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ML BASED LEAF DISEASE DIAGNOSTIC TECHNIQUE

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ABSTRACT

The quality of crop yield is reduced due to leaf diseases in agriculture. Therefore, it is possible to automatethe recognition of leaf diseases to improve yield in the farming sector. However, most systems lack in performance due to different patterns of leaf disease that influence the precision of detection. In this paper, a computer vision framework is developed by framing a model that consists of image acquisition, feature extraction and image classification. A deep learning classifier namely Deep Belief Network (DBN) is used for classification of realtime images. The experimental results on pepper plant leaf disease detection show that the proposed method has improved rate of classification than other existing methods. The classification result shows that whether the leaf is diseased or not

Keywords : the pepper bell leaf; using Convolutional Neural Networks; plant illness

I .INTRODUCTION

According to recent studies, there are currently between 220,000 and 420,000 species of flowering plants on Earth. Despite the fact that many species of animals are in danger of extinction because to catastrophic weather and pollution catastrophes, there are still many unidentified species.

Acknowledgement of a specific project to promote studies on biodiversity conservation and environmental monitoring

Today, automated plant identification in a variety of sectors can take the place of human sorting by subject matter experts from catalogues of enormous plant species, offeringa number of benefits including cost and time savings as well as improved accuracy. Plants contain essential data for emerging nations whose economies depends heavily on agriculture. Identification of seeds, leaves, stems, and pests or diseases, as well as the prevalence of such things, is essential for successful crop production or illnesses, signs of disease outbreaks or pest invasions. Plant diseases are now becoming an issue since they can significantly reduce the quality and quantity of agricultural

products as well as increase the overall expense of damage. The suggested method

intends to create an automatic system by assessing GA quality using PNN for variousillnesses of tomato leaf detection and
classification . Cultures are currently altered as a result of several diseases. Since some bird species can be harmed by insecticides, their effectiveness is not always understood.Indian agriculture offered a wide range of fruits and vegetables from which to select a suitable seasonal crop. With technical support and guidance, it will be strengthened.The suggested technique seeks to create a plant leaf disease detection system based on artificial neural networks.

II. LITERATURE SURVEY

The following table presents some of the existing works on plant leaf diseases detection:

S.No	Reference	Publication & year	Contributions	Techniques Used here	Results
1.	Shivkuma rBagde	IJCSM C2015	The research's primary objective is to boost the effectiveness of the disease detection approach.	Texture, K-means clustering, and SGDM Matrix Generation Computing statistics, the colour co-occurrence technique, the Otsu method, and artificial neural networks.	An image-based algorithm to determine if a plant is healthy or hazardous of computer learning algorithms and plant leaves.
2.	Aydin Kaya	ELSEVI ER2019	The technique for categorised plant species described in this paper makes use of automated plant systems for identification.	CNN from beginning to end, cross-dataset fine tuning,deep Learning attributes	This approach obtained average classification accuracy of up to 95%.Flavia Swedish Leaves Plant Village andUCI
3.	Md. Nazrul Islam	ICEC TE 2012	Implement an automated disease diagnosis and recognition system based on computer vision.The classification technique for plant leaves by evaluating the	Probabilistic Neural Network with Genetic Algorith m(GA) and (PNN).	The model demonstrates that Genetiec Algorithm has the best overall effectiveness,classification performance, outperforming PNN's 94.75 percent accuracy with an overall accuracy of 97 percent.

			effectiveness of GA and PNN		
4.	Amandeep Singh	IEEE 2018	This study suggests a way for paddy crop forecasting using image processing technology that is easily understood and trustworthy.	Determine and analysis of histograms.	The degree of accuracy was great.
5.	Alexander Johannes	ELSEVIER2018	In this article, an algorithm for identifying plant diseases with mobile devices is recommended for recording.	Preprocessing of Images	The classification results on the K-fold evaluation dataset. Rust, 0.85, 0.82, 0.7, 0.95 (Tan Place, 0.89, 0.73, 0.69, 0.78; Septoria, 0.90, 0.85, 0.91). Particularly (Disease AuC Accuracy Sensitivity)
6.	Siddhartha Singh Chauhan	IEEE 2018	The plan of action for automatically employing an artificial intelligence approach offered in the current research to discover and identify plant leaf diseases.	Techniques for determining bacteria and neural radial basis functions network.	K-Means' average specificity is 0.7914.Thegenetic algorithm's average specificity is0.8139. The BRBFNN's typicalspecificity is 0.8558.
7.	Artzai Picon	IEEE 2018	The Deep Residual NeuralNetwork approach suggested in this paper might identify various Plant diseases in their natural acquisition environments.	Residual Neural Network	An image of a plant leaf with septoria symptoms is used to illustrate the algorithm results. Specification is 0.96, BAC is 0.96, and Sensitivity is 0.94.
8.	Srdjan Sladojevic	Hindawi2016	This research illustrates a technique to diagnose plant diseases by predicting leaves using Deep Neural Systems	Fine-tuning and Training of Neural Networks	After some tweaking, an accuracy of 96% wasattained.
9.	Chia-Lin Chung	ELSEVIER2016	The way to develop a model that determines if	classifiers utilising support	This technique exhibits a very high degree of

			the crop is healthy or not was proposed in this paper not employing machine learning, image processing, and machine vision approaches (i.e. Bakanae illness).	vector machines (SVM)	disease detection accuracy.
10.	P. Revathi	IJCSI T 2018	Research on the value of data mining techniques in the agricultural industry.	ABC algorithm, SVM, and machine learning methods	Emphasises the value of machine learning for detecting plant diseases

III. PROPOSED WORK

In this study, CNN was utilised to find bacterialspots on bell pepper leaves. One of the main subcategories of neural networks for image
recognition and classification is (CNNs).CNNsare frequently utilised in a variety of
applications, including object detection, identification, etc. CNN uses an input image, analyses it, and assigns the items in it to several categories.

Convolutional layer:

The first layer to remove features from an input image is convolution. Convolution maintains the association by learning visual features from tiny squares of input data pixel to pixel. The "Feature Map" filter matrix is then multiplied by the image matrix conversion.

Figure 1 a) Infected Pepper Bell leaf

Figure 1 b) Healthy Pepper Bell leaf

Strides:

The number of pixels in a stride is how many pixels cross the results matrix. The filters are moved one pixel at a time if the step is 1. We immediately swap the filters, then move on to 2 pixels.when phase 2 is present.

Padding:

Sometimes the filter may not match the supplied image perfectly. We have two possibilities: the image with zero padding to fit.The area of the image where the filter did not fit should be eliminated. This is referred to as true padding and only makes up a portion of the actual image.

Non linearity (RELU):

ReLU stands for a rectified linear unit for anon-linear operation.

$$f(x) = \max(0, x).$$

The purpose of ReLU is to add non-linearity toour ConvNet.

ReLU may be substituted with other non-linear functions such as tanh or sigmoid.

Pooling layer:

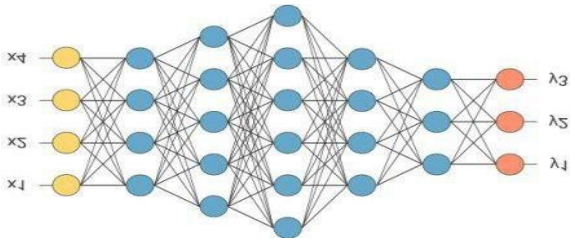
Section pooling layers would lessen the number of parameters if the images were too huge.

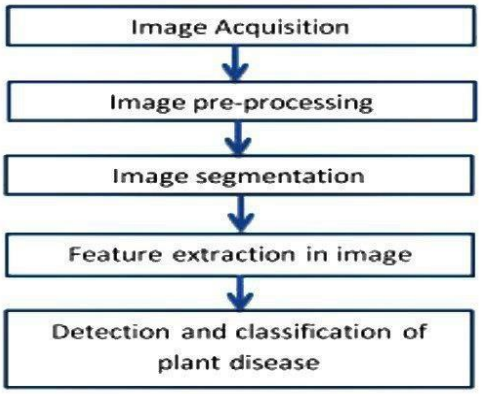
Subsampling or down sampling, a synonym for spatial pooling, reduces each dimensionality of the map while preserving significant data.

Multiple forms of spatial pooling are possible:

- Max pooling
- Average Pooling
- Sum Pooling.

The largest element is taken from the rectified feature map using max pooling. Additionally, it might take the biggest component from the typical pooling.Definitions for each component in thecomplete pooling is a function map.





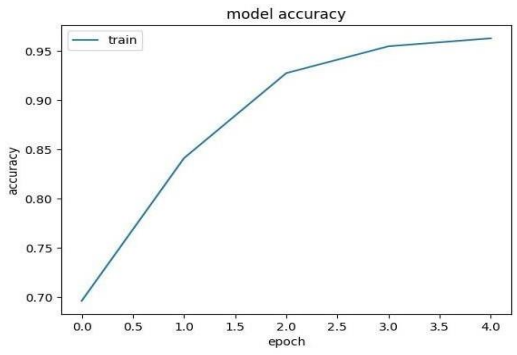
To analyse the image, Keras and the Tensor Flow Library were used. In this research, many hundred leaves have been tested. When the surrounding area is well-lit,it is photographed. To determine if two different varieties of leaves are healthy or sick, the method employs neural networks.

Everywhere in the world where tomatoes and peppers are cultivated in dry, damp environments, the disease is present. The majority of diseases are present in leaves, so classifying the healthy and diseased leaves can improve crop yield. The experiment's results are displayed in the table below. Test accuracy was 96.78%. To date,gathered pictures of bell peppers from the garden and verified to see if our system effectively classified them. For screening, twenty leaves were given, and the procedure correctly identifying the healthy leaves from the sick leaves.

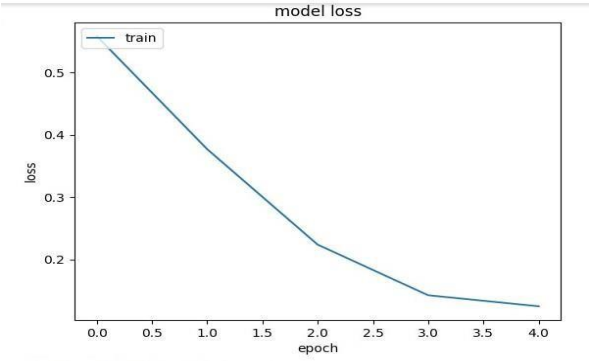
Table 1. Diseased leaf Identification Results

SL NO	LEAF NAME	RESULT
1	Sample 1	Unhealthy
2	Sample 2	Unhealthy
3	Sample 3	Unhealthy
4	Sample 4	Unhealthy
5	Sample 5	Unhealthy
6	Sample 6	Healthy
7	Sample 7	Healthy
8	Sample 8	Healthy
9	Sample 9	Unhealthy
10	Sample 10	Unhealthy
11	Sample 11	Unhealthy
12	Sample 12	Healthy
13	Sample 13	Healthy
14	Sample 14	Unhealthy
15	Sample 15	Healthy
16	Sample 16	Unhealthy
17	Sample 17	Healthy
18	Sample 18	Healthy
19	Sample 19	Healthy
20	Sample 20	Unhealthy

Training and Validation Accuracy



Training and Validation Loss



V. CONCLUSION

There are numerous approaches to automatic or computer vision plant disease identification and classification, however this area of study is still undeveloped.

Therefore, there are still no marketable commercial approaches, with the exception of

those that are focused with identifying plant species based on images of the leaves. In order to diagnose and recognise the disease, this study presents a picture recognition system that is based on neural networks. To detect disease, the leaves of the bell pepper plant are gathered as a group of leaves. With this method, it is possible to discern between healthy and diseased plants and get superior results. Because of this, managing insect populations is crucial for managing issues with pepper plants.Diseases connected to peppers can destroy your health.Like a virus or wilt, pepper-related diseases will obliterate your entire garden. The best course of action when there are problems with the pepper crop is to remove the sick plant before the entire gardenis diseased. We can create an integrated IOT application that uses CNN to successfully distinguish between unhealthy and healthy plant leaves.

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