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Plant Disease Detection Using Convolutional Neural Network Algorithm

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ABSTRACT -

Agriculture serves as a source of energy and a solution to the problem of global warming, in addition to feeding an ever-increasing population. Plant diseases are particularly important because they can have a negative impact on the quality and quantity of crops grown in agriculture. Plant disease identification is critical early on in order to cure and control the illness. The naked eye approach is commonly used to diagnose illnesses. Experts with the ability to identify changes in leaf colour are involved in this procedure. This procedure involves a great deal of labour, takes a long time, and is impractical for vast fields. Often, multiple professionals would diagnose the same ailment as a different one. This technology is costly since it necessitates expert monitoring on a continuous basis. Plant diseases can raise the cost of agricultural production and, if not treated early enough, can lead to a producer's utter financial ruin. Producers must monitor their crops and recognize early symptoms of a plant disease in order to limit the spread of the illness at a cheap cost and save the majority of the crop.

1 .INTRODUCTION:

Deep learning is a machine learning technique that teaches computers to do what comes naturally to humans: learn by example. Deep learning is a key technology behind driverless cars, enabling them to recognize a stop sign, or to distinguish a pedestrian from a lamppost. It is the key to voice control in consumer devices like phones, tablets, TVs, and hands-free speakers. Deep learning is getting lots of attention lately and for good reason. It's achieving results that were not possible before. In deep learning, a computer model learns to perform classification tasks directly from images, text, or sound. Deep learning models can achieve state-of-the-art accuracy, sometimes exceeding human level performance. Models are trained by using a large set of labeled data and neural network architectures that contain many layers. Deep learning achieves recognition accuracy at higher levels than ever before. This helps consumer electronics meet user expectations, and it is crucial for safety-critical applications like driverless cars. Recent advances in deep learning have improved to the point where deep learning outperforms humans in some tasks like classifying objects in images.

2 .LITERATURE SURVEY

To take care of the outwardly disabled people groups' concern, number of strategies and methods are presented.
In paper [1], This Paper presents a real time deep learning based model for identification and classification of major corn diseases without the requirement of Internet .Performance analysis of designed Deep CNN has shown the average accuracy of 98.40%. In addition, a modified version of designed CNN model with optimized trainable parameters is deployed on NCS to perform inference on live images captured from smart phone with average accuracy of 88.66%

In paper [2], In this study, we have reviewed related works in the literature for the plant leaf disease classification algorithms of machine learning. Europe Studio framework was used as an IDE to build a more facilitated deep CNN whereby the convolution and pooling feature extractions were embedded in the Europe library. The proposed CNN was trained and tested using datasets from Plant Village's online website. The CNN's overall accuracy of 92.85% proved its feasibility.

In paper [3], In this paper the through the proposed system utilizing transferability of CNN features along with boosting, we achieve dataset accuracy of 98% with classification score of precision, recall, in automated crop state diagnosis of corn leaves. Data augmentation to increase the variety in the training image set also helped in extraction of robust features thus resulting in better classification accuracy on different images..

3 .EXISTING SYSTEM

Even though the botanical categorization was not founded on their qualities, leaves are the most obvious and most used method of identifying tree species. They can be found practically all year, are simple to photograph, and their shapes have well-studied characteristics that make identification

possible, if not simple. It uses high-level geometric criteria inspired by those used by botanists to classify a leaf into a list of species, with the goal of being an instructional tool. By removing noise and other undesired pixels and extracting additional information from the image, digital image processing will increase the image's quality. Image segmentation is a technique for analysis images that can be used to classify or cluster an image into numerous discontinuous portions by grouping pixels to produce a homogeneous region based on pixel attributes such as grey level, color, texture, intensity, and other factors. The fundamental goal of the segmentation process is to learn more about the image, the region we're interested in, and to clearly distinguish the object from the backdrop.

4 .PROPOSED SYSTEM

In this proposed framework, we are utilizing Python with a Tensor Flow-based way to deal with track down the answer for the issue of item recognition in a start to finish style. We involved SSD Detection Model for the distinguishing of things in light of profound brain organizations to make compelling discovery and Open CV library for ongoing picture catching. Among Image Net, Google Open, COCO datasets we are utilizing COCO since it will gave class of grouped element to over 90% of this present reality objects. The picture is sent as a contribution to the model and in the interim distance is determined utilizing profundity assessment with the assistance of voice modules predefined by python the result of the article name will be changed over into default voice notes which are shipped off the visually impaired individuals for their assistance with determined distance alongside measures.

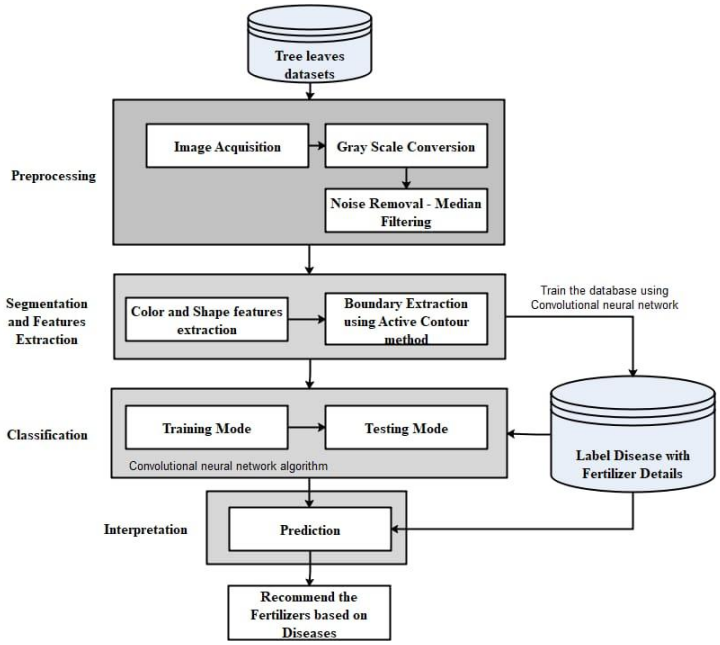


Fig 1: System Architecture

Automatic leaf disease identification is an important study area in agriculture since it can help monitor large fields of crops. Using image processing techniques to extract high-level properties including color, shape and texture features Segment the tree leaves using Active contour based algorithm depending on the green component's pixel intensity. Use Convolution Neural Network technique to classify diseases with fertilizer recommendation.

Benefits

Automated segmentation
Relevant features are extraction
Multiple leaf diseases are identified
Accuracy rate is high

5. MODULES

Leaf image Acquisition:

Leaves are structures specialized for photosynthesis and are arranged on the tree in such a way as to maximize their exposure to light without shading each other. In this module, we can upload the leaf images from the datasets. This database called LEAF was originally created for experiments with recognition of wood species based on a leaf shape. It contains leaves of species growing in the Czech Republic, both trees and bushes; native, invasive and imported (only those imported species which are common in parks are included). The number of samples (leaves) of one species varies from 2 to 25; their total number in the database is 795. The leaves were scanned with 300 dpi, threshold (binarized) reprocessed (denoising and cleaning) and saved in PNG format. In this module, we can input the corn leaf image datasets.

Preprocessing:
In this module convert the RGB image into gray scale image. The colors of leaves are always green shades and the variety of changes in atmosphere causes the color feature having low reliability. Therefore, to recognize various plants using their leaves, the obtained leaf image in RGB format will be converted to gray scale before pre-processing.

Image Segmentation:
In this module, we can implement grab cut method with automatic descriptors. Grab Cut is an image segmentation method based on graph cuts. Starting with a user-specified bounding box around the object to be segmented, the algorithm estimates the color distribution of the target object and that of the background using a Gaussian mixture model. This is used to construct a Markov random field over the pixel labels, with an energy function that prefers connected regions having the same label, and running a graph cut based optimization to infer their values. As this estimate is likely to be more accurate than the original, taken from the bounding box, this two-step procedure is repeated until convergence. "Grab Cut" is a segmentation technique that uses graph cuts to perform segmentation. Like most segmentation techniques "Grab Cut" uses information encapsulated in the image. Most segmentation techniques make use of either edge information or region information in the image. "Grab Cut" makes use of both edge and region information. This information is used to create an energy function which, when minimized, produces the best segmentation. In order to perform segmentation a graph is built, where nodes in the graph represent pixels in the image. In addition two special nodes are also created. These are the Sink and Source nodes.

Disease Prediction:
Leaves are affected by bacteria, fungi, virus and other insects. In this module implement Convolution neural network algorithm with multi-class to classify the leaf image as normal or affected. Layers are constructed based leaf features such as color, shape, textures. Then layers can be constructed with conditions to categorize the preprocessed leaves.

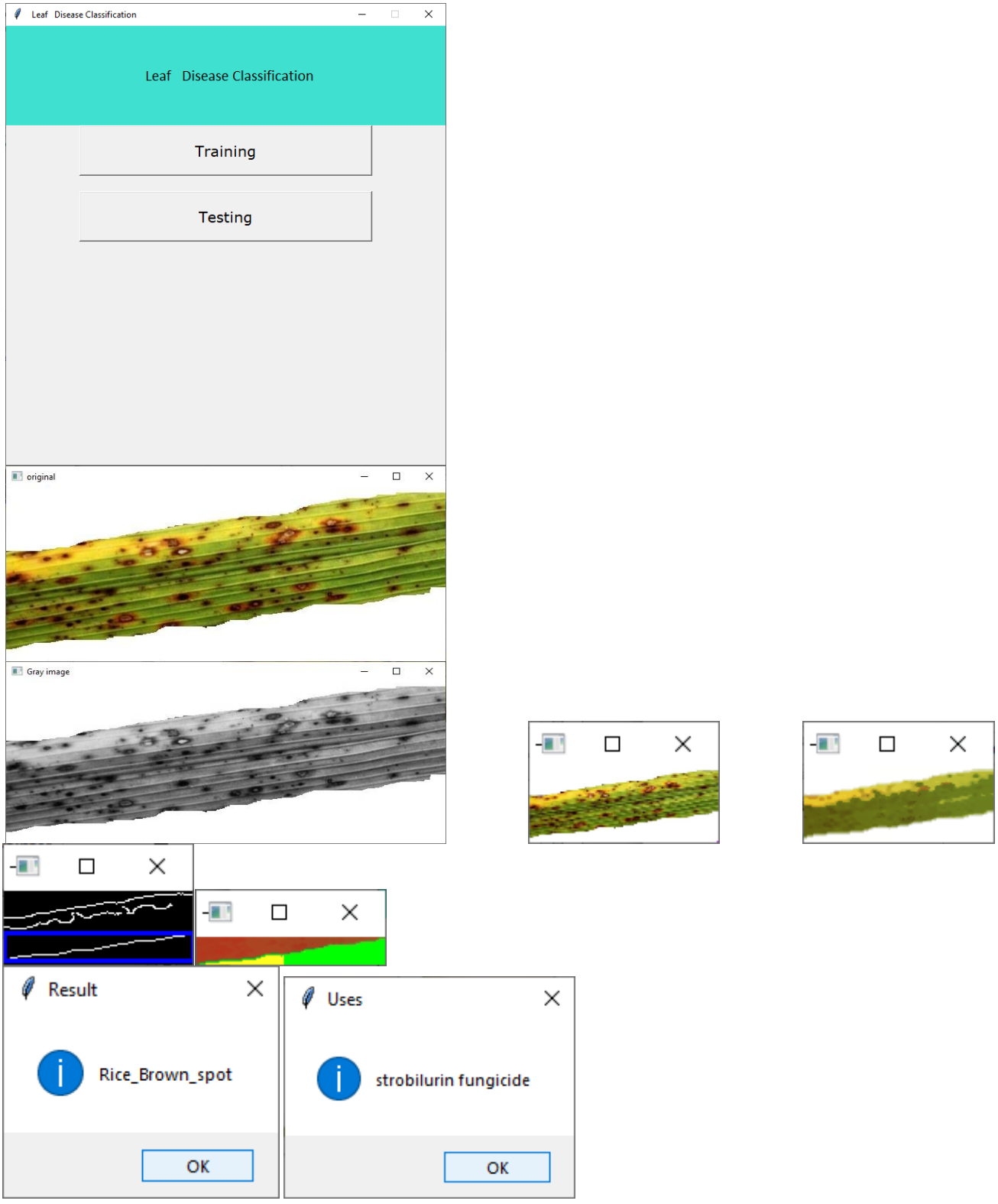
CNN has multiple layers that process and extract important features from the image. There are mainly 4 steps to how CNN works
Step: 1 Convolution Operation with Relu Activation Function
The objective of the Convolution operation is to find features in the image using feature detectors to preserve the special relationship between pixels. Relu activation function is used to break linearity and want to increase non-linearity because images are themselves are highly non-linear.
Step: 2 Pooling
Pooling is a down-sampling operation that reduces dimensions and computation, reduces over fitting as there are fewer parameters and the model is tolerant towards variation and distortion.
Step: 3 Flattening
Flattening is used to put pooling output into one dimension matrix before further processing.
Step: 4 Fully Connected Layer
A fully connected layer forms when the flattening output is fed into a neural network which further classifies and recognized images. And also implement multiclass classifier; we can predict diseases in leaf images with improved accuracy.

Fertilizer Recommendation:
In this module recommend the fertilizer or pesticides for affected leaves based on severity level. Fertilizers may be organic or inorganic. Admin can store the fertilizers or pesticides based on disease categorization with severity levels. The measurements of pesticides can be extracted based on disease severity.

6 .SYSTEM TESTING

Software testing is a method of assessing the functionality of a software program. There are many different types of software testing but the two main categories are dynamic testing and static testing. Dynamic testing is an assessment that is conducted while the program is executed; static testing, on the other hand, is an examination of the program's code and associated documentation. Dynamic and static methods are often used together.

7 .RESULTS



8 .CONCLUSION

In this project, we will look at the many strategies and algorithms for segmentation and classification methods that have been offered to increase segmentation quality.

However, the results demonstrate that, in comparison to the suggested graph cut model, segmentation techniques do not work well and are difficult to

implement in big datasets.

Based on the optimization of a polygonal leaf model used as a shape prior for a precise of grab cut segmentation, we have provided a method for segmenting a leaf in a natural scene.

It also includes a collection of global geometric descriptors that, when paired with local curvature-based features retrieved from the final contour, enable tree species categorization.

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