Title :

Identification of Leaf Spot in Coconut Plant (Cocos Nucefera) using Convolutional Neural Network

Full name of Speaker : Jocelyn Flores Villaverde

Institution : Mapua University

Contact : jfvillaverde@mapua.edu.ph

Project Title: Identification of Leaf Spot in Coconut Plant (Cocos Nucefera) using Convolutional Neural Network

Background :

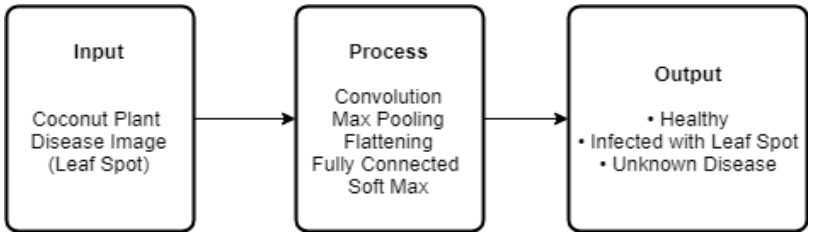
One of the earliest detection methods used by farmers is detection by inspection, which requires a trained eye to identify an early symptom of a disease. There are lab techniques that can identify coconut diseases but it is time consuming. A disease that can infect both young and old palms, leaf spot disease results in the reduction of photosynthetic activity of palms. During severe infection, seedlings become unfit for field planting. The spots gradually turn brown with an ashen gray center surrounded by dark brown bands. The spots enlarge and fuse making the leaf appear blighted or burnt. Leaf spots' mark will still be in the leaf even if the host leaf dried out.

Targets:

In this research, it will focused on the coconut plant leaf using different images and angels of the image for its trials. Unlike in plant identification that uses its leaf veins, neural network will be used to process the images to identify its disease. Rather than using image processing only, correlating it with Convolution Neural Network (CNN) can help determine the image with its specific feature. Using the image processing to extract the feature of an image then using the neural network to process the parameters to identify whether it has a disease or not. Convolutional Neural Network (CNN) will play a major part by processing the images of the coconut plant where if it's healthy, has unknown disease or has leaf spots preventing it from spreading.

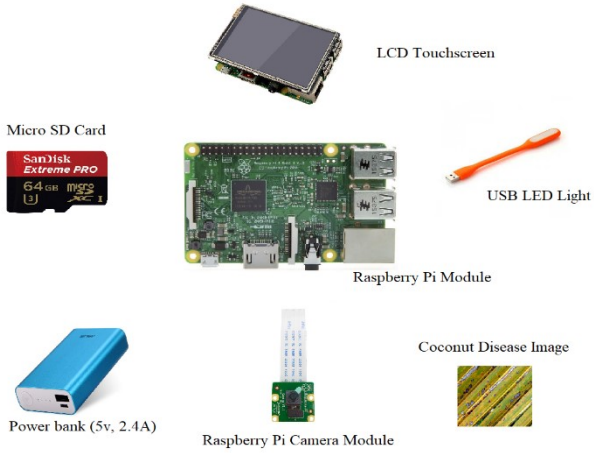
Proposed Method:

Conceptual Framework



The input is taken from the sample image of a coconut plant disease using the Raspberry Pi camera. The next step is to train the system to identify each image presented to it in the Convolutional Neural Network (CNN) with its extracting features correlated with Python. After training the system and extracting specific features of the leaf spot, the output will be based on the specific features of the leaf spot and classify it whether its diseased, healthy or unknown disease.

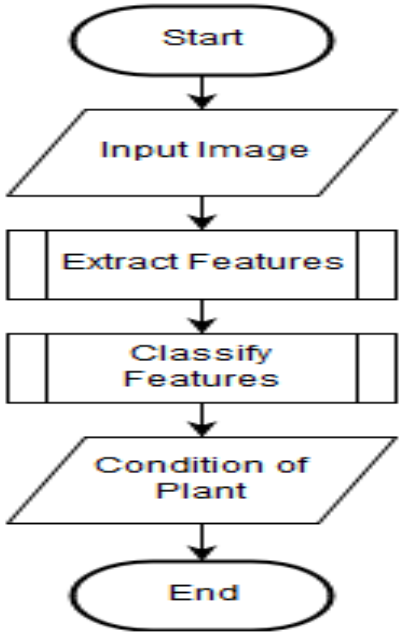
Pictorial System Diagram



The camera will capture the coconut leaf or stem, with the captured image being sent to the Raspberry Pi module where the processing will be done. It will then be compared to the stored data of the neural network in the micro storage device. The Asus power bank will serve as the power supply with 2.4 Amperes meeting the required current needed to power up the Raspberry Pi module. An LCD touchscreen will be used as the output to show the classification of the image presented.

Proposed Method: (Max. 3 slides)

Main Process Flowchart



The system starts when an input is presented and sent to the microcontroller, where it will then be processed by extracting the features needed to be analyzed. The result of the classification of the features will be shown in the LCD screen. When the image is received, the system will resize the image to 64 x 64 pixels then use the convolution and max pool functions to extract the features. The pool of extracted features is flattened to a one-dimension vector, which will become the input for the next layer. The layer that receives this input will have a ReLu activation function to activate the features that were found. The last layer will then receive the activated features and apply softmax function to classify which of the possible outputs possesses these features

Proposed Method:

This research requires an image database of the coconut plant leaf spot. To obtain database the researchers will took pictures of actual leaf spot. To obtain the best possible training set, it is encouraged that the researchers take pictures from all angles and in high resolution. Consequently, coconut trees are best known for their extreme height and thus, the researchers will need someone experienced enough to climb the tree and take the picture. In addition, the researchers have the option to use a drone to take pictures.

N = 45		Actual		
		Healthy	Leaf Spot	Unknown
Predicted	Healthy	11	2	0
	Leaf Spot	0	12	0
	Unknown	4	1	15

In terms of the general confusion matrix wherein the unknown label is not considered, the accuracy of the CNN is computed to be 92%. Subsequently, the misclassification rate is 8%. Consequently, the fall-out rate is computed at 11.7%.

Impact: (Max. 2 slides)

The development of the project will help professionals that work in the field such as botanist, farmers, plant pathologist, and students who want to conduct research on coconut disease identification. The device will remove the burden of sending the specimen to a lab for disease identification. It will immediately identify if the leaf has leaf spots, healthy or unknown disease.

This project can also be collaborated to the Department of Agriculture to make this device as a tool to the farmers in detecting a possible disease on the coconut leaf.

This project can be of great help to the cocounut plantation industry since this device will identifiy a leaf spots that may affect the growth and production of coconut.

Conclusion:

The purpose of the research was to develop a portable device capable of identifying leaf spot disease in coconut leaves. The researchers trained a neural network and deployed it to a raspberry pi. With an accuracy of 84% to 92% and a fall-out rate 11.7%, the researchers were able to surpass a benchmark of 80% for accuracy and go under a benchmark of 20% for fall-out rate. In it therefore concluded that the researchers were able to develop a decent CNN capable of identifying leaf spot disease in coconut leaves.