Garbage Classification using AI/ML

Project Overview:

This project focuses on building an AI model capable of classifying garbage into different categories such as recyclable, non-recyclable, organic, and hazardous. The main aim is to automate waste sorting using machine learning techniques to support proper waste management and environmental sustainability.

Objective:

To develop a machine learning model that can accurately classify images of waste into predefined categories to promote efficient waste segregation.

Tools and Technologies:

- Python
- TensorFlow / Keras
- Jupyter Notebook / Google Colab
- OpenCV (for image processing)
- Matplotlib / Seaborn (for visualization)

Dataset:

The project uses a labeled garbage image dataset containing images of various types of waste like plastic, metal, paper, glass, and organic materials. The dataset is split into training and testing sets.

Methodology:

1. Data Collection and Preprocessing: Images are resized, normalized, and augmented to improve the model's performance.
2. Model Building: A Convolutional Neural Network (CNN) is used for image classification.

3. Training and Validation: The model is trained on the dataset and validated using accuracy and loss metrics.

4. Testing: The model is tested on unseen data to evaluate its generalization.

5. Deployment (Optional): The model can be integrated into a web or mobile application for real-time classification.

Expected Outcome:

An AI-based system that can identify and categorize different types of garbage with good accuracy, helping in proper waste segregation.

Applications:

- Smart cities
- Waste management systems
- Environmental monitoring

Conclusion:

This project demonstrates how machine learning can be used to automate and improve the waste sorting process, which is crucial for sustainable development and environmental protection.