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Plant Disease Identification using Image Classification Techniques

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Abstract:
Plant diseases are one of the important aspects that have to be taken into consideration in agriculture to decrease loss. There are various prevention measures in action but there is always a chance for plants to get infected by diseases. In order to handle such chances, we need to identify the diseases before selecting the right cure for them. This will require images of various plant diseases that are considered here for supervised learning, apparently a trained model and an application interface to simplify the process. This image classification takes place in the cloud. The image of the infected plant is sent to the cloud through internet, the image is classified there and the result is sent back to the mobile application where the corresponding cures are displayed. This classification is based on Inception model of tensorflow.

Keywords: Image classification, neural networks, deep learning, tensor flow, inception, convolution.

I.INTRODUCTION:

Agriculture is considered to be the backbone of the Indian sub-continent with a large contribution to its economy. Unfortunately, 15 to 25 percent of agricultural crops are vandalized due to various diseases apart from other issues like drought and natural calamities. This mainly occurs because of the unawareness of the diseases. It is impractical to consult an expert every time a plant is infected. This solution mainly concentrates on amateur farmers and people who build green houses at their very homes. They do not have any prior experiences in these aspects. For image classification, we use tensorflow. TensorFlow is an open-source software library for dataflow programming across a range of tasks. It is a symbolic math library, and also used for learning applications such as neural networks. It is used for both research and production at Google.

II.SAMPLE DATA SET:

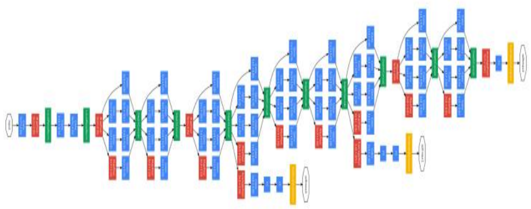
There is a huge spectrum of plants starting from domesticated plants to wild ones. Each one of these plants and trees has its own set of diseases. These disease in turn have a their own set of diseases. It is almost impossible to cover all these aspects in a single application. But this solution will try to cover the important of plants and their most possible diseases. To begin with, we take diseases of three crop types and their corresponding diseases. We use tensorflow's inception model which is pre-trained with some general types. This solution proposes to retrain that old model with our categories. There are images for diseases available in various places. These images are collected. Around 40 images are initially collected for each category for training. The inception model is retrained with these images and a trained model is obtained as an apparent action. This trained model is in turn used for further classifications.

III.RETRAINING THE INCEPTION MODEL:

The images collected from the aforementioned methods are provided to the inception model to extract features from each image. The common features in each category is the key to this way of classification. More the number of images, increased is the accuracy of the result. The result is a real number between 0 and 1; 0 being the lowest and 1 being the highest.
0<= probability <=1

A.Deep Learning:

As the name suggests, this way of learning includes different levels of learning. This solution proposes to use deep convolution networks to solve this problem. We decide on which type of convolution to use in each layer. For instance 3x3 could be used. In each layer, varied features are extracted to get a deeper understanding of the category. These features are stored in the trained model. Each of the convolution's feature maps will be passes through the mixture of convolutions of the current layer. The idea is that you don't need to know ahead of time if it was better to do, for example, a 3×3 then a 5×5. Instead, just do all the convolutions and let the model pick what's best. Additionally, this architecture allows the model to recover both local feature via smaller convolutions and high abstracted features with larger convolutions.



B.System requirements:

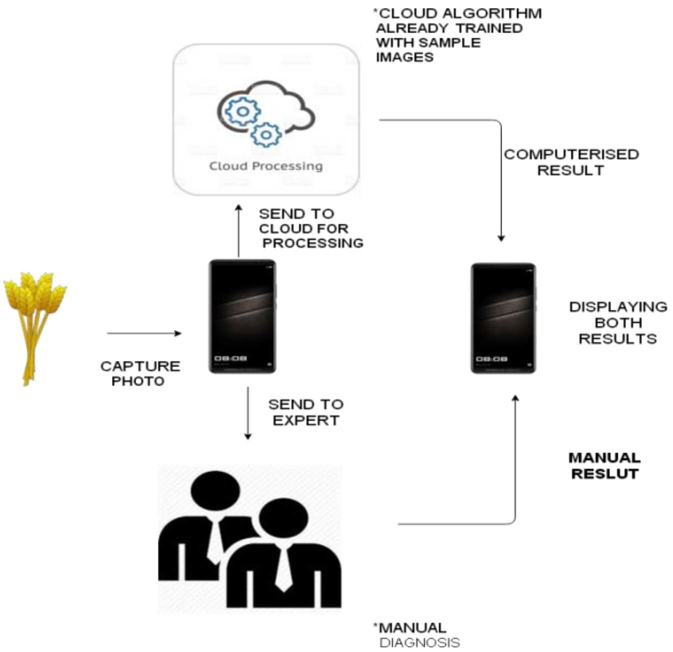
You'll definitely want to use your GPU to run the code, or else it'll will take hours to days to train. If you don't have a GPU, you can check to see if your model works by using just a couple hundred training steps. Depending on your computer, you might get a resource exhaust error and will have to shrink some of the parameters to get the code to run; in fact, I wasn't able to use the parameters described in the paper which is why mine are smaller. On the other hand, if your machine can handle more parameters, you'll be able to make your network wider and/or deeper.

IV.USING THE TRAINED MODEL:

The retraining process generates a file and we address it the trained model. This trained model contains all the features extracted during the training process for all the categories. So, every time the trained model is approached with a image, it looks for coherent features and suggests a list of categories with their corresponding probabilities in the decreaing order. The result is considered to be true if the value is higher than 0.9. The trained classification model cannot be used for clasification staright away as it works locally and has limited capabilities under such premises.So, we make these operations work in the cloud. This model classifies images on the cloud and the results are sent to the mobile application and corresponding results are displayes here.

V.ARCHITECTURE:

This solution proposes not only to classify images and identify diseases but also continuously improve the process. The image is sent to an expert for identifying diseases and a change can be made and the model could be retrained to produce better results.
The image classification model is trained with previously collected images and uploaded in the cloud further requirements. From the mobile application, an image is captures using its camera and uploaded to the cloud using internet services. The trained classifier in the cloud classifies images and sends it back to the mobile application. Simultaneously, this image is sent to an expert to get his/hers opinions. Both these results are compared and the most closest result is considered. If the expert's opinion is not available, then the result from the cloud is considered to be final.



VI.CONCLUSION:

This solution will be highly useful in place where an expertise in identifying diseases is not available like new comers in agriculture and people growing plants and crops at their homes. It is expected that the number of infected crops will reduce after this solution starts to work in full flow.

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