### 📝 CleanTech — Solution Architecture

**Collect the Dataset**

Sources: Kaggle, UCI Repository

Classes: biodegradable, recyclable, trash

Link: Dataset

Data loaded and visualized with pandas, matplotlib, and IPython.display

**Activity 1.1: Importing the Libraries**

python

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import tensorflow as tf import keras import pandas as pd import numpy as np import matplotlib.pyplot as plt import os, random

**Activity 1.2: Read the Dataset**

Format: .csv, .json, .zip, .txt

Loaded using pandas, visualized sample image distribution

**Data Visualization & Predictions**

Randomly selected files displayed using IPython and OS

✅ Biodegradable → Correct

✅ Recyclable → Correct

✅ Trash → Correct

**Data Augmentation**

Skipped as data is pre-cropped

Common methods: rotation, scaling, flipping, contrast changes

Skipping had no impact on accuracy, slightly increased training time

**Architecture**

csharp

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project/

├── app.py # Flask backend

├── templates/ # Frontend HTML

├── static/ # Image uploads, CSS

└── Vgg16.h5 # Trained VGG16 model

**Conclusion**  
CleanTech provides a scalable, AI-based image classification solution to support smart city waste segregation. Integrated with Flask, it allows real-time prediction with high accuracy and environmental impact.