Plant Disease Identification Using Supervised Learning

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ABSTRACT *: In recent years, a server-based and mobile-based approach to disease identification has been used. Detecting disease signals quickly and accurately is a critical difficulty in crop protection. Pests and Diseases results in a destruction of crops or part of the plant resulting in decreased food productions leading to food insecurity. Visual identification of diseases in a large farm by experts and agronomists is the primary approach in developing countries which is time-consuming and costly. The proposed system is a mobile application for farmers It also provide disease detection, provide seeds and pesticide name can be prescribe to farmer. Overall, using machine learning to train the large datasets available publicly gives as a clear way to detect the disease present in plants.*

Keywords: Convolutional Neural Network (CNN), Deep Learning, Supervised Learning

INTRODUCTION

Plant diseases and pests are examples of natural catastrophes that disrupt normal plant growth and even result in plant death during the whole developmental phase of plants, from seed formation to seedling development and seedling growth. Plant blight detection is critical for successful and precise plant disease prevention in today's complicated environment. Plant disease identification has become digitalized and data-driven as smart farming has grown, allowing for advanced decision support, smart analytics, and planning.

The paper proposes a model of plant disease detection and recognition based on supervised learning, which improves accuracy, generality, and training efficiency. Smart phones in particular offer very novel approaches to help identify diseases because of their computing power, high-resolution displays, and extensive built-in sets of accessories, such as advanced HD cameras. In this system, we proposed a leaf disease detection model for farmer by uploading the leaf image to the application and the admin processes the image and detecting the diseases. In the plant dataset the image were captured on uniform background and laboratory setup conditions.

RELATED WORK

This section presents a discussion and review of recent work on identifying plant diseases based on deep learning models. Mohanty et al. [5] used AlexNet and GoogleNet to identify 26 diseases of 14 different plant species. To train the models they have used both transfer learning and learning from the scratch method. They achieved a maximum accuracy of 99.34% using GoogleNet. Five different pre-trained deep learning models, such as VGG, AlexNet, AlexNetOWTBn, Overfeat, and GoogleNet used by Ferentinos [7] to identify 58 plant leaf diseases. Geetharamani and Pandian [17] used nine-layer deep CNN to identify the diseases in plants and achieved an accuracy rate of 96.46%. Liu et al. [18] used AlexNet and GoogLeNet architecture to construct a model that replaced the fully connected layer of AlexNet with the inception layer to diagnose four different apple leaf diseases with a 97.62 percent accuracy rate. Picon et al. [26] employed a deep residual neural network with 50 layers, batch normalisation, and ReLU activation after each convolution to identify three different wheat illnesses.

SqueezeNet architecture was used by Durmus et al. [27] to identify distinct tomato leaf diseases. SqueezeNet's architecture is similar to AlexNet's, which is 227.6MB in size compared to SequenzeNet's 2.9MB. To identify four different tea leaf illnesses, we modified Hu et alCifar10 .'s fast CNN model and substituted the usual convolution with depthwise separable convolution.They achieved an improved accuracy rate of 92.5%. Atila et al. [29] used EfficientNet architecture to identify diseases in plants and shown that EfficientNet outperforms the standard CNN model such as AlexNet, VGG, etc., with an accuracy rate of 99.97% using EfficientNetB4 on PlantVillage dataset. The EfficientNet model takes less time to train the network as the network uses fewer parameters compared to other deep learning models. Rangarajan and Purushothaman [20] used a pre-trained VGG16 model to identify different eggplant diseases. VGG16 was used for the extraction of features. For classification, they used multiclass SVM. To check the robustness of the model performances, they have used three different color model images, namely RGB, YCbCr and HSV.

Ramacharan et al. [23] used transfer learning on InceptionV3 to identify Ahmad et al. [19] employed four distinct pre-trained deep learning architectures to identify different tomato leaf diseases: VGG16, VGG19, ResNet, and InceptionV3. To achieve the best result, they fine-tuned the network parameter. On laboratory and field photos, they attained the greatest performance accuracy of 99.60 percent and 93.70 percent, respectively, using InceptionV3.three diseases and two pest damages on cassava plants. The dataset used consists of leaves with multiple numbers of leaves in a single image. Later on, Ramacharan et al. [24] used automatic devices to detect six different diseases in the cassava plant. The technology have been used MobileNet deep learning architecture to train the network. They have used both image and video files of diseased leaf images to evaluate the performance. They achieved an accuracy of 80.6% and 70.4% on the image file and video files respectively. Oyewola et al. [25] appeared that deep learning inclusively with residual connection outperforms plain convolution neural network in the identification of different diseases in cassava plants.

PROPOSED SYSTEM

In this paper we have proposed a system to supervise the disease on plants particularly on leaves and suggest alternative solutions by providing corresponding pesticides related to the identified disease for getting healthy yield and good productivity. The system is to provide an automatic approach for the agricultural department that helps farmer for plant disease detection ,take the sample leaf and diagnose using feature extraction technique and provide the solution to farmer. As there is a wide need for agricultural industries to improve the yield of plant is important there is need of automate technique which will find disease on plants for this artificial neural network methodology is suggested which can be helpful to categories leaf infection. K-Means clustering is applied to find infected area on the leaf but it has the disadvantage of sizable estimation load. The system is proposed to help non experts in identifying the leaf diseases on the picture that represent the symptoms of the leaf. Farmers can take image of leaf disease and upload it to the system. Then the farmer will see the leaf is affected by bacterial blight or not. Plant disease and pest detection methods based on deep learning can be considered as an application of relevant classical networks in the field of agriculture because the goal reached is totally congruent with the computer vision task.Plant diseases and pests have vastly different shapes, sizes, textures, color, backgrounds, layouts, and imaging illumination in the natural world, making identification challenging. CNN-based classification such as supervised learning Technique has implemented and become the most widely employed pattern in the classification of plant diseases and pests due to CNN's excellent feature extraction capacity. Trained database of infected image has been generated using Neural Network. Feature vectors such as image color, morphology, texture and structure of hole are applied for extracting features of each image for diagnosis of disease morphology gives accurate result.

Convolutional Neural Network

Compared with other image recognition methods, the image recognition technology supported deep learning doesn't have to extract specific features, and only through iterative learning can find appropriate features, which may acquire global and contextual features of images, and has strong robustness and better recognition accuracy. CNN may be a popular model within the field of deep learning the rationale lies within the huge model capacity and complicated information led to by the essential structural characteristics of CNN, which enables CNN to play a plus in image recognition. At the identical time, the successes of CNN in computer vision tasks have boosted the growing popularity of deep learning. First, the images are input into a pretrained CNN network to obtain image characterization features, and the acquired features are then input into a conventional machine learning classifier K-Means clustering for classification. First, the photographs are input into a pretrained CNN network to get image characterization features, and therefore the acquired features are then input into a standard machine learning classifier K-Means clustering for classification. The proposed a CNN architecture to spot 3 different disease dataset and therefore the related pesticides, which seamlessly integrates context metadata, allowing training of one multi-crop model. The model can do the subsequent goals: (a) obtains immense and more robust shared visual features than the corresponding single leaf (b) isn't suffering from different diseases during which different crops have similar symptoms; (c) seamlessly integrates context to perform leaf conditional disease classification.

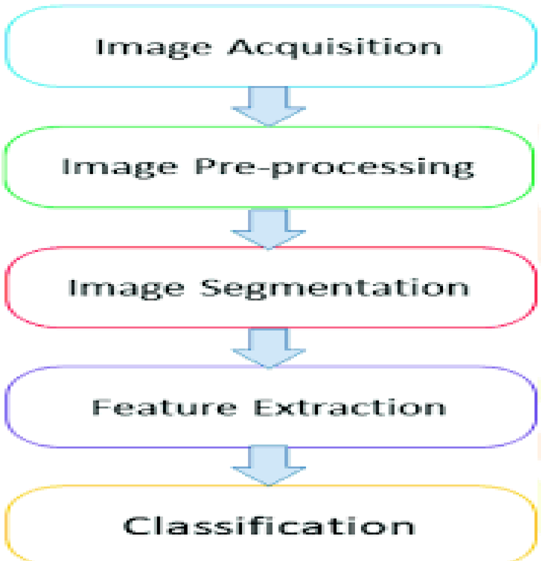

Fig 1.system flow architecture

Methodology

- Image acquisition: It is the first phase condition for the work flow sequence of image processing because as processing is possible only with the help of an image. The image acquired is entirely natural and is the consequence of any hardware machine which was handled to produce it.
- Image Segmentation: It is the method for shielding of digital image into several segments. Objects and boundary line of images are located by using image segmentation. Pixels with similar label parts share related features for devoting a label to each pixel in an image. For this we are using K-Means Clustering methodology.
- Feature Extraction: Different feature vectors are considered namely color, texture, morphology and structure of hole of the leaf. Algorithm used for extracting the features is SURF algorithm. This algorithm contain three sections: interest points detecting, interest points describing and interest points matching.
- Pattern Matching: Process of analyzing the related pixels that share the similar properties such as the texture of infected area, the color, figure, structure of holes.

ACKNOWLEDGEMENT

We would like to thank everyone who had contributed to the successful accomplishment of this whole project. We would like to show our esteemed gratitude to our project guide Ms. Sithara, Assistant professor in computer science and engineering department who gave valuable suggestion and guidance for our project. We express our deep felt gratitude to our beloved HOD Dr. Ramani , Head Of the Department for providing necessary information regarding the project and also her support in completing it. We also thank our project coordinator, Mr. Jithin Jacob, Assistant professor, for the the patient guidance, enthusiastic encouragement and useful critiques of this project work. and assistance in keeping our progress on schedule. We also grateful to all the authors of books and papers which have been referred to publish this paper.

CONCLUSION

Supervised learning in terms of image pattern recognition in machine vision task is a recent and advanced technique and much effective in the area of detecting infected parts or diseases in plants particularly on their leaves .In this paper, we have proposed an automated system artificial neural network model based on supervised learning that inclusively uses supervised learning that can effectively classify the diseases in plants across in major crops and prescribing the corresponding pesticide related to the identified diseases. Moreover, we have used the methodology to accomplish the performance of the system include image acquisition, image segmentation,feature extraction, blob analysis, pattern matching. The model has been trained upon the database of infected image has been generated using convolutional neural network and various future vectors such as leaf color, pattern of leaves, textures, structure of infected parts of the leaf are applied for extracting features of image for detecting of disease morphology use accurate result. Our proposed architecture is possible for the identification of plant diseases with different plant disease dataset with a wide diversity of images, which is taken under numerous geographical region.

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