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INFECTED LEAF CLASSIFICATION USING DEEP LEARNING AND ANALYZE THE BEHAVIOUR WITH ADAM AND RMSPROP OPTIMIZER

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Abstract— Agribusiness is the essential occupation throughout the world that assumes a vital job in the economy of the nation and also responsible for global Gross-Domestic-Product. But, yearly 15.7 percentage of the crops are being lost due to attack by insect pests and diseases. Therefore, accurate detection of plant disease through some automatic technique is beneficial as it minimizes large work of monitoring in big farms of crops, and at very early stage itself. Recent research has shown that Convolution Neural Network (CNN) to be capable of pattern recognition and the classification of image data. It includes examining the potential for the application of neural network computing to image processing. A second objective is to provide a preliminary comparison of training data images and generalized classification results analysis for CNN classification. It proposes the identification and classification of Maize plant leaf diseases using the deep learning technique to design, implement and evaluate an image processing-based software solution for automatic detection and classification of plant leaf diseases. The behavior is analyzed by using Adam optimizer.

Index Terms – Convolution Neural Network, Image Classification, Activation Functions, Optimizer, Corn leaves.

Introduction

Yearly 15.7% of plants was destroyed owing to insect invasion and disease assaults. Rapid and effective identification and detection of plant diseases will monitor disease development on different crops in order to increase crop quality and productivity. For large farms with vegetables, this eliminates a significant control job quite early on.

"Deep learning is an artificial intelligence mechanism that has networks that can learn unstructured or unlabeled data without supervision."

Gray leaf spot is a foliar fungal disease, also known as grain, affecting maize. GLS is recognized as one of the world's most important diseases that limit the yield of maize. Specific GLS symptoms include the spacing between the secondary vein of the leaf, brown to gray necrotic lesions which run in parallel to the leaf.

Common rust occurs per growing season as a consequence of puccinia sorghum fungus. In hybrid maize, it is rarely an problem. Typically, rust pustules emerge first towards the end of June. Chlorotic spots on the leaf surface are the early signs of widespread rust.

Northern maize leaf blight is the foliary maize disease triggered by the ascomycete Setosphaeria turcico, Exserohilum turcicum. This disease will lead to substantial loss of yield from susceptible maize hybrids with its characteristic cigar-like lesions.

Literature survey

Title: Image Processing for Soybean Disease Classification and Severity Estimation (2015).

Author: Saylee Gharge, Priyanka Singh.

Description

This paper mainly concentrates on reducing the usage of pesticides on plants by identifying and gardening and in increasing the productivity of soybeans. It uses K-means clustering for segmentation and neural network.

Title: Detection of unhealthy region of plant leaves using Image Processing and Genetic Algorithm. (2015)

Author: Vijai Singh, Varsha, Prof. A K Misra.

Description

This paper gives a note on different diseases and classification techniques which can be used for plant leaf diseases. Image segmentation techniques is tested on ten different plants and their leaf diseases. The results were obtained with less computational efforts.

Titile: Identification of plant leaf diseases using image processing techniques (2017).

Author: Pooja V, Rahul Das,Kanchana V.

Description

This paper focuses on the detection of plant diseases through the application of various methodology. Usage of sufficient, stable data set have facilitated in obtained satisfactory experimental results.

Existing System

In the existing system, the process of deep forest instead of deep learning is being used. the method consists of in-model feature transformation where basic model of machine learning work on the original set of features. the Random Search and Grid Search python functions are used for optimal configuration.

Proposed System

The methodology of the proposed solution is image-processing-based and is composed of five main phases. Data Collection, Pre-processing, Model Implementation, Image classification, Evaluation of the model. The Data Collection process involves collection of datasets from various authentic sources and splitting the datasets into train and test data images. The pre-processing involves scaling of images, reshaping of images to specific width and height. The Model Implementation stage involves creating Neural Network model with specifying Hidden Layers, Nodes, Activation Functions, Optimizers, Learning Rate and Epochs. The Image Classification process involves in fitting the datasets with the model. The final stage, evaluation of model involves, evaluating model with loss and accuracy. Accuracy of the Model is improvised and verified with changing Activation Functions and Optimizers. The Experimental results with change in activations functions and Optimizers are studied. Resultant improvised model is obtained and application is developed accordingly.

i. Dataset collection

A total of 3,852 expertly curated images on healthy and infected leaves of corn plant. It consists of 1,162 images of healthy corn leaves, 985 images of Northern leaf blight disease, 1,192 images of common rust, and 513 images of Cercosporin leaf spot disease.

ii. Image Pre-Processing

Computers can do abstract equations and cannot view pictures like we do. Somehow, we will convert the pictures into numbers to comprehend the machine. Of image analysis, there are two can forms:

Using Greyscale

The picture is transformed into a black level and each pixel is given a meaning depending on the darkness. Both numbers are set in an array and the machine measures the list. That is how the 8 with the greyscale is used.

Using RGB Values

Colors can be seen as importance of RGB. Computers will then retrieve each pixel's RGB value and position the output in a representation sequence. The machine must transform the picture into an array by using the same method to equate the numbers ' patterns with the already defined artifacts while viewing a new item.

iii. Model implementation

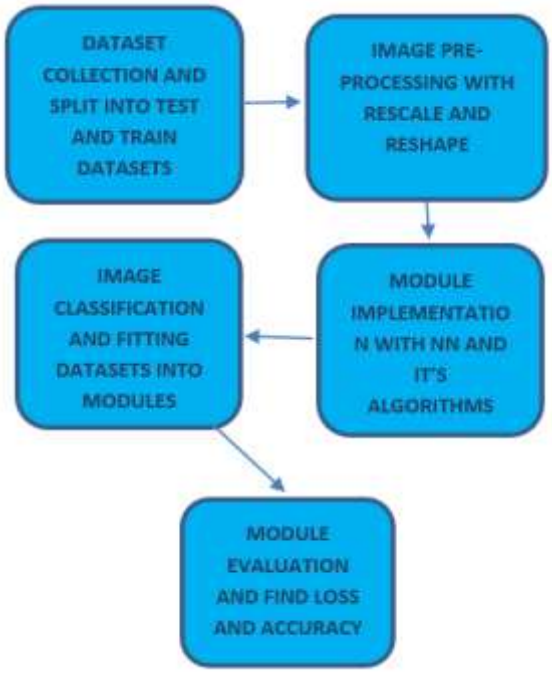
Implementation of the model includes a form of Neural Network called the Neural Network Convolution. It is used to identify the characteristics of the image using filters. Tanh, Relu and Sigmoid are the control functions used. For the performance row, the softmax classiator is used. The Adam Optimizer is included.

iv. Image classification

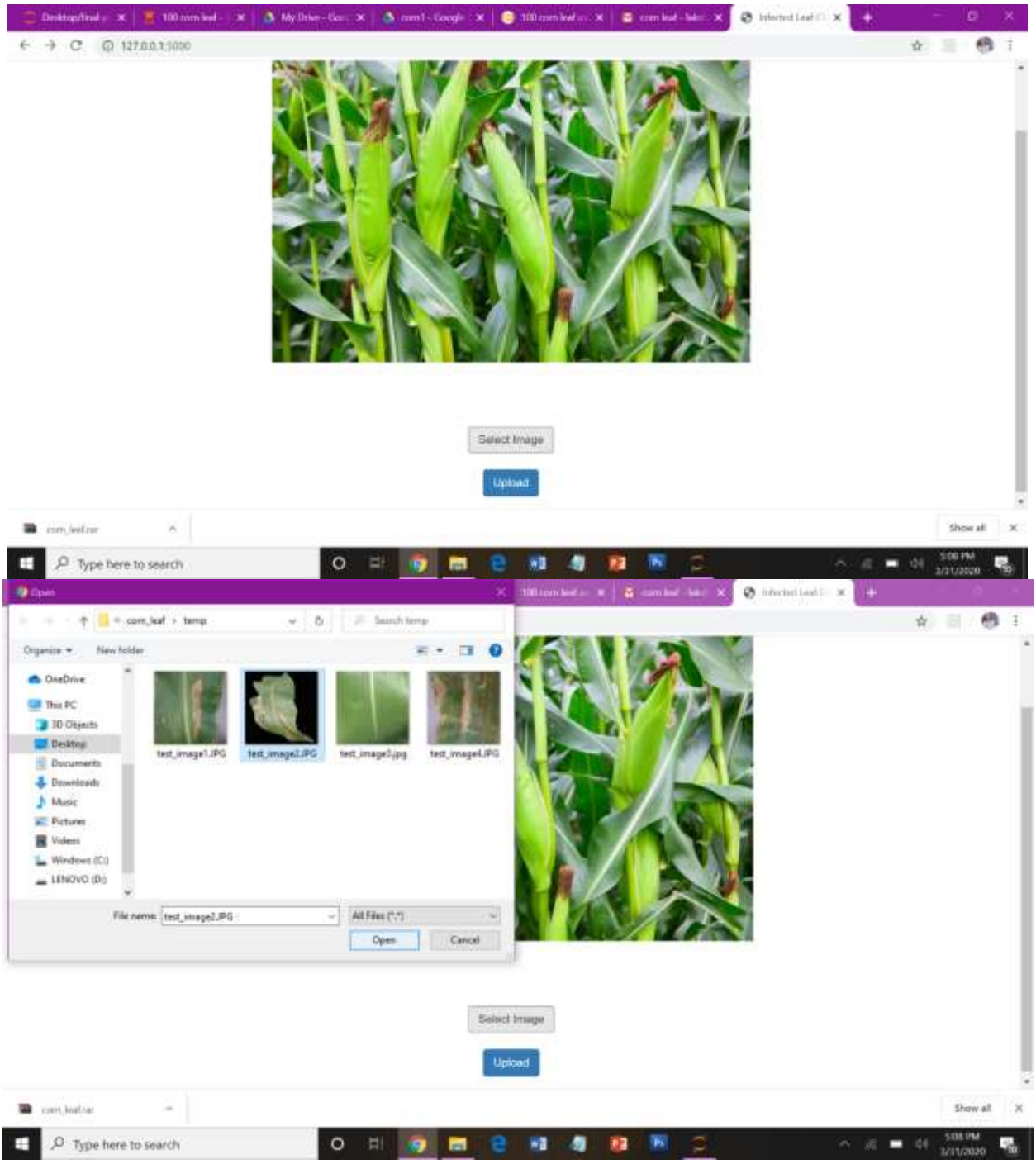
Image recognition refers to a computer vision algorithm that can visually classify an item. For example, an image recognition algorithm can be used to decide whether an image contains an person or not. Whilst people can quickly recognize an object, thorough identification of the picture remains a challenge in the implementation of computer vision.

v. Model evaluation

Project testing includes, Error and Quality process measurement. Component consistency with increasing Activation and Optimizers is enhanced and tested. Experimental effects are tested with shifts in stimulation mechanisms and optimizers. The result is achieved and implemented in conjunction with the modified pattern.



Experimental Output Screenshots


Select Image
Upload
Type here to search
Open
corn_leaf › temp
Organize
New folder
OneDrive
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Windows (C:)
LENOVO (D:)
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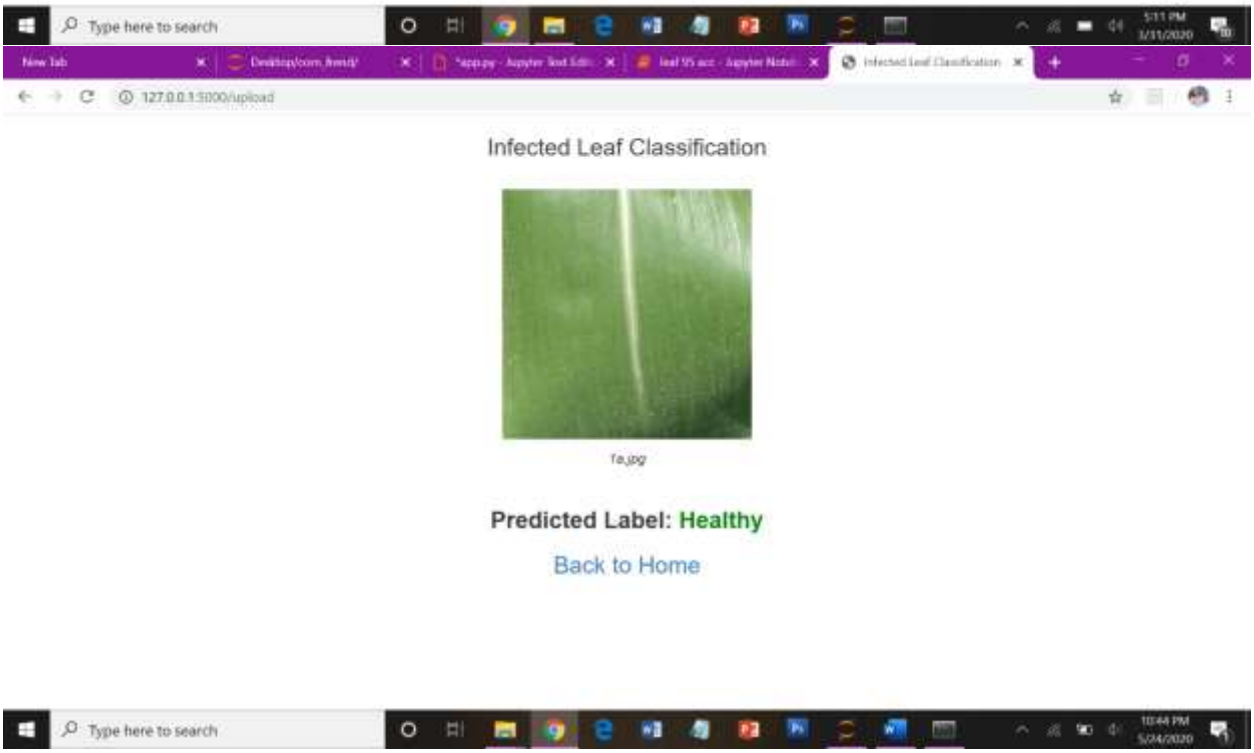
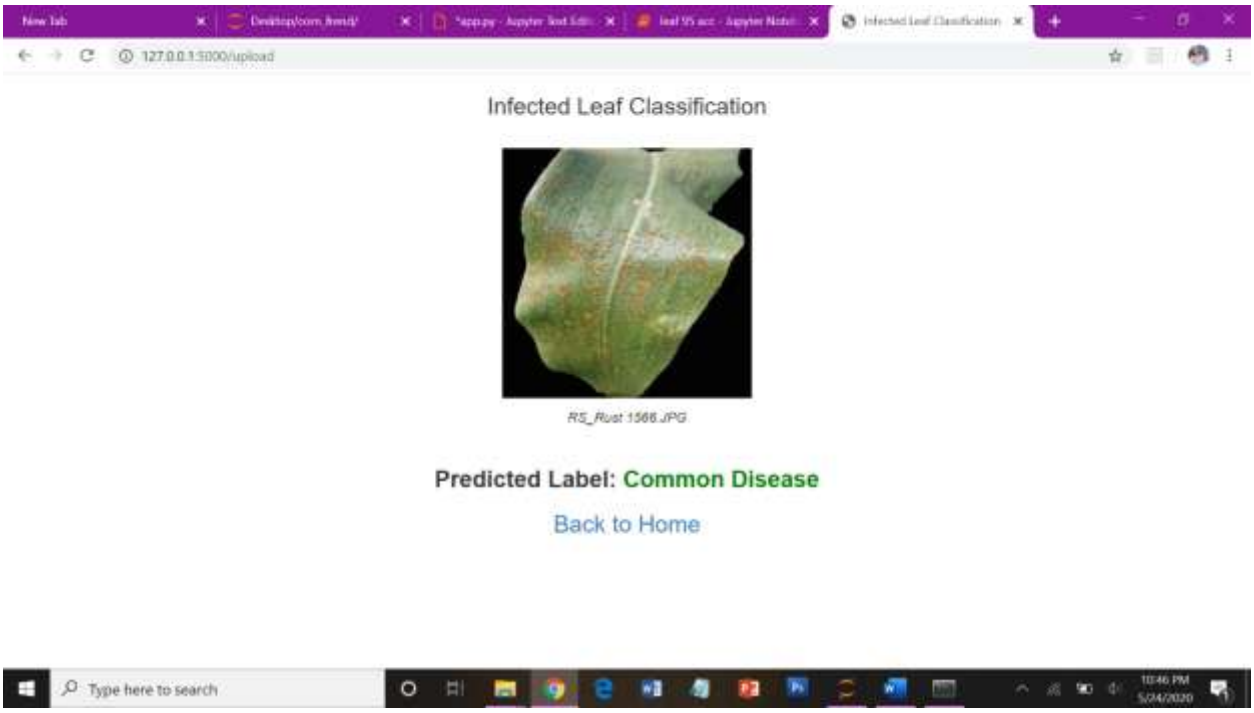
test_image2.JPG
test_image3.jpg
test_image4.JPG
File name: test_image2.JPG
All Files (*.*)
Open
Cancel
Select Image
Upload
Type here to search


Infected Leaf Classification
test_image2.JPG
Predicted Label: Cercospora
Back to Home


Infected Leaf Classification
1a.jpg
Predicted Label: Healthy
Back to Home



Conclusion

Corn is a widely used food crop worldwide. Therefore, there is a need to prevent diseases attacking the crops. This helps in well-developed growth of corn plants. This paper has, CNN model with convolution 2D layer. The activation functions are Tanh, relu and softmax. The optimizers used are RMSProp and Adam. The diseases classified are northern leaf blight, leaf spot, and common rust. The images are split into train and test dataset. The accuracy of 95.36 percentage is obtained.

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