**Smart Waste Sorter (HX2501)**

**AI-Powered Waste Segregation System Using Deep Learning**

🚀 **An intelligent waste classification system that identifies and sorts garbage using AI and Machine Learning.**

**📌 Project Overview**

The **Smart Waste Sorter** is an AI-driven solution designed to automate waste classification. Using **deep learning (CNNs)** and **image recognition**, this system identifies waste items and categorizes them into **recyclable and non-recyclable** types. It aims to **promote efficient recycling** and reduce landfill waste by providing real-time waste disposal recommendations.

**🎯 Key Features:**

✅ **AI-Based Waste Classification** – Uses a Convolutional Neural Network (CNN) to classify garbage.  
✅ **Multi-Category Sorting** – Identifies plastic, paper, glass, metal, organic, and e-waste.  
✅ **Web-Based UI for User Interaction** – Allows users to upload images and receive waste disposal suggestions.  
✅ **Real-Time Image Processing** – Quickly processes and classifies waste for efficient sorting.  
✅ **Data Analytics & Tracking** – Stores waste classification history and provides insights.

**🛠️ Tech Stack**

💡 **Machine Learning** – TensorFlow/Keras for training the CNN, One-DNN-based waste classifier.  
💡 **Backend** – Flask (Python) to serve the AI model via an API, .gitignore  
💡 **Frontend (UI)** – HTML, CSS, JavaScript (React.js for an advanced UI), Python , Flask   
💡 **Vs Code, Goggle Collab**  – Used for model training and testing.

**🧠 How It Works**

1️ I**mage Input** – User uploads an image of waste, or a camera captures it automatically.  
2️**AI Model Classification** – The deep learning model predicts the waste type (recyclable or non-recyclable).  
3️ **Sorting Suggestion** – The system provides disposal recommendations for efficient waste management.  
4️ **Data Storage & Tracking** – Classification history is stored for analytics and insights.

**📊 Dataset & Model Training**

* **Dataset:** Uses custom dataset of labeled waste images.
* **Model:** Trained using a **CNN (Convolutional Neural Network)** architecture for accurate classification.
* **Training Process:** Data augmentation, hyperparameter tuning and testing

Social Impact:

Image classification for recycling has the potential to create significant social impact in a number of ways:

Environmental sustainability: By automating the sorting of recyclable materials, image classification can help increase the recovery of valuable materials and reduce waste. This can help promote environmental sustainability by conserving resources and reducing greenhouse gas emissions associated with the production of new materials.

Job creation: The implementation of image classification technology in recycling facilities can create new job opportunities for individuals with skills in technology and data analysis. These jobs can help promote economic growth and provide new career pathways for individuals in the recycling industry.

Education and awareness: Image classification for recycling can also be used as a tool for education and raising awareness about the importance of recycling. By creating more efficient and accurate recycling processes, individuals and communities may become more engaged in sustainable practices and waste reduction efforts.

Equity and access: Image classification can also help promote equity and access to recycling services, particularly in communities that may have limited resources or access to recycling facilities. By making recycling processes more efficient, these communities may have greater access to recycling services and a reduced burden of waste disposal. Overall, image classification for recycling has the potential to create significant social impact by promoting environmental sustainability, job creation, education and awareness, and equity and access.

**🛠️ Future Enhancements=**  
🔹 Add a reward system for sustainable waste disposal habits.  
🔹 Integrate with IoT sensors for real-time waste monitoring.

**👨‍💻 Contributors**

**Team Name** – DATA DYNAMOS!!

👤 **Teammate 1** – Khyati Singh

👤 **Teammate 2** – Sneha Dammani

👤 **Teammate 3** – Aarya Chandorkar

👤 **Teammate 4** – Gauri Barai