Final Project Overview: Classify Waste Products Using Transfer Learning

Estimated Reading Time: 15 minutes

Project Scenario

The city of GreenCity has been struggling with waste management, especially in distinguishing between recyclable and organic waste. The local waste management organization, EcoClean, is tasked with improving the efficiency of waste sorting. However, the current manual process is both time-consuming and error-prone. To enhance the system, EcoClean wants you to develop an AI-powered solution that can automatically classify waste products using image recognition techniques. This project aims to build a model that can differentiate between recyclable and organic waste products using transfer learning.

Project Background

EcoClean currently lacks an efficient and scalable method to automate the waste sorting process. The manual sorting of waste is not only labor-intensive but also prone to errors, leading to contamination of recyclable materials. The goal of this project is to leverage machine learning and computer vision to automate the classification of waste products, improving efficiency and reducing contamination rates. The project will use transfer learning with a pre-trained VGG16 model to classify images.

Aim

The aim of the project is to develop an automated waste classification model that can accurately differentiate between recyclable and organic waste based on images. By the end of this project, you will have trained, fine-tuned, and evaluated a model using transfer learning, which can then be applied to real-world waste management processes.

Final Output: A trained model that classifies waste images into recyclable and organic categories.

Learning objectives

After completing this project, you will be able to:

- Apply transfer learning using the VGG16 model for image classification
- Prepare and preprocess image data for a machine learning task
- Fine-tune a pre-trained model to improve classification accuracy
- Evaluate the model's performance using appropriate metrics
- Visualize model predictions on test data

Instructions

To achieve the above objectives, you will complete the following tasks:

Task 1: Print the version of TensorFlow
Task 2: Create a `test_generator` using the `test_datagen` object
Task 3: Print the length of the `train_generator`
Task 4: Print the summary of the model
Task 5: Compile the model
Task 6: Plot accuracy curves for training and validation sets (extract_feat_model)
Task 7: Plot loss curves for training and validation sets (fine-tune model)
Task 8: Plot accuracy curves for training and validation sets (fine-tune model)
Task 9: Plot a test image using Extract Features Model (index_to_plot = 1)
Task 10: Plot a test image using Fine-Tuned Model (index_to_plot = 1)

Let's start the project by developing and deploying a trained model that classifies waste images into recyclable and organic categories.