**Edunet Foundation, in collaboration with AICTE & Shell-**

**on Green Skills using AI technologies.**

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**Plant Disease Detection System for Sustainable Agriculture**

# Problem Statement

Design and implement a Convolutional Neural Network (CNN)-based system for automatic detection and classification of plant diseases using leaf images from crops such as apple, cherry, grape, and corn. The model should distinguish between healthy and diseased leaves and accurately identify specific types of diseases. This solution aims to support sustainable agriculture by facilitating early diagnosis, minimizing crop loss, and promoting timely and targeted disease management practices.

**Plant Disease Detection System Pipeline**

**Step 1: Data Collection & Loading**

1.Identify the specific plant species and diseases to be detected.  
2.Collect image data from public sources like PlantVillage or create a custom dataset using cameras or mobile devices.  
3.Ensure the images are of high quality and properly labeled as either healthy or diseased.  
4.Annotate or label the images with the correct disease name or "healthy" using annotation tools if needed.  
5.Organize the dataset into folders, where each folder represents a class (e.g., one disease or healthy category).

## Step 2: Model Setup

1.Take important details from the images (like color or texture) and turn them into numbers.  
2.Split your data into two parts: one for training the model and one for testing it.  
3.Teach the model using the training data so it can learn to find patterns.  
4.Test the model using the test data to see how well it predicts the disease.

**Step 3: ZIP & Upload**

1.Compress all your project files into a ZIP folder to make uploading easier.  
2.Include important files like your dataset, model, and code in the ZIP folder.  
3.Name the ZIP file something clear, like plant\_disease\_model.zip.  
4.Upload the ZIP file to the platform where you’ll be hosting or running the project.  
5.Once uploaded, extract the files to access them and run the model.

## Step 4: Image Processing & Augmentation

1.Resize all images to a uniform size (e.g., 128x128) to ensure consistency

2.Apply image augmentation techniques to increase the diversity of the training data, such as:

3.Flipping (horizontal and vertical)

4.Rotation (random angles)

## Step 5: CNN Model

1.Use a Convolutional Neural Network (CNN) architecture to train on the processed data - CNNs are suitable for image classification tasks due to their ability to extract features from images   
2. It automatically finds patterns in images like edges, shapes, and textures.  
3.A CNN has layers like convolution, pooling, flatten, and dense.  
4. Convolution layers scan the image using filters to detect features.

## Step 6: Test/Evaluate

Use the test set to evaluate the final performance of the model - Metrics for evaluation may include:

1.Test Data  
2.Predict Labels  
3.Check Accuracy  
4.Confusion Matrix  
5.Precision Score

## Step 7: Deployment

1.Save the trained model using joblib or pickle.  
2.Load the saved model when starting the application.  
3.Create a user interface to upload plant images.  
4.Host the project on a web server or cloud platform.

By following the Plant Disease Detection System Pipeline, we develop a robust system using deep learning techniques. This system enables accurate disease detection in plants, providing valuable insights for farmers, researchers, and agricultural professionals.