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Image-based Plant Diseases Detection Using Convolution Neural Networks

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ABSTRACT:

In developing countries like India, agriculture has a major role to play but the issue of food security continues to be an important one. Because of the lack of storage facilities, transportation and plant disease there is a high incidence of crop loss. An automatic system allowing identification of these diseases and providing assistance for farmers to manage their crop loss needs to be put in place. Farmers are using a conventional method of identifying plant diseases with their naked eye and it is not possible for all farmers to do the same. In the agricultural sector, there is a need to take advantage of computer vision due to advances in artificial intelligence.Deep learning is the preferred method of starting with this problem, due to its rich libraries and user experience as well as developer friendly environment.

1.INTRODUCTION

The identification of plant diseases through image analysis has recently been addressed by a number of researchers. It is becoming increasingly important to identify diseases with precision and timeliness in view of the increasing amount of crop waste caused by disease. The use of applications is becoming more and more important in developing countries, especially South Asia, where most people are either directly or indirectly dependent on agriculture based plant disease identification which can help farmers to know the cause of diseases and get the precaution to treat them.

Farmers can be encouraged to identify plant diseases early on by size of leaf, colour and growth pattern etc. In a world in which mobile phones are being used everywhere, picture images of leaves can easily be obtained and many people have access to basic Internet facilities at their disposal. The internet is used by more than 300 million people across the world for their convenience, using a variety of applications. A basic application where farmers can simply work on self-paced image based disease identification would be helpful.

The global threat of crop diseases is growing and researchers need to take a close interest, use of pesticides or insecticides may provide an interim solution but it does not help in the long run. Moreover, the chemicals are capable of having adverse effects on crops which can have a negative effect on citizens' health. It would be useful to tap into Artificial Intelligence's assistance for solving agricultural problems, given that applications of AI are spreading across a wide range of area.

A deeper neural network is composed of several neural networks that are driven by a math model to interpret the input. The layers are configured in each level according to the input data, and the data is passed through all these networks, changing and clearing the data for each layer, and getting the output from the last level. The decision as to whether or not each layer's features and size of the network are used together with a model which will be used is an important task. . In order to enhance the training process and provide accurate final results, network parameter tuning is carried out during a training phase. The basic deep learning model used in this paper takes help of Convolution Neural Networks (CNNs), it is one of the powerful technique while working with huge amount of data and also turn out to be one of the most favored techniques for pattern recognition. As the work continues to focus in on image input.

It is important to have a large number of data that can be used for the training of this model in order to develop more accurate models so as to classify plant diseases. The Plant Village dataset, with 3 x 224 x 224 pixels and 50,000 photographs, has been applied in the present paper. They have developed the technique for image segmentation in which plant diseases can be identified on a black andwhite background, with an objective of reducing man error while saving time to detect them. These classes have achieved

results of 99.53%, and are recommended to be used immediately in the identification of plant diseases.

2.LITERATURE SURVEY

Different ways of identifying diseases in plants have been explored. Nevertheless, we are still far from a computerised system that will allow us to practice and solve this problem easily. At different levels, studies have been carried out on the use of computer technologies to identify crop diseases. Factors which influence the use of deep learning techniques in identifying plant diseases have also been identified, such as lack of annotated databases, identification of signs, accurate split between training and testing data from model, image quality, pictures capturing conditions, multi concurrent disorder and disease with similar symptoms. Curled disease in tomato plants that use the leaves of tomatoes. As their model and the average 90% accuracy, they used a technique called NN'fold cross validation. In the area of plant leaves, they've applied minimal distance criteria. In these classes, the results were 99.53% and were recommended for use in real time for the early detection of plant diseases.

2.1. Implementation

As we have an image dataset and our problem is find defective images from that deep learning model is the best model to solve our model. 'Cause to keep in mind that we don't have as many data on trains, deep learning is about structural learning.

Apart from the final convolution layer, which has 64 filters, we have convolution layers with 32 filters of size 3 3, activations such as rectifier linear unitReLUDN, and each layer has a maximum pooling layer of size 2 2. At first, all the layers that are fully connected have the ReLU activated with 64 units in them, and then the dropout rate is 50% in the dropout layer. The last layer, which also acts completely together, has exactly four outputs when it relates to the 4 classes. Which is used as input to a second layer so that the probability output can be calculated.

The activation of the VGG16 model visualization has been shown in the first layer, which shows only the intensity of the color and direction, and in the first layer, which shows the activation of the VGG16 model visualization. This architecture is activated by the spots of disease, also in the leaf and in the background, without training on our existing dataset.

2.2. Material and experiment

DataSet*:* This is the plant village we use. Dataset which is available to be used as an access dataset at Kaggle . The plant village databank contains about 15,000 pictures of full health and unhealthful The crops, which currently have a range of 38 classes labeled. The selection of the input is our concern. pictures of the fully healthy leaves of tomatoes Input image has been affected by the presence of leaf Black Disease by the fungus named Septoria leaf spot. Every Domain experts retain the input images in a suitable class. botanists: early healthy stage, middle healthy stage, healthy stage or in fully healthy stage. There are no stains on the leaf in a fully healthy stage. The early stage healthyleaves have circular shape small spots withradius about 2.5 mm.

The middle stage healthy leaves having more spots growing to random or shallow shape. The end stage healthy leaves infected by the tree in greater amount and He couldn't keep it in the tree. In early stage healthy, middle stage healthy, and end stage healthy, We have 80–20 The split strategy of train testing, which means about 80 % Input photos shall be retained for the training pack, The reimaginings have been kept for testing purposes. The The resulting accuracy shall be measured using an average of the results 12 runs on the classes.

As we all know that's the plant Images have been captured from the village's data base various angles and orientations of the same leaf, Almost all images of the same leaf are supposed to be kept either in the training set or in the testing set.

Preprocessing: The samples taken from Plant Village Data sets have different sizes of red, green and blue images. By using basic deep learning, We need Only four images of the 1st stage, that is preprocessing stage.

This shall be done in a range of stages, starting with Initially, to size the input image up to 256 x 256 pixels of naive networks, 224 x 224 pixels with all The InceptionV3 models we've used up to now are 299 x 299 pixels. Appropriate predictions and optimizations have been applied during the rescaling of the images. For each pixels value, then a division of 255 shall be carried out. computable to starting value of our network. After that, normalization was implemented to all of them samples.

Training Algorithm : The basic model of The CNNconvolution Neural Network is composed of: convolution layers, pooling layers, and at the As We need to make a calculation of the maximum pooling layer The biggest value for all outputs convolution layers, which are not interconnected to each other other. This way, the rank is set in a variety of ways. existing surroundings and optimizes the size of our output. The role of the full connected layer is Keep the final layer at the top. Then all such c The layers that are on the upper floors will be calculating where X is a symbol for the image to be given, fc's an indication A matrix of the final layer's weight. The loss The variation of the result is calculated by the function. With the input, which is given by the domain Expert, which is defined as a group of experts cross entropy. Then the final convolution layer will be All the architectures that are used in our network are resumed with parallel training and slightly lower learning rate.

3 .METHODOLOGY

3.1 ARCHITECTURE

The architecture of the desktop notifier It's going to involve a lot of components working together To make sure that the application complies with its purpose It functions effectively and efficiently. It involves Making high level decisions in the area of design Determine the way in which this system is split up Components, how these components are going to be How to communicate with each other and how they're interacting will Make sure you get the functionality and performance that you want. The architecture development process is an essential element of software project success because it sets out the basic rules for developing, testing and maintaining a system. It is possible to make the system flexible and maintainable through a well planned architecture, which will enable it to respond to changes in requirements and environments.

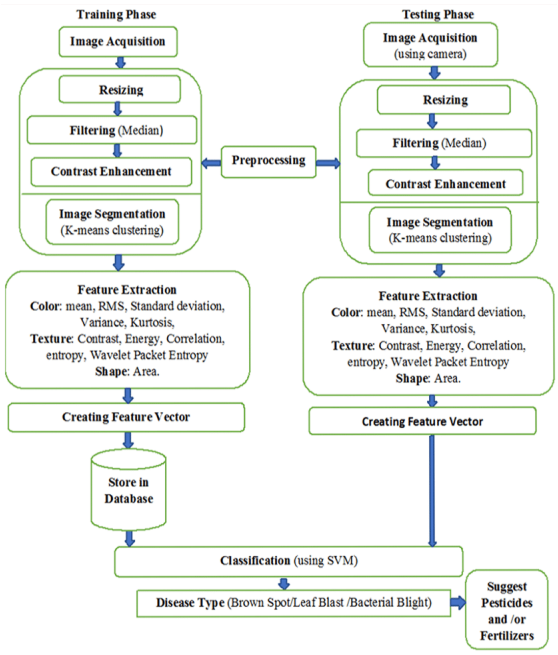


Fig1.Architecture

3.2 DESIGN

DATA FLOW DIAGRAM

The abbreviation for the data flow is DFD. Diagram. DFD relates to the flow of data from a system or process. It also provides insight into the inputs and outputs of each entity, as well as their own processes. DFD does nothave control flow and no loops or decisionrules are present. It is possible to explain specific operations depending on the type of data by a flowchart. It's a graphical tool that's useful for communicating with users, managers and other staff.

It is useful to analyse both existing and proposed systems. There are several ways in which the Data Flow Diagram can be represented. The DFD is associated with structuredanalytic modeling tools. There's a great deal of interest in data flow diagrams because they make it easy to visualize the main steps and data related to software system processes.

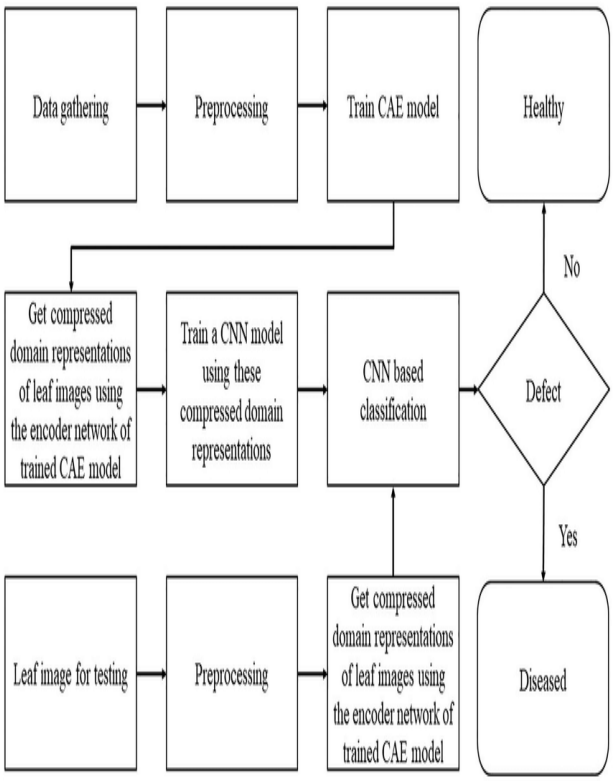


Fig2.Data flow Diagram

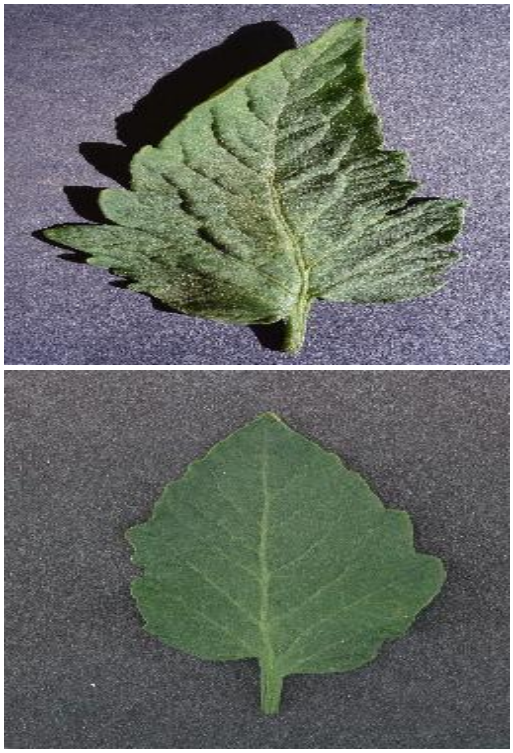
4.RESULT&DISCUSSION

The results of the tuning of the parameters the Net Image models are shown. The final accuracy of the existing validation regime varies between 84,0% and 93.5%. Compared to the current model that has already been calibrated, precision gains after parameter tuning are greater. In celebration of the most important outcome, A VGG16 model with an accuracy of 93.5%. Our results show that the transfer experience can lead to a better result, even when we don't have enough data.

The accuracy rate is 93.5% in the first and last stage. They were 87.2% and 87.2% respectively. It is expected that, with an accuracy of 80.4% achieved, intermediate stage accuracy will not be correctly classified. However, the rest of the subsequent phases are confused by all those stages that were not properly classified. As for the initial stage, which is confused with the only intermediate stage, and no one of the

initial stages is confused with the final stage. But, as we know, deep learning is data driven.

(a) Healthy Leaf



(b) Early Blight leaf

(b) Septoria leaf spot

4.CONCLUSION&FUTURE WORK

Our research build a deep learning The model's ability to search for meaning features that are related to classification automatically, that actually prepare a complete In order to identify the seriousness of the situation disease. There are only a few input data. we trained a naïve network of slightly smaller size In the beginning, there were a series of different layers Four recent and completely tuned parameters models.

We have found that there is a significant improvement in the model's efficiency when well tuned to an already trainable Deep Learning Model. How, with the increased scope of classification, our model is a new dominant technology. The use of a range of sensors, such as infrared cameras also in multi camera systems, could be used to collect data for several diseases at all stages. With a cure proposal, outcome validation, and so on, a deep learning model will be added.

5.REFERENCES

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