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Agritech Pro: Empowering Farmers With AI-Driven Solutions For Crop Health And Yield Enhancement

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Abstract

Image Processing, Machine Learning, and Deep Learning concepts were used to assist farmers. Our application includes features such as early detection of plant disease, which is accomplished through a variety of methods. Following evaluation, the results revealed that the Convolutional Neural Network performed better for plant disease detection with high accuracy. It also assists the farmer in forecasting the weather to determine the best time for agricultural activities such as harvesting and plucking. To prevent disease reoccurrence due to soil mineral loss, a crop specific fertiliser calculator is included, which can calculate the amount of urea, diammonium phosphate, and muriate of potash required for a given area.

1.INTRODUCTION

A study conducted by the Associated Chambers of Commerce and Industry of India found that pests and diseases cost crops Rs.50,000 crore ($500 billion) each year, which is equivalent to a nation in which at least 200 million people go to bed hungry every night [1]. As a vital industry, agriculture is relied upon by the majority of rural populations in developing nations. The area is looked by significant difficulties like phenomenal irritation assault and unexpected atmospheric conditions influencing their produce prompting significant loss of food and exertion. A straightforward agroandroid application system can use technology to improve the livelihoods of rural residents. Plant diseases can affect a lot of crops, putting food security at risk and costing farmers a lot of money. We conducted a comprehensive review of previous research on this topic [5] and designed the Android application Agricultural Aid, which makes use of machine learning to detect plant diseases, with the intention of assisting farmers in overcoming this issue. This location is joined with an android application which gives highlights like weather conditions conjecture of as long as 7 days, compost adding machine and language interpretation in up to 4 dialects which has been carried out and coordinated utilizing Android Studio and its APIs. For illness grouping, we followed two methodologies: Processing images using models from deep learning and machine learning. Multi-step preprocessing methods like these are typical of the first approach, which is known as the Image Processing approach: thresholding, color space

conversion, filtering, and contouring to identify the infected area. These techniques can be utilized with AI ideas to give grouping of contaminated districts. However, these methods don't do very well when it comes to accuracy. The "GrabCut" Algorithm, which is an optimized method of foreground extraction that eliminates background noises with minimal user interaction [4], can also be used in place of these steps. It can be used for better classification and has better background elimination accuracy; however, this method was not utilized in the application at the time, but it may be incorporated in the future to improve accuracy. A deep neural architecture is used to train and test the Deep Learning method on leaf image databases to classify the disease. The results of applying Deep Learning Models like CNN, ResNet-152, and Inception v3 are compared in this paper. In our horticulture help, CNN Model is utilized to prepare and shape a computerized plant illness framework in view of pictures of leaves of both solid and sick plants

2.LITERATURE SURVEY

2.1 V. Singh, V. and P. A. K. Misra , "Detection of unhealthy region of plant leaves using Image Processing and Genetic Algorithm," in 2015 International Conference on Advances in Computer Engineering and Applications (ICACEA), Ghaziabad, India, 2015.

Agricultural productiveness is that element on which Indian Economy fantastically depends. This is the one of the motives that ailment detection in plant life performs an essential position in agriculture field, as having sickness in plant life are pretty natural. If suitable care is now not taken in this vicinity then it reasons serious outcomes on flowers and due to which respective product quality, volume or productiveness is affected. Detection of plant ailment via some automated method is really helpful as it reduces a giant work of monitoring in massive farms of crops, and at very early stage itself it detects the signs and symptoms of ailments skill when they show up on plant leaves. This paper provides an algorithm for photo segmentation approach used for computerized detection as nicely as classification of plant leaf ailments and survey on exceptional illnesses classification strategies that can be used for plant leaf sickness detection. Image segmentation, which is an necessary component for disorder detection in plant leaf disease, is executed by using the use of genetic algorithm

2.2 W. Ding and G. Taylor, "Automatic moth detection from trap images for pest management", Computers and Electronics in Agriculture, vol. 123, pp. 17-28, 2016. Available: 10.1016/j.compag.2016.02.003.

We advocate a convolutional neural network-based automated moth detection pipeline.We describe a set of strategies for preprocessing uncooked moth entice images.Our approach indicates promising overall performance on a codling moth dataset from photographs amassed in the field.Our species-agnostic technique can be effortlessly tailored to one-of-a-kind pests and/or environments. Monitoring the range of insect pests is a quintessential thing in pheromone-based pest administration systems. In this paper, we suggest an computerized detection pipeline based totally on deep mastering for figuring out and counting pests in pictures taken interior area traps. Applied to a industrial codling moth dataset, our technique suggests promising overall performance each qualitatively and quantitatively. Compared to preceding tries at pest detection, our strategy makes use of no pest-specific engineering which allows it to adapt to different species and environments with minimal human effort. It is amenable to implementation on parallel hardware and consequently succesful of deployment in settings the place real-time overall performance is required.

[3] Athmaja S1, Hanumanthappa M2, “Applications of Mobile Cloud Computing and Big Data Analytics in Agriculture Sector- A Survey”. International Journal of Advanced Research in Computer and Communication Engineering ICRITCSA M S Ramaiah Institute of Technology, Bangalore Vol. 5, Special Issue 2, October 2016.

The objective of this literature survey was to identify the applications of Mobile Cloud Computing and Big Data Analytics techniques in the agriculture sector. Related literature from IEEE journals and other International journals were collected and reviewed. A conclusion is made by proposing a new model that uses mobile cloud computing and big data analytics techniques together to meet several challenges that the farmers are facing today in the agriculture sector. The proposed model helps farmers in making optimal decisions on their agricultural production and thereby reducing the post-harvest wastage of their products.

3.PROPOSED WORK

In the Deep Learning Approach, we decided to train and test the CNN model using a subset of the PlantVillage

dataset as well as the cotton dataset. The input image is fed into this model, which initially used a portion of the PlantVillage and Cotton Datasets with a 70-30 training-validation split, yielding 4200 images for training and 1800 images for validation. A CNN (Convolutional Neural Network) is a deep learning model that takes inputs and assigns weights to them based on various features. CNN is a common neural network used for image-based datasets.

Our CNN model is made up of four main convolutional layers that are followed by a ReLU activation function, max pooling, and a dropout layer. This set of convolutional layers is followed by a flatten and then a dense layer, and finally by the softmax activation function, which tells us which class has the highest probability.

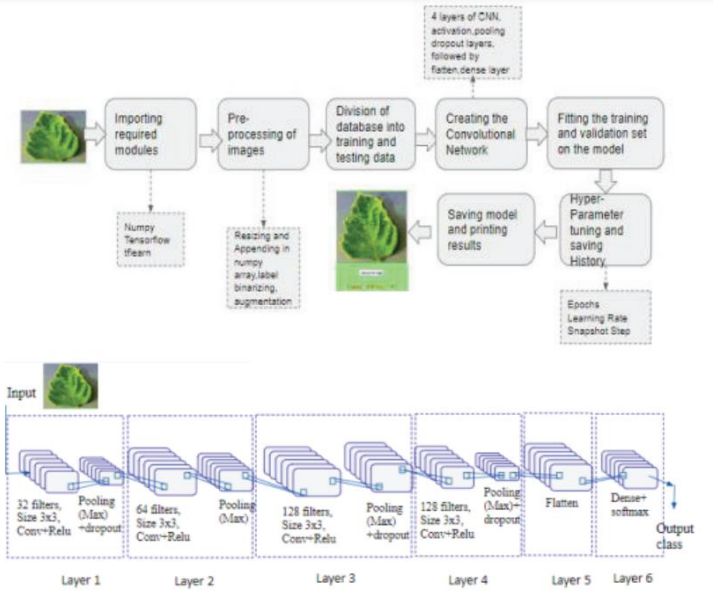


Fig 1:Architecture

3.1 IMPLEMENATION

Upload image: in this module user can upload trained images using upload option we have took dataset from rom the kaggale website and upload to the proposed model

Generate Train & Test Model: We have to preprocess the gathered data and then we have to split the data into two parts training data with 80% and test data with 20% .

Analysis :In this module we will analyse the upload image using CNN algorithm

Predict:in this module finally we can predict the result based on input image

3.2 CNN ALGORITHM

Deep Learning is turning into a very famous subset of laptop studying due to its excessive degree of overall performance throughout many sorts of data. A amazing way to use deep gaining knowledge of to classify pix is to construct a Convolutional Neural Network (CNN). The Keras library in Python makes it extraordinarily easy to construct a CNN. Computers see pictures the usage of pixels. Pixels in pix are typically related. For example, a sure team of pixels may additionally signify an part in an photograph or some different pattern. Convolutions use this to assist become aware of images. A Convolution multiplies a matrix of pixels with a filter matrix or kernel and sums up the multiplication values. Then the convolution slides over to the subsequent pixel and repeats the identical technique till all the photograph pixels have been covered.

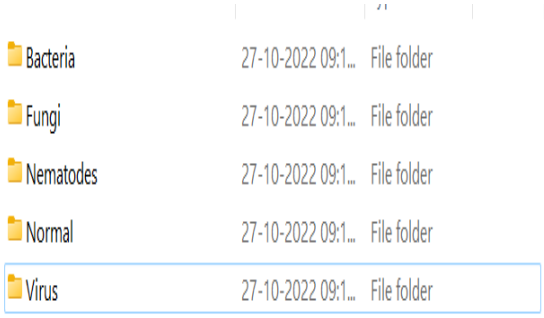
Convolutional Neural Networks are very comparable to everyday Neural Networks; they are made up of neurons that have learnable weights and biases. Each neuron receives some inputs, performs a dot product and optionally follows it with a non-linearity.

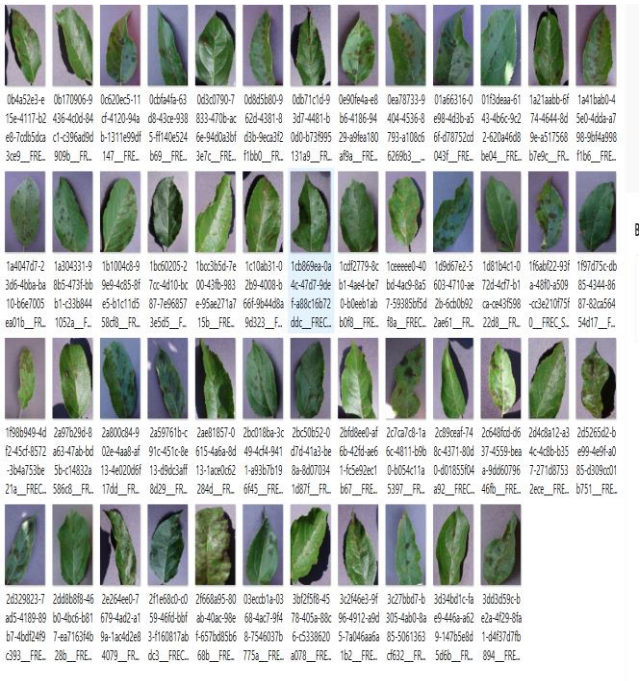
Regular Neural Nets don’t scale nicely to full images. Consider a picture of measurement 32x32x3(32 wide, 32 high, three colour channels), so a single utterly related neuron in a first hidden layer of a everyday Neural Network would have 32*32*3 = 3072 weights. This quantity nevertheless appears manageable, however simply this completely linked shape does no longer scale to large images. For example, an photo of extra first

rate size, e.g.200x200x3, would lead to neurons that have200*200*3 = 120,000 weights. Moreover, all of us desire to have numerous such neurons, so the parameters would add up quickly! Clearly, this full connectivity is wasteful and the massive variety of parameters would rapidly lead to overfitting.
Convolutional Neural Networks take gain of the truth that the enter consists of snap shots and they constraint the structure in a greater good way. In particular, not like a ordinary Neural Network, the layers of a ConvNet have neurons organized in three dimensions:width, height, depth. For example, the enter photograph with dimensions XxYxZ (width, height, depth respectively), the neurons in a layer will solely be linked to a small vicinity of the layer earlier than it, rather of all of the neurons in a fully-connected manner, the remaining output layer would have dimensions(1,1,C), because with the aid of the quit of the ConvNet architecture, it will limit the full photo into a single vector of category scores, organized alongside the depth dimension.

3.3 ABOUT DATASET

Parameter	Plant Village
Size of Database	**250 Images**
Format of Images	.jpg
Resolution	256x256 (pixels), 96x96 (dpi)
Types of Diseases	**Bacteria, Fungi, Nematodes, Normal, Virus**
Availability	**Public**





4.RESULTS

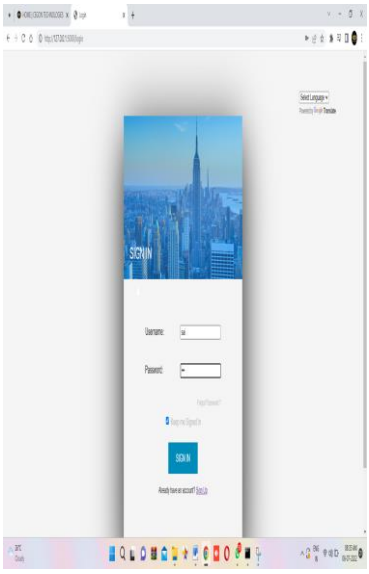


Fig 2: Signin page

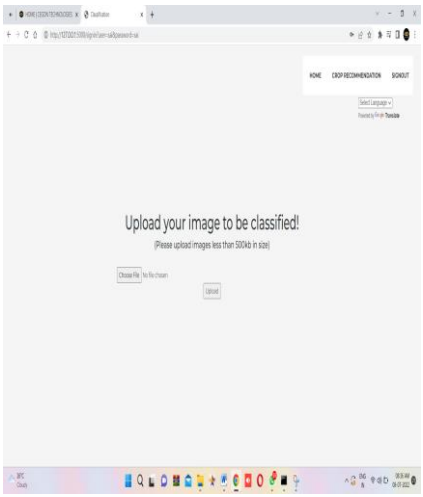


Fig 3:in this screen User can upload images

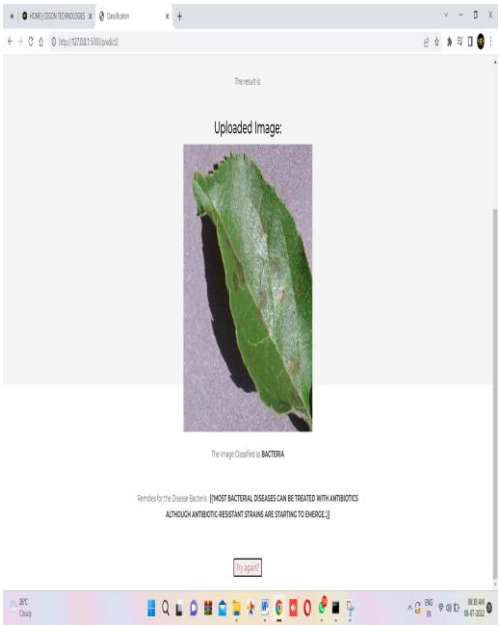


Fig 4: In this screen based on input we will get output with remedies

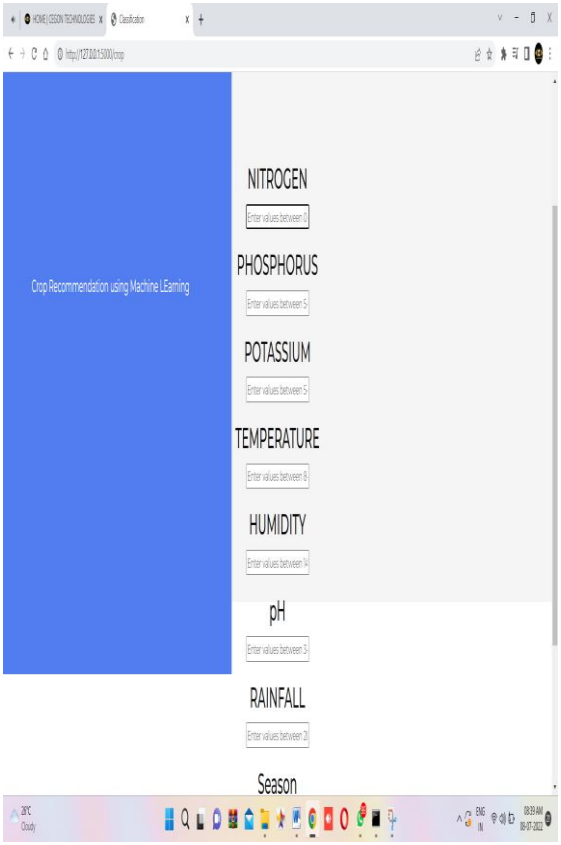


Fig 5: In this screen we can get crop recommendation based on parameters

5. CONSLUCION

During our research, we discovered the need for effective plant disease identification and classification algorithms, as well as prevention methods. Because there are so many different crops and diseases, it is critical that the detection system be able to adapt to changing variables and trends. As a result, machine learning and deep learning approaches were used for this project, ensuring that the code trains itself against as many different crops and diseases as possible. The paper includes an Android application that detects plant diseases as well as other features like language translation, weather forecasting, and fertiliser calculator. . With this application, we hope to assist in unprecedented agricultural activities while also ensuring a healthy plant. We tried several approaches, as discussed above, and chose the best model- CNN with an accuracy of 97.94 using 20 epochs, based on our thorough literature review and robust implementation. We also tested our application on a cotton dataset and ran real-time analysis on a diseased tomato crop to ensure that our model does not overfit and performs well in a live environment. In the future, we hope to expand our dataset to include more diverse types of crops and diseases, allowing the algorithm to adapt to real-time conditions and provide broad coverage

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