Rice Leaf Disease Detection using Basic CNN

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Dataset: PRCP-1001 Rice Leaf Disease Detection

1. Introduction
Rice is one of the most important staple crops worldwide. However, rice plants are highly vulnerable to various leaf diseases that significantly affect crop yield and quality. Early detection of these diseases is essential for farmers to take timely preventive measures. This project uses Convolutional Neural Networks (CNN) to automatically detect rice leaf diseases from images.

2. Problem Statement
The objective of this project is to develop a deep learning-based image classification system that can accurately classify rice leaf images into different disease categories using a CNN model.

3. Dataset Description
The dataset contains 119 jpg images of rice leaves divided into three classes: Leaf Smut (39), Brown Spot (40), and Bacterial Leaf Blight (40). .

4. Tools and Technologies
Python, TensorFlow, Keras, NumPy, Matplotlib, Jupyter
Notebook.

5. Data Preprocessing and Augmentation
Images were resized to 128x128 pixels and normalized. Data augmentation techniques such as rotation, zooming, and horizontal flipping were applied to improve model generalization and reduce overfitting.

6. CNN Model Architecture
The CNN consists of convolution layers for feature extraction, max-pooling layers for dimensionality reduction, fully connected dense layers for classification, and a dropout layer to prevent overfitting.

7. Model Compilation and Training
The model was compiled using the Adam optimizer, categorical crossentropy loss function, and accuracy as the evaluation metric. The model was trained for 10 epochs using training and validation datasets.

8. Results
The CNN achieved good training and validation accuracy, demonstrating effective learning and generalization despite a limited dataset size.

9. Challenges Faced
Small dataset size and overfitting risk were addressed using data augmentation and dropout techniques.

10. Conclusion
The project successfully demonstrates the use of a Basic CNN for rice leaf disease detection. The model can be further improved using advanced deep learning architectures and larger datasets.

11. Future Scope
Future enhancements include using pre-trained models, deploying the model as a web or mobile application, and expanding the dataset for improved accuracy.