# Problem Statement: Plant Disease Detection using CNN

Plant diseases can severely affect agricultural productivity and food security across the globe. Traditional methods of disease detection rely on manual inspection by experts, which is time-consuming, subjective, and not scalable. There is a pressing need for an automated and accurate method to detect and classify plant diseases at an early stage to minimize crop damage and improve yield.  
  
Convolutional Neural Networks (CNNs), a class of deep learning models, have shown significant success in image classification tasks. By leveraging CNNs, it is possible to develop an intelligent system capable of identifying various plant diseases from images of leaves with high accuracy. Such a system can assist farmers and agricultural workers in making timely and informed decisions for crop management.

**Pipelines**

Identify the goal: automatically detect plant diseases from leaf images. Understand the structure, labels, and variety of diseases in the dataset.

**1. Data Preprocessing**

Prepare the images by resizing, normalizing pixel values, and applying augmentation techniques like rotation and flipping to improve model generalization.

**2. Dataset Splitting**

Divide the data into training, validation, and testing sets to train the model, tune hyperparameters, and assess its final performance.

**3. Model Building (CNN Architecture)**

Design a CNN or use a pre-trained model to extract features from images and learn to classify them into disease categories.

**4. Model Compilation and Training**

Compile the model using appropriate loss function and optimizer, then train it using the training set while monitoring performance on the validation set.

**5. Model Evaluation**

Test the trained model on unseen data to evaluate its accuracy, precision, recall, and confusion matrix to understand strengths and weaknesses.