International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

Plant Leaf Disease Detection using Deep Learning and Convolutional Neural Network

JOGU MALLESH
SENIOR LECTURER IN ELECTRONICS AND COMMUNICATIONS ENGINEERING
GOVERNMENT POLYTECHNIC, WARANGAL

Abstract
Early Disease Detection and pets are important for better yield and quality of crops. With Reduction in Quality of the agricultural Product, Disease Plant can lead to the huge Economic Losses to the Individual farmers. In country like India whose major Population is involved in Agriculture It is very important to find the disease at early stages. Faster and precise prediction of plant disease could help reducing the losses. With the Significant advancement and developments in Deep learning have given the Opportunity to improve the performance and accuracy of detection of object and recognition system. This Paper, focuses on finding the plant diseases and reducing the economic losses. We have proposed the deep leaning based approach for image recognition. We have examined the three main Architecture of the Neural Network: Faster Region-based Convolution Neural Network (Faster R-CNN), Region-based Fully CNN(R-CNN) and Single shot Multibook Detector (SSD). System Proposed in the paper can Detect the different types of disease efficiently and have the ability to deal with complex scenarios. Validation result show the accuracy of 94.6% which depicts the feasibility of Convolution Neural Network and present the path for AI based Deep Learning Solution to this Complex Problem
Keywords -- Plant Leaf Diseases, Deep Learning, faster R-CNN, RFCN, SSD

I. INTRODUCTION

Today's better technologies have enabled people to provide the adequate nutrition and food needed to meet the needs of the world's growing population. If we talk about India unequivocally, 70% of the Indian people is directly or by suggestion related to the cultivating territory, which remains the greatest region in the country. If we explore the broader Picture According to Research Conducted by 2050 overall yield creation can augment by at any rate half putting more weight on the inside and out pushed and cultivating Sector. The greater part of the Farmers is poor and have no inclination in development which may incite hardships more essential than half because of pets and sicknesses of plant. Vegetables and fruits are common items and the principal agricultural things. Powerful dependence on engineered pesticides achieves the high substance content which creates in the earth, air, water, and shockingly in our bodies antagonistically influence the environment. At present, the conventional technique of visual inspection in humans by visual inspection makes it impossible to characterize plant diseases. Advances in computer vision models offer fast, normalized, and accurate answers to these problems. Classifiers can also be sent as attachments during preparation [5]. All you need is a web association and a camera-equipped cellphone. The well-known business applications "I Naturalist" and "Plant Snap" show how this is possible. Both apps excel at sharing skills with customers as well as building intuitive online social communities

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

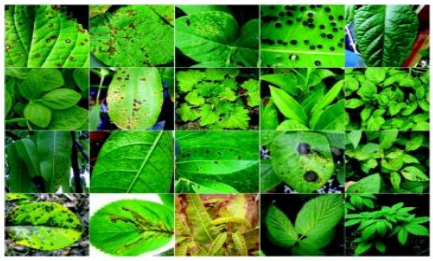


Fig: 1 Disease Plant Leaves

In Recent Years, Deep Learning has led to great performance in various fields like Image Recognition, Speech Recognition, and Natural Language Processing. The use of the Convocational Neural Network in the Problem of Plant Disease Detection has very good results. Convocational Neural Network is recognized as the best method for Object Recognition. We Consider the Neural Architecture namely faster Region-Based Convolutional Neural networks (Faster R-CNN), Region-based Convolution Neural Networks(R-FCN), and single-shot Multi box detector (SSD). Each of the Neural Architecture should be able to be merged with any feature exactor depending on the application. Pre-processing of data is very important to models for accurate performance. Many infections (viral or fungal) can be hard to distinguish often sharing overlap of symptoms.

II. LITERATURE SURVEY

Liu, Bin, et al. "Identification of apple leaf diseases based on deep convolutional neural networks. In this paper, Liu proposes a new model of deep convolution networks for accurate prediction and identification in apple leaves. Model Proposed in the Paper can automatically recognize the different character trades with a very high level of accuracy. A total of 13,689 images were created with the help of image processing technologies like PCA oscillation. Apart from this new AlexNet based neural network was also proposed by implementing the NAG Algorithm to optimize the network. In future work to predict the apple leaf disease, other Models of Deep Learning like F-CNN, R-CNN, and SSD can be implemented.

This article [2] suggests a new way to classify leave using the CNN model and builds two models by adjusting network depth using Google Net. We assessed the effectiveness of each model based on discoloration or leaf damage. The recognition rate achieved is more than 94%, even if 30% of the leaves are damaged. In future research, we will seek to identify leaves attached to branches to develop a visual system that can mimic the methods humans use to identify plant species

This Paper [8] also describes various strategies for Extracting the nature of infected leaves and classifying plants Disease. Here we are using a Convolution Neural Network (CNN), Which consists of various levels that are used for forecasting. That The complete method is described based on the images used for training and pretreatment testing and Image enhancement and then a training method for CNN deep and optimizers. Use these images We can precisely determine the processing method and differentiate between different plant diseases.

The purpose of this paper [10] is to review evidence of foliar disease thermal, digital, and hyperspectral imaging studies with various classification techniques. The segmentation method is applied to identify the required areas. The method helps Isolate the desired area from the background. Based on the threshold Value, grayscale image, color image segmentation method different. Used to extract features as well as various methods such as grayscale the matrix is used for associated values, histogram intensity, etc. To Classification of disease reproduction from holidays, artificial neurons Maintenance vector networks and machines are used in maintenance the vector engine provides the most satisfactory results for each type Picture

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

On paper [8], RGB images are converted to grayscale images using color conversion. Various enhancement techniques such as histogram alignment and contrast adjustment are used to improve image quality. Different types of classification characteristics are used here, e.g. B. Classification according to SVM, ANN, and FUZZY. When extracting functions, different types of characteristic values are used; B. Textures, structures, and geometric elements. The ANN and FUZZY classifications can be used to identify diseases in unpeeled plants

III. PROPOSED METHOD

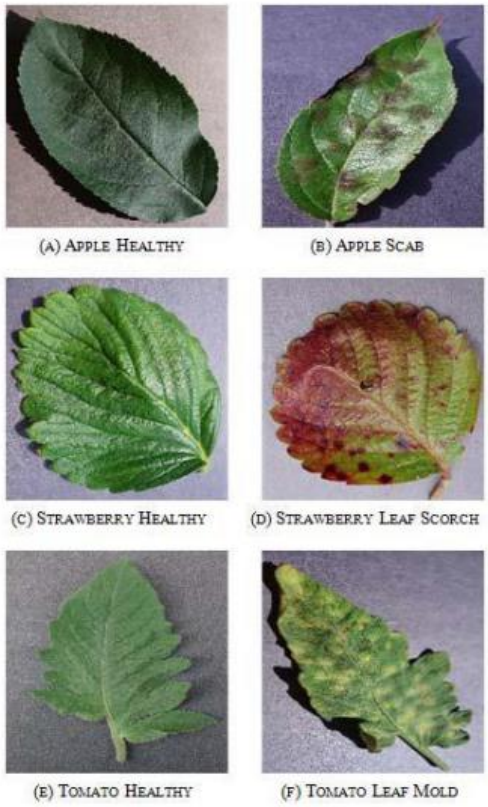
Plants are susceptible to various disease-related disorders and seizures. There are various causes which can be characterized by their effect on plants, disturbances due to environmental conditions such as temperature, humidity, excessive or insufficient food, light and the most common diseases such as bacterial, viral and fungal diseases. In the proposed system, we use the CNN algorithm to detect disease in plant leaves because with the help of CNN the maximum accuracy can be achieved if the data is good.

A. Dataset

We use Plant Village Dataset. The Plant Village dataset consists of 54303 healthy and unhealthy leaf images divided into 38 categories by species and disease. We analyzed more than 50,000 images of plant leaves with distributed labels from 38 classes and we tried to predict the class of diseases. We resize the image to 256 × 256 pixels and perform optimization and model predictions on this compressed image.

Leaf Category	Images
Apple	3171
Cherry	1906
Grape	4062
Peach	2657
Pepper	2475
Potato	2152
Strawberry	1565
Tomato	18170
Total	36148

Table I. DATASET BREAKUP



IMAGES FROM THE DATASET

B. Data Processing and Argumention

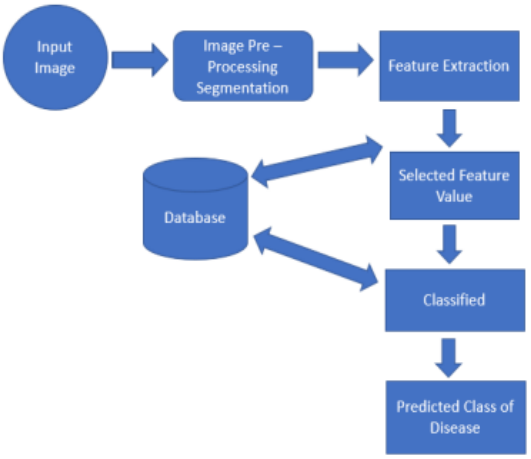
Image augmentation plays a key role in building an effective image classifier. Though datasets may contain anywhere from hundreds to a couple of thousand training examples, the variety might still not be enough to build an accurate model. Some of the many image augmentation options are flipping the image vertically/horizontally, rotating through various angles and scaling the image. These augmentations help increase the relevant data in a dataset. The size of each image in the Plant Village dataset is found to be 256 x 256 pixels. The data processing and image augmentation are done using the Keras deep-learning framework.
The augmentation options used for training are as follows:

- Rotation - To rotate a training image randomly over various angle.

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

- Brightness - Helps the model to adapt to variation in lighting while feeding images of varying brightness during training
- Shear - Adjust the shearing angle.

C. System Overview



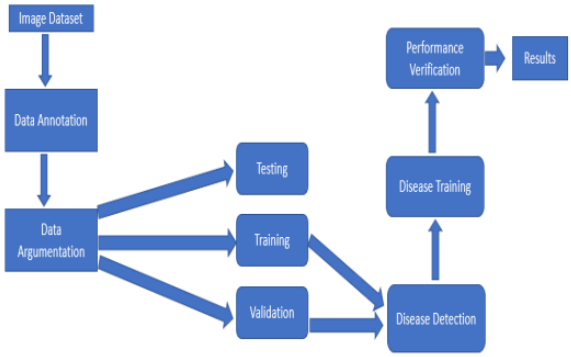
Steps related to image processing to detect plant diseases

The whole process is divided into three stages:

1. Input images are first created by an Android device or uploaded to our web application by users.

2. Segmentation pre-processing includes the process of image segmentation, image enhancement and color space conversion. First, the digital image of the image is enhanced with a filter. Then convert each image into an array. Using the scientific name for Binarizes Diseases, each image name is converted to a binary field.

3. CNN classifiers are trained to identify diseases in each plant class. Level 2 results are used to call up a classifier, which is trained to classify various diseases in that plant. If not present, the leaves are classified as "healthy".



IV. EXPERIMENTION AND RESULT

We only selected 400 images from each folder. Each image is converted into an array. In addition, we processed the input file by scaling the info points from [0, 255] (image minimum and most RGB values) to the vary [0, 1]. We then split the dataset into 70% of the training images and 30% for testing. Image generator objects are created which perform random rotations, movements, inversions, cultures and parts of our image set.

In the standard model we use a "last channel" architecture, but we also build backend switches that support "first channel". Then we do Conv => Relu => Pool first. Our Conv layer has 36 filters with 3 x 3 core and Relu activation (linear correction module). We apply batch normalization, maximum aggregation, and a 27% reduction (0.26).

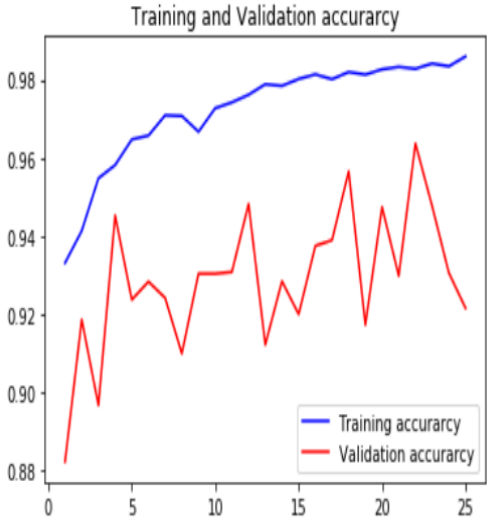
Dropout is a control technology used to reduce neural network readjustment by preventing the correction of complex collaborative data for training. This is a very effective method for averaging neural network models.

Then we create two sets (Conv => Relu) * 2 => Pool blocks. Then just a series of fully connected layers (fully connected layers) => Relu.

We use Adam's Hard Optimizer for our model. Our network starts where we call model.fit_generator. Our aim is to add data, train - test data and the no.of epochs we want to train.

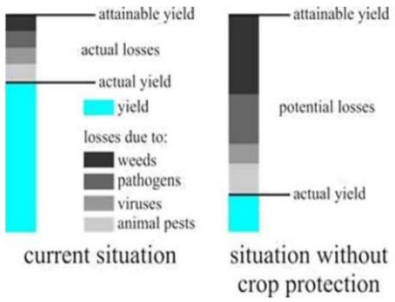
International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

For this project we used a value for epochs of 26.



V. CONCLUSION

Protecting crops in organic farming is not an easy task. This depends on a thorough knowledge of the crop being grown and possible pests, pathogens and weeds. In our system, a special deep learning model has been developed based on a special architectural convolution network to detect plant diseases through images of healthy or diseased plant leaves. The system described above can be upgraded to a real-time video entry system that allows unattended plant care. Another aspect that can be added to certain systems is an intelligent system that cures identified ailments. Studies show that managing plant diseases can help increase yields by about 50%



CROP PROTECTION YIELD ANALYSIS

VI.REFERENCES

1. Liu, Bin, "Identification of apple leaf diseases based on deep convolutional neural networks
2. Jeon, Wang-Su, and Sang-Yong Rhee. "Plant leaf recognition using a convolution neural network." International Journal of Fuzzy Logic and Intelligent Systems 17.1 (2017): 26-34.
3. Amara, Jihen, Bassem Bouaziz, and Alsayed Algergawy. "A Deep Learning-based Approach for Banana Leaf Diseases Classification." BTW (Workshops). 2017.
4. Lee, Sue Han, et al. "How deep learning extracts and learns leaf features for plant classification." Pattern Recognition 71 (2017): 1-13.
5. Sladojevic, Srdjan, et al. "Deep neural networks-based recognition of plant diseases by leaf image classification." Computational intelligence and neuroscience 2016 (2016).
6. Lee, Sue Han, et al. "Plant Identification System based on a Convolutional Neural Network for the LifeClef 2016 Plant Classification Task." CLEF (Working Notes). 2016.
7. He, Kaiming, et al. "Deep residual learning for image recognition." Proceedings of the IEEE conference.
8. K.Padmavathi, and K.Thangadurai,"Implementation of RGB and Gray scale images in plant leaves disease detection –comparative study,"

9. Kiran R. Gavhale, and U. Gawande, "An Overview of the Research on Plant Leaves International Journal of Pure and Applied Mathematics Special Issue 882 Disease detection using Image Processing Techniques," IOSR J. of Compu. Eng.

10. Y. Q. Xia, Y. Li, and C. Li, "Intelligent Diagnose System of Wheat Diseases Based on Android Phone," J. of Infor. & Compu. Sci., vol. 12, pp. 6845-6852, Dec. 2015.

11. Wenjiang Huang, Qingsong Guan, JuhuaLuo, Jingcheng Zhang, Jinling Zhao, Dong Liang, Linsheng Huanand Dongyan Zhang, "New Optimized Spectral Indices for Identifying and Monitoring Winter Wheat Diseases", IEEE journal of selected topics in applied earth observation and remote sensing,Vol. 7, No. 6, June 2014

12. Monica Jhuria, Ashwani Kumar, and RushikeshBorse, "Image Processing For Smart Farming: Detection Of Disease And Fruit Grading", Proceedings of the 2013.

13. Zulkifli Bin Husin, Abdul Hallis Bin Abdul Aziz, Ali Yeon Bin MdShakaffRohaniBinti S Mohamed Farook, "Feasibility Study on Plant Chili Disease Detection Using Image Processing Techniques", 2012.

14. Mrunalini R. Badnakhe, Prashant R. Deshmukh, "Infected Leaf Analysis and Comparison by Otsu Threshold and k-Means Clustering"