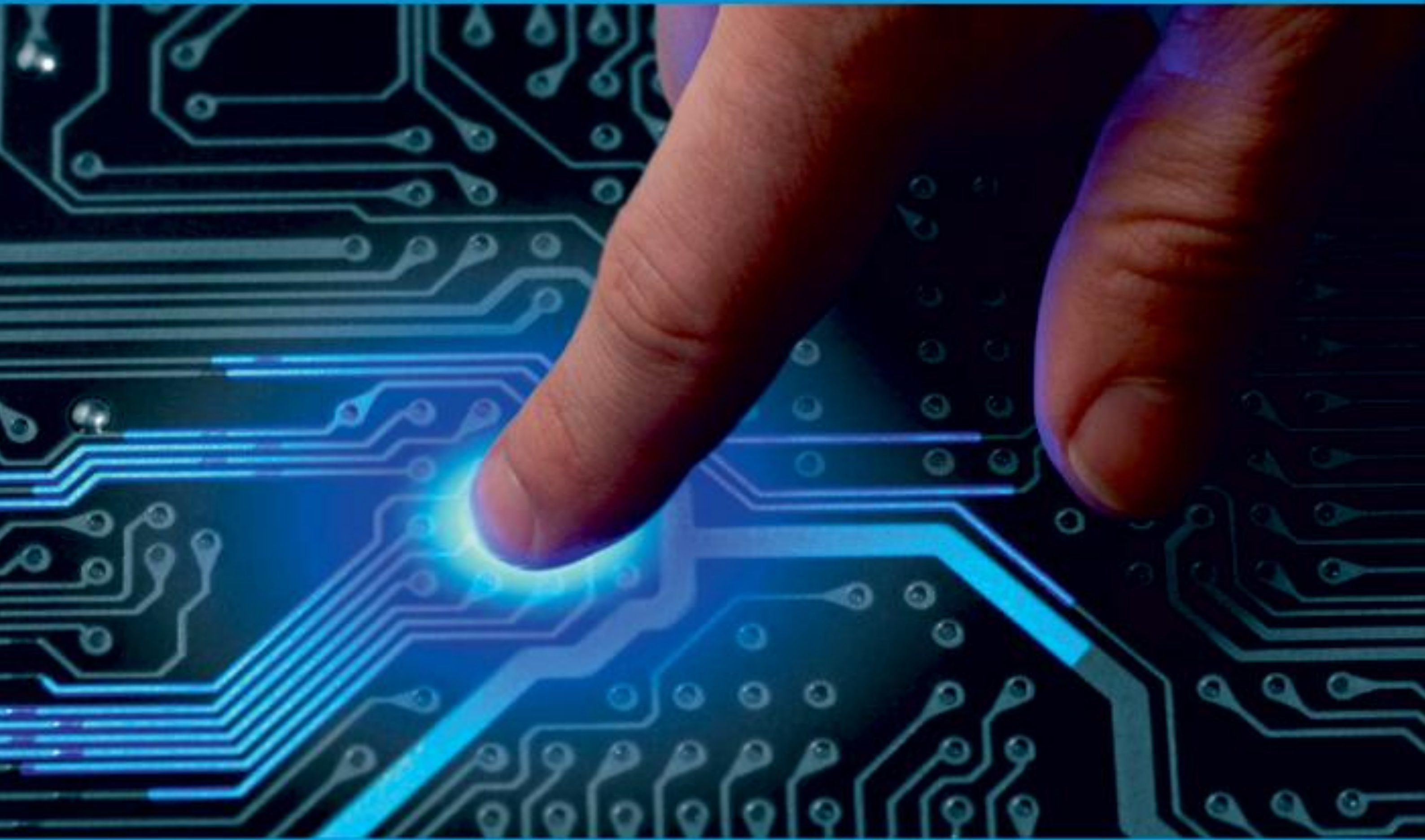
IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 9, Issue 7, July 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.542

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 7, July 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0907158 |

Plant Leaf Disease Detection Using Machine Learning (Convolution Neural Networks)

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ABSTRACT: Agriculture, as one of the primary means of subsistence, plays a critical part in a country's economic prosperity. Plant diseases affect the expansion of their respective species, therefore their early identification is extremely important. Leaf diseases are a serious threat to food security. The combination of accelerating global advancement penetration and up to date advances in computer vision made possible by deep learning has paved the way for web-assisted disease diagnosis. We trained a deep convolutional neural network to recognise crop species and diseases using a public dataset of 507 photos of damaged and healthy plant leaves taken under controlled conditions. Overall, the approach of coaching deep learning models on increasingly large and publicly available image datasets presents a transparent path toward plant, plant disease detection on a huge global scale. In the field of image classification, the latest generation of convolutional neural networks (CNNs) has produced excellent results.

KEYWORDS: Convolutional neural network, damaged and healthy plant leaves, image datasets.

I. INTRODUCTION

The purpose of developing PLANT LEAF DISEASE DETECTION USING MACHINE LEARNING (CONVOLUTION NEURAL NETWORKS) is to understand the training data and fit that training data into models that should be useful to the people. As a result, we'll employ machine learning to detect plant diseases. It has been assisting good decisions making and predicting the massive amount of knowledge produced. The color of leaves, amount of injury to leaves, area of the unhealthy plant leaf are utilized in classification. Crop diseases are a fascinating threat to food security, but because to the lack of a critical foundation in many regions of the world, detecting them quickly remains difficult.. The development of precise techniques in the field of leaf-based image categorization has yielded promising results. This project makes use of ML (CNN) to identify the diseased leaf and the healthy leaf. Second, most photographs have complicated backgrounds, ensuring the approach's excellent generalisation performance. Finally, specialists manually annotate all sick photographs in the dataset.

II. RELATED WORK

Plant diseases are a serious threat to plant growth and crop yield and lots of researchers have expended substantial efforts on detecting plant diseases. Visual examination by professionals has traditionally been used to detect plant diseases, with biological examination as a backup option if necessary. In recent years, through the event of technology, machine learning has been widely utilized to coach and detect plant diseases and may be a satisfactory alternative for the detection of plant diseases. In the processing scheme, images were subjected to a color conversion structure and a segmentation mechanism. Finally, the extracted features were skilled a support vector machine classifier. The algorithm effectively detected and classified the examined diseases with an accuracy of 94%. However, traditional machine learning approaches require complicated image pre-processing, feature extraction and classification steps; it is easier to realize higher accuracy by using a deep learning approach that is based on convolution neural networks. It was trained a deep convolutional neural network to identify 14 crop species and 26 diseases using a public dataset of 54,306 images. The trained model had a 99.35 percent accuracy rate. The model nevertheless achieved a 31.4 percent accuracy when tested using photographs from online sources rather than the images used for training. The experimental results demonstrated that the most successful model architecture was the VGG convolution neural network, which realized a success rate of 99.53%.

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III. PROPOSED ALGORITHM

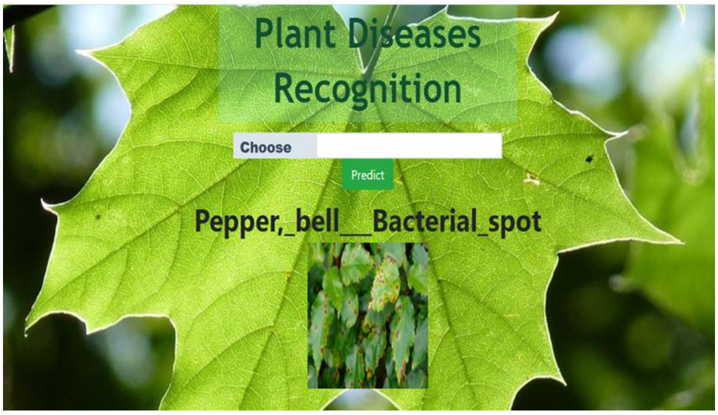
A. IMAGE PROCESSING AND LABELLING

Images downloaded from the online were in various formats in conjunction with different resolutions and quality. Final photos meant to be utilised as a dataset for a deep neural network classifier were pre-processed to ensure uniformity, in order to encourage improved feature extraction. Furthermore, the picture preparation approach included manually cropping all of the photographs, creating a square around the leaves to highlight the region of interest (plant leaves).Only the photos with a greater resolution of the region of interest were designated as candidates for the dataset. Because it's understood, it is vital to use accurately classified images for the training and validation dataset. During this stage, duplicated images that were left after the initial iteration of gathering and grouping images into classes described in Section were away from the dataset.

B. ARGUMENTATION PROCESS

The main purpose of applying augmentation is to extend the dataset and introduce slight distortion to the images which helps in reducing over-fitting during the training stage. In machine learning, also as in statistics, over-fitting appears when a statistical model describes random noise or error rather than underlying relationship. The image augmentation contained one of several transformation techniques including transformation, perspective transformation, and easy image rotations. Affine transformations were applied to express translations and rotations (linear transformations and vector addition, resp.) where all parallel lines within the first image are still parallel within the output image. to hunt out a change matrix, three points from the primary image were needed also as their corresponding locations within the output image. For perspective transformation, a change matrix was required. Even after the transition, straight lines would stay straight. For the augmentation process, simple image rotations were applied, also as rotations on the varied axis by various degrees.

IV. RESULTS



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V. ARCHITECTURE DIAGRAM

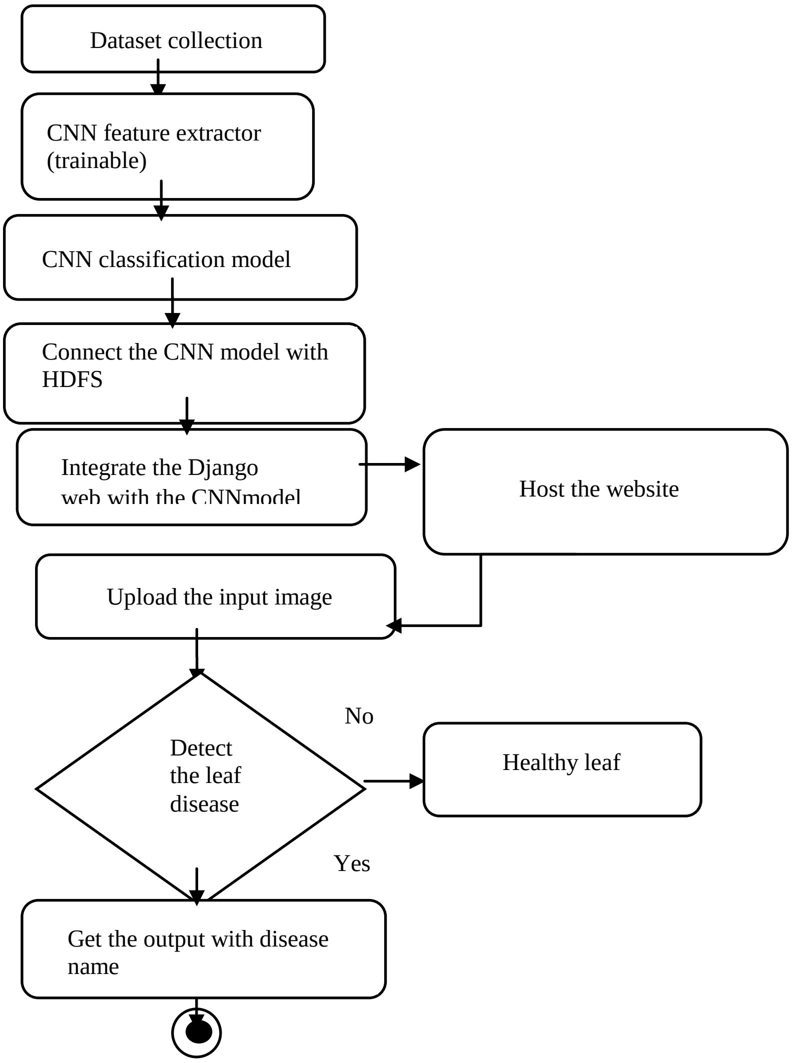

FIG 1: BLOCK DIAGRAM OF PLANT DISEASE DETECTION USING MACHINE LEARNING (CONVULOTION NEURAL NETWORKS)

VI. PROPOSEDSYSTEM STEPS

A. DATASET FORMATION:

The leaf images from predefined datasets must be gathered together. Outside of competition setting, if we expect our model to be utilized in practical applications, it's important to elucidate why the model classified a given image. We explored a couple of examples using an explainable AI technique called Gradient-weighted Class Activation Map (Grad-CAM) to spotlight the areas of images that the model based its decision on. The gathered dataset must be classified with proper category such as healthy, disease. One way to see what the model has learnt is to show the network the wrong way up and ask it to reinforce an input image in such how as to elicit an output class. Say you'd wish to understand what quite image would end in "Banana", start with an image crammed with random noise, then gradually tweak the image towards what the neural net considers a banana. This is called Deep Dream.

B. WEB INTEGRATION:

The installations of the required softwares like tensorflow, PIL(pillow) etc should be done. Python has a library namely Numpy, which is used for numerical operations with a MATLAB syntax. All the OpenCV array structures are converted to Numpy arrays and vice versa. OpenCV is employed for all kinds of image and video analysis, like face recognition and detection, car place reading, photo editing, advanced robotic vision, optical character recognition, and a whole lot more. The CNN configuration must be done by writing the relevant python code. An

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efficient way for visualizing the disease in plants should be introduced because it will save costs by avoiding the unnecessary of fungicide/pesticide/herbicide. Plant Village dataset was used to evaluate the accuracy and performance DL models/architectures. Although this dataset features a lot of images of several plant species with their diseases, it's a simple/plain background. The webpage is created in Django to show the output in a user friendly way. Web frameworks emerged as a gaggle of components designed to form it easier and simpler to form websites. One such framework is Django. Django is gaining popularity, and lots of large companies use it to make web projects. Django is taken into account the simplest web framework written in Python. The python code to configure the CNN is to be implemented in the local host. Line up the feature and therefore the image, multiply each image pixel by corresponding feature pixel, Add the values and find the sum, Divide the sum by the entire number of pixels in the feature.

C. DISEASE DETECTION:

The Local host link created by running the CNN python code. LocalHost is that the standard host name given to the address of the local computer, and therefore the IP address for your local host is 127.0.0.1. The local server isn't connected to the web, but makes it possible to ascertain your site within the browser as if you're viewing it online - so Local Host addresses could also be used during development of an internet site. Because these files aren't accessible to the public, the hostname is replaced with the actual domain name when the website goes live. . The Initial web page is created by pasting the URL from the python console. The Hint addresses instances where links stay to Local Host addresses, which can be inaccessible to the general public and will be removed/corrected. This makes us to input the leaf image from the desktop to check whether the leaf is diseased or not. Once you clicked the predict button, the web page will automatically show the result whether the leaf is healthy or defected with the name of diseases.

VII. CONCLUSION AND FUTURE WORK

This project has showed a real-time detection approach that is based on improved convolutional neural networksfor plant leaf diseases. The deep-learning-based approach can automatically extract the discriminative features of the diseased plant images and detect several common types of leaf diseases with high accuracy in real time. In this project, to ensure satisfactory generalization performance of the proposed model and a sufficient plant disease image dataset, a total of 507 images with uniform and complex backgrounds were collected in the laboratory and in a real crop field and generated via data augmentation technology. Furthermore, the new deep convolution neural network model, namely, keras, was designed by introducing the googlenet inception module and integrating the rainbow concatenation to reinforce the multi-scale disease object detection and small diseased object detection performances. The new deep-learning-based approach was implemented in the caffe framework on the gpu platform. Using a dataset of 507 images of diseased leaves, the proposed model, namely, keras, was trained to detect plant leaf diseases. Furthermore, the new deep convolution neural network model, namely, inar-ssd, was designed by introducing the googlenet inception module and integrating the rainbow concatenation to reinforce the multi-scale disease object detection and small diseased object detection performances. Taste of 26,377 images of diseased leaves, the proposed model, namely, inar-ssd, was trained to detect apple leaf diseases. The comprehensive detection performance reaches 78.80% map. Meanwhile, the detection speed of the model reaches 23.13 fps. Hence, the proposed model is fully capable of real-time detection of apple leaf diseases. The results demonstrate that the proposed inar-ssd model can detect the common types of plant leaf diseases with high accuracy in real time and provides a feasible solution for the real-time detection of plant leaf diseases.

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