International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 05 | May 2022 www.irjet.net p-ISSN: 2395-0072

RICE PLANT DISEASE DETECTION AND REMEDIES RECOMMENDATION USING MACHINE LEARNING

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Abstract - *Now a days, farmers face production loss in crops because of several reasons. Crop disease is one of the most concerning reasons. This is because of lack of knowledge about the crop diseases and the preventive measures to stop spreading these diseases. In order to control the disease, first it needs to be detected correctly, then needs the expert opinion, and this is not affordable to farmers in both time and cost perspectives. To help the farmers in this problem, we are developing a machine learning algorithm to detect rice crop disease by uploading the image and to give the exact remedy. The remedies provide the appropriate information about the pesticide or insecticide to be used to cure the disease.*

Key Words: **Rice Crop Diseases, Machine Learning Algorithm, Convolutional Neural Network, Training Model, Rice Blast, Bacterial Leaf Blight, Leaf Blast, Hispa**

1. INTRODUCTION

India's most economy is predicated on agribusiness. What's more to be explicit, India is the world's second biggest maker of rice, and thusly the biggest exporter of rice inside the world. Still India has many developing worries like developing populace, intense environment changes that influence horticulture creation. Because of the arising development of the populace, horticulture area needs a much better headway utilizing the freshest innovations. The harvest should be good for a superior yield. Along these lines profoundly compelling and cost effective strategy is expected for quick identification of harvest infection.

Rice is among the significant yields in India. It's contaminated by some illnesses which are brought about by parasites, microorganisms and infections. Ranchers can't distinguish the infection on rice crop and consequently they can't utilize appropriate preventive measures to direct the illness. There is an assortment of medical measures accessible like kinds of pesticides or bug sprays to direct the yield illness and increment the harvest creation. Yet observing the current sickness and giving the best cures requires well-qualified assessment or earlier information so as to regulate the infection. The presence of sickness on the plant is thought about leaves by showing a few explicit manifestations related with that infection. This particular manifestation goes about as a component to recognize the genuine infection. Utilizing these elements we fostered an AI model, an advanced innovation which is more affordable and gives exact outcomes less range of time when identifying the rice crop infections and gives the appropriate cures like insect poisons or pesticides so as to manage the sickness. We are considering three rice crop diseases that happen every now and again and cause more misfortune in paddy crop creation. Alongside, we can likewise show the healthy leaf.

1.1 Leaf Blast

Leaf blast is taken into account as the most severe and destructive disease within the rice plants. It can affect various parts of leafs which incorporates neck and leaves. This disease is extremely frequent within the regions where there's intermittent precipitation, cool temperature and minimum soil dampness. A paddy crop can be affected by the leaf blast at any stage. Whenever developed, it can kill the whole leaf. Figures (a), (b), (c) and (d) depict the images of leaf blast affected rice plant leaf.

Fig. 1 Leaf Blast affected leaves

1.2 Hispa

This illness is frequently recognized in the event that the mining of the grubs are obviously seen on the leaves. Assuming the area is seriously pervaded the paddy crop fields seems consumed. On the off chance that the rice plant is seriously contaminated, the harmed leaves shrink off. This illness normally influences the plants inside the youthful stage. This infection is regularly overseen by trying not to over prepare the area. Following figures, shows the leaves affected by Hispa disease.

Fig. 2 Hispa affected Rice plant Leaf

1.3 Brown Spot

Earthy colored spot - Figure (c) shows the rice plant leaf experiencing the earthy colored spot illness. This illness is that the dark spots on the paddy crop leaves. This disease is frequently distinguished by the indications like death of seedlings, demise of enormous region of the leaf, earthy colored spots or dark spots. It falls under the fungal class. It causes both amount and quality misfortune. 5% yield misfortune is caused everywhere the South and South East Asia. We will affirm the paddy crop isn't impacted by this illness by furnishing the harvest with perfect proportion of supplements and by keeping away of water stress. Treating seeds with compound likewise can be useful on the grounds that it diminishes the possibility of contamination.

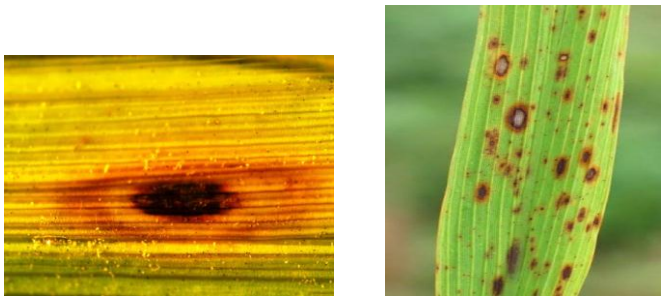

Fig. 3 Brown Spotted Rice Plant Leaf

2. Literature Review

In "Paddy Crop Disease Detection Using Machine Learning" by Prajwal Gowda B. S., Nisarga M A, Rachana M and others have developed a machine learning model using the Convolutional Neural Network (CNN) algorithm. This system detects the paddy crop diseases like rice blast and Bacterial leaf blight. It contains two phases, one for training the model and the other is for detecting the given image of the disease. In the first phase, the model is trained using the image dataset. Image dataset contains both healthy and disease leaf image. They have collected 2000 images of Rice blast, 2000 images of Bacterial Blight and 2000 healthy paddy leaf images. The images are collected from the kaggle website. Convolutional Neural Network (CNN) Algorithm is used to train these images.

In "Rice Plant Disease Classification Using Transfer Learning of Deep Convolution Neural Network", the researchers Vimal Shrivastava, Monoj K. Pradhan, Sonajharia Minz, Mahesh P. Thakur, they detect and classify plant diseases using machine learning approach. Transfer learning of deep CNN was explored first time in this paper to classify paddy crop diseases. Moreover, the whole dataset was divided into different ratio of training-testing set. The classification accuracy of 91.37% for 80%- 20% training-testing partition was achieved in this model.

The researchers S. Ramesh and D. Vydeki have succeeded in classifying 4 paddy crop diseases along with healthy leaf in the paper "Recognition and classification of paddy leaf diseases using Optimized Deep Neural network with Jaya algorithm". This model has five phases which include image acquisition, pre-processing, image segmentation, feature extraction and classification.

"Paddy Crop Disease Prediction- A Transfer Learning Technique" researched by Siddharth Swarup Rautaray, Manjusha Pandey, Mahendra Kumar Gourisaria, Ritesh Sharma, Sujay Das is another paper for reference. Transfer Learning approach is experimented in this paperbecause it is very easy to work with a huge number of images. Developed Model Approach follows four important steps which are selecting source task, developing source model, reusing the model and tuning the model. Pre-trained Model Approach follows three important steps which are selecting the Source model, reusing the model and tuning the model.

3. Proposed Methodology

Earlier techniques for naturally ordering sick plant pictures like rule-based classifiers are used in depend on a decent arrangement of rules to section the leaf into impacted and unaffected areas. A portion of the standards to extricate highlights include noticing the changes inside the mean and standard deviation between the shade of the impacted and unaffected locales. Rules to separate shapes highlights include independently putting a few crude shapes on top of the impacted district and recognizing the shapes that covers the most extreme region of the impacted area. When the elements are removed from the pictures, a bunch of fixed principles are utilized to group the pictures relaying on the sickness which might have impacted the plant. The significant downside of such a classifier is that it'll require a few fixed standards for each infection which progressively could make it powerless against noisy data.

The picture characterization method portrayed in this paper utilizes the essential construction of CNN that comprises of a few convolutional layers, a pooling layer and a last completely associated layer. The convolutional layer goes about collectively of channels that remove the undeniable level highlights of the picture. Max-pooling is

one among the normal strategies used in pooling layers to downsize the spatial size of the separated elements along these lines lessening the calculation power expected to work out the loads for each layer. At long last, the separated information is gone through a completely associated layer alongside a softmax initiation work which decides the class of the picture.

This study expects to help ranchers by early recognition of infection through rice leaf picture handling utilizing convolutional neural organization. The model is prepared on the Rice Illness Picture Dataset by Huy Minh Do which fuses many rice leaf pictures. More than 4 classifications: Leaf Blast, Brown Spot, Hispa, and Healthy. This dataset comprises of absolute 3355 images, out of which 1488 images are Healthy, 779 are of Leaf Blast, 565 are of Hispa and remaining 523 are of Brown Spot disease.

This model gives ranchers plentiful opportunity to possibly save their harvest, have better yield and save cost from compost and pesticides. We split the picture dataset into preparing, approval and testing picture sets. To keep away from over fitting, we expand the preparation pictures by scaling and flipping the preparation pictures to broaden the quantity preparing tests, to discover the highlights of the preparation pictures, we utilize a strategy called CNN.

A convolutional neural network is a feed-forward neural organization that is generally used to breakdown visual pictures by handling information with network like geography. It's otherwise called a ConvNet. A convolutional neural organization is utilized to distinguish and characterize objects in the picture.

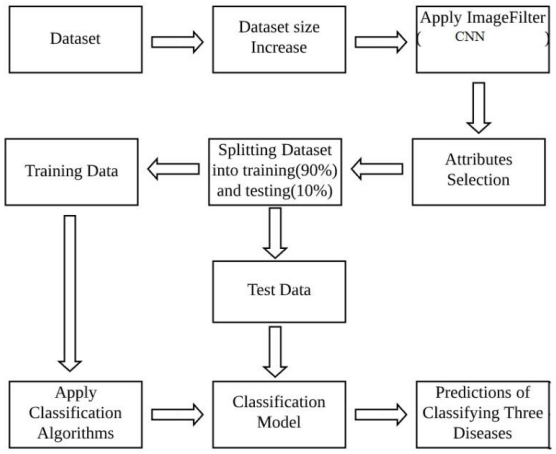

Fig. 4 Block Diagram for Proposed Method

A convolution neural organization has numerous concealed layers that assistance in seperating data from a picture. The four significant layers in CNN are:

- Convolution layer
- ReLU layer
- Pooling layer
- Completely Associated layer

Convolution Layer

This is the initial phase during the time spent removing important elements from a picture. A convolution layer has a few channels that play out convolution activity. Each picture is considered as a framework of pixel values.

ReLU layer

ReLU represents the amended direct unit. When the element maps are separated, the following stage is to move them to a ReLU layer.

ReLU plays out a component shrewd activity and sets everyone of the negative pixel to 0. It acquaints non-linearity with the organization, and the created yield is redressed include map.

Pooling Layer

Pooling is a down-inspecting activity that diminishes the dimensionality of the element map. The corrected element map presently goes through a pooling layer to generate a pooled highlight map.

Fully Connected Layer

The pooled highlight map is straightened and taken care to a completely associated layer to get the last result.

3. CONCLUSIONS

This paper presents an AI way to deal with identify three different rice leaf illnesses: hispa, bacterial leaf scourge and brown spot disease.The picture order method depicted in this paper utilizes the fundamental construction of a CNN that comprises of a few convolutional layers, a pooling layer and a last completely associated layer. This study intends to assists ranchers by early identification of infection through rice with leafing picture handling utilizing convolutional neural organizations. Having subsequently recognized a close ideal calculation, we desire to broaden this concentrate further with the expanded number of rice plant infections as more excellent datasets become accessible later on.

ACKNOWLEDGEMENT

I wish to acknowledge the help provided by all the teachers of Computer Science & Engineering department of the Wainganga College of Engineering and Management. I would also like to show my deep appreciation to my guide, Prof. Shital Patil ma'am and co-guide Prof. Rupali Saha ma'am who helped me finalize my project.

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