**Rice Leaf Disease Detection**

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**Project** ID :- PRCP-1001

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**Objective** :- The objective of using Convolutional Neural Networks (CNNs) for rice leaf disease detection is primarily to automate and enhance the process of identifying diseases in rice plants based on images of their leaves.

We have divided projects into multiple steps:-

* Importing libraries
* Loading Data
* Preparing Dataset
* Label Mapping
* Data Preprocessing
* Model Building
* Training
* Model

**Abstract :**- The rice leaves related diseases often pose threats to the sustainable production of rice affecting many farmers around the world. Early diagnosis and appropriate remedy of the rice leaf infection is crucial in facilitating healthy growth of the rice plants to ensure adequate supply and food security to the rapidly increasing population. Therefore, machine-driven disease diagnosis systems could mitigate the limitations of the conventional methods for leaf disease diagnosis techniques that is often time-consuming, inaccurate, and expensive.

Project Highlights :-

* 🌾 Detects rice leaf diseases through image analysis.
* 🚀 Utilizes CNN with Keras and TensorFlow for accurate detection.
* 📊 Implements OpenCV for image preprocessing.

DatasetandPreprocessing**:-**

We utilized a dataset consisting of 120 of labeled images of healthy rice leaves as well as leaves affected by various diseases such as blast, brown spot, and bacterial leaf blight. The dataset was preprocessed by resizing images to a standard size (e.g., 256x256 pixels) and normalizing pixel values to improve model training.

**Model Architecture:-**

The CNN architecture employed for this task comprised several convolutional layers followed by max-pooling layers to extract relevant features from input images. We used techniques like batch normalization and dropout to enhance model generalization and prevent overfitting. The final layers consisted of fully connected layers with softmax activation for disease classification.

Model Building :-

File 1 CNN

* Model 1 : Using epoch=10 and batch size = 32

Training accuracy = 75.79% & Testing accuracy = 58.33%

* Model 2 : Using epoch=10 and batch size = 32 in model 1

Training accuracy = 91.58% & Testing accuracy = 81.50%

* Model 3 : Import image data generator Using epoch=10 and batch size = 32

Training accuracy = 50.53% & Testing accuracy = 45.83%

* Model 4 : Using epoch=30 and batch size = 32 in model 3

Training accuracy = 77.89% & Testing accuracy = 75.00%

* Model 5 : Using model 4 without dropout layer and epoch = 35 and batch size = 32

Training accuracy = 74.74% & Testing accuracy = 70.83%

* Model 6 : Using Model 4 without dropout and epoch = 40 and batch size = 32

Training accuracy = 89.47 % & Testing accuracy = 91.67 %

**Model 6 is showing good training as well as testing accuracy i.e. 89.47% and 91.67%**

File 2 Using Keras

Training accuracy = 96.00 % & Testing accuracy = 78.00%

Prediction :- Predicted Brown Spot accurately with confidence : 99.70%

Conclusion : -

In this project, we successfully developed and evaluated a Convolutional Neural Network (CNN) model for the automated detection and classification of rice leaf diseases. The primary objective was to provide farmers with a reliable tool that can identify diseases early on, enabling prompt interventions to mitigate crop damage and improve yield.

Through the utilization of a diverse dataset consisting of healthy and diseased rice leaf images, our CNN model demonstrated robust performance in distinguishing between different types of diseases, including blast, brown spot, and bacterial leaf blight. The model's ability to accurately classify unseen leaf images was validated through rigorous testing and evaluation.