RICE LEAF DISEASE RECOGNITION USING CNN

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Abstract

Numerous bacterial, viral, or fungal conditions affect the rice splint, and they drastically lower rice product. The identification of rice leaf conditions is essential to meeting the demand for rice from a sizable worldwide population. Rice leaf disease can only be linked grounded on the backgrounds and circumstances of the image accession. By lowering the network parameters, we present a new CNN- grounded model to identify ails of rice leaves. Several CNN-based models are trained to recognize typical rice splint conditions using a fresh dataset of prints of rice splint conditions. The suggested model obtains the stylish confirmation delicacy of97.35 percent and training accuracy of 99.7 percent. These issues prove our strategy's energy and supremacy. With a topmost accuracy of 97.82 and an area under wind(AUC) of0.99, the effectiveness of the suggested model is assessed using a collection of independent rice leaf disorder. photos. Also, studies with this have been done. These outcomes show how our strategy outperforms cutting-edge CNN-based models for identifying rice leaf diseases, proving its usefulness.

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1. Introduction

The world's most significant food crop, rice, has always been essential for ensuring food security worldwide. In developing countries, ensuring food security is crucial for meeting the need for nutrition created by growing populations. It goes beyond simply addressing hunger. In Asia, rice is the main component of the diet for almost 70% of the people. Rice provides 21% of a person's energy and 15% of their protein. Unfortunately, all rice cultivars are plagued by a number of illnesses and pests. Diseases can have an impact on crop quality and output. The majority of current CNN-based models for identifying plant leaf diseases are constrained by the settings and backdrops used during image capture. It limits the detection of diseases to the known dataset.. Several tests have been carried out to adjust the model's parameters for spotting illnesses in rice leaves. A series of convolutional and pooling layers, a dense layer and a softmax layer, are used to create our unique CNN model. Our approach has the benefit of being deployable in devices with limited memory because it drastically decreases the parameters count. The suggested model is validated using a brand-new dataset with a variety of image backdrops. In order to increase the generalizability of our model, we used data augmentation. For the purpose of assessing the effectiveness of our model and area under the curve, we evaluated it on a separate collection of photos of rice leaf disease (AUC).

Existing System:

Plant diseases can significantly reduce the quality and quantity of agricultural goods and have a severe effect on the safety of food production. Plant diseases can sometimes be so bad that there is no grain harvest at all. Hence, in the field of agricultural information, the automatic detection and diagnosis of plant diseases is widely desired. Several approaches have been put forth to solve this problem, but deep learning is quickly winning popularity due to its outstanding results. In this research, we examine the transfer learning of deep convolutional neural networks for the detection of plant leaf diseases and take into account applying the pre-trained model discovered from the typical large datasets to the specific job discovered by our own data.

Objective:

There are numerous publications for finding and categorising plant diseases, especially for recognising the illnesses of rice leaves. Three separate rice diseases and healthy images are identified using a CNN-based framework. Looking at the issue of picture capture settings and backdrops is the main challenge in identifying rice/plant leaf diseases. These constraints limit model performance, for instance, some of the previous studies are restricted to pastal backgrounds and intolerant of image taking settings. With the goal of identifying rice leaf illnesses, we propose a unique CNN-based model . To minimise the amount parameters of the network, we developed a model based on CNN. To increase the generalizability of our model, we created a novel dataset with a variety of image backdrops and image-capture settings. It is verified on a separate batch of photos of rice leaf disease to confirm the efficacy and superiority of our model**.**

Disadvantages of Existing System:

1.Reduced Predictability.
2.There is decreased security.
3.The conventional way for this supervision is naked eye inspection, which is more time-consuming, expensive, and requires a great deal of experience. Hence, automating the disease detection system is necessary to speed up this procedure.

Proposed System:

The approach we suggest using to identify illnesses of rice leaves is described in this section.The entire procedure is broken down into several parts, starting with the creation of a novel training dataset, followed by the creation.In each of the trials we did for this research, the performance of identifying rice leaf diseases was assessed using photos in various sizes.The photos of the rice leaf disease are 128 by 128, 256 x 256, and 512 x 512 in size.We include natural, plain, and complicated image backgrounds to address the problem of identifying the greatest aspects in various backgrounds. Also, our experiment contains a variety of symptoms, including tiny, large, isolated, and spread. Five samples are displayed with a range of symptoms in Fig. 1 against various visual backdrops. As an illustration, the samples in Figures 1(a), 1(b), and 1(e) show, respectively, photographs of bacterial leaf blight, brownspot, and tungro with a background of the natural world. On the other hand, the Blast sample is the sample in Fig. 1(c).

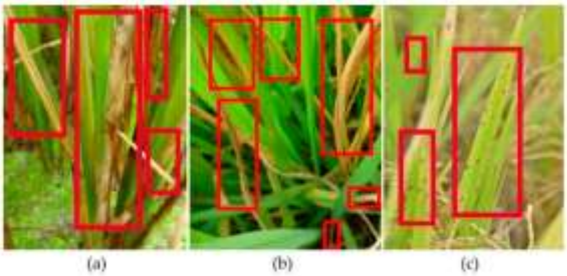


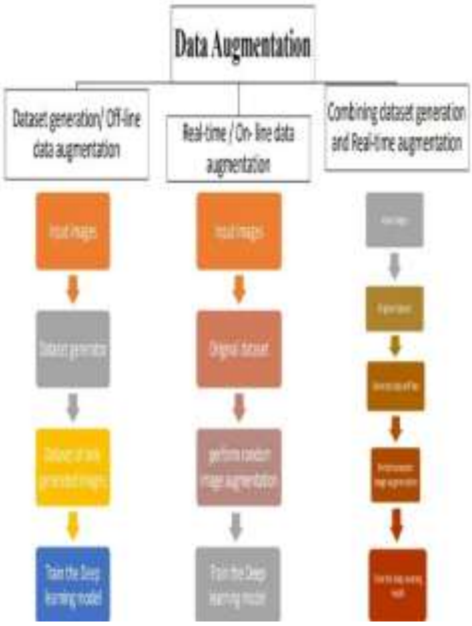
Fig 1:Defect areas

Advantages of Proposed System:

1. More security.
2. Added Prediction.
3. To detect disease in a plant.

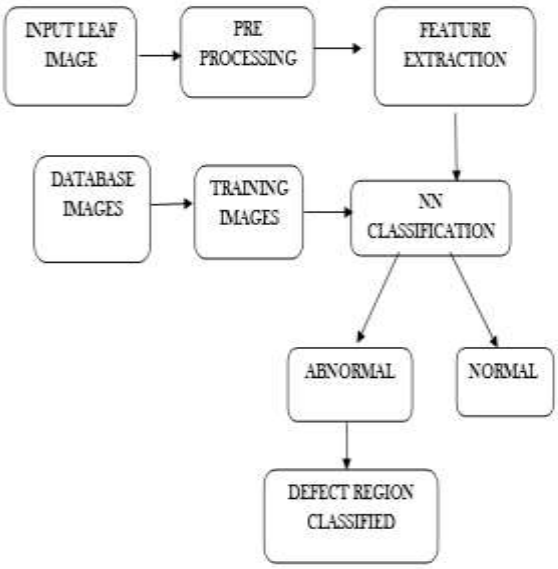
Dataset Augmentation:

We use picture data augmentation to slightly distort the dataset. The model's generalisation is strengthened by this data improvement .We use twelve different augmentation approaches. It displays the statistics of the enhanced dataset. We rotate the photos by 90, 90, 180, and 270 degrees, respectively, to add image rotations to the data.We also use scaling, shifting (horizontal and vertical), and flipping (up-down, left-right) to improve the data (by 0.6, 0.75 and 0.90). Last but not least, photos of rice leaf disease are enhanced by zooming in only. In order to put the mentioned data augmentation approaches into practice ,we use OpenCV library.



System Design Architecture:

Figure 2: Architectural view of Rice leaf disease recognition using CNN



Algorithm:

- CNN
- VGG16

CNN: a kind of artificial neural network used in image recognition and processing that's especially designed to reuse pixel data.

VGG 16 :VGG stands for VISUAL figure GROUP; it's a standard deep convolutional neural network(CNN) armature with multiple layers. The " deep " refers to the number of layers as 16 and 19 convolutional layers.

Layers Used in the Model:

We suggest a unique CNN-grounded methodology for identifying illnesses in rice leaves.

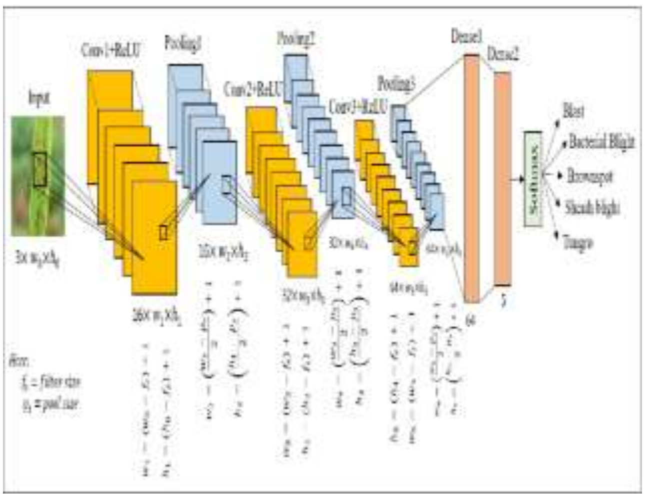
Input Layer: An image of RGB with a size of w0 h0, where w0 is the picture breadth and h0 is its height.

Convolutional Layer (s):maps local conjucations of the previous layers.

Pooling Layer (s): Because pooling simplifies computations and lowers variance in our model, there are fewer parameters to learn.

Dense Layer (s): output of the ultimate maximum To feed a completely linked dense layer, the pooling layer is compressed into a single dimension.

Output Layer (Softmax): Uses activation function to calculate M exponentially.



Modules:

3 Modules are used to run this project.

- Login
- Train CNN Algorithms
- Upload Rice leaf image

Module Description:

In order to carry out this project, we created the following modules.
1) Login: Since this is an online programme, the user must first log in using the credentials "admin" and "admin."
2) Train CNN Algorithms: After logging in, users can use this model to train the regular CNN and VGG16 CNN using the dataset above for the rice sickness. After training the models, we will determine the accuracy of both models using test data.
3) Upload a Rice Image: With this module, users can upload pictures of rice leaves, and the application will determine if the leaves are disease-free or infected.

Functions:

- loadCNNModel()
- loadVGGModel()
- Train(request)
- Upload(request)
- Index(request)
- Login(request)
- Userlogin(request)
- uploadImage(request)

Images:

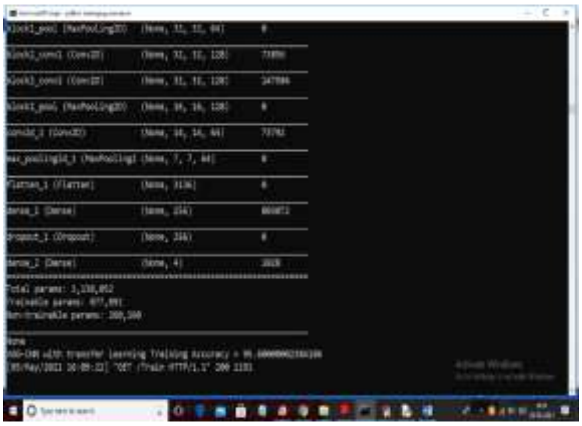


Figure 3: Disease predicted

Testing:

Testing is the process where test data is set and utilised to test the modules as a whole before the fields' confirmation is supplied. Moreover, system testing is carried out to guarantee that each component of the system property operates as a whole. It is important to choose the test data such that it can withstand any scenario.

2. Conclusion

Classification of four different rice leaf diseases was done utilising a few DL techniques. We utilized the images of the leaves with various diseases which are different in nature compared to each other, which we then analysed using a variety of well-known deep learning techniques, including VGG19, VGG16, Xception, Resnet, as well as a custom Five layered convolutional network.The accuracy of our suggested Five layered CNN model is roughly 6% higher than that of the other common deep learning models. Additionally, we discovered that by modifying the training parameters, such as the learning rate, the number of epochs, and the optimizer techniques. A handmade model can also give a high rate of accuracy with fewer layers than other conventional models. It will be easier for farmers to secure their crops the more effectively we can detect illnesses.

Future Scope:

We shall increase the reach of disease detection in the future so that it is widespread, simple, and quick. Creating extremely effective detection methods using massive datasets of various plant leaf diseases will have a critical future influence. By requiring substantial generalised datasets, this would also address the class disparity. The only thing done in this papaer is recognition**;** moving forward, we'll further widen the recovery procedures. We would also attempt to put into practise the feature to offer remedies for the ailments affecting rice leaves. To a considerable extinct and to prevent the influence on food yield, this would be helpful to the farmer**.**

3. References

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