



Transfer Learning-Based Classification of Municipal Waste: HealthyVsRotten

Seshadri Rao Gudlavalleru Engineering College

Presented By :

Bandaru Vinodhini

Areti Jaswanth Vijay

Annapareddy Yakshitha Bala Sai

Arepalli Sukeerthi

Brainstorming & Ideation

Objective

To improve municipal waste management through using transfer learning and deep learning

Problem Statement

Manual waste segregation is time-consuming, error-prone, and inefficient. Workers are exposed to unhygienic conditions, and visual assessment is not scalable for smart cities or industrial zones.



Proposed Solution & Impact

We propose using transfer learning (e.g., VGG16, ResNet50) to develop an intelligent image classification system. This system will identify and sort waste (organic, recyclable, general, hazardous) from camera images, deployable as a web-based or embedded tool in bins or conveyor systems.



Increased Accuracy

Enhances waste segregation accuracy.



Reduced Exposure

Reduces human exposure to waste.



Efficiency

Enhances recycling efficiency.



Scalability

Scalable in urban and industrial settings.



Requirement Analysis

Technical Requirements

- Programming Language: Python
- Libraries/Frameworks: TensorFlow/Keras, OpenCV, NumPy/Pandas, Matplotlib/Seaborn, Flask/Streamlit
- Development Environment: Google Colab, Jupyter
- Deployment Platforms: Heroku, Streamlit, Raspberry Pi

Functional Requirements

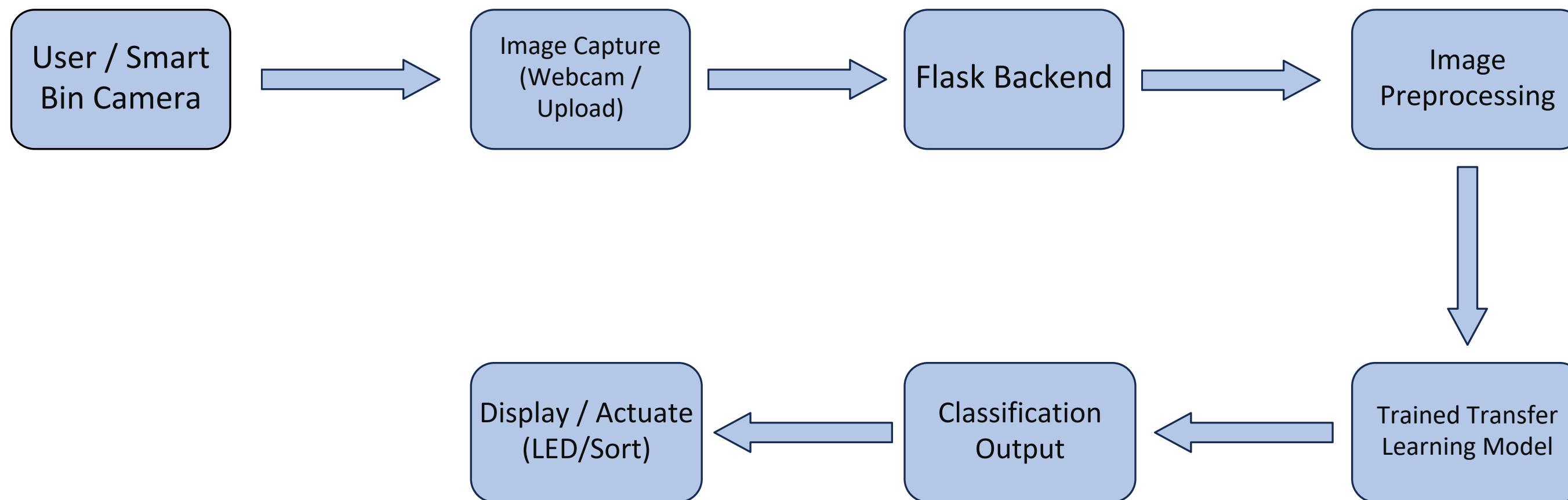
- Image classification using CNN + Transfer Learning
- Waste type prediction
- Real-time image preprocessing
- Confusion matrix and metrics display
- Web/Embedded UI with image input and prediction display

Constraints

Real-time constraints in smart bins, dataset diversity and labeling, resource limits on embedded devices, and environmental lighting variations.

Project Design

System Architecture



Project Planning (Agile Methodology)

Sprint Planning

- Sprint 1: Data collection & preprocessing
- Sprint 2: Model training with transfer learning
- Sprint 3: Flask/Streamlit integration
- Sprint 4: UI development and deployment

Task Allocation

- Member A: Data collection & OpenCV preprocessing
- Member B: Model development using VGG16
- Member C: Backend and Flask integration
- Member D: UI design + hardware bin integration

Timeline

Week 1-2: Dataset preparation. Week 3-4: Model training & evaluation. Week 5: Backend API setup. Week 6: Frontend/Smart bin integration. Week 7: Functional testing. Week 8: Final deployment.

Project Development

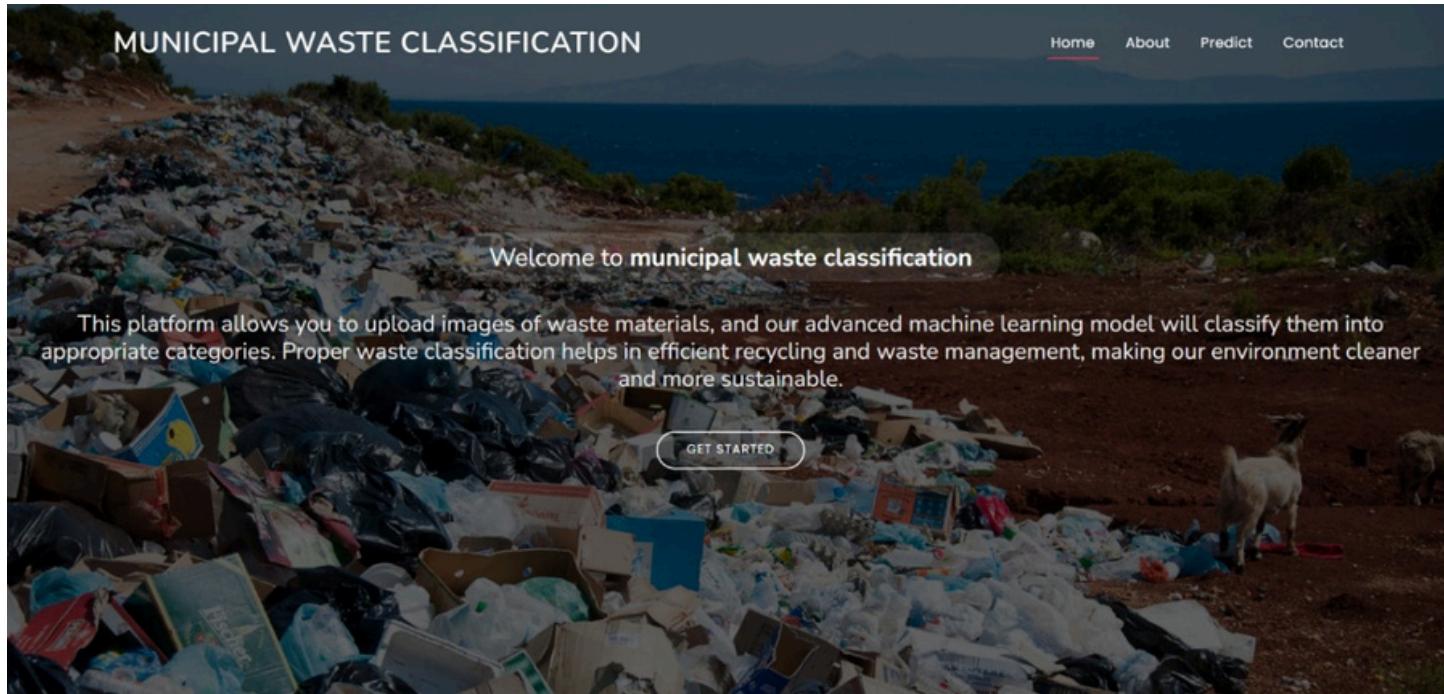
Technology Stack

- Languages: Python, HTML, CSS
- Libraries: TensorFlow, Keras, OpenCV, PIL, Flask
- Tools: Google Colab, GitHub, VS Code
- Deployment: Heroku / Streamlit / Raspberry Pi

Workflow

- Train model with preprocessed data (VGG16).
- Save .h5 model.
- Set up Flask backend to load model and receive image.
- Predict label and show on UI.
- Optionally trigger sorting mechanism.

Web page :



About us :

Learn More About Us

GreenGuard Insights is a pioneering organization dedicated to enhancing the efficiency and sustainability of municipal waste management.

Our team comprises innovative scientists, technologists, and environmental experts committed to leveraging advanced classification technologies to ensure that waste is sorted accurately and managed effectively.

- ✓ Comprehensive analysis and classification of municipal waste based on type and recyclability.
- ✓ Continuous monitoring of waste processing to ensure efficient recycling and disposal.
- ✓ Innovative solutions to minimize landfill use by identifying and separating recyclable materials early in the waste management process.

Our team is our greatest asset. We are a diverse group of experts in fields such as environmental science, data analytics, software engineering, and waste management. Together, we bring a wealth of knowledge and experience to tackle the challenges of municipal waste classification and management.

[Learn More](#)

Contact Us:

The image shows a contact form. At the top, there are three circular icons: a location pin, an envelope, and a phone. Below the icons, the form is divided into sections: 'Location' with a pin icon and the text 'Medhipatnam, Hyderabad, 535022'; 'Email' with an envelope icon and the text 'NutrigazeOrg@example.com'; and 'Call' with a phone icon and the text '+1 5589 55488 55s'. The form fields include 'Your Name', 'Your Email', 'Subject', 'Message', and a 'Send Message' button at the bottom.

Output:

WASTE CLASSIFICATION

Home About Contact

Cleanliness Detection

Result of municipal waste classification

Biodegradable Images (0)

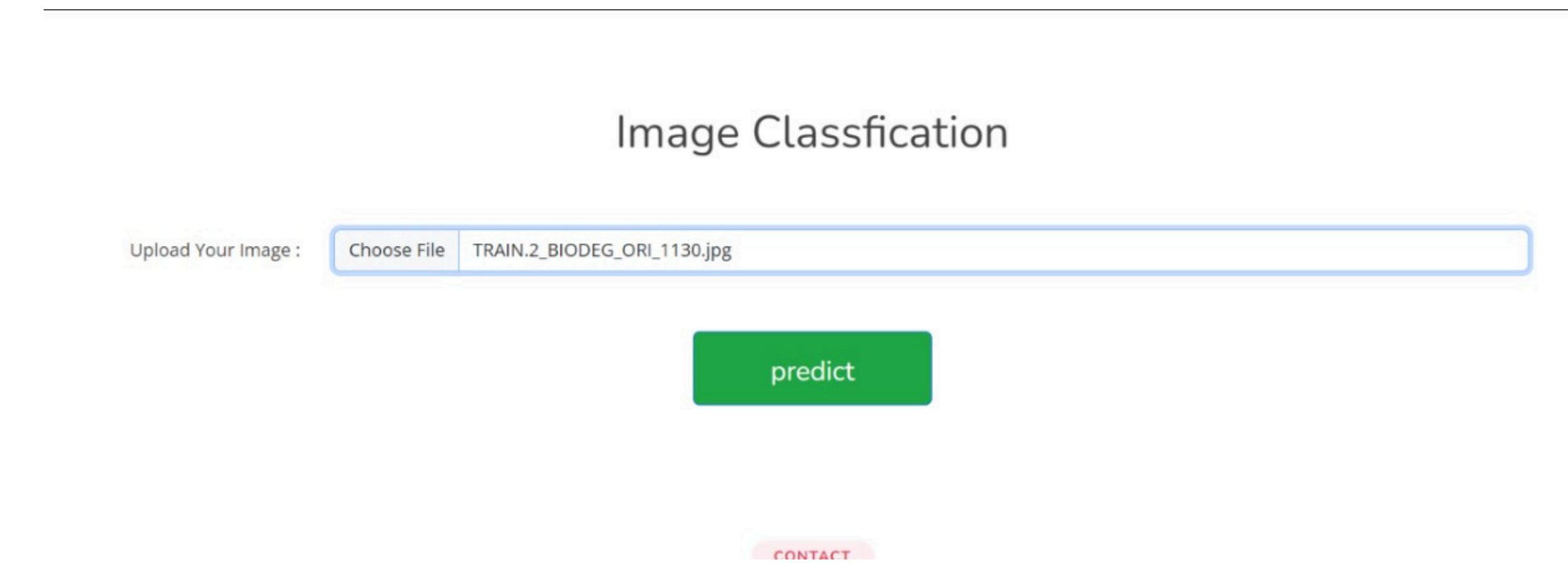


Image Classification

Upload Your Image : Choose File

predict

CONTACT





Conclusion

The HealthyVsRotten project showcases how AI and transfer learning can streamline urban waste management. By automating waste segregation through intelligent classification systems, cities and industries can reduce manual labor, enhance recycling accuracy, and build toward sustainable smart ecosystems.