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Plant Disease Detection System for Sustainable Agriculture

Problem Statement

In modern agriculture, plant diseases pose a significant threat to crop yields and food security. Early detection and diagnosis of plant diseases are essential to minimize losses, reduce pesticide use, and promote sustainable farming practices. Manual monitoring is time-consuming, error-prone, and requires expertise that may not be readily available to all farmers. Therefore, there is a need for an automated, efficient, and accessible solution that can accurately detect and classify plant diseases from images.

This project aims to develop a Plant Disease Detection System using Convolutional Neural Networks (CNN) to automatically identify diseases from leaf images. The system will assist farmers by providing early alerts and actionable insights, contributing to sustainable agriculture and improved crop management.

Project Pipeline

The project will follow a systematic pipeline to achieve the objective of disease detection. The steps involved are as follows:

1. Data Collection and Data Loading

- Collect a dataset containing images of plant leaves categorized into different disease types.
- The dataset will be organized into training, testing, and validation folders with subfolders for each category.

2. Data Preparation and Organization

- The dataset will be compressed into a ZIP file and uploaded to Google Drive.
- In Google Colab, the Drive will be mounted, and Python code will be used to unzip the dataset and prepare it for use.

3. Image Processing and Augmentation

- Perform preprocessing steps such as resizing images to a uniform dimension (e.g., 129x129 pixels).
- Apply image augmentation techniques like rotation, flipping, and zooming to increase dataset diversity.

4. CNN Model Development

- Build a Convolutional Neural Network (CNN) to learn features from the processed images.
- The model will be trained using the training dataset and validated using the validation dataset.

5. Model Testing and Evaluation

- Evaluate the model's performance using the testing dataset.
- Metrics like accuracy, F1-score, and AUC-ROC will be used to assess model effectiveness.

The following diagram illustrates the pipeline :