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Problem Statement:

Design and implement a CNN-based system that can detect and classify plant diseases from leaf images across multiple crop types such as tomato, potato, grape, and corn. The objective is to accurately differentiate between healthy and diseased leaves and identify the specific disease affecting the plant. This solution aims to support farmers in early diagnosis and treatment, thereby improving crop yield and contributing to smart farming practices.

Pipeline:

The proposed pipeline for this system includes the following stages:

Data Collection & Loading:

The dataset is organized into training, testing, and validation directories. Each directory contains subfolders representing different classes (e.g., healthy, disease1, disease2). These images are loaded using image data generators or similar utilities to prepare them for model training.

ZIP & Mounting:

The dataset is compressed and uploaded to Google Drive. In Google Colab, the drive is mounted, and the dataset is extracted into the working directory using Python scripts, making it ready for processing.

Image Preprocessing & Augmentation:

All images are resized to a uniform dimension e.g, 128x128 pixels for consistency. Augmentation techniques such as rotation, zoom, flipping, and shifting are applied to increase dataset diversity and enhance model robustness.

CNN Model Development:

A Convolutional Neural Network is constructed and trained on the preprocessed images. The CNN architecture learns to extract features and classify leaf images into their respective disease categories.

Model Testing & Evaluation:

The trained model is evaluated using the test dataset. Accuracy, precision, recall, and confusion matrix are calculated to assess the model’s performance and ability to generalize to unseen data.

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