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Plant Leaf Disease Detection Using CNN

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Abstract: **Smart farming system is an innovative technology that helps improve the quality and quantity of agricultural production in the country. Plant leaf disease has been one of the major threats to food security since long ago because it reduces the crop yield and compromises its quality. diagnosis of accurate diseases has been a major challenge and the recent advances in computer vision made possible by deep learning has paved the way for camera assisted disease diagnosis for plant leaf. It described the innovative solution that provides efficient disease detection and deep learning with convolutional neural networks (CNNs) has achieved great success in the classification of various plant leaf diseases. A variety of neuron-wise and layer-wise visualization methods were applied and trained using a CNN, with a publicly available plant disease given image dataset. So, it observed that neural networks can capture the colors and textures of lesions specific to respective diseases upon diagnosis, which can act like human decision-making.**

Index Terms - **Component, formatting, style, styling, insert.**

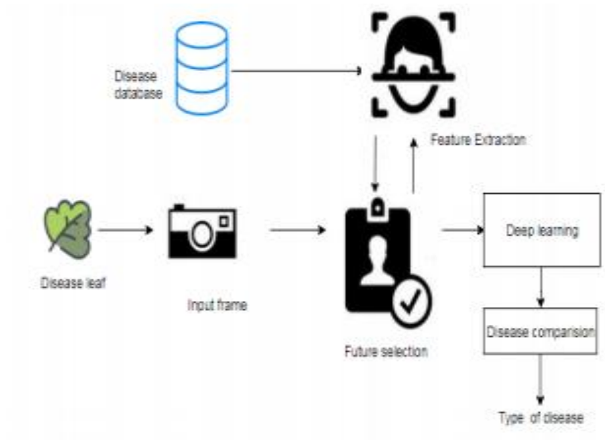
I. INTRODUCTION

Deep learning is a branch of machine learning which is completely based on artificial neural networks, deep learning is also a kind of mimic of human brain because the neural network can mimic the human brain. It's on hype nowadays because earlier we had lot of data and not enough processing power. A formal definition of deep learning is- neurons Deep learning is a particular kind of machine learning that achieves great power and flexibility by learning to represent the world as a nested hierarchy of concepts, with each concept defined in relation to simpler concepts, and more abstract representations computed in terms of less abstract ones. In human brain approximately there are 100 billion neurons, all together this is a picture of an individual neuron and each neuron is connected through thousands of their neighbours. The question here is how it recreates these neurons in a computer. So, it creates an artificial structure called an artificial neural net where we have nodes or neurons. It has some neurons for input value and some for output value and in between, there may be lots of neurons interconnected in the hidden layer.

II. LITERATURE SURVEY

A. Chowdhury, Dhruba K. Bhattacharyya, Jugal K. Kalita propose an Co-Expression Analysis of Gene Expression: A Survey of Best Practices. It presented an overview of best practices in the analysis of (differential) co-expression, coexpression networks, differential networking, and differential connectivity that can be discovered in microarrays and RNA-seq data, and shed some light on the analysis of scRNA-seq data as well. XiaoyanGuo, MingZhang, Yongqiang Dai proposed Image of pant disease segmentation model based on pulse coupled neural Network with shuffle frog leap algorithm. A novel image segmentation model SFLA-PCNN for plant diseases based on hybrid frog-hopping algorithm is proposed. Using the weighted sum of cross entropy and image segmentation compactness as the fitness function of SFLA, the image of potato late blight disease is taken as a trial segmentation image to find the optimal configuration parameters of PCNN neural. Image segmentation is a key step in feature extraction
and disease recognition of plant diseases images.

III. SYSTEM ARCHITECTURE



As shown in figure 1 there is a database which consist of all the different plant leaf diseases which we have taken into account. The module is trained repetitively to attain the maximum accuracy. If a new image is given to the module it's features get compared with the features that are already trained in the database. It then provides the appropriate result.

IV. ALGORITHM

1) Phase One – Trialling of Image size Phase one aims to investigate the effect that image size has on model performance. In total, five images sized are tested ranging from 150 x 150 to 255 x 255.

To begin, the Resnet34 pre-trained weights are downloaded. As a default of transfer learning, all layers with the except of the final two layers are frozen. These contain new weights and are specific to the plant disease classification task. Freezing allows these layers to be disease separately trained, without backpropagating the gradients. In exactly this way, the 1cycle policy is used to train the final layers. With this complete, the remaining layers are released. To aid the fine-tuning process, a plot displaying learning rate vs loss is generated and analysed. From this, a suitable learning is selected, and the model is run. With results recorded, the model is re-created to the additional four image sizes (Table III.). All steps remain consistent in each trial including the learning rate

2) Phase Two – Model Optimisation Using the most suitable image size, the ResNet34 model is optimised. To further improve the model's performance, additional augmentation settings are added (Fig. 2). Operations include brightness changes (0.4,0.7) and warp (0.5). Next, the final two layers are isolated and trained at the default learning rate. With this complete, fine tuning is performed, running multiple trials to test a series of learning rates and number of epochs.

3) Phase Three – Visualisations For the purpose of interpretation, a series of visualisations are generated based on the validation and test datasets. Additionally, the model is deployed to create a web application. To achieve this, the completed essential files are stored in a GitHub repository and the model is exported as a pickle file. To deploy the model, the repository is connected to the unified platform; Render. In carrying out this task, the 'Render Examples' GitHub repository was used as a guide.

V. CONCLUSION

It focused how image from given dataset (trained dataset) in field and past data set used predict the pattern of plant diseases using CNN model. This brings some of the following insights about plant leaf disease prediction. As maximum types of plant leaves will be covered under this system, farmer may get to know about the leaf which may never have been cultivated and lists out all possible plant leaves, it helps the farmer in decision making of which crop to cultivate. Also, this system takes into consideration the past production of data which will help the farmer get insight into the demand and the cost of various plants in market.

VI. FUTURE ENHANCEMENT

Agricultural department wants to automate the detecting the yield crops from eligibility process (real time).To automate this process by show the prediction result in web application or desktop application. To optimize the work to implement in Artificial Intelligence environment.

VII. REFERENCES

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