**Templates**

**Project phase templates:**

**Project title:**

Clean Tech: Transforming waste management with transfer learning

**Team Name:**

LTVIP2025TMID42148 **Team members:**

* **Team Leader:** Yallaturi Surekha
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**Phase 1:** Brain storming & ideation

**Objective:**

* **Identify the problem statement**

Waste management is a growing concern in rural land urban areas, where the classification and disposal of waste are often inefficient, leading to environmental pollution, health hazards, and increased operational costs.

* **Define the purpose and impact of the project**

The purpose of this project is to harness transfer, learning techniques in machine learning to revolutionize waste management the impact of the project is environmental sustainability, smart automation cost efficiency, scalability, society benefits.

**Key points:**

**1.Problem** **Statement:**

Traditional waste management systems suffer from inefficiencies in accurately classifying and segregating different types of waste.

**2.Proposed** **Solution:**

Develop and ai powered waste classification system using transfer learning.

**3.Target Users:**

* Municipal waste management authorities
* Smart City planners and urban developers
* Waste tech solution providers

**4.Expected outcome:**

* Reduction in manual labor and sorting errors
* Increased recycling rates and material recovery

**Phase 2: Requirements Analysis**

**Objective: -**

Define technical and functional requirements the technical is a about labeled image data set of various waste management types like organic, plastic, metal, e-waste and predefined, categories in real time or batch made.

**Key Points:**

* **Technical requirements**

1.Data set requirement

2.model architecture

3.computing infrastructure

4.software stack

* **Functional requirements**

1.automated waste classification

2.user interface

3.feedback loop

4.reporting and analysis

* **Constraints and challenges**

1.data quality and availability

2.class imbalance

3.realtime performance

4.scalability

**Phase 3: Project design**

**Objective: -**

We create the architecture and user flow waste images from smart bins, municipal waste centers, re cycling units, cameras, barcode, RFID scanners, noise removal, image resizing, image augmentation.

**Key points:**

**1.User flow:**

Guide users through the waste management system that efficiently

* Waste image upload
* Waste category recommendation
* Based on type, user can schedule a waste pickup
* View pickup request by location, category, urgency

**UI/UX consideration**

* Simplify and accessibility
* Image upload UX
* AI Feedback loop

**Phase 4: - Project Planning**

**Objective: -**

* Break down the task using methodologies especially focusing on transfer learning integration.

**Key Points: -**

**1.sprint planning:**

Agile methodology encourages development via sprints are four types

* **Sprint 1:** Research and requirement set up
* **Sprint 2:** Aimodel and backend
* **Sprint 3:** Frant integration
* **Sprint 4:** Testing, feedback and optimization

**2.Task allocation:**

1. Role Responsibility copied

|  |
| --- |
|  |

product customer define future set pro

**Phase 5: - Project development**

**Objective:**

* Code the project and integrate component
* Define scope and objectives
* Identify stakeholders

**Key points: -**

**1.technology stack:**

Python, open cv, ten sort flow, scikit-learn

**2.development** **process:**

The development process should be requirement analysis, system design, data preparation and transfer learning

**3.challenge and fixes:**

* Data set limitations for waste classification
* Model mis-classification
* Slow forcers
* Data privacy

**Phase 6: - functional and performance testing**

**Objective:**

Ensure the project work as expected the work as expected to verify that each function of the system behaves as expected according to the requirements.

**Key points:**

**1.test cases executed:**

Test case id description input expected output status

Tc-foo1 user login valid email/ redirect to pass

Functionality password dashboard

Tc-foo2 waste image image of plastic image uploaded pass

Upload bottle successfully

These are some listed scenarios in testing.

**2.bug fixes and improvement:**

bug id description root cause fix implemented status

bug-1 image uploaded backend didn’t implement file fixed

failed for large files handle large size limit of

files upload compression

bug-2 mis-classification similar visual add more training fixed

of gasses features’ images

**3.final validation:**

The final validation phase evaluates whether the clean tech waste management project using transfer learning meets the initial technical functional and performance requirements.