlow & Streamlit – Integrate model inference into a web app.



## Tools and Technology used

**Python** – Programming language for model training and deployment.

**TensorFlow/Keras** – Deep learning framework for model training.

**Streamlit** – Framework for building interactive web applications.

**Pillow (PIL)** – Image processing for handling uploaded images.

**NumPy** – Data handling and preprocessing.

## Methodology

- 1. Data Collection** – Gather waste images categorized into recyclable and non-recyclable.
- 2. Model Training** – Train a **CNN model** on the dataset using **TensorFlow/Keras**.
- 3. Preprocessing** – Resize images to 224x224, normalize pixel values (0-1).
- 4. Web Deployment** – Use **Streamlit** to deploy an interactive web-based application.
- 5. Evaluation & Optimization** – Test and optimize the model for better accuracy.

## Problem Statement:

Waste classification is a crucial step in effective **waste management and recycling**. Manually sorting waste is inefficient, labor-intensive, and error-prone. An **automated waste classification system** using AI can significantly enhance efficiency, reduce environmental pollution, and promote sustainability.

## Solution:

- 1. Deep Learning-Based Model** – A Convolutional Neural Network (CNN) trained on waste images.
- 2. Preprocessing Pipeline** – Resize and normalize images to match the model's input format.
- 3. User-Friendly Web Interface** – A **Streamlit** application allowing users to upload images.
- 4. Instant Prediction & Feedback** – The app provides a **waste category prediction** with confidence scores.

## Screenshot of Output:

### Waste Classification Model

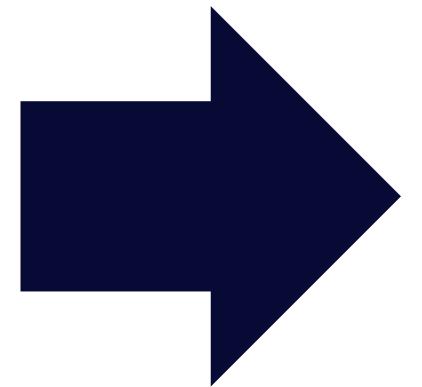
Upload an image to classify waste categories.

Choose an image...

Drag and drop file here  
Limit 200MB per file • JPG, PNG, JPEG

Browse files

 R\_10005.jpg 9.3KB



Uploaded Image

**Prediction: This is a Recyclable Waste**

Confidence: 99.99%

## Conclusion:

The **Waste Classification App** successfully classifies waste items using **deep learning**. The **Streamlit-based UI** makes the system accessible, providing instant feedback on waste categories. This project demonstrates how AI can contribute to **sustainable waste management** and encourage better recycling practices.