Federated Learning Based Tomato Plant Disease Detection Using Deep Learning: A Collaborative Approach

Project Overview

This project implements a federated learning approach for tomato plant disease detection using deep learning techniques. It aims to provide a collaborative and privacy-preserving method for identifying diseases in tomato plants across distributed datasets.

Team Details

Mentor

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Team Members

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Features

- Federated learning implementation for distributed data processing
- Deep learning models for accurate disease detection
- Privacy-preserving approach to handle sensitive agricultural data

Data Transformation Process

The data transformation process balances the dataset between two clients while ensuring data diversity. Here are the key steps:

1. **Dataset Selection**: The process focuses on three categories of tomato plant diseases:
    - Tomato Late Blight
    - Late Mold
    - Bacterial Spot
2. **Client Data Balancing**:
    - **Client 1 (Downsampling)**: If Client 1 has more images than the target size, random images are removed to reach the target.
    - **Client 2 (Upsampling)**: If Client 2 has fewer images than the target size, new images are generated through augmentation.
3. **Image Augmentation** (for Client 2 upsampling):

- Random rotations and flips
- Gaussian noise, blur, and median blur
- Motion blur, optical distortion, and piecewise affine transformations
- Shift, scale, and rotate transformations
- CLAHE, sharpening, embossing, and brightness/contrast adjustments
- Hue, saturation, and value modifications

4. **Output**: Balanced datasets for both clients, with Client 2 having augmented images to match Client 1's quantity.

This process ensures that both clients have similar amounts of data while introducing variety in Client 2's dataset through augmentation.