CleanTech – Transforming waste with transfer learning

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Abstract

This project aims to develop an intelligent waste classification system using transfer learning. It classifies waste into categories such as glass, plastic, metal, organic, and recyclable. The system improves waste segregation efficiency, promoting sustainable waste management.

Introduction

Waste management is a critical issue globally. Manual waste sorting is inefficient and prone to errors. This project leverages machine learning and transfer learning to automate waste classification, helping in better recycling and sustainable practices.

Objectives

- Develop an AI-based waste classifier.
- Deploy a user-friendly web app using Streamlit.
- Promote sustainable waste management practices.

Methodology

1. Data Collection: Kaggle waste image dataset.
2. Preprocessing: Resizing, normalization, augmentation.
3. Model: Transfer Learning with MobileNetV2.
4. Training: 80% training, 20% validation.
5. Deployment: Using Streamlit.

Architecture Diagram

Architecture involves input images passing through a pre-trained MobileNetV2 model for feature extraction, followed by dense layers for classification.

Workflow

1. Dataset Preparation
2. Data Preprocessing

3. Model Training
4. Model Evaluation
5. Deployment

Results

Achieved approximately 90% accuracy in classifying five categories of waste. The deployed web app functions effectively for real-time predictions.

Conclusion

The project automates waste classification efficiently, aiding in effective waste segregation and recycling. This contributes to sustainable waste management practices.

Future Enhancements

- Expand dataset with more waste categories.
- Deploy as a mobile application.
- Integrate with IoT devices for real-time sorting.

References

1. Kaggle Waste Dataset
2. TensorFlow Documentation
3. Streamlit Documentation