**Workflow of the Project**

**Problem Statement:**

Plant diseases have important effects on crop health and yield. Manual diagnosis tends to be slow and unreliable. This project will establish a Convolutional Neural Network (CNN)-based model that will automatically recognize and diagnose plant diseases from leaf images of crops such as apple, cherry, grape, and corn. The model would successfully identify if the leaf is healthy or not and it also predict the disease. This will facilitate early detection, proper treatment, and encourage precision agriculture.

**CNN:**

A Convolutional Neural Network (CNN) is a deep learning architecture that is used for image analysis. It extracts features from images automatically through layers such as convolution, pooling, and fully connected layers. CNNs are commonly applied to image classification tasks and are best suited for pattern detection in leaf images to diagnose plant diseases.

**Pipeline to be followed:**

The project takes a step-by-step process to develop a CNN-based model that identifies plant leaf images as healthy or diseased based on different crops such as apple, cherry, grape, and corn.

**1. Data Collection & Loading**

The dataset is structured into training, validation, and test directories, each with categorized images. These sets are used to train the model, fine-tune, and test its predictions.

**2. ZIP Upload & Google Drive Mounting**

The dataset is zipped and uploaded to Google Drive. In Google Colab, the drive is mounted, and the dataset is unzipped using Python to make it available for training.

**3. Image Preprocessing & Augmentation**

All images are resized to the same dimensions (e.g., 128x128 pixels). Data augmentation (such as rotation, flipping, etc.) is done to increase diversity and prevent overfitting. Pixel values are normalized for effective model training.

**4. CNN Model Training**

A Convolutional Neural Network (CNN) is designed to extract features and classify images. It consists of convolution, pooling, and dense layers. The model is trained on the training set while keeping an eye on validation accuracy.

**5. Testing & Evaluation**

The trained model is tested on unseen data. Metrics like accuracy, precision, recall, and confusion matrix are used to assess how well the model can identify and classify the diseases.