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Convolution Based Neural Network Model to Prevent Diseases Classification and Prediction Using Deep Learning

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Abstract— The farmer is a backbone to nation, but majority of the cultivated crops in india affecting by various diseases at various stages of its cultivation. Recent research works shows that diseases are not providing accurate results and few identifying but not providing optimized solutions to the system. In proposed work, the recent developments of Artificial intelligence through Deep Learning show that AIR (Automatic Image Recognition systems) using CNN algorithm models can be very beneficial in such scenarios. The Rice leaf diseases images related dataset is not easily available to automate , so that we have created our own trained data set which is small in size hence we have used transfer learning to develop our Proposed model which supports deep learning models. The Proposed CNN architecture illustrated based on VGG-16 model and it is trained, tested on given dataset collected from rice fields and the internet. The accuracy of the proposed model is moderately accurate with 92.46%.
Keywords: Introduction, Related Work, proposed model, Proposed architecture.

I. INTRODUCTION

Rice is the main source of food in south India and Northern States of india as well as across many of the countries in the world. A variety of rice crop diseases in different stages of its cultivation. Therefore, the rice disease detection is difficult and providing remedies of such diseases are more beneficial to farmers to ensure high quality of food crops is possible, but huge expanse of land under individual farmers and the variety of diseases occurrence to the same plant. The proposed automated system provides detection with solution using support vector machine and CNN algorithm. Another challenge is that it is very difficult to obtain large sized dataset for such problems. For identified rice disease cases where size of the dataset is relatively small, it is more preferable to use a model which is automated and train dataset could be pretrained on a large dataset. This technique called Transfer Learning and it can be utilized to create a model that can be used as a fixed feature extractor removing the last fully

connected layer but now a days the concerned specific fine tuning few layers captured by mobile phones and this method can be used every one and with is idea an automated neural network system allows the farmers to upload the images and get back the remedy based solutions We have used the pre-trained VGG-16 model (assumed Trained data by uploading the huge ImageNet and using Transfer learning methods we have tested with fully connected layers so that we can accommodate our own dataset and at the end we have done some error analysis and tried to explain the reasons for the error.

II. RELATED WORK

A lot of research has been done in agriculture and Indian government focusing to provide better possible solution for rice diseases by using traditional classifiers with better results are dependent on image preprocessing selection techniques are used as major step .we have referred lot a research papers and identified phenomenon diseases in plants and listed below.

A. Plant Disease Detection using CNN

CNN is trained using 77,848 images, with 52 plant varieties having 85 classes which includes healthy plants. CNN models were trained, of which the best model provided 99.53% accuracy in correct identification. In CNN was used to train 54306 images of 14 crop types, with 26 diseasesand healthy leaves.

B. Rice Disease Detection using CNN

CNN classifier is predicated using a dataset of 227 images of snail-bitten, diseased and healthy rice plants in [8].The classifier is transfer learning based using AlexNet. Training the above architecture an accuracy of 91.23% is achieved but it can only predict whether plant is diseased or not. In [13], Since the data is very less they used various preprocessing step like image resizing to 512*512, normalization, PCA and whitening.

III.TYPES OF RICE DISEASES AND TRAINED DATASET

The rice image dataset has been collected over the past few months mostly from the cultivation fields, gathering the images of rice leaves from the fields of Rajampet (District: Kadapa) And Gunthapalli village (District: Kadapa), belonging to the state of Andhra Pradesh, India.as well as from the Internet. The images were taken using Redmi 5A and realme mobile camera. The IRRI institute raw data is used as primary data which is available in Rice Knowledge Bank website. he dataset consists of 1849 images of diseased leaves of rice consisting of three most common diseases namely Rice leaf Blast, Rice Leaf Blight and Brown spot. There are 508 images of Healthy leaves. We felt difficult to remove noise from the raw data. Identified a number of difficulties faced while collecting the data like poor image illumination and more than one disease occurrence in the same plant. We have tried to overcome them by using image preprocessing steps used such as resizing and zooming.

Fig. 1. (a)-(c) From Left to right. (a) rice Leaf Blast (b) rice Leaf Blight and (c) BrownSpotted Rice disease

A. Rice Leaf Blast

The Magnaporthe oryzae is a is a fungal disease. The preliminary symptoms are white to grey-green spots which are elliptical or spindle-shaped with dark red to brownish borders. In the Figure 1 (a) some images illustrates with diamond shapes of images with spindle shaped lesions with white spots and darken circles border can be seen.

B. Rice Leaf Blight

The Xanthomonas oryzae is a bacterial disease. The infected leaves turn green and slightly changes in yellowing and then it turns braced colored and finally dies after wilting. The lesions encompass wavy margins and progress towards the base. In the above second image shows leaves affected by Rice Leaf Blight disease.

C. Brown Spotted Rice disease

This is also one type of fungal disease. By this fungal infection leaves are affected and it shows as initially small circular dark brown lesions can be observed and copious developed lesions are circular to oval with light brown to gray center and surrounded by a reddish brown ray margin caused by toxins which produces the fungi which illustrated in fig 1(c).

IV. METHODOLOGY

The CNNs are multi-layered networks whose architecture determines the performance of the network. The proposed model consists of three parts (i) convolution layer part (ii) pooling layer part and (iii) fully connected layer part. The first and second layers data can be extracted with the feature extractor and the 3 layer works as a classifier. The pooling layer reduces the dimensionality of the features extracted by the convolutional layer.. The dot product of each filter with the raw image pixel in sliding window manner provides the 2-D feature map. The ReLU is one of the most popular activation function used to rectify the disease. The max pooling layer is a sub-sampling layer that reduces the size of feature map..As shown in Figure 2.

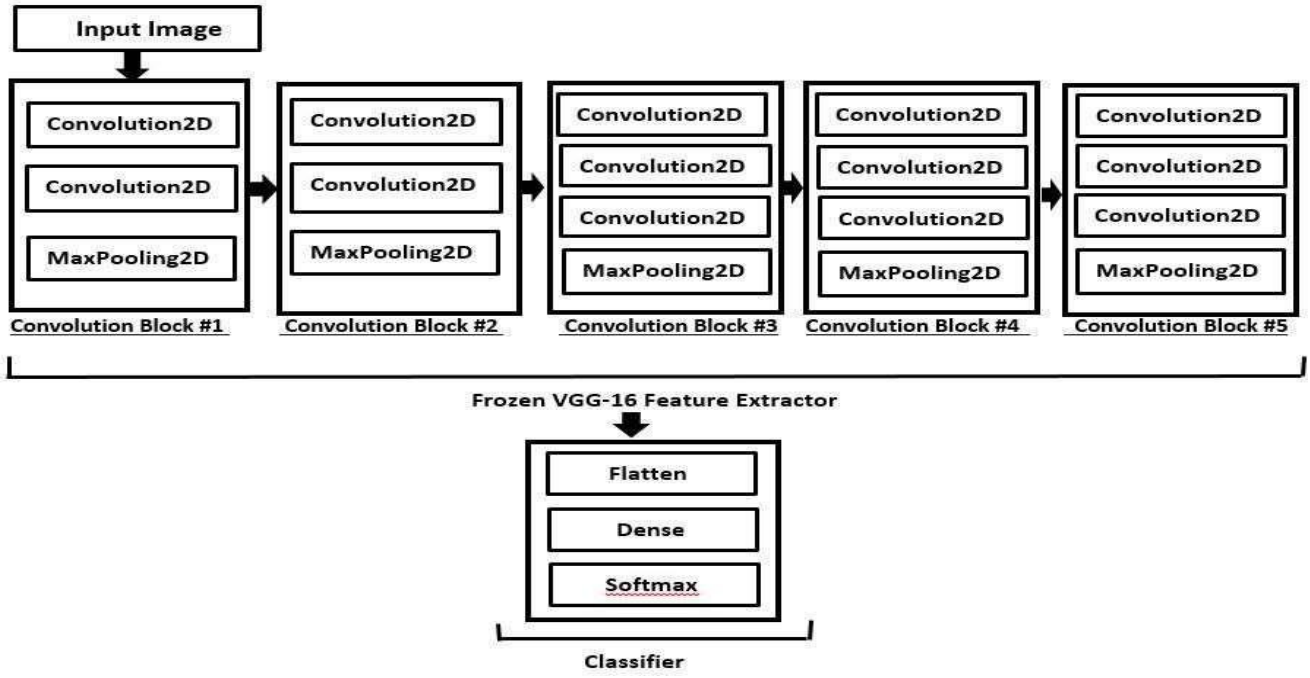

Fig. 2. VGG-16 Architecture fine–tuned with the last two layers with 128 Dense FC Layer and 4 Dense Softmax Layer as the output

V. RESULTS

A. Error Analysis

The Figure 3 (a)-(f) illustrates images that are misclassified by theproposed CNN model. The misclassifications are described in below.

Rice Blast disease: Image (a) belongs to Rice Blast disease but (a) is classified as Brown Spot as the image is blurred. The blurred image could not provide exact result for that presence of small shaded brown spots are seems in same rice leaf.

Rice Leaf Blight: Images (d) and (e) are classified as Healthy but they belong to Blight category. The reason could be blurring of images with poor illuminations.

Healthy Rice leaves: Image (f) is healthy but it is classified as Brown Spot probably because the image is blurred and contrast is poor.

Brown Spotted Rice leaf: Images (b) and (c) belong to Brown Spot rice leaf but are classified as Blast rice disease. One reason could be the presence of small pieces of leaves affected with blast lesions on the leaf. In (d) the brown spotted rice lesions resemblethe blast lesion.

Fig. 3. From left to right (a)-(f) Rice disease images that are misclassified by themodel. (a) Rice Blast disease (b) and (c) Brown Spotted Rice disease (d) and (e) Rice Leaf Blight (f) Healthy Rice leaves

VI. CONCLUSION

In this paper we have proposed a deep learning architecture with training on 1509 images of rice leaves and testing on different 647 images and that correctly classifies 92.46% of the test images. To improve the performance of the model decreasing the both training and cross validation data set with accuracy point. In future work the automated system will collect and extract more images from agricultural institutes which helps us to bring notice of few more diseases related to this issue.

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REFERENCES

[1]. T. Gupta, "Plant leaf disease analysis using image processing technique with modified SVM-CS classifier," *Int. J. Eng. Manag. Technol*, no. 5, pp.11-17, 2017.

[2]. Y. Es-saady,T. El Massi,M. El Yassa,D. Mammass, and A. Benazoun, "Automatic recognition of plant leaves diseases based on serial combination of two SVM classifiers," *International Conference on Electrical and Information Technologies (ICEIT)* pp. 561-566, 2016.

[3]. P. B. Padol and A. A. Yadav, "SVM classifier based grape leaf disease detection," *Conference on Advances in Signal Processing (CASP),* pp. 175-179, 2016.

[4]. L. Liu and G. Zhou, "Extraction of the rice leaf disease image based on BP neural network," *International*

*Conference on Computational Intelligence and Software Engineering ,pp. 1-3,*2009.S. Arivazhagan and S.V. Ligi, "Mango Leaf Diseases Identification Using Convolutional Neural Network," *International Journal of Pure and Applied Mathematics*, vol. 120,no. 6, pp. 11067-11079,2008.

[5]. B. Liu,Y. Zhang, D. He and Y. Li, "Identification of Apple Leaf Diseases Based on Deep Convolutional Neural Networks Symmetry*".*

[6]. *X.X. & Suen, C. Y. A novel hybrid CNN–SVM classifier for recognizing handwritten digits. Pattern Recognition, vol. 45,pp. 1318–1325,*2012.

[7]. Y. Lu, S. Yi,N. Zeng,Y. Liu, and Y. Zhang, "Identification of Rice Diseases Using Deep Convolutional Neural Networks", *Neurocomputing, 267, pp. 378-384,*2017.

[8]. R. R. Atole, D. Park, "A Multiclass Deep Convolutional Neural Network Classifier for Detection of Common Rice Plant Anomalies," *International Journal Of Advanced Computer Science And Applications, vol. 9,*no. 1,pp. 67–70,2018.

[9]. V. Singh, A. Misra, "Detection of Plant Leaf Diseases Using Image Segmentation and Soft Computing Techniques," *Information Processing in Agriculture, vol.* 4 ,no. 1,pp. 41–49,2017.

[10].P. Konstantinos Ferentinos, "Deep Learning Models for Plant Disease Detection and Diagnosis," *Computers and Electronics in Agriculture, vol.* 145,pp. 311–318,2018.

[11].S. P. Mohanty, D. P. Hughes, M. Salath´e, "Using Deep Learning for Image-Based Plant Disease Detection," *Frontiers in plant science, vol.7.*

