Image-based Waste Classification for Sustainable Waste Management

Theme: Sustainability

Context:

Improper waste segregation is a growing environmental issue that affects sustainability efforts worldwide. In many urban and rural areas, waste from households and public spaces is not correctly sorted into recyclable, organic, and hazardous categories. This leads to increased landfill waste, pollution, and loss of reusable materials.

Problem Statement:

There is a lack of scalable and automated systems capable of accurately classifying waste based on its type. Manual segregation is inefficient, time-consuming, and exposes workers to health risks. To address this, a deep learning-based waste classification system will be developed to identify and classify waste items using images, supporting efficient recycling and sustainable waste management practices.

Objective:

To design and implement a deep learning model capable of classifying images of waste into predefined categories such as organic, recyclable, and hazardous. The system will use image-based recognition techniques (such as YOLOv8 or CNN models) to assist in automated waste segregation for improved sustainability.

Dataset Description:

Dataset Name: Garbage Classification v2
Source: Kaggle (by user sumn2u)
Link: https://www.kaggle.com/datasets/sumn2u/garbage-classification-v2

The dataset contains thousands of labeled images of waste materials categorized into paper, cardboard, plastic, glass, metal, and trash. Images are captured under varied lighting and background conditions, making the dataset suitable for training a deep learning model. This dataset will serve as the foundation for model training, testing, and validation to ensure accurate real-world waste classification.

Expected Outcome:

1. A trained deep learning model capable of accurately identifying different types of waste.
2. A prototype interface (web or mobile) for capturing or uploading waste images.
3. Enhanced waste segregation practices contributing to sustainable waste management and recycling.

Keywords: Sustainability, Deep Learning, Waste Classification, YOLOv8, Computer Vision, Smart Segregation