ASSIGNMENT WEEK-1

PROBLEM STATEMENT:  
The objective of this project is to design and implement a Convolutional Neural Network (CNN)-based model capable of detecting and classifying plant diseases from leaf images of various crops, including apple, cherry, grape, and corn. The model should accurately distinguish between healthy and diseased leaves and identify specific disease types. By automating the disease detection process, the system aims to support precision agriculture through early diagnosis and effective disease management.

In the context of modern agriculture, timely and accurate identification of plant diseases is vital to securing high crop yields and ensuring food security. Traditional approaches—primarily manual inspection by farmers or agricultural professionals—are often inefficient, subjective, and limited in accuracy, particularly in rural or under-resourced regions. Delayed or incorrect diagnosis can lead to extensive crop damage, excessive pesticide use, and significant economic loss.

This project addresses the critical need for an automated, scalable, and reliable solution for plant disease identification using computer vision and deep learning techniques. By leveraging CNNs and image classification methods, the system will provide farmers with actionable insights for timely intervention, thereby fostering sustainable farming practices and reducing crop wastage.

**ABOUT THE PIPELINE:**

1. Data Collection & Data Loadings

- The dataset consists of images categorized into multiple classes (e.g., healthy, diseased categories).

- It is split into three subsets:

- Train

- Validation

- Test

2. Upload to Google Drive

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- The dataset is zipped and uploaded to Google Drive.

- In Google Colab, the Drive is mounted to access the data.

- The zipped file is unzipped in the Colab environment to make the dataset available for processing.

3. Image Processing & Image Augmentation

- Input images are resized (e.g., 180x180 pixels).

- Image augmentation techniques (e.g., rotation, flipping, zooming) are applied to enhance dataset variety.

- Preprocessing helps normalize and prepare data for training.

4. CNN Model Development

- A Convolutional Neural Network (CNN) is developed to learn features and classify images.

- The model processes input images through convolutional layers, pooling layers, and fully connected layers.

5. Model Training

- The CNN is trained using the training dataset.

- Validation data is used to monitor performance and adjust parameters.

6. Testing & Evaluation:

- The trained model is evaluated on the test dataset.

- Accuracy, loss, and possibly confusion matrix are used to measure model performance.

Objective:

To build a robust image-based plant disease detection system that enables early intervention and supports sustainable agriculture.