Edunet Foundation – Weekly Internship Report

Project Title: *E-Waste Generation Classification using EfficientNetV2B0*
Internship Duration: *June – July 2025*
Organization: *Edunet Foundation*
Mode: *Virtual*
Project Type: *AI/ML-based Image Classification*
Platform Used: *Google Colab, Gradio, GitHub*

Week 0: Orientation & Project Allocation

Date: 13 June 2025

Activities:

- Attended the orientation session conducted by Edunet Foundation.
- Understood the internship timeline, deliverables, expectations, and evaluation criteria.
- Received the project title – *"E-Waste Generation Classification"*.
- Explored project-based learning structure and weekly mentorship framework.
- Gained access to all tools and resources to begin project work.

✅ Key Learning:

- Structure of project-based internships.
- Overview of AI/ML domains and real-world applications.

Week 1: Project Setup, Data Import & Visualization

Mentor Session Date: 16–17 June 2025
Master Session Date: 20 June 2025
Topic: *Sustainable Technologies in Engineering*

🔧 Technical Work:

- Downloaded and extracted the Kaggle E-Waste Image Dataset.
- Structured the dataset into training, validation, and test directories.
- Loaded image datasets using `image_dataset_from_directory()` API.
- Visualized class distributions using bar graphs to ensure balance.

✅ **Key Learning:**

- Data loading and preprocessing in TensorFlow.
- Visual inspection of dataset health (class imbalance, size).

☐ **Master Session Insight:**

Learned about sustainable innovations and their impact on environmental challenges. Understood the significance of e-waste management through smart technology integration.

Week 2: Model Selection, Augmentation & Training

Mentor Session Date: 23–24 June 2025
Master Session Date: 27 June 2025
Topic: *Digital Transformation in Industry 4.0*

🔧 **Technical Work:**

- Selected **EfficientNetV2B0** as the base model with pretrained ImageNet weights.
- Applied data augmentation (Random Flip, Rotation, Zoom) for better generalization.
- Fine-tuned model architecture by freezing initial layers and adding:
  - `GlobalAveragePooling2D`
  - `Dropout`
  - `Dense(10, softmax)`
- Trained the model for 8 epochs using EarlyStopping to avoid overfitting.
- Achieved **96% test accuracy** on the image classification task.

✅ **Key Learning:**

- Transfer learning implementation using Keras.
- Benefits of model regularization and early stopping.

☐ **Master Session Insight:**

Learned how industries are integrating AI/ML, IoT, and automation to drive Industry 4.0. Understood how intelligent systems like e-waste classification support digital transformation.

Week 3: Model Evaluation, Visualization & Deployment

Mentor Session Date: 30 June – 1 July 2025
Master Session Date: 4 July 2025
Topic: *Design Thinking & Critical Thinking*

🔧 Technical Work:

- Evaluated the model using:
  - Confusion Matrix
  - Classification Report
  - Accuracy vs. Loss Curves
- Saved the final model in `.keras` format.
- Built and deployed a **Gradio Web Interface** for real-time prediction.
- Enhanced Gradio UI with confidence score and clean layout.
- Performed prediction on sample images to visualize real-time results.

✅ Key Learning:

- Model evaluation metrics (precision, recall, F1-score).
- Hands-on deployment using Gradio.

☐ Master Session Insight:

Understood the principles of design thinking and how they guide user-centric development. Applied these while designing the Gradio interface to be intuitive and accessible.

Week 4: Documentation, Presentation & Submission

Mentor Session Date: 5–11 July 2025
Presentation Date: 14–16 July 2025

📄 Technical Work:

- Created a professional and well-structured `README.md` file with:
  - Problem statement
  - Objectives
  - Architecture
  - Results
  - Deployment
  - Future scope
- Designed a PowerPoint presentation using the provided template.
- Included:
  - Confusion Matrix
  - Accuracy/Loss plots

    o Methodology visual
    o Gradio Web Interface screenshot
- Final project submitted successfully and presented.

☑ Key Learning:

- Communicating technical results through documentation.
- Structuring a technical project for storytelling and clarity.
- Importance of UI design, user flow, and demo usability in real-world AI solutions.

☑ Summary of Improvements Made

- Replaced basic CNN with **EfficientNetV2B0**, achieving better accuracy and efficiency.
- Tuned learning rate, batch size, and added **Dropout** for better generalization.
- Applied **data augmentation** to reduce overfitting.
- Integrated a clean, functional **Gradio UI** with real-time image upload capability.
- Evaluated predictions using confusion matrix and classification metrics.
- Finalized project with clear documentation, visuals, and a user-facing interface.