An Image Classification Based on CNN Approach For Plant Leaf Disease Detection

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Abstract- *This paper provides survey on plant leaf disease detection using machine learning techniques. As Disease in plants makes significant impact on production in agriculture finding this diseases in an early stage is difficult thing as farmers are not aware of the diseases and what measures should be used we are providing solution for this problem using machine learning image classification with convolutional neural network. Applying machine learning with cloud computing environment provides most efficient environment for a machine learning environment to function smoothly by scaling as system grows .*

Keywords- machine learning, cloud computing, image classification, convolutional neural network.

I. INTRODUCTION

The food we eat is a product by agricultural industry and every countries economy greatly depends on agriculture. As we know diseases in plants greatly influences the production and makes significant impact on quality and quantity. The main reason for this damage is farmers are unable to detect disease on plants and what precaution should be taken to avoid diseases.

To detect these diseases there should be some computerized central system which is consistently updating database of the new disease and there cures. Images are the most preferred and detailed input which contains all information of the plants as images are brief and real world data.

Using image classification of machine learning is more efficient way than using image processing as image processing approach for plant leaf disease detection it requires algorithm and code based on image analysis but its not general purpose. Using image classification technique of machine learning gives us the advantage of adding new diseases in the system easily as it gets integrated easily.

If we use image classifier and softmax function provided by tensorflow we don't have to write code for every new disease added as it uses general purpose algorithms

In Classifiction Data is labelled meaning it is assigned a class, for example spam/non-spam or fraud/non-fraud. The decision being modelled is to assign labels to new unlabeled pieces of data. This can be thought of as a discrimination problem, modelling the differences or similarities between groups.

In this paper, we focus on the classsifying sample image dataset with labled class of diseases using different machine learning aprochese

The contributions of this paper are:

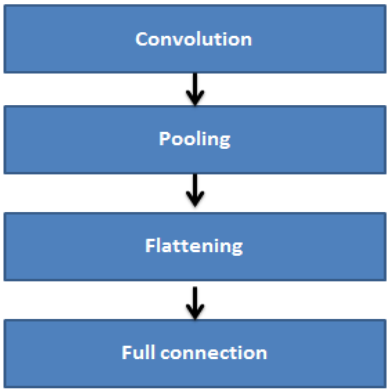
1) Presenting machine learning based approach for detection of plant disease.
2) Implementing model of machine learning model on centralized server.

Image Classifier for plant leaf disease detection using CNN

Image classification refers to the task of extracting information classes from a multiband raster image. The resulting raster from image classification can be used to create thematic maps. Depending on the interaction between the analyst and the computer during classification, there are two types of classification: supervised and unsupervised.

We are using supervised learning in out system as we have the image datasets of the plant

There are 4 stages in building Convolutional Neural Network



Fig(1) CNN building

The convolution and sub-sampling layers in a CNN are not different from the hidden layers in a common MLP, i. e. their function is to extract features from their input. These features are then given to the next hidden layer to extract still more complex features, or are directly given to a standard classifier to output the final prediction (usually a **SOFTMAX**, but also SVM or any other can be used). In the context of image recognition, these features are images treats, like stroke patterns in the lower layers and object parts in the upper layers.

pooling is a **sample-based discretization process**. The objective is to down-sample an input representation (image, hidden-layer output matrix, etc.), reducing its dimensionality and allowing for assumptions to be made about features contained in the sub-regions binned.

The flattening step is needed so that you can make use of fully connected layers after some convolutional layers. Fully connected layers don't have a local limitation like convolutional layers (which only observe some local part of an image by using convolutional filters). This means you can combine all the found local features of the previous convolutional layers. Each feature map channel in the output of a CNN layer is a "flattened" 2D array created by adding the results of multiple 2D kernels (one for each channel in the input layer).

The fully Connected layer is a traditional Multi-Layer Perceptron that uses a softmax activation function in the output layer (other classifiers like SVM can also be used, but will stick to softmax in this post). The term “Fully Connected” implies that every neuron in the previous layer is connected to every neuron on the next layer.

II. RESULTS AND CONCLUSION

This research presented a machine learning with neural network approach for plant leaf disease detection in cloud data centers where prediction is done on the basis of the predefined dataset. We have achieved,

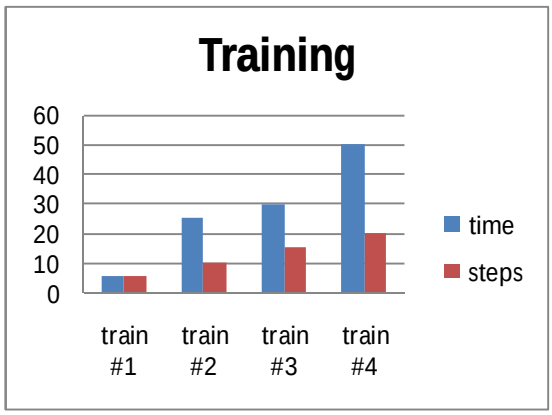
- Developing scalable system which will scale and evolve exponentially over period of time. Using machine learning allows us to use any dataset without changing dataset.
- regression analysis we can find new trends and data by location of user and using crowdsourcing results will be influenced

We did analysis on the image classifier prediction and the accuracy on the system with specification of 1 GB of Ram having HDD running on flask python as a web service

[1] Parameter	[2] Anthracnose	[3] Bacterial blight
[4] Time (avg)	[5] 16.05 sec	[6] 15.03 sec
[7] accuracy	[8] 97.4	[9] 91.6

As we can see in results it takes similar to compute both disease and time and accuracy varies according to change in input.

We did some analysis on training data of the system to count how much time it takes to train dataset with increasing no of steps to build convolutional neural network.



As we can see training time of the system increases proportionally with no. of steps to build a convolutional neural network.

We came to a system architecture as follows

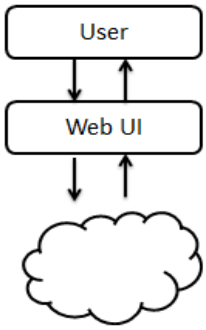


Image classification API

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