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PADDY CROP DISEASE DETECTION USING SVM AND CNN ALGORITHM

Banda Pavani[1], Dr.R. Maruthamuthu[2] M.C.A., Ph.D.

Assistant Professor[2]
Department of Computer Applications[1,2]
Madanapalle Institute of Technology and Science, Angallu, AP, India

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Abstract

Rice is one of the most important crops in India and suffers from various diseases during different stages of cultivation. It is very difficult for farmers with limited knowledge to accurately identify these diseases manually. Recent developments in deep learning show that automatic image recognition systems using convolutional neural networks (CNN) and transfer learning (TL) and support vector machine (SVM) models are very useful for such problems. Since rice leaf disease image datasets are not readily available, we created our own small dataset. Therefore, I developed a deep learning model using transfer learning. The proposed CNN architecture is based on Mobile Net and is trained and tested using paddy field and internet datasets.

Keywords: Convolutional Neural Network, Deep Learning, SVM, Rice Leaf Diseases, Transfer Learning.

I. Introduction

Rice is a major food source not only in India but around the world. At different stages of cultivation, it is attacked by different diseases. To support the plight of farmers and improve the accuracy of crop disease detection, research has been done using various machine learning algorithms disease detection, research has been done using various machine learning algorithm such as support vector machines (SVMs) and artificial neural networks.

However, the accuracy of such systems is highly dependent on the feature selection technique. Recent work on convolutional neural networks has provided major break throughs in image-based detection eliminating the need for image pre-processing and providing integrated feature selection.

Advances in computing electricity have revolutionized now no longer best the variety of applications, however additionally the cap potential to method massive quantities of data. Neural networks, as soon as restricted to 3 layers of neurons, can now span more than one layers, every containing hundreds of computational neurons, because of big upgrades in computing hardware. This shape has advanced neural networks into extra effective computational equipment that intently mimic human intelligence.

Recent work on convolutional neural networks has provided major breakthroughs in image-based detection, eliminating the need for image pre-processing, and providing integrated feature selection. Today, mobile phones are accessible to everyone, so I came up with the idea of an automated system that would allow farmers to upload pictures of diseased leaves and post them on a server. The system uses neural networks to classify diseases and illnesses and remedies can be returned to farmers.

II. Literature Survey

Recently R. R. Atole,[1] D. Park have done the research on paddy disease detection by using Convolutional neural network Classifier for Detection of Common Rice leaf is having disease or not.

Author Konstantinos Ferentinos [2] have done research on paddy crop disease detection and diagnosis. Constantine et al. [16] developed a deep learning method based on CNN models to present plant disease detection and diagnosis. **Marco** et **al.** [17] proposed **a new two-level neural** network architecture for classifying plant diseases.

Author Y. Lu, S. Yi, N. Zeng,[3] Y. Liu, and Y. Zhang have done research on paddy crop Recent developments in deep learning-based convolutional neural networks (CNNs) have allowed researchers to significantly improve the accuracy of image classification. This article presents a deep learning-based approach for detecting rice diseases and pests from images captured in real landscapes with heterogeneous backgrounds.

[4] Y. Es-saady,T. El Massi, M. El Yassa,D. Mammass, and A. Benazoun**,** have done research paddy crop disease detection. In this paper presents a machine vision system for automatic detection of plant leaf diseases from images. The proposed system is based on the serial combination technique of two of his SVM classifiers. The first classifier classifies images using colour. At this stage, diseases of similar or similar colour are assumed to belong to the same class. A second classifier is then

used to distinguish classes of similar colours according to their shape and texture features. Tests in this study will be conducted in 6 disease classes, including 3 types of pest damage (minor moth, thrips, and tuta absoluta) and 3 types of pathogen symptoms (early wilt, late wilt, powdery mildew) . The research results demonstrate the advantages of the proposed method compared to other existing methods.

III. Proposed System

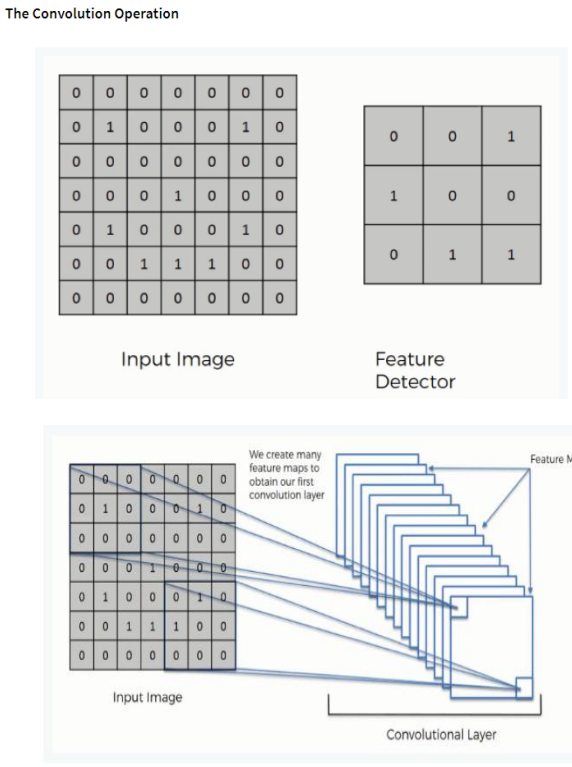
The proposed system proposes a deep learning technique that automatically classifies images using convolutional neural networks (CNN) and transfer learning models. This is very helpful for problems like this. Using these techniques, diseases can be easily recognized and identified. Proper classification is therefore critical for proper treatment, which is made possible using the proposed method. In this paper, we propose a new CNN-based model for detecting leaf diseases in rice by reducing network parameters. It is just like different neural networks in that it makes use of ahead propagation to enter records and spark off the hidden layer; lower back propagation loss values adjust the parameters of the hidden. The activation of the hidden layer relies upon at the activation function, which introduces non-linear elements in order that the neural community can arbitrarily technique any non-linear. The distinction among CNN and different neural networks is that it's far a deep neural community. After numerous convolutional layers and pooling layers are alternately linked, the absolutely linked layer is linked, thereby changing the hidden layer inside the community. However, growing the quantity of community layers and schooling parameters will increase the threat of edition in the course of the schooling procedure and decreases the generalizability of the model. On CNN he has essential parts. One is the convolutional pooling layer, wherein picture characteristic extraction is completed. The output is classed with a totally linked layer and the alternative part. Convolutional layer performs a convolution operation.

IV. METHODOLOG AND ALGORITHMS:

Implementation of CNN Algorithm

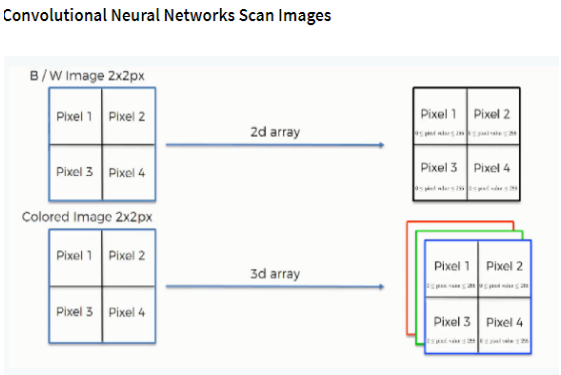
Step1: convolutional operation

The first aspect of the assault plan is the convolution operation. This step describes a characteristic detector, which essentially works as a neural community filter. We additionally speak characteristic maps, gaining knowledge of parameters for such maps, the way to apprehend patterns, reputation levels, and the way to map the outcomes.



Step (1b): Relu Layer

The second part of this step is about the Rectified Linear Unit or Relook. We discuss Rilook layers and explore how linearity works in the context of convolutional neural networks. You don't need to understand CNN, but a quick lesson won't improve your skills.



Step 2: Pooling Layer

In this part, we'll look at pooling and understand exactly how it works in general. However, the relevance here would be some sort of pooling. Maximum pooling. However, we discuss different approaches, including average (or sum) pooling. This part ends with a demonstration created with a visual interactive tool. This makes the whole concept clear

Step 3: Flattening

Here's a quick breakdown of the flattening process and how to move from pooled to flattened layers when using convolutional neural networks.

Step 4: Full Connection

This part brings together everything that was discussed in this section. Learning this will give you a more complete understanding of how convolutional neural networks work and how the resulting "neurons" learn to classify images.

1.Input Layer: In input layer we consider images as input. Here we considering the input layer is the pre-trained model Mobile Net.

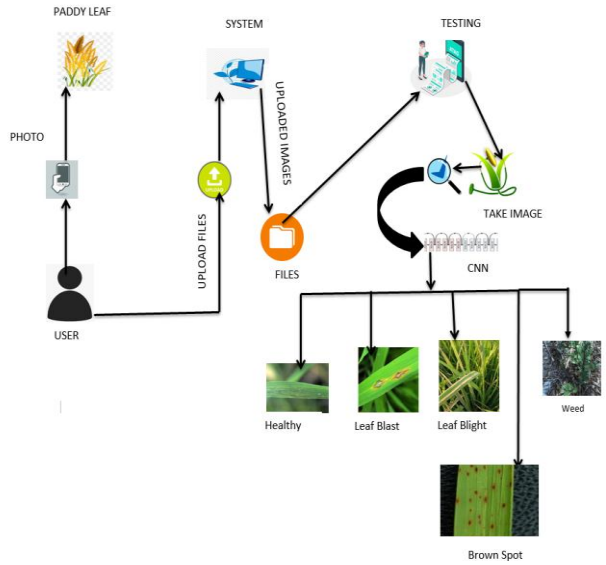
2.Convolution Layer: In Convolution layer, we convert image into matric format. Here matrix size is 1024 X 1024 (rows X columns).

3.Pooling Layer: In the pooling layer the numerical values will be stored. To change the numerical data to binary data, we use machine learning algorithm named SoftMax (supervised learning algorithm). In SoftMax layer we will convert the numerical data to binary.

4.In flatten layer and dense the classes of total dataset (5 types) is stored which will be in the binary data format.

We use fit_generator method for saving the data in the form of .h5. Here model is a format for storing the binary data.

Architecture of CNN Algorithm:



The architecture of Paddy crop disease detection displays the how image is processed using algorithms and how user get the accurate output.
Step by step process in this project is as shown below:

Step-1: Take paddy leaf image and image uploaded by user.

Step-2: Initially, we are using SVM Algorithm Here the process is done with SVMs where the algorithm did not work accurately and failed to reach adequate accurately and failed to reach adequate accuracy.

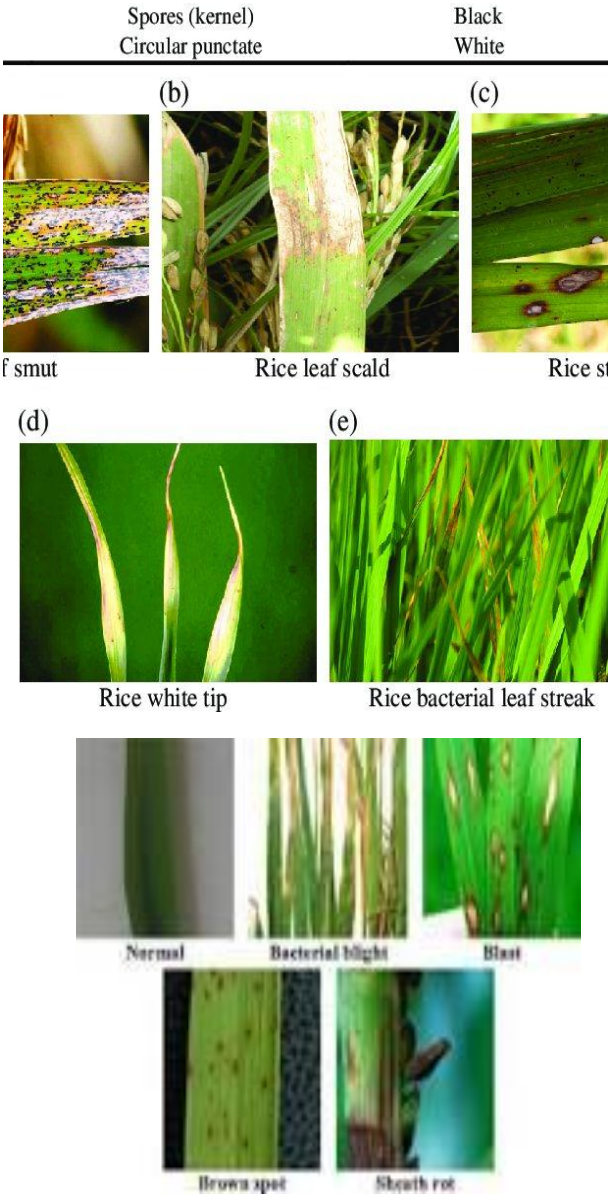
Step3: Finally, we are using CNN Algorithm For automatic image recognition to identify the disease

Step-4: By Using CNN Algorithm we can easily identify the disease. And we can get accurate result.

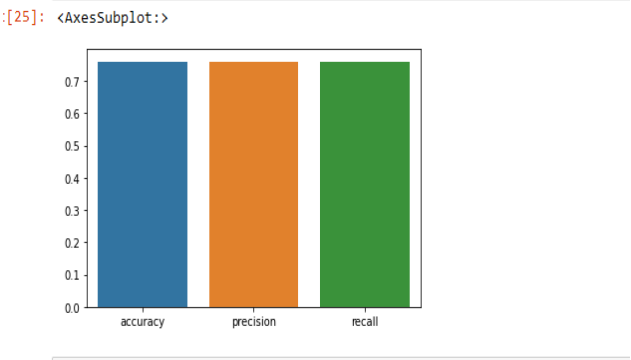
Step5: After prediction, we get 5 [brown spots, healthy, leaf blight, leaf blight & weeds] value.

Experimental Analysis and Result:

This experiment is conducted by using Jupiter Notebook and the paddy image dataset is collected from the Kaggle website. And the collected data directly uploaded to the Jupiter Notebook. The dataset contains two types of data they are training data and testing data



By conducting these experiment by using CNN Algorithm we can get accurate result



V. Conclusion:

In this paper, we succeeded in developing an application that can detect and detect paddy field diseases. Here, we developed a method using CNN with transfer learning (MobileNet) and SVM algorithms. Here, we examined a data set of rice leaf images consisting of four different types (Brown Spot, Healthy, Leaf Blight, Leaf Blight) and weed images. After training, the dataset results were tested, uploaded images and classified.

VI. Future Work

In the future, we would like to collect more images of fields and agricultural research institutes to further improve the accuracy. We hope to add a cross-validation process in the future to validate our results. We also want to use better deep learning models and other state-of-the-art research to compare with the results obtained. Using the developed model, other foliage diseases of plants that are important crops in India can also be detected in the future.

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