**Model Performance Test**

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| Date | 1 july 2025 |
| Team ID | - |
| Project Name | Project - cleantech |
| Maximum Marks |  |

**Model Performance Testing:**

Project team shall fill the following information in model performance testing template.

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| --- | --- | --- | --- |
| **S.No.** | **Parameter** | **Values** | **Screenshot** |
|  | Metrics | **Regression Model:** MAE - , MSE - , RMSE - , R2 score -  **Classification Model:** Confusion Matrix - , Accuray Score- & Classification Report - |  |
|  | Tune the Model | Hyperparameter Tuning -  Validation Method - |  |

Project Title: CleanTech: Transforming Waste Management with Transfer Learning  
  
Overview:  
This project aims to revolutionize waste management by using transfer learning with the VGG16 model to classify waste images into three categories: biodegradable, recyclable, and trash. The project is deployed through a Flask-based web interface.  
  
Collect the Dataset:  
We use data with three classes—biodegradable, recyclable, and trash. This data is downloaded from kaggle.com. It can also be accessed using APIs.  
  
Link: Dataset  
  
After downloading the dataset, unzip and explore it using pandas and visualization tools.  
  
Note: Multiple visualization and analysis techniques can be used; only a few are shown here.  
  
Activity 1.1: Importing the Libraries:  
Import necessary libraries like tensorflow, keras, pandas, matplotlib, os, numpy, and random.  
  
Activity 1.2: Read the Dataset:  
The dataset can be in .csv, .txt, .json, or .zip formats. Use pandas to read and convert it into a DataFrame.  
  
Data Visualization:  
Randomly select and display image files using Python’s IPython display module, os, and random libraries to explore dataset contents.  
  
Examples:  
- Biodegradable class: The model correctly predicted a biodegradable image.  
- Recyclable class: The model correctly predicted a recyclable image.  
- Trash class: The model correctly predicted a trash image.  
  
Data Augmentation:  
Data augmentation is used to increase the size and variety of the dataset using transformations like flipping, scaling, rotation, brightness change, etc.  
  
However, in this case, the data is already cropped and cleaned, so augmentation is skipped to reduce training complexity. Accuracy is unaffected, but training time increases slightly.  
  
Project Structure:  
- app.py (main Flask script)  
- templates/ (HTML frontend)  
- static/ (CSS, image uploads)  
- Vgg16.h5 (saved deep learning model)  
  
Model Integration:  
The VGG16 model is fine-tuned and saved in H5 format, then integrated into a Flask app for real-time predictions.  
  
Conclusion:  
CleanTech provides a modern solution to aid smart city initiatives with waste segregation using AI-powered waste classification.