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Crop Disease Diagnosis and Remedies

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ABSTRACT

Agriculture plays a crucial role in the Indian economy. Early detection of plant diseases is very much essential to prevent crop loss and further spread of diseases. Most plants such as tomato, corn and potato which show visible symptoms of the disease on the leaf. These visible patterns can be identified to correctly predict the disease and take early actions to prevent it. This can be overcome by the use of machine learning and deep learning algorithms. Hence, we are proposing a method that which is detecting the disease of a plant from their leaf images. Here, the process is performed by using deep learning algorithms along with machine learning methods. Once after training, the dataset with the algorithms, the images are classified and appropriate remedies are suggested.

Keywords: Plant diseases, machine learning, deep learning, CNN, ANN, SVM.

1. INTRODUCTION

The automated identification of plant diseases based on plant leaves is a major landmark in the field of agriculture. Moreover, the early and timely identification of plant diseases positively impacts crop yield and quality. Due to the cultivation of a large number of crop products, even an agriculturist and pathologist may often fail to identify the diseases in plants by visualizing disease-affected leaves. However, in the rural areas of developing countries, visual observation is still the primary approach of disease identification. It also requires continuous monitoring by experts. In remote areas, farmers may need to travel far to consult an expert, which is time-consuming and expensive. Automated computational systems for the detection and diagnosis of plant diseases assist farmers and agronomists with their high throughput and precision. In order to overcome the above problems, researchers have thought of several solutions. Various types of feature sets can be used in machine learning for the classification of plant diseases. Among these, the most popular feature sets are traditional handcrafted and deep-learning (DL)-based features. Pre-processing, such as image enhancement, color transformation, and segmentation, is a prerequisite before efficiently extracting features. After feature extraction, different classifiers can be used.

Exploiting common digital image processing techniques such as colour analysis and thresholding were used with the aim of detection and classification of plant diseases. Various different approaches are currently used for detecting plant diseases and most common are artificial neural networks (ANNs) and Support Vector Machines (SVMs). They are combined with different methods of image pre-processing in favour of better feature extraction.

In machine learning and cognitive science, ANN is an information-processing paradigm that was inspired by the way biological nervous systems, such as the brain, process information. The brain is composed of a large number of highly interconnected neurons working together to solve specific problems. An artificial neuron is a processing element

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with many inputs and one output. Although artificial neurons can have many outputs, only those with exactly one output will be considered. Their inputs can also take on any value between 0 and 1. Also, the neuron has weights for each input and an overall bias.

Detecting plant diseases using the deep convolutional neural network trained and fine-tuned to fit accurately to the database of a plant's leaves that was gathered independently for diverse plant diseases. The advance and novelty of the developed model lie in its simplicity; healthy leaves and background images are in line with other classes, enabling the model to distinguish between diseased leaves and healthy ones or from the environment by using deep CNN.

Implementing the appropriate management strategies like fungicide applications, disease-specific chemical applications, and vector control through pesticide applications could lead to early information on crop health and disease detection. This could facilitate the control of diseases and improve productivity.

2. LITERATURE SURVEY

[1] Monica Jhuria, Ashwini Kumar, and Rushikesh Borse: Due to the increasing demand in the agricultural industry, the need to effectively grow a plant and increase its yield is very important. In order to do so, it is important to monitor the plant during its growth period, as well as, at the time of harvest. In this paper image processing is used as a tool to monitor the diseases on fruits during farming, right from plantation to harvesting. For this purpose artificial neural network concept is used. Three diseases of grapes and two of apple have been selected. The system uses two image databases, one for training of already stored disease images and the other for implementation of query images. Back propagation concept is used for weight adjustment of training database. The images are classified and mapped to their respective disease categories on basis of three feature vectors, namely, color, texture and morphology. From these feature vectors morphology gives 90% correct result and it is more than other two feature vectors.

Summary: In this paper image processing is used as a tool to monitor the diseases on fruits during farming, right from plantation to harvesting. For this purpose artificial neural network concept is used. Three diseases of grapes and two of apple have been selected. The system uses two image databases, one for training of already stored disease images and the other for implementation of query images. Back propagation concept is used for weight adjustment of training database.

[2] Shiv Ram Dubey, Anand Singh Jalal: Diseases in fruit cause devastating problem in economic losses and production in agricultural industry worldwide. In this paper, an adaptive approach for the identification of fruit diseases is proposed and experimentally validated. The image processing based proposed approach is composed of the following main steps; in the first step K-Means clustering technique is used for the defect segmentation, in the second step some state of the art features are extracted from the segmented image, and finally images are classified into one of the classes by using a Multi-class Support Vector Machine. We have considered diseases of apple as a test case and evaluated our approach for three types of apple diseases namely apple scab, apple blotch and apple rot. Our experimental results express that the proposed solution can significantly support accurate detection and automatic identification of fruit diseases.

Summary: The image processing based proposed approach is composed of the following main steps; in the first step K-Means clustering technique is used for the defect segmentation, in the second step some state of

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the art features are extracted from the segmented image, and finally images are classified into one of the classes by using a Multi-class Support Vector Machine. We have considered diseases of apple as a test case and evaluated our approach for three types of apple diseases namely apple scab, apple blotch and apple rot.

[3] **Manisha A. Bhange, Prof. H. A. Hingoliwala:** In this paper, we suggest a solution for the detection of pomegranate fruit disease (bacterial blight) and also the solution for that disease after detection is proposed. Bacterial Blight need to control at primary stages otherwise it will lead to economic loss. Web-based system used to help non experts in identifying fruit diseases, based on the picture representing the symptoms of the fruit. Farmers can take the photo of the fruit disease and upload it to the system. Then system will show to the farmer is the fruit is infected by the bacterial blight or not. We have added new approach of Intent Search in this system that is useful when quality of input image is poor. The image processing based proposed system uses two image databases, one for training and other for testing. The images are classified and mapped to their respective disease categories on basis of three feature vectors namely, color, texture and morphology.

Summary: In this paper, we suggest a solution for the detection of pomegranate fruit disease (bacterial blight) and also the solution for that disease after detection is proposed. Bacterial Blight need to control at primary stages otherwise it will lead to economic loss. Web-based system used to help non experts in identifying fruit diseases, based on the picture representing the symptoms of the fruit.

3. PROPOSED SYSTEM

In our proposed method, we are performing the prediction of the plant diseases. Here, we are proposing a method that which is detecting the disease of a plant from their leaf images and providing remedies. Here the process is performed with machine learning along with deep learning algorithms like Convolutional Neural Network. Once after training the dataset with the algorithms the images are classified.

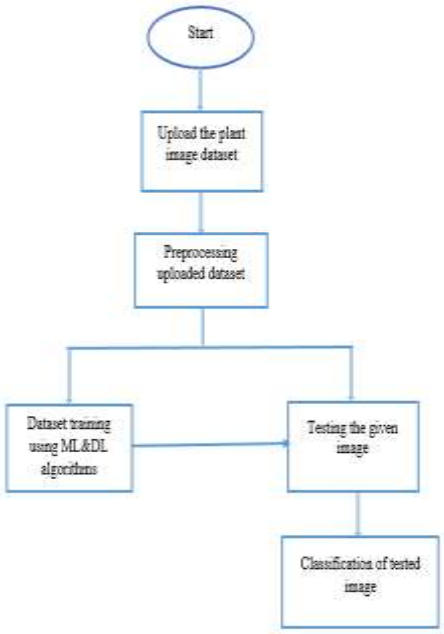

Fig1 : Block diagram of proposed method

3.1 Convolutional Neural Network

Step1: convolutional operation

The first building block in our plan of attack is convolution operation. In this step, we will touch on feature detectors, which basically serve as the neural network's filters. We will also discuss feature maps, learning the parameters of such maps, how patterns are detected, the layers of detection, and how the findings are mapped out.

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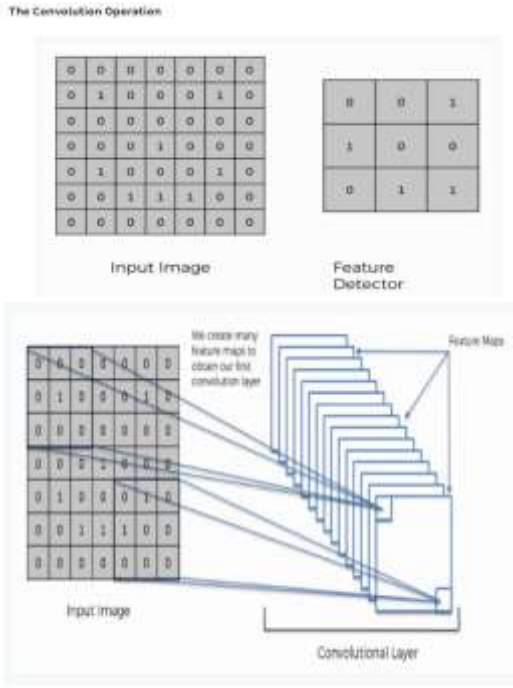
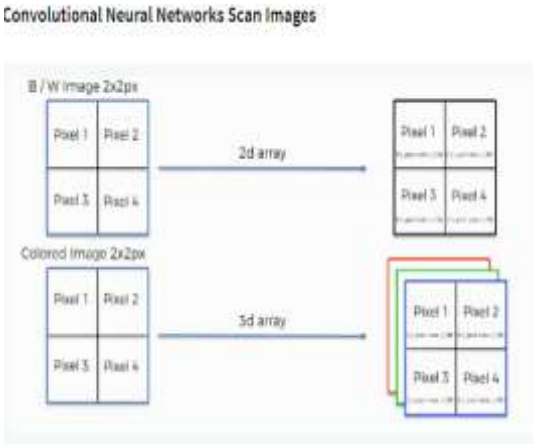


Step (1b): ReLU Layer

The second part of this step will involve the Rectified Linear Unit or Relook. We will cover Relook layers and explore how linearity functions in the context of Convolutional Neural Networks.

Not necessary for understanding CNN's, but there's no harm in a quick lesson to improve your skills.



Step 2: Conv2D

Keras Conv2D is 2D Convolution Layer; this layer creates a convolution kernel that is wind with layers input which helps produce a tensor of outputs.

Kernel: In image processing kernel is a convolution matrix or masks which can be used for blurring, sharpening, embossing, edge detection, and more by doing a convolution between a kernel and an image

Step 3: Flattening

This will be a brief breakdown of the flattening process and how we move from pooled to flattened layers when working with Convolutional Neural Networks.

Step 4: Full Connection

In this part, everything that we covered throughout the section will be merged together. By learning this, you'll get to envision a fuller picture of how Convolutional Neural Networks operate and how the "neurons" that are finally produced learn the classification of images.

Summary

In the end, we'll wrap everything up and give a quick recap of the concept covered in the section. If you feel like it will do you any benefit (and it probably will), you should check out the extra tutorial in which Softmax and Cross-Entropy are covered. It's not mandatory for the course, but you will likely come across these concepts when working with Convolutional Neural Networks.

4. RESULTS AND DISCUSSION:

Here in our project we train our datasets using some algorithms like CNN, SVM and ANN

Home Page: This page displays the basic information of our project.

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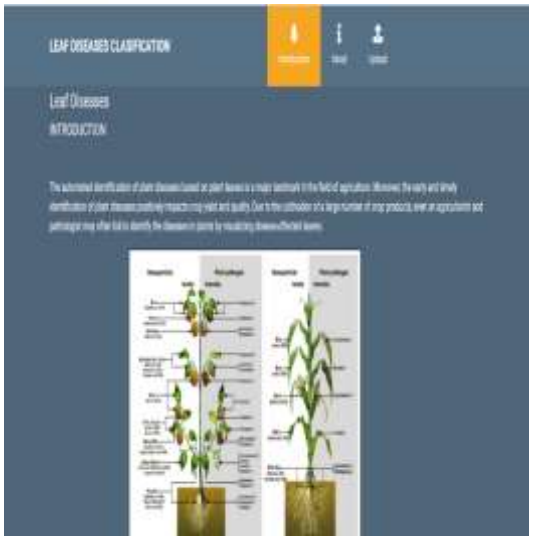
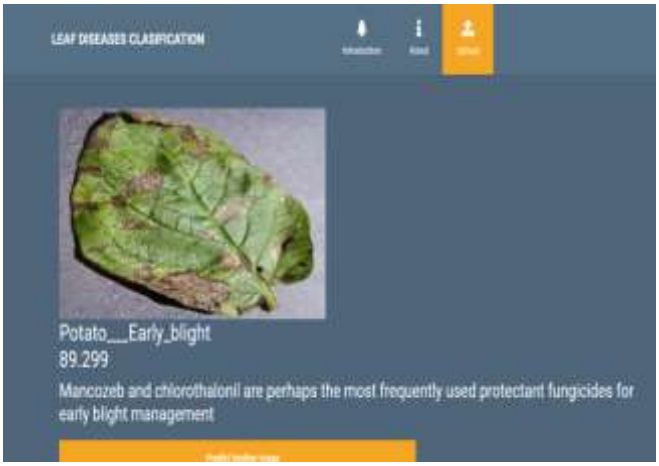


Upload Page: Here the images can be uploaded which are to be classified.

Classified output: The uploaded image is classified as the Corn_(maize)_Cercospora _leaf spot _Gray_leaf_spot.

The uploaded image is classified as the Potato___Early_blight.



5. CONCLUSION

In this project we have successfully classified the images of Identification of Plant Leaf Diseases Classification, are either affected with the Plant Leaf diseases using the deep learning and machine learning. Here, we have considered the dataset of Plant Leaf Diseases Classification images which will be of different types and different plants (healthy or unhealthy) and trained using SVM, CNN and ANN. After the training we have tested by uploading the image and classified it.

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