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Rice Leaf Disease Detection Using Hybrid Approach

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ABSTRACT: Plant sicknesses adversely affect the agrarian area. These illnesses bring down the efficiency of the yield and gives tremendous misfortune to the ranchers. For accuracy horticulture it is vital to identify sicknesses in theplants to save rural harvest yield and limiting the utilization of pesticides.
Discovery of infections at beginning phase should be possible utilizing Image handling space. Detection of diseases in rice leaf can be done using Deep Learning and Machine Learning techniques. Convolution Neural Network (CNN) can be used
for feature extraction, extracting features for the rice leaf images. Further for the classification of diseases various machine learning algorithms such as Random Forest. We get 91.5% accuracy on 100 epochs.

KEYWORDS: Rice Leaf Disease Detection, Convolutional Neural Network, Neural Network, Deep Learning, ImageProcessing, Machine Learning, Random Forest

I.INTRODUCTION

Agribusiness is India's main kind of income. 70% of Indian people and around 58% of India's rural people depend upon agribusiness. Among various harvests, rice is the most crucial. It gives energy and protein to most of the all-out people. It has been approximated that the quantity of occupants in the world will climb around 8.5 billion of each 2030,

9.7 billion out of 2050 and 10.9 billion out of 2100, independently. The interest and use of rice increases with the extension in the general population. To address out this trouble, it is surveyed and expected that rice creation is to be extended by 40% in 2030. A useful extension in rice creation is essential which will give overall food security. This extension in the rice creation would be possible by change of exceptional yield collections and confirmation of sicknesses and bugs in cultivating field. Living being organisms and contamination are the essential blameworthy gatherings for the rice plant diseases. The eruption of these diseases achieves decline of rice creation. This investigation chiefly bases on three most ordinary leaf contaminations named Brown spot, Leaf influence, commonplace andHispa.

II.LITERATURE REVIEW

S.Ramesh, D.Vydeki et al. [1] stated that, author proposes a machine learning algorithm to find the symptoms of the disease in the rice plant. Automatic detection of plant disease is carried out using machine learning algorithm. Images of healthy and blast disease affected leaves are taken for the proposed system. The features are extracted for the healthy and disease affected parts of the rice leaf. These images are processed with the proposed method and the leaf is categorized as either infected or healthy. Minu Eliz Pothen, Dr.Maya L Pai [2] proposed that different strategies utilized for rice leaf disease classification purpose. Bacterial leaf blight, Leaf smut and Brown spot diseased images are segmented using Otsu's method. From the segmented area, various features are separated utilizing "Local Binary Patterns (LBP)" and "Histogram of Oriented Gradients (HOG)". Then the features are classified with the assistance of Support Vector Machine.

Panuwat Mekha, Panuwat Mekha [3] stated that experimented with image classification is used to classify the data set of rice leaf diseases, such as Brown Spot Rice disease (BSR), Brown Spot Rice disease (BSR), Bacterial Leaf Blight disease (BLB), which is the rice leaf disease with severe outbreaks around Thailand. Moreover, image processing technology in the classification types of rice leaf disease, such as RandomForest classification algorithm, Decision tree classification algorithm.

Shreya Ghosal1, Kamal Sarkar [4] stated that in this paper, deep Learning show that Automatic Image Recognition systems using Convolutional Neural Network (CNN) models can be very beneficial in such problems. Transfer

Learning to develop our deep learning model. The proposed CNN architecture is based on VGG-16 and is trained and tested on the dataset collected from rice fields. Farhana Tazmim Pinki et al. [5] Stated that diagnosis three common paddy leaf diseases (Brown spot, Leaf blast, and Bacterial blight) and pesticides and/or fertilizers are advised according to the severity of the diseases. K-means clustering is used for separating affected part from paddy leaf image. Visual contents (color, texture, and shape)are used as features for classification of these diseases.

Deni Mahdiana [6] Stated that fuzzy system with ten inputs. This input is the result of the extraction of rice plant images, i.e., contrast, correlation, energy, homogeneity, average, variance, kurtosis, entropy, standard deviation, and skewness. The fuzzification process is carried out using the Gauss membership function, the fuzzy inference is done using the Sugeno method, and the defuzzificationprocess uses the weight average method.

III.PROPOSED METHOD AND ALGORITHM

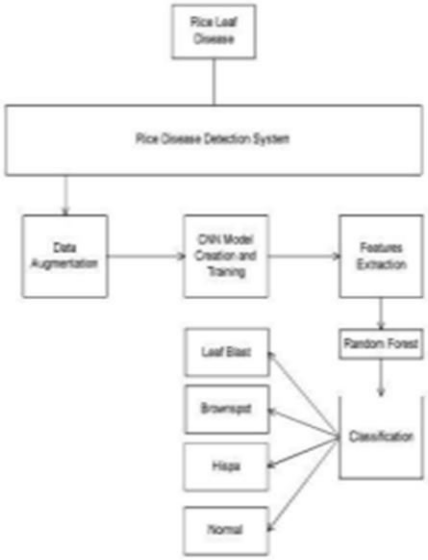
A. Proposed Methodology

In a proposed system, we are proposing experiment on rice leaf disease with limited set of supervised data as shown in figure1. We are proposing a Convolutional neural network for feature extraction and classification by using support vector machine- based model for disease risk prediction model for disease with higher accuracy. We are going to solve accuracy issue in diagnosis of disease with accurate stage predictions.

1) Dataset: We have collected the dataset from Kaggle. In that total 700 images are present. Out of them we have split the dataset into two categoriestraining and testing such as 600 and 100, respectively.

2) Pre-processing: In pre-processing we must convert every image into 224*224.

3) Data Augmentation: In data augmentation we simply increase the dataset of training directory. We generate every image in different format such as rotation, zoom and we change the brightness of image.



4) Algorithm

1. CNN: The principal utilization of the Convolution activity if there should be an occurrence of a CNN is to recognize fitting highlights from the picture which goes about as a contribution to the primary layer [4]. Convolution keeps up the spatial interrelation of the pixels This is finished by fulfillment of picture highlights utilizing miniscule squares of the picture. Convolution equation. E very picture is seen as a

network of pixels, each having its own worth. Pixel is the littlest unit in this picture grid. Allow us to take a 5 by 5(5*5) framework whose qualities are just in twofold (for example 0 or 1), for better agreement. It is to be noticed that pictures are by and large RGB with upsides of the pixels going from 0 - 255 i.e., 256 pixels.

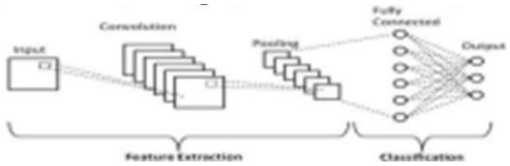


Fig. 2 CNN Architecture

(i) Activation Functions:

Rectified Linear Unit (Relu): Relu follows up on a rudimentary level. All in all, it is an activity which is applied per pixel and overrides every one of the non- positive upsides of every pixel in the component map by nothing. It is represented as:

$$f(x) = \begin{cases} 0, & \text{if } x<0 \\ x, & \text{otherwise} \end{cases} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (1)$$

(ii). Pooling or sub-sampling Spatial Pooling which is likewise called sub-sampling or down sampling helps in lessening the elements of each element map yet even at the same time, holds the most important data of the guide. After pooling is done, in the longrun our 3D element map is changed over to one dimensional component vector.

2. *Random Forest:* A random forest is a machine learning technique that is used to solve regression and classification problems. It utilizes ensemble learning, which is a technique that combines many classifiers to provide solutions to complex problems [3]. A random forest algorithm consists of many decision trees. The 'forest' generated by the random forest algorithm is trained through bagging or bootstrap aggregating. Bagging is an ensemble meta-algorithm that improves the accuracy of machine learning algorithms. The (random forest) algorithm establishes the outcome based on the predictions of the decision trees. It predicts by taking the average or mean of the output from various trees. Increasing the number of trees increases the precision of the outcome.

IV.RESULTS AND DISCUSSION

150 images are used per class. Out of which 600 images are used for training dataset and 100 images are used for testing dataset. So, 90% and 10% distribution are used for training and testing dataset, respectively. Images are resized to 224*224 matrix and used as input to CNN. In our system we have used 128 filters for extracting the features from image. Once model is trained then we extracted the features from flatten layer and we have passed these features to random forest. The random forest algorithm is used for classification. In the figure 4 and 5 we have shown the training graphs on X-axis epochs and y axis accuracy and loss. The epochs increase the accuracy also increases as shown in fig. 4 vice versa in fig. 5 the epochs increase, the loss decreases.

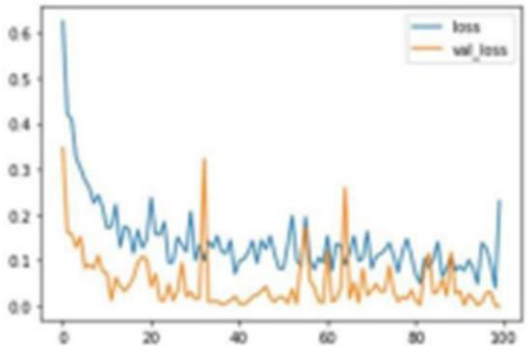


Fig. 4 Loss graph

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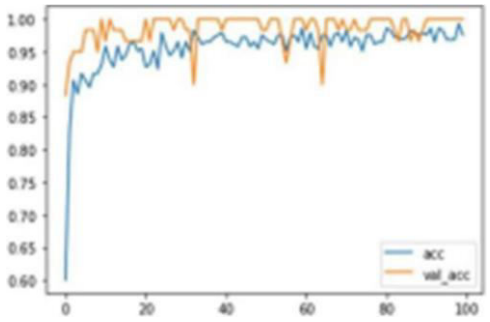

Fig. 5 Accuracy graph

TABLE I COMPARATIVE ANALYSIS

Images	Train	Test	Accuracy
700	600	100	91.5%

Table1: Comparative Analysis

Learning model is partially implemented. It is trained Once the CNN is trained with features of the training for 4 classes. For training and testing purpose total dataset, it performs the process of feature extraction in appropriate manner. The output of this trained CNN model is passed to multiclass linear random forest, which performs the classification process. Batch size for training and testing are kept as 700 and 80 respectively. Training and testing accuracy of model for 100 epochs is shown in figure 4 and 5. It is observed that accuracy increases with number of epochs. In this paper we have compare the results with one activation functions like Relu. But Relu gives the better accuracy as shown in Table1. The speed of building models based off on Relu is veryfast opposed to using Sigmoid activation function.

V.CONCLUSION

We are going to invent multi rice leaf disease detection system over machine learning and CNN techniques which solves existing accuracy problem as well as reduce death rates by rice type diseases like hispa, leaf blast, brown spot. We get 91.5% accuracy on 100 epochs. For future work, we can implement this technique on some more diseases with rich dataset. Increasing the number of diseases and dataset used for the process can improve the accuracy.

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