National University of Computer and Emerging Sciences

Data Science (7-B)
Assignment 2

SustainAI - Automated Recycling Classification

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Dataset Description

We gathered a dataset containing more than 5000 total images of different garbage types that include plastic, metal, paper, leaf waste and wood waste. The dataset has been extracted from Kaggle. To use it, you need to create a shortcut of the "DS-Dataset" folder to "My Drive". Upon running the code, you will be asked to choose your google account whose Drive will be mounted.

Data Preprocessing

We split the data into training, validation and testing sets with 4095 images in the training set, 917 images in the validation set, and 125 images in the testing set. The preprocessing of the image dataset before training the AI model is one of the crucial tasks in this project. The pipeline for data preprocessing includes the following actions:

1. **Reading Images:** The cv2.imread() method is used to read the pictures, allowing us to load them into memory for later processing.
2. **Color Format Conversion:** The cv2.COLOR BGR2RGB method is used to change the images' color format from BGR to RGB. By converting the photos, it is made sure that they are consistently represented in terms of color for analysis.
3. **Resizing:** Using the cv2.resize() method, the images are resized to a fixed size (IMG HEIGHT, IMG WIDTH). Making sure that all of the photographs have the same proportions is essential for effectively training the AI model. The algorithm used to resize the image is determined by the interpolation=cv2.INTER AREA option.
4. **Conversion to Numpy Arrays:** Using the np.array() function, the photos are transformed into numpy arrays. We can now manipulate and perform numerical operations on the image data thanks to this conversion.
5. **Data Type Conversion:** Using the image.astype('float64') method, the images' data type is changed to float64. By converting the image, it is ensured that the pixel values are appropriately recorded for later processing.
6. **Normalization:** By dividing each pixel value by 255, the pixel values of the images are normalized in the range [0, 1]. In order to aid in the training process, this normalization phase makes sure that the pixel values are on a consistent scale.
7. **Image Reshaping:** For the AI model's input dimensions to be uniform, the photos are reshaped to a size of (200, 200, 3).
8. **Class Label Storage:** Each image has a class mark that designates whether it belongs in the plastic or scrap metal group. These labels are employed in the training and performance assessment of the AI model.

Dataset Link:

Link to the extracted dataset uploaded on drive is provided below:
https://drive.google.com/drive/folders/1VFLg0dTHNs1od-8Rd3g4nsbw84U9O5Li

Kaggle Link:

Link to the actual dataset used from kaggle is provided below:
https://www.kaggle.com/datasets/aashidutt3/waste-segregation-image-dataset