Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X
IMPACT FACTOR: 6.199

IJCSMC, Vol. 8, Issue. 9, September 2019, pg.18 – 23

LEAF DISEASE DETECTION AND DISEASE IDENTIFICATION USING ARTIFICIAL DEEP LEARNING NEURAL NETWORK

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ABSTRACT: Plant disease analysis is to identify the percentage and the exact location of plant diseases caused by viruses, fungi and bacteria. When one part of the leaf is affected by disease and another part is also affected as soon. In our work, identifying the disease spot at early stages, the growth level of the diseases. The classification is one of the most energetic research and relevance area of neural network. Multilayer perception is used to classify the leaf diseases and the back propagation algorithm is used to calculate the disease spot by total area of the leaf. Implementation has been done by using MATLAB 2017a simulation tool which generates better result for clustering algorithm.
Keywords: Plant disease, Neural network, classification, multilayer perception, Back propagation.

I. INTRODUCTION

Now days, a new idea of clever farming has been introduced the place the field stipulations are managed and monitored the use of the self working systems. The self-recognition of the ailment is primarily based on the identification of the symptoms of disease. So that statistics about the disease occurrence ought to be rapidly and precisely supplied to the farmers, professionals and researchers. This in flip reduces the monitoring of large discipline by using human being. In disease recognition from photograph the key is to extract the characteristic feature of the diseased region. According to the disorder the features can also vary. The aspects that are extracted from the image are color, shape, texture etc. Sometimes for detection of the ailment more points are extracted and this extracted feature would amplify the hardware as properly as software program cost. This similarly reasons extend in the complexity and the computation time.

Hence it is imperative to minimize the feature data. A plant disease is any irregular condition that alters the appearance or function of a plant, thus it is a physiological process that affects some or all plant functions. Plant disease affects both the quality and quantity of the crops. The Image processing plays a main role to detect the plant leaf diseases. Automatic detection of plant diseases is to monitoring large fields of crops, and thus automatically detects the symptoms of diseases as soon as they appear on plant leaves. Monitoring of health and disease on plant plays an important role in successful cultivation of crops. Detecting plant leaf disease the image should go through some process like image pre-processing, segmentation, feature extraction and classification processes. Here the coconut, turmeric and groundnut leaf images are preprocessed to remove unwanted distortion. Once preprocessing done segmenting the images into regions and it is essential process to extract the images. Various features of an image such as grayscale, HSV, CYK and so on. Classification is done by using multilayer perception for classifying the diseases based on bacteria, fungi and viruses and back propagation is to calculate the diseases affected area from the total leaf image with the affected images.

II. PLANT DISEASE ANALYSIS

Disease management may be a difficult task. Principally diseases square measure seen on the leaves or stems of the plant. Precise quantification of those visually discovered diseases, pests, traits has not studied however as a result of the complexness of visual patterns. Hence there has been increasing demand for a lot of specific and complex image pattern understanding. The various types of leaf spot diseases are: Fungal, Bacteria and Viruses.

A. Fungal:

Fungi area unit the fore most common parasites inflicting disease. Most area unit microscopic plants that kill living inexperienced plants or on dead organic material. Once they attack living plants, an illness results. Fungi typically turn out spores that, once carried to a plant, will begin an infection. So as for plant life spores to start new infections, adequate wet and therefore the right air temperature area unit needed. A plant wound is typically additionally required as an entry for the plant life. Plant life diseases area unit common throughout wet and wet seasons.

For identifying fungal diseases in leaves and their symptoms

- Leaf Spots
- Leaf Blights
- Rust
- Downy Mildew
- Powdery mildew

A symptom of un-wellness could be a visible impact of disease on the plant. Symptoms could embody a detectable amendment in color, form or operate of the plant because it responds to the microorganism. The Symptoms of fugal diseases are:

- Birds eye spot
- Damping off of seedlings
- Leaf spot (septoria brown spot)
- Chlorosis (yellowing of leaves)

B. Bacteria

Bacteria are single-celled microscopic organisms. Some attack living plants and cause plant disease. Bacteria can be carried from plant to plant by wind, rain splash, insects and machinery.

Bacterial disease signs (difficult to observe, but can include):

- Bacterial ooze
- Water-soaked lesions
- Bacterial streaming in water from a cut stem

Bacterial disease symptoms:

- Leaf spot with yellow halo
- Fruit spot
- Canker
- Crown gall
- Sheperd’s crook stem ends on woody plants

C. Viruses:

Viral disease signs:

- None – the viruses themselves can’t be seen

Viral disease symptoms:

- Mosaic leaf pattern
- Crinkled leaves
- Yellowed leaves
- Plant stunting

Figure 1: Bacterial Leaf Spot

Figure 2: Fungal Leaf Spot

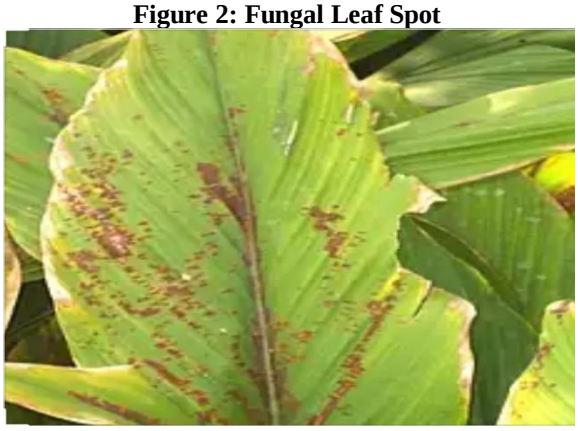

Figure 3: Viral Leaf Spot

III. STANDARED AREA DIAGRAM:

It divides rust intensity into five grades representing 0,5,10,20 and 50% of leaf area occupied by the visible or sporulating rust pustules. The highest grade(50%) represented maximum possible cover. A common formula as fallows is generally used to calculate the average infection index, sometimes also known as disease index or percent disease index, which is calculate as fallows.

Percent Disease Index(PDI)= $\frac{Sum\ of\ all\ disease\ rating \times 100}{Total\ number\ of\ ratings \times Maximum\ disease\ grade}$

Severity estimates from fairly small areas can be combined cover large areas, villages or state. This overall index can be obtained by using the formula.

Percent Disease Index(PDI)= $\frac{Field\ rating\ class \times Number\ of\ hectares\ in\ the\ class}{Total\ number\ of\ hectares}$

For Measuring Severity

0: No diseases on leaf and pods.
1: Small brown spot covering < 1% leaf area(pin points spot on pod).
3: Brown sunken spot 1-10% leaf area (< 1% pod area).
5: Brown spot 11-25% leaf area (1-10% pod area).
7: Circular brown sunken spots 26-50% leaf area (11-25% pod area).
9: Circular to irregular >51% leaf area(> 25% pod area).

IV. CLASSIFICATION ALGORITHM:

The image classification fallows the steps as pre-processing, segmentation, feature extraction and classification. In the classification system information is incredibly vital that contains predefined sample patterns of objects into account that compare with the test object to classify it appropriate classes. Image classification is a crucial task in various fields such as statistics, remote sensing, biological images and medical images. In a typical organization images is captured by a camera and some are taken through web. Multilayer and back propagation algorithm is used to classify the diseased leaf images and calculate the affected leaves from various plant leaves.

A. MULTILAYER PERCEPTION:

The supervised learning drawback of the multilayer perception is often solved with the back propagation algorithm. The algorithmic rule consists of two steps: with in the forward pass, the expected outputs are calculated resembling the given inputs. Within the backward pass, partial derivatives of the price perform with regard to the different parameters are propagated back through the network. A typical multilayer perception (MLP) network consists of a collection of supply nodes forming the input layer, one or more additional hidden layer of computation nodes, and an output layer node. The sign propagates through the network layer – by – layer. Multi layer feed forward back propagation algorithm is employed to coach the network and tests the performance of the network. Multilayer perception network square measures usually used in supervised learning issues this implies that there is a training set of input-output pairs and also the network should learn to model the dependency between them. Multilayer perception (MLP) network may be a well-liked learning algorithm rule in an exceeding sense that neural network is aware of the required output and adjusting of weight coefficient is finished in such means, which calculated and desired outputs square measure as close and possible.

B. FEED FORWARD BACK PROPOGATION METHOD:

Another main part of this work is that the integration of a feed-forward back propagation neural network. The inputs of the neural network or the individual tokens of a leaf image, and as a token usually consist of a cosines and sinus angle, the quality of input layers for this network. In this network, the information moves in exactly one direction, forward, from the input nodes, through the hidden nodes and to the output nodes. There are not any cycles or loops within the network. Multi-layer networks use a spread of learning techniques, the most in style being back propagation. Here, the output values square measure compared with the right answer to compute the value of some predefined error –function. By various techniques, the error is then fed back through the network. Using this data, the formula algorithmic rule adjusts the weight of each association so as to cut back the worth of the error function by some bit. When continuance this process for a sufficiently sizable amount of training cycles, the network will sometimes converge to some state wherever the error of the calculations is tiny. During this case, one would say that the network has learned a precise target operates. Back propagation network is taken into account to be example neural network. Back propagation is that the training or learning algorithm instead of the network itself to coach the network we want to offer the output referred to as the target for a particular input. Once the network is trained, it will provide the required output for any of the input patterns. The network is first analyzed by setting up all its weights to be small random numbers say between -1 to +1.The calculation offers associate in nursing output which is totally different to what expected the target. Since all the weights square measure random we have a tendency to then calculate the error of every somatic cell that is essentially: target- actual output. The error is used mathematically to change the weights in such a way that the error can get smaller. In the other words the output of every somatic cell can meet up with to its target. The process is recurrent again and one more till the error is tokenize. The neurons have a sigmoid activation operate. The network keeps coaching all the patterns recently till the entire error falls to some pre-determined low target worth then it stops. When the network has totally trained, the validation set error reaches a minimum once the network is overtraining the validation set error start raising.

V. RESULT AND DISCUSSION

All the experiments are implemented by RMatlab 2017a. The sample of leaf images belonging to 3 classes (i.e Bacterial, fungal and viral). The database consists of three plant leaves that have various shapes, colors and sizes. We checked the plant leaves based on the classes and split the images based on that. The classes contain more number of leaves that are differentiated from the plant leaves. Finally, the sample output of work is given below.

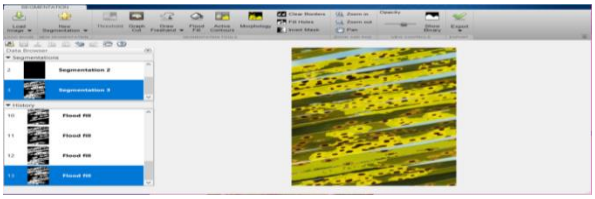

Figure 4: Sample output Segmented Bacterial Spot Image

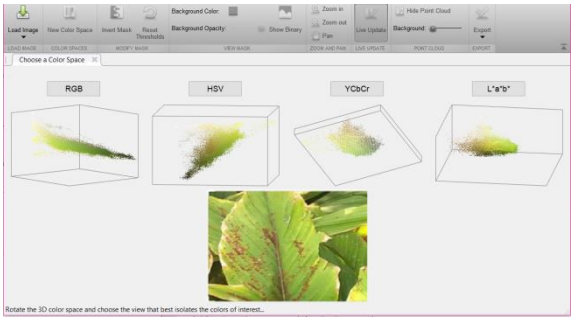

Figure 5: Sample Color Segmentation for Viral Leaf Spot

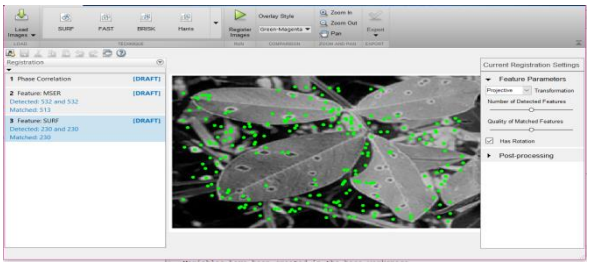

Figure 6: Sample Disease Identification using Multilayer Perception algorithm

Disease Grade	Total Rating	Number of Ratings
0	5	0
1	5	5
3	8	24
5	4	20
7	8	56
9	4	36
Total	34	186

Table 1: Disease Severity Grade chart

$$(PDI)= \frac{Sum\ of\ all\ disease\ rating \times 100}{Total\ number\ of\ ratings \times Maximum\ disease\ grade}$$

Sum of all disease rating = 186
Total Rating = 34
PDI (Disease Severity) = $\frac{186 \times 100}{34 \times 9}$

VI. CONCLUSION

In our work, we would like to conclude that is an efficient and accurate technique for a detection of bacteria, fungal and viral diseases of plant leaves. In our work plant leaf diseases are detected by Multilayer perception classification algorithm. The Multilayer perception classifies based on color, shape and texture of the images based on the plant leaves. A Back propagation neural network for recognition of leaves is implemented in this paper. The training set contains minimum three spices for each type of leaf in each data file. Using more number of species in training set and number of output nodes can increase the detection ability. Using quick training algorithms without losing recognition performance can enhance the scope of this work.

REFERENCES

[1] Jean Beagle Ristaino: Tracking[Augus2006] The Evolutionary History of The Potato LateBlight Pathogen with historical Collections, Outlooks on Pest Management.

[2] H.AI-Hiary, S.Bani-Ahmad, M.Reyalat, M.Braik&Z.AIRahamneh [2011] Fast and accurate detection and classification of plant disases, International Journal of Computer applications90975-88870, Volume 17-no.1, pp 31-38).

[3] Mr.Pramod and S. Landge, "Automatic Detection and Clssification of Plant Disease through Image Processing", International Journal of Advanced Reasearch in Computer Science and Software Engineering, Volume 3, Issue 7, ISSN: 2277 128X,2013.

[4] Jayme Garcia, ArnalBarbedo, "Digital Image Processing Techniques for Detecting, Quantifying and Classifying Plant Diseases", Springer Plus, 2013.

[5] M. Egmont-Petersen, "Image processing with neural networks", Elsevier, Volume 35, Issue 10, October 2002, Pages 2279-2301, 2002.

[6] Georgr, E.F, Plant propagation by tissue culture. Part 1: The technology.1993 No.Ed. 2pp.vii + 574 pp.ref.71 pp.of.

[7] T Rumpf and L.Plumer, Early Detection and Classification of Plant diseases wit support vector Machines based on Hyperspectral reflectance, Computers and Electronics in Agriculture, Volume 74, Issue 1, October 2010, Pages 91-99.

[8] Sindhuja Sankaran, Ashish Mishra, Reza Ehsani, Cristina Davis, A review of advanced techniques for detecting plant diseases, Computers and Electronics in Agriculture 72 (1), 1-13,2010.

[9] Vijai singh and A.K.Misra, Detection of Plant leaf diseases using image Segmentation and Soft computing techniques, Information Processing in Agriculture 4 (2017) 41-49.

[10] Kulkarni anand H, Ashwin Patil RK, Applying Image processing technique to detect plant diseases. Int J Mod Eng Res 2012;2(S):3661-4.

[11] Jagadeesh D. Pujari, Rajesh Yakkundimath, Abdulmunaf S.Byadgi, Image Processing Based Detection of Fungal Diseases in Plants, International Conference on Information and Communication Technologies (ICICT 2014).

[12] Chen. YR, Chao K, Moon SK, Machine Vision Technology for agricultural Applications. Compuetr and Electronics in Agriculture;2002, vol.36, no.2-3,pp.173-191.

[13] Megha S, Niveditha C.R, Sowmyashree.N, Vidhya.K, Image Processing System for Plant Disease Identification by Using FCM Clustering Techniques, International Journal of Advance Research, Ideas and Innovations in Technology, ISSN: 2454-132X,Volume 3,Issue2.

[14] Nikos Petrellis, "Plant Disease Diagnosis Based on Image Processing, Appropriate for Mobile Phone Implementation", 7th International Conference on Information and Communication Technologies in Agriculture (HAICTA), pp.238-246,2015.

[15] Savita N.Ghaiwat and Parul Arora, "Detection and Classification of Plant Leaf Diseases Using Image Processing Techniques: A Review, International Journal of Recent Advances in enginerring and Technology(IJRAET), pp.2347-2812,2014.

[16] Prof.sanjay B. Dhaygude, Mr.Nitin P.Kumbhar, "Agricultural plant Leaf Disease Detection Using Image Processing" IJAREEIE, vol.2(1),pp. 599-602, January 2013.

[17] Jayamala K. Patil, Raj Kumar, "Advances in Image Processing For Detection of Plant Diseases" JABAR, vol.2(2),pp.135-141, June-2011.

[18] Sachin D.Khirade, A.B.Patil, Plant Disease Detection Using Image Processing, International Conference on Computational Communication Control and Automation,2015.

[19] Ananthi, S. Vishnu varthini, Detection and Classification of Plant Leaf Diseases, International Journal of Research in Engineering and Applied Sciences, Volume 2, Issue 2 (February 2012) ISSN: 2249-3905.

[20]. Dr.N.Nagarajan and R.Shanmugavadivu, "Network Intrusion Detection System Using Fuzzy Logic", Indian Journal of Computer Science and Engineering (IJCSE), ISSN : 0976-5166 Vol. 2 No. 1.

