Dataset Strategy For Neural Network Mini Project

(MINI PROJECT 1)

1. Objective(MINI PROJECT 1)

MINI PROJECT 1 : Build an image dataset that contains grayscale images of leaves of various plants/trees growing in MBMU campus. Perform necessary preprocessing steps to make the dataset uniform and ready for training. Train a deep autoencoder network that can reproduce any random image of a leaf from MBMU campus.

Project Overview

We are building a dataset of grayscale leaf images from different plant species found on the MBMU campus. The goal is to train a deep autoencoder network that can reconstruct any random leaf image from this dataset.

2. Leaf Image Collection

- Location: MBMU campus
- Total teams: 8
- Species per team: 2 species per team
- Images per species: 100-120 images
- Species assigned to our team :
    - Crinum asiaticum (Poison Bulb / Nagadamani)
    - Catharanthus roseus(Madagascar Periwinkle / Sadabahar)
- Format: Collect images in RGB format.
- Aspect Ratio: Maintain a 1:1 aspect ratio while capturing images.
- Image format: JPG

- Lighting Conditions: Capture images in both sunlight and artificial light.

3. Dataset Upload & Collaboration

- All teams will upload their collected images to a shared GitHub repository.
- Each team will organize their images into two separate folders (one per species).
- The dataset will be processed only after all teams have uploaded their images.

- Each team will independently carry out preprocessing steps on the entire dataset before training their models.

4. Preprocessing

Organizing Images

- We will maintain two main folders initially—one for each species.

Resolution

- The resolution (500x500 and 256x256) will be changed during preprocessing, not during collection.
- Resizing**:** Images will be resized to 500x500 first, then to 256x256 for comparison.

Grayscale Conversion

- Convert images to grayscale using an OpenCV script.

Noise Removal

- No smoothing will be applied to retain the natural texture of leaves.
- Use thresholding to remove unnecessary noise.
- Any grayscale values greater than a threshold should be converted to 255 (pure white) , and below it to 0 (black) , to eliminate background shadows.

Intensity Normalization

- Adjust brightness and contrast programmatically to ensure all images have a similar intensity range.

Experiment with different optimizers for preprocessing efficiency.

5. Dataset Folder Structure

Initially, the dataset will be structured as follows:

Dataset/

|— Madagascar_Periwinkle/

|— Crinum_Asiaticum/

Once preprocessing is done, we will introduce subfolders for different resolutions:

Dataset/

|— Madagascar_Periwinkle/

| ├— 256x256/

| ├— 500x500/

|— Crinum_Asiaticum/

| ├— 256x256/

| ├— 500x500/

6. Model Training Plan

- We will train a deep autoencoder model using grayscale images.
- Training will first be done with 500x500 resolution images and later with 256x256 to compare results.
- The model will be evaluated based on reconstruction error (MSE, SSIM).

7. Next Steps

1. Preprocess the dataset (grayscale conversion, noise removal, resizing)
2. Augment data (optional).
3. Train the deep autoencoder with 500x500 images first, then with 256x256.
4. Evaluate and refine the model.