PROJECT: PLANT DISEASE DETECTION SYSTEM

PROBLEM STATEMENT:

Agricultural productivity is highly dependent on plant health, which can be severely affected by various diseases. Early detection and classification of plant diseases are crucial to prevent crop loss and ensure food security. However, traditional disease identification methods rely on manual inspection by experts, which is time-consuming, expensive, and prone to human error.

This project aims to develop a **Plant Disease Detection System using Convolutional Neural Networks (CNNs)** that can automatically detect and classify diseases from images of plant leaves. The system will use a dataset of leaf images categorized into healthy and diseased classes, process and augment the data, train a deep learning model, and provide accurate predictions to assist farmers and agricultural professionals in early diagnosis and treatment.

PIPELINING:

**1. Data Collection & Loading**

* We collect images of plant leaves—some healthy, some diseased.
* The dataset is split into three parts:
  + **Training**: to teach the model.
  + **Validation**: to fine-tune it during training.
  + **Testing**: to check how well it works after training.
* Each part has folders for each disease category (like folders named "Healthy", "Rust", etc.

**2. Zipping & Uploading**

* The dataset folder is **zipped** to make it easier to upload.
* You upload it to **Google Drive**.
* In **Google Colab**, you use Python code to:
  + **Mount Drive**
  + **Unzip the dataset**
  + Now the images are ready to be used in your notebook.

**3. Image Processing & Augmentation**

* All images are resized to the same size (like **128x128 pixels**) for consistency.
* **Image augmentation** helps improve model performance by:
  + Flipping, rotating, zooming images to create variations.
  + This teaches the model to recognize leaves in different conditions.

**4. CNN Model**

* A **Convolutional Neural Network (CNN)** is built.
* It automatically learns features (shapes, textures) from the images.
* Then it predicts which disease (or healthy) the leaf belongs to.

**5. Testing & Evaluation**

* After training, the model is tested on the test data.
* We check the following:
  + **Accuracy**: How often it predicts correctly.
  + **Loss**: How far off its predictions are.
  + This helps you understand how well the model performs.