

SET Project Report

“Garbage Segregation using Deep Learning”

- **Review existing research paper for finding gap and analyze which technologies they were used**

While review existing research paper we analyze that most of the previous research paper done on only solid waste. For ex if it is glass then in image only one object glass is there same in paper or other objects.

In existing research paper they are used pre trained model like VGG, ResNet, DenseNet, MobileNet, Inception etc.

They achieve good accuracy (around 90% - 93%) by using these all models but it is solid waste that is main reason to achieve good accuracy.

- **Research Question :**

Make classification model to classify collective waste either it is biodegradable or non biodegradable.

To solve this problem we will using pre-trained model or vision transformer.

- **Data Collection :**

We are collect data from different different sources like Kaggle, UCI Machine Learning Repository, Government Site etc.

- **Base Model Development :**

We implemented a base CNN model on approximately 15,000 garbage images belonging to 15 different classes. The model achieved around 70% accuracy however, it was specifically applied on solid waste.

- **Collect More Diverse Data :**

We are collect more collective waste data and combine all these data. Then will try different Deep Learning models like transfer learning, vision transformer.

We have already completed the steps mentioned above, and now we are focusing on the following tasks.

- **Dataset Preparation :**

Process the images to achieve good accuracy and make robust model for e.g. resizing the images, normalization, label the data into categories such as biodegradable and non-biodegradable.

- **Dimensionality Reduction :**

Reduce the high dimension of data by using PCA. It help us to making the model more efficient and also it decreasing computation cost without losing information.

- **Model Design :**

First we will try existing CNN models with advanced architecture like ResNet or EfficientNet etc. Then will implement vision transformer to handle complex classification to get more accuracy.

- **Training and Validation :**

Train the model on updated dataset and evaluate its performance on validation data and do hyperparameter tuning to maximize accuracy.

Future Planning :

- **Integrate Gas Sensor Data:**

In the future, we plan to integrate gas sensor data along with images to improve the accuracy of garbage classification. By combining visual and Gas sensor data, the model will be able to identify waste types more efficiently, especially in cases where visual data alone might be insufficient.

- **Preprocess Gas Data :**

After collecting gas sensor data will apply standardization technique and handle missing values and do EDA to detect outlier and remove the outlier.

- **Multi Model Approach :**

After collecting gas sensor data along with images we are build Multi Model deep learning model to classify the garbage into biodegradable or non biodegradable.

Here we will use ANN + CNN. ANN for gas sensor data and CNN for image classification then we combine both model and make predication based on images the chemical which they are released.

TO build Multi Model architecture we will use Keras Functional API instead of Keras Sequential API.