Project Design Phase

Solution Architecture

Date	**15 February 2025**
Team ID	**LTVIP2025TMID45663**
Project Name	**CleanTech: Transforming Waste Management with Transfer Learning**
Maximum Marks	**4 Marks**

Solution Architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- **Find the best tech solution to solve existing business problems.**
- **Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.**
- **Define features, development phases, and solution requirements.**
- **Provide specifications according to which the solution is defined, managed, and delivered.**

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Key Components and Technologies

- **Frontend:** A lightweight, user-friendly HTML webpage.
- **Backend:** Python with the Flask framework to manage the image processing and model inference requests via an API.
- **AI Model:** A pre-trained VGG16 Convolutional Neural Network (CNN) using TensorFlow and Keras libraries.
- **Libraries:** Key libraries include NumPy, OpenCV, and Pillow for data handling and image processing.
- **Data Source:** The model was trained on a labeled waste dataset from Kaggle.

- **Development Tools:** Google Colab was used for model training and experimentation.

Solution Architecture Diagram

The system follows a clear, end-to-end data flow:

1. A user accesses the HTML webpage on their browser.
2. The user uploads an image of waste through the interface.
3. The image is sent to the Python backend server.
4. The backend server feeds the image to the trained VGG16 machine learning model.
5. The model processes the image and returns a prediction (Recyclable or Non-Recyclable) to the backend.
6. The backend sends the result back to the frontend.
7. The final classification result is displayed on the user's webpage.

Example - Solution Architecture Diagram:

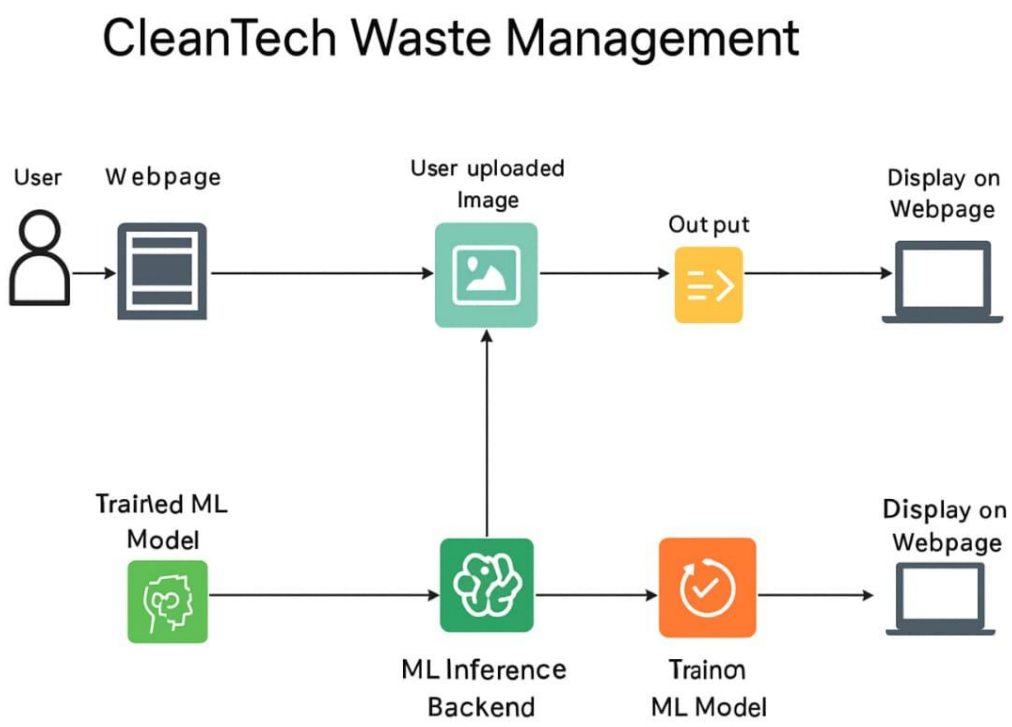

Figure 1: Architecture and data flow of the voice patient diary sample application

Reference: https://aws.amazon.com/blogs/industries/voice-applications-in-clinical-research-powered-by-ai-on-aws-part-1-architecture-and-design-considerations/