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Crop Disease Detection Using Convolution Neural Net

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ABSTRACT:Agriculture in India is much more than just producing food for a living. Agriculture accounts for a substantial percentage of the Indian economy since India is one of the leading exporters of food, grains, and other agricultural products. Agriculture provides a living for more than 70 percent of India's rural population. A smart farming system is an innovative technology that aids in the improvement of the country's agricultural produce in terms of both quality and quantity. Plant leaf disease has long been considered a serious concern to food security because it decreases crop output and quality. Accurate disease detection has been a big difficulty, and recent breakthroughs in computer vision enabled by deep learning have cleared the road for camera-assisted disease detection for plant leaves. New Technology introduced a unique system that enables rapid disease detection and deep learning with convolutional neural networks (CNNs), which has had remarkable success in the categorization of diverse plant leaf diseases. A CNN was used to train a number of neuron- and layer-wise visualisation approaches using a publicly accessible plant disease picture dataset. As a result, it was shown that neural networks can record the colours and textures of lesions particular to respective diseases during diagnosis, acting similarly to human decision making.

KEYWORDS:CNN, Crop disease detection, TensorFlow.

I. INTRODUCTION

India is a developing country with the world's second most populous people. The need for food increases day by day as the population grows, yet expanding population also causes terrible climate, which not only causes global warming but also a horrible environment for plants to develop and live due to new illnesses and infections. Traditional methods, such as naked eye detection, are not only time demanding, but also need a large number of people to regularly monitor plants in farms. Plant disease control is critical for the growing Indian economy and providing a better lifestyle for industrious farmers, many of whom have committed suicide due to financial difficulties. Thus, crop quality and quantity guarantee are required since the economic success of farmers and agriculture-based enterprises is dependent on it. There are roughly 100 billion neurons in the human brain and each neuron is connected by hundreds of its neighbours. The question here is how these neurons can be recreated in a computer. The answer is Convolution Neural Net. It generates an artificial structure known as an artificial neural net, which has nodes or neurons. It has neurons for input and neurons for output, and in between there may be many neurons coupled in the hidden layer.

II. LITERATURE REVIEW

A. Chowdhury, Dhruba K. Bhattacharyya, and Jugal K. Kalita presented a survey of best practises for Co-Expression Analysis of Gene Expression. It provided an overview of recommended practises for analysing (differential) co-expression, co-expression networks, differential networking, and differential connectivity seen in microarrays and RNA-seq data, as well as shed some light on scRNA-seq data interpretation.

Plant image disease segmentation model based on pulse coupled neural network with shuffle frog jump method was proposed by XiaoyanGuo, MingZhang, and Yongqiang Dai. The SFLA-PCNN image segmentation model for plant diseases is suggested, which is based on a hybrid frog-hopping algorithm. The picture of potato late blight disease is used as a trial segmentation image to discover the ideal configuration parameters of PCNN neural using the weighted sum of cross entropy and image segmentation compactness as the fitness function of SFLA. Image segmentation is an important step in extracting features and recognising plant diseases in photos.

Plant Diseases Recognition for Smart Farming was proposed by Chit Su Hlaing and SaiMaung MaungZaw. It has demonstrated the benefits of the GP distribution model for SIFT descriptors and has been effectively employed in

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plant disease classification. Furthermore, the suggested feature provides a fair balance of performance and classification accuracy. Although the suggested feature successfully models the SIFT feature and may be used to recognise plant illnesses, it is necessary to strive to enhance our suggested feature by considering and cooperating with other image processing methods.

III. EXISTING SYSTEM

Plants are known to be a source of energy for humans. Plant diseases can have a significant impact on agriculture, resulting in significant agricultural output losses. As a result, detecting leaf diseases is critical in the agricultural area. However, it necessitates a big workforce, additional processing time, and specialised knowledge and abilities in plant disease management. As a result, machine learning can play an important role in the identification of disease in plant leaves by analysing data from a diverse range of plants and classifying it into one of a pre-set set of classes. Colour, intensity, and size of plant leaves are regarded as important factors for classification, as are the many forms of plant illnesses and classification approaches in machine learning that are used for recognising illnesses in different plant leaves.

IV. PROPOSED SYSTEM

I intended to develop the module in such a way that even someone with no programming experience could use it and obtain information on the plant's condition. It offers a method for predicting crop diseases using plant leaf images. Dataset used here is provided by Sravan Suresh. It contains a total of approximately 20 thousand images in 20 classes. These images are from common crops of Northern India; Grapes, Bell Peppers, Potatoes, Tomatoes, Jack Fruit and Mangoes. Dataset include leaf images from common disease among these crops as well as their healthy counterparts. A proprietary CNN based classifier model is trained on this dataset to classify any image into one of these 20 classes.

V. CNN MODEL LAYERS

Conv2D: This is the layer that divides a picture into numerous pictures. The feature vector is referred to as activation.

MaxPooling2D: This function is used to maximise the value from the specified size matrix, and it is repeated for the following two levels.

Flatten: This function is used to flatten the dimensions of a picture that has been convolved.

Dense: This is the hidden layer that is utilised to build this fully linked model.

Dropout: Dropout is employed to avoid overfitting on the dataset, and dense is the output layer comprising just one neuron that determines which category a picture belongs to.

Image Data Generator: It rescales the picture, adds shear in specific ranges, zooms the image, and flips it horizontally. This Picture Data Generator supports all conceivable image orientations.

Process of Training: The function train datagenflow from directory is used to prepare data from the train dataset directory. The image's goal size is specified by target size. test datagen. Flows from the directory are used to produce test data for the model, and everything is the same as before. A fit generator is used to fit the data into the model created above, and steps per epoch informs us how many times the model will execute for the training data.

Epochs: The number of times the model will be taught in both forward and backward passes.

Validation procedure: The validation data variable is used to provide validation/test data into the model. The number of validation/test samples is indicated by validation steps.

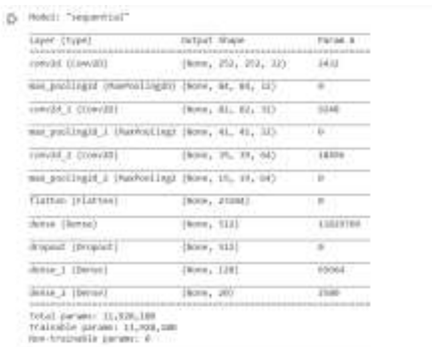

Fig. 1. CNN classification model and its layers.

VI. TRAINING AND TESTING MODEL

The dataset is pre-processed, which includes image reshaping, resizing, and array conversion. The test picture is likewise subjected to similar processing. A dataset of roughly 20 distinct plant leaf diseases is obtained, and any image from that dataset may be used as a test picture for the programme.

The train dataset is used to train the model (CNN) to recognise the test image and the ailment it contains. CNN layers include Dense, Dropout, Activation, Flatten, Convolution2D, and MaxPooling2D. If the plant species is included in the dataset and the model has been properly trained, the programme may identify the illness. Following successful training and pre-processing, a comparison of the test picture and trained model is performed in order to forecast the illness.

Fig. 2. Training summary of CNN model.

Fig 3.1 Sample Input.

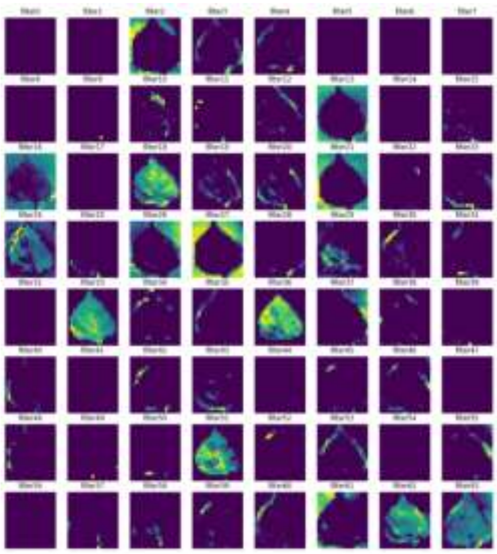

Fig 3.2 Feature map of sample input

VII. RESULTS

In this research, we suggested detecting crop diseases using a CNN system based on Deep Learning. Farmers can benefit from the proposed method since it provides real-time information regarding crop disease. It also decreases outbreaks and upsurges, which cause massive crop and pasture losses and endanger the lives of poor farmers. As In comparison to standard crop disease detection systems, the proposed approach has an accuracy rate of 89 percent, implying proper identification of 8 crop photos out of a total of 9. The experimental findings show that our suggested method is successful, and it may be extensively utilised by farmers to detect crop disease.

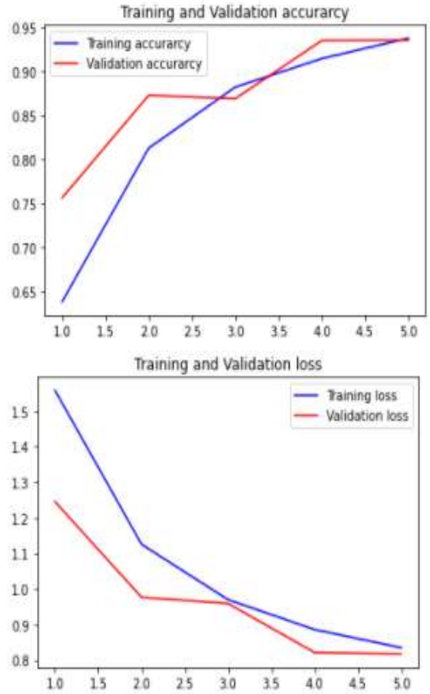

Fig. 4. Accuracy and loss during training and validation phases respectively.

Fig. 5. Prediction on a small set of unseen data, model predict 8 out of 9 correctly.

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