iJRASET
International Journal For Research in Applied Science and Engineering Technology



# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

**Volume:** 8 **Issue:** VI **Month of publication:** June 2020

**DOI:** http://doi.org/10.22214/ijraset.2020.6033

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429*
*Volume 8 Issue VI June 2020- Available at www.ijraset.com*

# Rice Plant Disease Detection

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***Abstract: Detection of leaf disease is very essential in crop growing field these days. Leaf disease detection require huge amount of work, understanding in the plant field. So we can make use of image processing for detection of leaf disease using PYTHON. This paper tells about leaf disease detection using deep CNN.***
***The automatic detection of rice plant diseases are greatly desired in the field of agricultural. In this study, we put forward a novel rice disease detection technique based on Convolutional Neural Networks (CNNs) techniques. Using a dataset of natural images of diseased rice plant leaves captured from agricultural field. CNNs are trained to classify common rice diseases. The proposed CNNs-based model achieves an accuracy of 95%. This accuracy is very high. The results for the detection of rice diseases show the efficiency of the proposed method.***
***Keywords: Python, dataset, Leaf Disease Detection, Deep Convolutional Neural Network (CNN).***

## I. INTRODUCTION

In agricultural study, the progress of automatic system for identifying and classifying different types of rice diseases are emerged as research area in correctness crop growing. We can decrease the loss in agricultural fields by detecting the rice diseases in early stages. Agriculture provides food and raw materials for industry so it is called as backbone of our Indian economy.
Plants are not only the source of food production but they are also important for providing the food that is rich in energy, minerals, and vitamins. In today's world the production for food source is much more than the land mass of agriculture.
In India, we are highly dependent in agricultural productivity for our economic growth. In today's modern world the detection of rice diseases in plants play the vital role in agricultural fields. We can detect by automatic techniques which are more beneficial in today's modern world. In India rice is one of the major crop production. Due to infection in rice plants it increases the loss in the production and it badly affects our economy.
Detecting the diseases in plants by manually is very difficult and it is not precise, so we can use a new technology. In agricultural field by using this technology we can create the technique of image processing it will help in detection of diseases correctly and in time, so the manual detection will be reduced. Digital image processing is a new method to detect and classify the diseases in rice plants.
The rice disease detection using image processing technique involves the following steps:

*A.* Input the sample diseased rice leaf image.
*B.* Removing unwanted noise by using pre-processing techniques.
*C.* Detecting the affected region.
*D.* Classification techniques are used to classify the disease.

## II. LITERATURE SURVEY

*A. Paper [1], Paddy Plant Disease Identification and Classification of Image Using AlexNet Model.*
Authors: R.Jeya Bharathi: This paper is mainly advanced to find the blast disease and lessen the crop loss and hence upsurge the rice agriculture production in an active custom. In current agriculture field, pest and disease identification is a main role of rice cultivation. Image organization by the use of deep convolutional neural networks of training and methodology used the ease a fast and easy system implementation. Pests and diseases are a danger to paddy production, specially in India, but identification remains to be a task in huge scale and repeatedly. Gathering images from Image Net dataset. The results show that we can successfully spot and distinguish the rice diseases and pests including healthy plant class by means of a deep Convolutional neural network, with the greatest exactness of 96.50%. The meaningfully high success rate makes the model a really beneficial advisory or early caution tool, and an method that would be further prolonged to support an integrated plant disease identification system to effort in real cultivation situations.

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*B. Paper [2], A survey on Plant Leaf Diseases Detection Using Image Processing Techniques.*

Authors: K. Narsimha Reddy, B. Polaiah and N. Madhu: Survey on dissimilar classification methods that can be used for plant leaf diseases arrangement. Identification of indications of disease by naked eye is hard for farmer. Crop safety in large frames is done by by means of computerized image processing technique that can sense diseased leaf using color information of leaves. There are so many classification techniques such as k-Nearest Neighbor Classifier, Probabilistic Neural Network, Genetic Algorithm, Support Vector Machine, and Principal Component Analysis, Artificial neural network, Fuzzy logic. Choosing a classification technique is always a tough task because the value of result can vary for different input data. Plant leaf disease classifications have varied applications in many fields such as in biological research, in Agriculture etc. This paper delivers an impression of different classification procedures used for plant leaf disease classification

*C. Paper [3], A survey on Detection and classification of rice plant diseases*

Authors: Jitesh P. Shah, Harshadkumar B. Prajapati and Vipul K. Dabhi: Classifying disease from the images of the plant is one of the exciting research areas in computer and agriculture field. This paper grants a survey of different image processing and machine-learning techniques used in the identification of rice plant diseases created on images of disease infected rice plants. This paper grants not only survey of many procedures but also briefly deliberates significant ideas of image processing and machine learning useful to plant disease detection and classification. We carry out full study of 19 papers, cover the work on rice plant diseases and other diverse plants and fruits, and present a survey of these papers based on important principles. These principles contain size of image dataset, no. of classes (diseases), preprocessing, segmentation procedures, types of classifiers, exactness of classifiers etc. We apply our survey and study to propose and design our work on discovery and classification of rice plant diseases.

*D. Paper [4], Rice Blast Disease Recognition Using a Deep Convolutional Neural Network.*

Authors: Wan-jie Liang, Hong Zhang, Gu-feng Zhang & Hong-xin Cao: Rice disease acknowledgement is vital in automated rice disease diagnosis systems. At present, deep convolutional neural network (CNN) is generally measured the state-of-the-art solution in image recognition. In this paper, we offer a novel rice blast recognition technique based on CNN. A dataset of 2906 positive samples and 2902 negative samples is recognized for training and testing the CNN model. In accumulation, we conduct relative experiments for qualitative and quantitatively study in our calculation of the efficiency of the proposed method. The evaluation results show that the high-level features removed by CNN are more discriminative and real than traditional handcrafted structures as well as local binary patterns histograms (LBPH) and Haar-WT (Wavelet Transform). Also, quantitative evaluation results show that CNN with Softmax and CNN with support vector machine (SVM) have alike performances, with advanced accuracy, larger area under curve (AUC), and better receiver operating characteristic (ROC) curves than both LBPH plus an SVM as the classifier and Haar-WT plus an SVM as the classifier. So, our CNN model is a top performing method for rice blast disease recognition and can be possibly employed in real-world applications.

*E. Paper [5], Smart Paddy Crop Disease Identification And Management Using Deep Convolutional Neural Network And SVM Classifier.*

Authors: R. Rajmohan, M. Pajany, R. Rajesh, D. Raghu Raman, U. Prabu: Today agricultural resources are receiving to be plainly scarcer and later more gainful. In combination with the populace development over a period ago, the condition for finding new, more actual and economical plans for agrarian development and paddy cultivation lead to to be more indispensible. To inspire this technique, we are outlining, a Sensor based Mobile App framework for accuracy agribusiness which provides agriculturists with valued information about the paddy yield and its state. Our framework aims to make progress more productive as the agriculturist can settle on better educated choices and then extra time and assets.

## III. PROBLEM STATEMENT

To detect and classify the rice plant leaf diseases using latest machine learning techniques.

## IV. CONVOLUTIONAL NEURAL NETWORK

Deep learning is a class of machine learning algorithms that has sequential layers. Each layer uses the output of the previous layer as input. The learning process can be unsupervised, supervised or semi-supervised. We here use unsupervised learning. These algorithms help to find the most convenient way to represent the data. We do not have to divide the feature extraction and the classification because the model automatically extracts the features while training the model.

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It is used in many research areas such as image processing, image restoration, speech recognition, natural language processing and bioinformatics. CNN is preferred as a deep learning method in this study. CNN, which can easily identify and classify objects or images with minimum pre-processing, is successful in analyzing visual images.

It consists of three main layers: Convolutional layer, Pooling layer and fully connected layer. Fig. 1 shows a general CNN architecture.

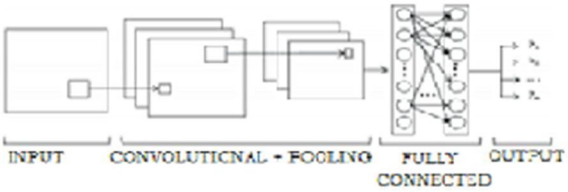



Fig. 1 A general CNN architecture.

*A. Convolutional Layer*

CNN takes its name from the convolution layer. In this layer, a chain of mathematical operations are performed to extract the feature map of the input image. The input image is reduced to a small size using a filter. The filter is shifted step by step starting from the upper left corner of the image. At each step, the values in the image are multiplied by the values of the filter and the result is summed. A new matrix with a small size is obtained from the input image.

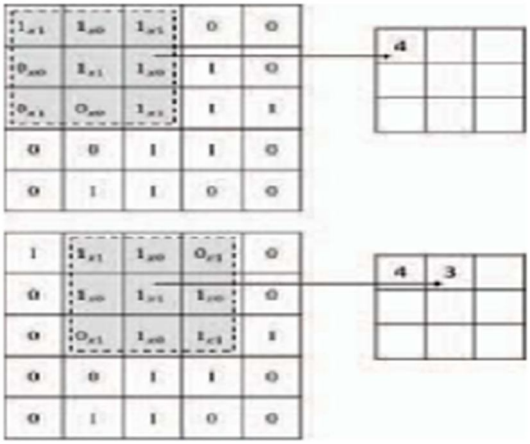


Fig. 2. Convolution operation for 5x5 input image and 3x3 filter.

*B. Pooling Layer*

The pooling layer is normally applied after the convolution layer. The size of the output matrix obtained from the convolution layer will be reduced in this layer. Even though filters of different sizes can be used in the pooling layer, generally 2x2 size filter is used. Functions such as max pooling and average pooling can be used in this layer. Max pooling is done by selecting the largest value in the sub windows and this value is transferred to in a new matrix.

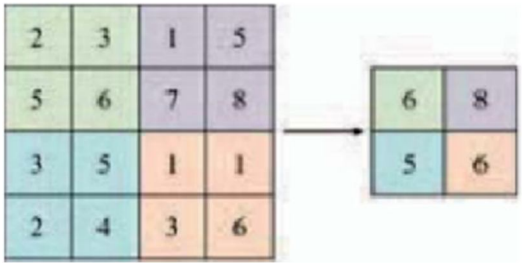



Fig. 3. Max pooling with 2x2 filters and stride 2.

*C. Fully Connected Layer*

The last obtained matrix, after completing the convolution and pooling operations, is fed into the fully connected layer as input. Classification is performed in this layer.

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## V. SYSTEM DESIGN AND ARCHITECTURE

In order to develop a model for leaf disease detection, the approach used is deep CNN.

### A. Dataset

For the purpose of image based classification which includes, training phase to evaluation phase where the performance of classification algorithms are evaluated, it is necessary to have vast data sets. Then, there is a need to improve the dataset by adding the images that are augmented. This will train the network to learn features that differentiates one class from other. Likewise, a dataset consisting of 500 images are used to train and around 100 images are further used to validate the same.

### B. Process And Label Of Images

A number of samples of images are collected. They have different levels of resolutions and hence variations in quality. Thus, to obtain a reasonable image quality feature extraction is used. The final images are used as input data for classifier which are then pre-processed to achieve uniformity. At the time of data collection, the images whose resolution is smaller and which has a dimension less than 500 px is not taken into consideration as valid images for the dataset. Such images having higher resolution form the potential candidates for this investigation purpose. Thus, images are ascertained to contain all the required information for feature learning. As a result, images used for the dataset were resized to 50 X 50. This ensures that there is a reduction of the time required for training and automatically computes it using script in Python, using the OpenCV framework. Pre-processing images involves removing background noise, intensity normalization of individual image particles, removing reflections and masking portions of images. Convolution Neural Networks is designed for accurate analysis. Unsupervised Learning classification is used since the input image is unknown and new to the algorithm. Most of the real time applications need unsupervised learning data since the input is always unknown to the algorithm.

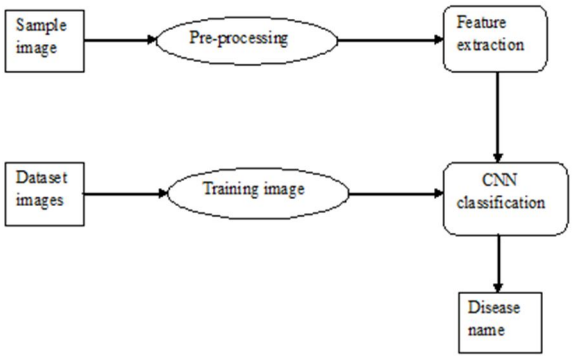



Fig. 4 Block diagram depicting overview of the process

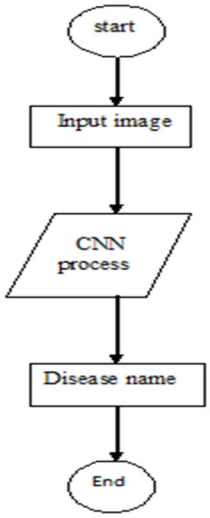



Fig. 5 Flow diagram of the working process

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*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429*
*Volume 8 Issue VI June 2020- Available at www.ijraset.com*

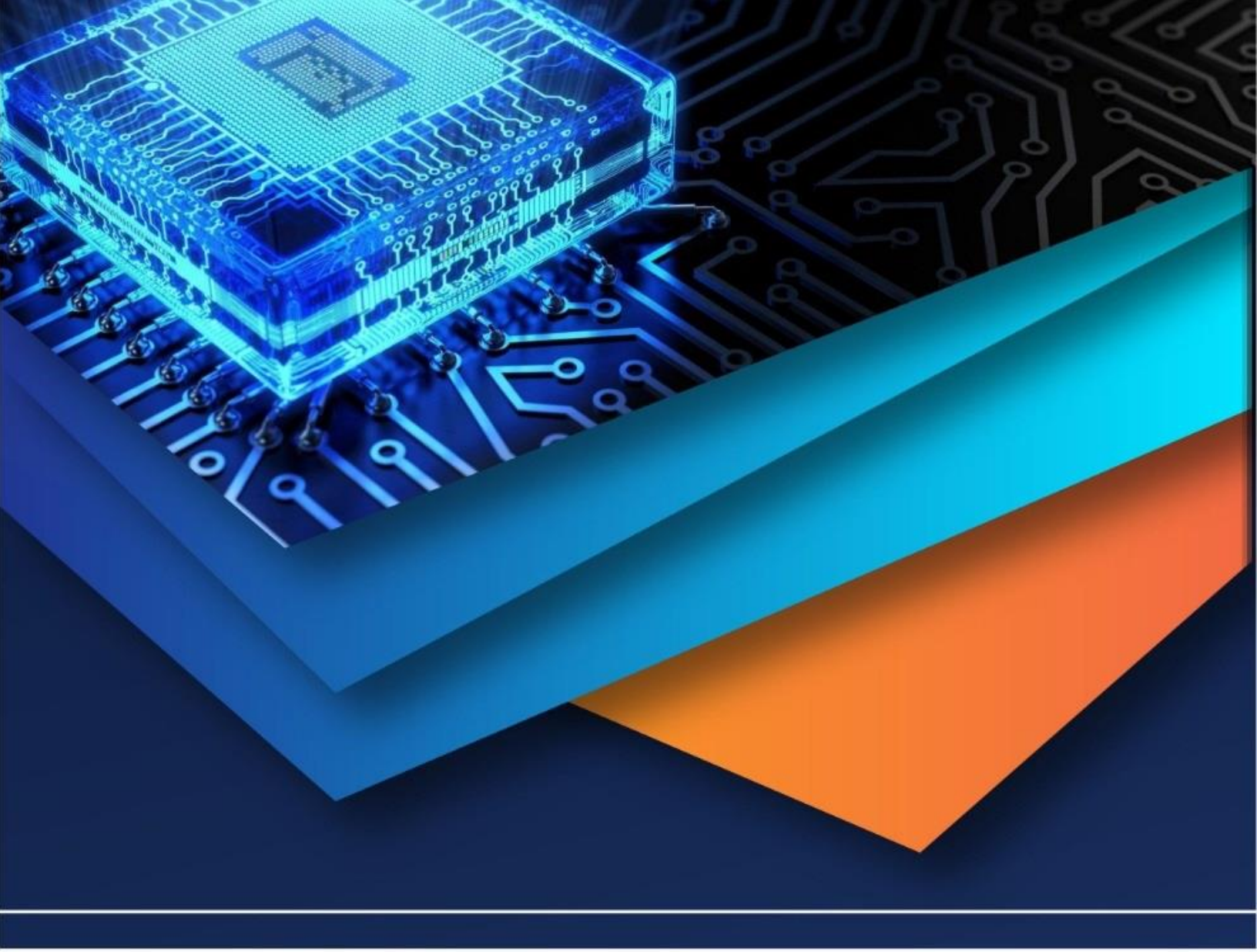
## VI. CONCLUSION

CNN is a important pattern-recognition method both in theory and in application. The proposed CNNs-based model can successfully classify 3 common rice diseases through images recognition. The recognition rate achieved will be greater than 90%. Detecting the disease in the early stages reduces the loss to the farmers.

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