**Project Report: Plant Disease Prediction Using CNN**

**Problem Statement**

The objective of this project is to develop a Convolutional Neural Network (CNN) based model capable of detecting and classifying plant diseases from images of leaves of various crops, including apple, cherry, grape, and others. The model should accurately identify both healthy and diseased leaves while predicting the specific type of disease. This system will aid in precision agriculture by enabling early detection and effective disease management, ultimately helping farmers reduce crop losses and improve yield.

**Project Pipeline**

**1. Data Collection and Uploadation**

The dataset will be organized into three main folders: train, test, and validation. This structure is essential for training the model effectively and evaluating its performance.

The dataset will be uploaded to Google Drive, allowing for easy access and management.

**2. Working Environment**

The project will be executed in Google Colab, leveraging the capabilities of Gemini AI.

The processing will utilize a T4 GPU, which provides the necessary computational power for training deep learning models efficiently.

**3. Data Upload and Preparation**

A zip file containing the dataset will be uploaded to Google Drive.

In Google Colab, the drive will be mounted to access the uploaded zip file.

The zip file will be unzipped to extract the dataset, which will then be used for training, validation, and testing the model.

**4. Image Processing and Augmentation**

The images will undergo preprocessing to ensure they are suitable for model training. This may include resizing, normalization, and other transformations.

Image augmentation techniques will be applied to increase the diversity of the training dataset. This can include rotations, flips, zooms, and shifts to help the model generalize better.

**5. Model Development**

A Convolutional Neural Network (CNN) will be designed and implemented to classify the images of plant leaves.

The architecture of the CNN will be chosen based on best practices for image classification tasks, potentially including multiple convolutional layers, pooling layers, and fully connected layers.

**6. Model Training**

The model will be trained using the training dataset, with the validation dataset used to tune hyperparameters and prevent overfitting.

Appropriate loss functions and optimizers will be selected to enhance the model's learning process.

**7. Model Evaluation**

After training, the model will be evaluated using the test dataset to assess its performance.

Metrics such as accuracy, precision, recall, and F1-score will be calculated to determine the effectiveness of the model in classifying healthy and diseased leaves.

**8. Conclusion**

The successful implementation of this CNN-based model will provide a valuable tool for farmers and agricultural professionals, enabling early detection of plant diseases and facilitating effective disease management strategies.