# Plastic Waste Segregation – Script Usage & Installation Guide

## 1. Environment Setup

To get started with the Plastic Waste Segregation system, follow the steps below to configure your environment:

1. Install Python 3.10 or higher from https://www.python.org/downloads

2. (Optional) Install Git from https://git-scm.com/downloads

3. Set up a Python virtual environment and install all dependencies. Use the following commands:

# For Windows  
python -m venv .venv  
.venv\Scripts\activate  
  
# For macOS/Linux  
python3 -m venv .venv  
source .venv/bin/activate

4. Install required Python libraries:

pip install --upgrade pip  
pip install ultralytics opencv-python opencv-python-headless torch torchvision torchaudio rich requests python-dotenv

## 2. Folder Structure Requirements

Ensure the following folders exist in the project directory before running scripts:

- captured\_videos/  
- queue/  
- VIDEOS/  
- dataset/images/verified/  
- dataset/labels/verified/

## 3. Script Descriptions and Usage

### camera\_check.py

Scans camera indices (0 to 4) to identify which webcam index is available.

To run this script, open terminal and type:  
python camera\_check.py

### capture\_dataset.py

Captures HD video from webcam and saves it to the 'captured\_videos/' directory.

To run this script, open terminal and type:  
python capture\_dataset.py

### detect\_live\_cam.py

Runs real-time detection using YOLOv8 'best.pt' model on the webcam feed with live bounding boxes.

To run this script, open terminal and type:  
python detect\_live\_cam.py

### detect\_and\_queue.py

Processes videos in 'VIDEOS/' folder, detects objects, saves cropped images and .txt labels to 'queue/'.

To run this script, open terminal and type:  
python detect\_and\_queue.py

### verify\_with\_gemini.py

Verifies multi-label results with Gemini. Moves validated data to dataset folders.

To run this script, open terminal and type:  
python verify\_with\_gemini.py

### verify\_single\_label.py

Verifies single-label entries using Gemini. Deletes incorrect ones from the queue.

To run this script, open terminal and type:  
python verify\_single\_label.py

### verify\_confidence\_fallback.py

Validates low-confidence labels using Gemini, falls back to GPT-4o if needed.

To run this script, open terminal and type:  
python verify\_confidence\_fallback.py

### checker\_valid.py

Helper script to validate logic and test integration pipelines.

To run this script, open terminal and type:  
python checker\_valid.py

### test\_all\_scripts.py

Runs all Python scripts in the directory and logs their success/failure.

To run this script, open terminal and type:  
python test\_all\_scripts.py

## 4. API Keys and Model File Setup

Create a `.env` file in the project directory containing your API keys for Gemini and GPT in the following format:

GEMINI\_API\_KEY=your\_gemini\_api\_key  
GPT\_API\_KEY=your\_gpt\_api\_key

Place the YOLOv8 model file named 'best.pt' in the same folder as the detection scripts.

## 5. Additional Notes

- Scripts should be run from the root directory of the project for proper path resolution.

- Activate the Python environment each time before running scripts.

- Ensure your webcam is connected and permissions are enabled (especially on macOS).

- Use 'test\_all\_scripts.py' to verify that everything is working after setup.