International Journal of Research in Engineering, Science and Management
Volume-2, Issue-6, June-2019
www.ijresm.com | ISSN (Online): 2581-5792

Identification of Crop Diseases using Deep Learning

Maheshgouda Patil[1], Indira R. Umarji[2]
[1]*Student, Department of Computer Science and Engineering, Shri Dharmasthala Manjunatheshwara College of Engineering and Technology, Dharwad, India*
[2]*Assistant Professor, Department of Computer Science and Engineering, Shri Dharmasthala Manjunatheshwara College of Engineering and Technology, Dharwad, India*

***Abstract*: Crop diseases and harmful insects are a main challenge in the agriculture sector quick and an accurate prediction of crop diseases could help to develop an early treatment technique while considerably reducing economic losses Modern advanced developments in Deep Learning have allowed researchers to extremely improve the performance and accuracy of object detection and recognition systems we proposed a deep-learning-based approach to detect leaf diseases in many different crops using images of crop leaves Our goal is to find and develop the more suitable deep learning methodologies for our task Therefore, we Proposed our system so we are using the Deep Learning in which the CNN (Convolutional neural network) is implemented to give more accurate results here we train the set of images dataset using deep learning and all the image processing will be done by CNN internally and we build the web application using the Django for GUI purpose where we provide the option of uploading the image if the user upload image it will processed by the Deep Learning and predict the results of the various crop diseases our application is more accurate and complete its work within less time it predicts correctly most of the time.**

***Keywords*: Crop Diseases, Deep Learning, CNN, Django, Insects.**

1. Introduction

Agriculture is the strength of the Indian economy. Huge commercialize of an agriculture has built a very adverse effect on our environment. The usage of chemical pesticides has led to immense levels of chemical buildup in our surrounding, in soil, water, air, in animals and even in our own bodies. Artificial fertilizers gives on a short-term response on productivity but a longer-term gloomy effect on the environment, where they remain for years after leaching and running off, pollute ground water. Another negative effect of this tendency has been on the portion of the farming association worldwide. Despite this so-called enlarged productivity, farmers in practically every country around the world have seen a decline in their fortunes. This situation organic farming comes in. Organic farming has the facility to take care of each of these problems. The chief activity of organic farming relies on fertilization, bug and disease control. About 78% of the farmers are small and marginal in the country and they are poor in resources.

Therefore, they are not in a position to use most favorable quantity of inputs in their crops which are necessary for increasing the capacity. Most of farmers may not know the amount of fertilizer required for crops and thus it may lead to unbalanced use of fertilizer and they may also not know which pesticide/insecticide to be used for the diseased crop. Hence the crop gets affected. Here, we demonstrate the technical usefulness of using a deep learning approach utilizing 2000 images of 7 crop species with 14 diseases made openly available through the project Plant Village

Deep learning integrate a recent, latest technique for image processing and data analysis, with solid results and large probable. As deep learning has been strongly applied in different domains, it has newly entered also the sphere of agriculture. So we will apply deep learning to create an algorithm for automatic detection and classification of crop leaf diseases.

Nowadays, Convolutional Neural Networks are treated as the leading approach for object detection. A user friendly web application is developed to help farmer solve the problem of a farmer to detect a crop disease. The farmer uploads image to web application it. The image is processed using the Deep learning techniques and the disease is detected. If the leaf is affected by any disease then the name of the disease and required measures to be taken are displayed. This may prove assistance in monitoring large fields of crops, and thus naturally detect the syndrome of diseases as soon as they appear on plant leaves.

2. Related work

Here, we take few of the papers related to crop diseases detection using various leading techniques and some of them shown down.

In paper [2], author depict and to perform an analysis of 40 research attempt that employ deep learning techniques, enforced to various agricultural and food management challenges. Examine the precise agricultural problems below study, the exact models and frameworks occupied the sources, type and pre-processing of data, and the overall performance accomplish according to the metrics pre owned at each work below study. Moreover, study correlation of deep learning with

other existing famous techniques, in respect to variation in classification or regression performance. Findings hint that deep learning keep high accuracy, better existing commonly used image processing techniques.

In paper [3], author depicts about convolutional neural network models, in order to do crop disease detection and diagnosis applying simple leaves images of healthy and diseased crops, through deep learning methodologies. Training of the models was complete with the use of an open database of 87,848 images, consists of 25 different plants in a set of 58 unique classes of [crop, disease] combinations, including healthy crops. Certain model architectures were trained, with the good performance reaching a 99.53% success rate in describe the corresponding [crop, disease] combination The naturally high success rate makes the model a very useful help-in or early warning tool, and a process that could be further enhanced to support a combined plant disease identification structure to operate in real cultivation conditions.

In paper [4] author depict a methodology for previous and accurately crop diseases detection, using artificial neural network (ANN) and differing image processing techniques. As the suggested approach is based on ANN classifier for classification and Gabor filter for feature extraction, it gives good results with a recognition rate of up to 91%. An ANN classifier classifies different crop diseases and uses the combination of textures, color and features to make those diseases.

In paper [5] authors depict crop disease detection in Malus domestica through an efficient method like K-mean clustering, texture and color study. To classify and recognize different agriculture, it makes use of the texture and color features those commonly appear in normal and affected areas.

In paper [6] authors depict compared the act of conventional multiple regression, artificial neural network and the support vector machine It was completed that SVM based regression approach has led to a better explanation of the relationship between the environmental circumstances and disease level which could be used for disease management

3. Proposed methodology

We Proposed our system so we are using the Deep Learning in which the CNN (Convolutional neural network) is implemented to give more accurate results here we train the set of images dataset using deep learning and all the image processing will be done by CNN in internally and we build the web application using the Django for GUI purpose where we provide the option of uploading the image if the user upload image it will processed by the Deep Learning and predict the results of the various crop diseases our application is more accurate and complete its work within less time it predicts correctly most of the time.

A. System Architecture

The fig. 1, depicts the Architecture for the project i.e. it provides information about various modules involved in the project.

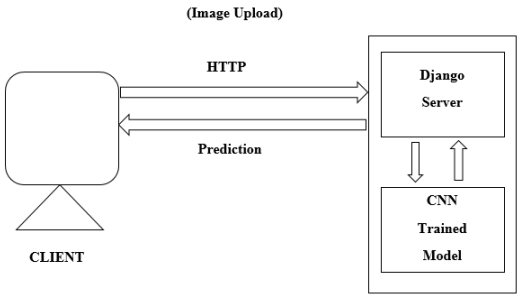

Fig. 1. System architecture design

1) Steps involved in system architecture

- Client Will Post the request to through the http to Django Server
- Launches the CNN Model
- CNN Predict the Model Send Predicted results to Django Server
- Django Server Send back predicted Results to Client
- Client will get the Actual Results

B. The Model is designed as following parameters

- **Choice of deep learning architecture:** Alex Net
- **Choice of training mechanism:** Training from Scratch.
- **Choice of dataset type:** Color
- **Choice of training-testing set distribution:** Train: 80%, Test: 20%

1) Deep learning model

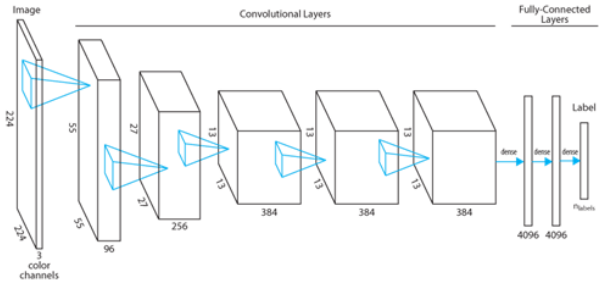

Fig. 2. Deep learning model

The fig. 2 depicts the for deep learning model the project.

2) The Deep Learning Model - It uses AlexNet Architecture

The initial layer in Alex Net is a convolutional layer. One by one neuron in the layer part as input data from an 11-pixel x 11-pixel x 3 color channel (RGB) place of the input image. The neuron's accomplished weights, which are mutually referred to as its convolution filter, complete the neuron's single-valued output result to the input. A convolution with size 55 x 55 x 1

could be formed between the neuron's tickle and the full 224 x 224 x 3 input image by falling the input region along the image's *x* and *y* element in four-pixel strides. In practice, the equivalent convolution is normally implemented by static connecting 55 x 55 identical copies of the neuron to distant input regions. Ninety-six alike sets of neurons make up the initial layer of Alex Net, allowing 96 convolution filters to be learned.

3) Convolutional neural network

In neural networks, Convolutional neural network is one of the important categories to do images identification, images classifications. Objects detections, faces identification etc., are few of the areas where CNNs are mostly used. CNN image classifications receives an input image, process it and classify it below certain categories Computers sees an input image as array of pixels and it lays on the image resolution. Placed on the image resolution, it will see h x w x dEg., an image of 6 x 6 x 3 array of matrix of RGB and an image of 4 x 4 x 1 array of matrix of grayscale image.

4) A CNN architecture has three main parts

- A convolutional layer that extracts features from an origin image. This is the necessary feature of a CNN, which works on parts of the image every time, instead of feeding all the input to every layer of the network.
- A pooling layer that down samples each and every feature to decrease its dimensionality and focus on the most of important elements. There are several rounds of convolution and pooling; and in few CNN architectures, there may be hundreds or thousands.
- A fully connected layer that straighten the features identified in the earlier layers into a vector, and cover a traditional neural network with all neurons in each and every layer connected to all neurons in the next layer, to make this a prediction about the image.

5) Keras Conv2d

- Keras is an API developed for human beings, not machines. Keras ensure best practices for decreasing cognitive load: it offers steady & simple APIs, it reduces the number of user actions vital for common use cases, and it gives clear and actionable feedback upon user error.
- This makes Keras simple to learn and easy to use. As a Keras user, you are further productive, allowing you to try more ideas than your competition, much faster which in turn helps you to win machine learning competitions.
- This ease of use does not comes at the cost of reduced flexibility: because Keras integrates with lower-level deep learning languages it enables you to implement anything to you could have built in the common language. In particular, as the Keras API integrates easily with your Tensor Flow workflows.

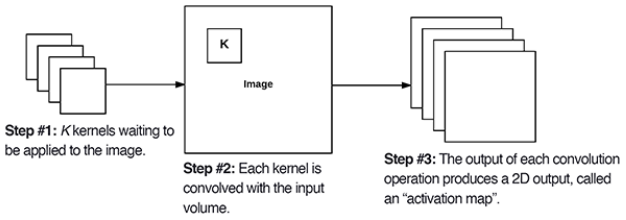

Fig. 3. The Keras Conv2D

2D convolution layer this layer creates a convolution kernel this is convolved with the layer input to gives a tensor of outputs. If use bias is true, a bias vector is build and added to the outputs. Finally, if activation is not none, it is enforced to the outputs as well. When using this layer as the first layer in a model, give the keyword argument input shape.

C. Django

We are Using Django Web Frame Work to develop our web application Is a high level Python Web framework that boost rapid development and clean, pragmatic design. Developed by experienced developers, it takes care of much Web development, so you can focus on writing your app without require to reinvent the wheel. It's free easily available.

4. Experimental result

The Graph for accuracy and loss validation the test set to train set ratio and observe that even in the at most case of training on only 20% of the data and testing the trained model on the rest 80% of the data, the model obtains an overall accuracy of 98.21%.

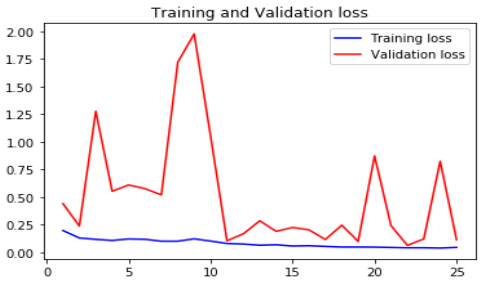

Fig. 4. The Graph for accuracy and loss validation

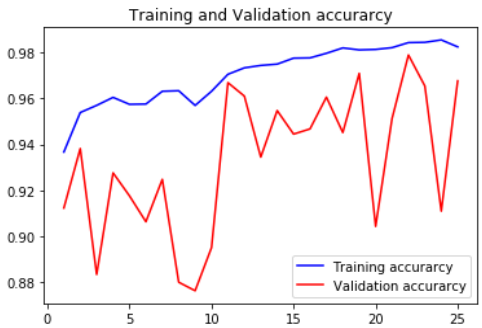

Fig. 5. The Graph for accuracy and loss validation accuracy

Fig. 6. The web application user should click on go to app

The user need to click on the go to app to as shown in figure once he clicked on the app he will gets the upload option. He need to click on choose file once user uploads image it will be processed using Deep Learning Technique and Predicted output will be displayed on screen as you see on figure the apple scab leaf image will be uploaded by user so he gets that apples scab diseases leaf as output and also if user click on the remedies he gets solution for his crop we are able to check 7 crops of 14 different diseases we have used around 20000 images for training the web application using the Django for GUI purpose where we provide the option of uploading the image if the user upload image it will processed by the Deep Learning and predict the results of the various crop diseases our application is more accurate and complete its work within less time it predicts correctly most of the time.

Fig. 7. The web application user should click on choose file and then click on predict

Fig. 8. The results of image uploaded by user i.e. apple scab

Fig. 9. The results of remedies for apple scab

A. *Advantages of this web application*

- This Web Application can be used to identify various crop diseases from the leaf images.
- This application is helpful for farmers to save their crops from the various crop diseases.
- Once they know diseases, in future they will prevent and take precautionary steps.
- From this application, farmers can improve their crop yields and which is helpful for farmers to be economically strong.
- This Web application can be made accessible to all Indian farmers to solve their problems and find solutions.
- This web application is designed to give solution for farmers for the crop diseases.

5. Conclusion

Crop protection in organic agriculture is not a simple matter. It depends on a thorough knowledge of the crops grown and their likely pests, pathogens and weeds. In our system specialized deep learning models were developed, based on specific convolutional neural networks architectures. This Application is developed for checking the various crop diseases to help farmers from this application they can check their crops diseases and prevent loss occur in future and this application also provides solution for diseases affected crops from this a farmer can monitor his crops and takes the precautionary measure to avoid various disease affected to his crops from this he can improve yield of crops and become more strong economically which will also help to grow Indian economy, as said, all these to get the better results we should use more accurate images which will help for application to identify correctly.

References

[1] Jiang Lu, Jie Hu, Guannan Zhao, Fenghua Mei, Changshui Zhang, An in-field automatic wheat disease diagnosis system, Computers and Electronics in Agriculture 142 (2017) 369–379.
[2] Andreas Kamilaris, Francesc X. Prenafeta-Boldu Deep learning in agriculture: A survey, Computers and Electronics in Agriculture 147 (2018) 70–90.
[3] Konstantinos P. Ferentinos, Deep learning models for plant disease detection and diagnosis Computers and Electronics in Agriculture 145 (2018) 311–318.
[4] Kulkarni Anand H, Ashwin Patil RK. Applying image processing technique to detect plant diseases. Int J Mod Eng Res 2012;2(5):3661–4.

[5] Bashir Sabah, Sharma Navdeep. Remote area plant disease detection using image processing. IOSR J Electron Commun Eng 2012;2(6):31–4.
[6] Rakesh Kaundal, Amar S Kapoor and Gajendra PS Raghava "Machine learning technique in disease forecasting: a case study on rice blast prediction," BMC Bioinformatics, 2006.
[7] Srdjan Sladojevic, Marko Arsenovic, Andras Anderla, Dubravko Culibrk, and Darko Stefanovic, Deep Neural Networks Based Recognition of Plant Diseases by Leaf Image Classification, Hindawi Publishing Corporation, Computational Intelligence and Neuroscience, Volume 2016.
[8] J. Howse, OpenCV Computer Vision with Python, Packt Publishing, Birmingham, UK, 2013.
[9] D. M. Hawkins, "The problem of over-fitting," Journal of Chemical information and Computer Sciences, vol. 44, no. 1, pp. 1–12, 2004.
[10] C. C. Stearns and K. Kannappan, "Method for 2-D affine transformation of images," US Patent No. 5,475,803, 1995.
[11] Sankaran, S. Mishra, A.; Ehsani, R. A review of advanced techniques for detecting plant diseases. Comput. Electron. Agric. 2010, 72, 1–13.
[12] Huang, J., Rathod, V., Sun, C.; Zhu, M., Korattikara, A., Fathi, A., Fischer, I., Wojna, Z.,Song, Y., Guadarrama, S., et al. Speed/accuracy trade-offs for modern convolutional object detectors. In Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition, Honolulu, HI, USA, 22–25 July 2017.
[13] Alvaro Fuentes, Sook Yoon, Sang Cheol Kim and Dong Sun Park, "A Robust Deep Learning-Based Detector for Real-Time Tomato Plant Diseases and Pests Recognition," Sensors, 2017.