

University Teaching Department

Chhattisgarh Swami Vivekanand Technical University, Bhilai

B.Tech. (HONS.)

Computer Science and Engineering(AI)

Session: 2025

Semester: 5th



Minor-Project Report

Faculty In-charge:

Mr. Rishabh
Shukla

Submitted by: -

Group : 9

Branch: CSE(AI)

CERTIFICATE

This is to certify that the Minor Project titled "**Garbage Classifier for Waste Management**" has been completed and submitted by the following students of **B.Tech (Hons.) in the Department of Computer Science and Engineering [A.I], 5th Semester, University Teaching Department**, during the academic year **2025–2026**:

- 1. Abhay Singh Sisoodiya**
- 2. Abhinav Anand**
- 3. Aditya Verma**
- 4. Anshul Yadav**
- 5. Aman Banajre**
- 6. Harsh Kumar Chandrakar**

The project has been completed as part of the prescribed academic requirements of the department and is hereby accepted for submission.

Internal Signature

External Signature

DECLARATION

We, the students of B.Tech (Hons.) CSE (AI), hereby declare that our Minor Project titled “” has been completed by our group as part of the curriculum requirements for the academic year 2025–2026.

The work included in this report has been carried out by our team members through regular study, practical understanding, and collaborative effort. Any materials, references, or resources used during the preparation of this project have been properly acknowledged within the report.

Team Members:

1. Abhay Singh Sisoodiya | 3000127230
2. Abhinav Anand | 3000127230
3. Aditya Verma | 3000127230
4. Anshul Yadav | 3000127230
5. Aman Banajre | 3000127230
6. Harsh Kumar Chandrakar | 3000127230

Date:

Place: University Teaching Department

ACKNOWLEDGMENT

We would like to express our sincere thanks to the **Department of Computer Science and Engineering of University Teaching Department**, for giving us the opportunity to work on our Minor Project titled "**Garbage Classifier for Waste Management**" as part of our academic curriculum.

We are grateful to the faculty members and staff of the department for providing guidance, support, and a helpful learning environment throughout the duration of this project. Their encouragement and cooperation made the completion of this work possible.

We also appreciate the support of our classmates, friends, and families for motivating us during the project. Lastly, we acknowledge the efforts and teamwork of all group members in successfully completing this Minor Project.

Team Members
(Group of 6 Students)

INDIVIDUAL CONTRIBUTION REPORT

Anshul Yadav

Garbage Classifier for Waste Management

AI-Powered Garbage Segmentation System

Primary Roles

- ☛ System Integration
- ☛ Pipeline Development
- ☛ Testing

BTech (Hons.) CSE - Artificial Intelligence

5th Semester | Group 09

University Teaching Department (UTD)

CSVTU, Bhilai

December 2025

Contents

1	Role Overview	2
2	System Integration	2
2.1	Component Integration	2
2.2	Package Structure	2
2.3	Integration Pipeline Code	2
3	Testing	3
3.1	Integration Test Results	3
3.2	Error Handling	3
4	Technical Achievements	4
5	Skills Demonstrated	4

1 Role Overview

👤 Assigned Responsibilities:

- ☛ **System Integration** — Connecting all components
- ☛ **Pipeline Development** — End-to-end inference flow
- ☛ **Testing** — Integration and functional testing

2 System Integration

2.1 Component Integration

Integrated the following system modules:



2.2 Package Structure

Listing 1: Module Organization

```

1 models/
2   |-- __init__.py
3   |-- yolo_segmentation.py      # Core model
4   |-- gradio_app.py            # Web interface
5   |-- inference.py             # Unified pipeline
6   |-- utils/
7     |-- preprocessing.py       # Image enhancement
8     |-- visualization.py      # Charts & masks

```

2.3 Integration Pipeline Code

Listing 2: Unified Pipeline

```

1 class GarbageDetectionPipeline:
2     def __init__(self, use_enhancement=True):
3         self.segmentor = GarbageSegmentor()
4         self.use_enhancement = use_enhancement
5
6     def process(self, image, confidence=0.25):
7         # Step 1: Preprocess
8         if self.use_enhancement:

```

```

9      image = auto_brightness(image)
10     image = enhance_image(image)

11
12     # Step 2: Inference
13     self.segmentor.confidence_threshold = confidence
14     results = self.segmentor.segment(image)

15
16     # Step 3: Visualize
17     annotated = self.segmentor.visualize(results)

18
19     # Step 4: Statistics
20     class_counts = self._count_classes(results)
21     pie_chart = create_pie_chart(class_counts)

22
23     return annotated, pie_chart, class_counts

```

3 Testing

3.1 Integration Test Results

Table 1: Test Cases Executed

Test Case	Status	Result
Single image detection	✓	Pass
Multiple objects per image	✓	Pass
Empty image handling	✓	Graceful
Invalid input handling	✓	Error msg
Enhancement toggle	✓	Pass
Confidence threshold	✓	Pass
UI component rendering	✓	Pass

3.2 Error Handling

Listing 3: Robust Error Handling

```

1 def safe_segment(self, image):
2     """Segment with error handling."""
3     try:
4         if image is None:
5             return None, "No image provided"
6
7         results = self.model.predict(image)

```

```
8
9     if results[0].masks is None:
10        return image, "No objects detected"
11
12    return self.visualize(results), "Success"
13
14 except Exception as e:
15     logging.error(f"Error: {e}")
16     return None, f"Error: {str(e)}"
```

4 Technical Achievements

🏆 Key Accomplishments:

- ★ Successfully integrated 4 major system components
- ★ Developed robust error handling mechanisms
- ★ Created unified, modular inference pipeline
- ★ Ensured seamless data flow between modules
- ★ Conducted comprehensive testing suite

5 Skills Demonstrated

Category	Skills
Architecture	System integration, modular design
Python	Package development, OOP
Quality	Error handling, logging
Testing	Integration testing, QA