RESEARCH ARTICLE

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Crop Disease Detection System Using Deep Learning Method

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ABSTRACT

Agriculture forms a crucial part of the economy of India. More than 50 percent of India's population is reliant on on agriculture for their income. India export many crops like wheat and other cereals. It can thus be seen that wheat is a big part of the Indian agricultural system and the economy of India. Therefore, it is very important to maintain the steady production of wheat and cereals. Planning for agriculture plays a major role in agro-based economy of country development and food security. In agricultural planning, the selection of crops is a significant question. It relies on different parameters, such as the rate of production, market price and policies of the government. Many researchers have researched crop yield rate prediction, weather prediction, soil classification and crop classification using statistical methods or machine learning techniques for agricultural planning. In this paper, novel crop diseases detection system based on deformable model have proposed to handle the segmentation of crop images.

Keywords: Crop disease, pre-processing, classifier algorithm, feature extraction Convolutional neural network.

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INTRODUCTION

Predictive Analysis in order to increase productivity and crop production efficiency, agricultural systems are very efficient. Population, however, increases slowly, while the crop production resource declines day by day. Traditionally, farming includes planting the crop or harvesting it according to a predetermined timetable. With the impact of weather variation in India, majority of the agricultural crops are being severely affected in terms of their performance [1]. Attaining maximum yield rate of crop using restricted land resource is a goal of agriculture planning in an agro-based country [2]. In their study they have shown that a method name crops selection method to solve crops selection problem. Recently, modern people don't have cognizance about the cultivation of the crops in a right time and at a right place [3]. For improving prediction of crop yield under different climatic scenarios, machine learning methods are widely being used.

In this paper, the reviews on use of such machine learning technique for Indian rice cropping areas have presented [4]. If plants and crops suffer from pests, it impacts the country's agricultural production [5], in their study suggested identify the symptoms of plants at very early stage. Precision agriculture requires the collection of real-time weather data, air quality, soil, crop maturity, machinery, labor costs and current data convenience. This prognostic analytics can be used to make cleverer decisions in agricultural field. Farmers, through their experience, predict the diseases; however this is also not the correct approach. Crop diseases are triggered by bacteria, fungi, viruses etc. To control this, diseases in crop are classified based on diseased leaf types using ANN and

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therefore we can take necessary steps in time to minimize loss of production. In this impression, people take the picture of leaf of crop which he has swon in his farm. After connecting it will be uploading on server and then uploaded image is processed and accordingly the features of that image are extracted. Oculus observation by consultants is the most adopted method for the detection and identification of plant diseases.

In this section, some existing detection system has presented. Shruthi, Nagaveni V, Dr. Raghavendra B K [6] proposed the review that does a comparative analysis different machine learning classification methods for plant disease recognition. When compared to other classifiers, the SVM classifier is applied by many authors for disease classification. Machine learning algorithms for disease identification and classification have been compared in a large survey.We investigated the effectiveness of the Support Vector Machine (SVM) Classification Technique, the K-Nearest Neighbor Classification Technique, and the Fuzzy C-Means Classifier techniques for detecting plant illnesses. Kirti, Navin Rajpal [7] proposed the review where Black Rot is a fungal disease that affects both yield and wine quality, and can even result in crop loss. The Plant Village Dataset is used, which includes photos of grape plant leaves that have been afflicted by Block Rot Disease as well as healthy leaves. For segmentation, the HSV and L*a*b* colour models are utilized. Color-based approaches are used to differentiate the healthy and diseased parts of the leaves, and the features are saved for each leaf. The colour of the diseased half of the leaf is extremely different from the healthy part, making it simpler to spot. Jayraj Chopda, Sagar Nakum, Vivek Nakrani ,Prof. Hiral Raveshiya [8] have presented a method that uses a 'Decision Tree Classifier' to predict cotton crop illnesses based on temperature, soil moisture, and other variables. This would benefit farmers by allowing them to produce higher-quality products, and we would also focus on developing an Android application that would provide real-time output to farmers in an efficient manner. : Zeel S.Ramesh, D.vydeki [9] described Rice blast disease is a big issue in the agriculture industry all over the world. The farmer will save a significant financial loss if the sickness is detected early. In this research, a machine learning technique is proposed for detecting disease symptoms in rice plants. The use of a machine learning algorithm allows for the automatic detection of plant disease. For the suggested method, photographs of healthy and diseased leaves are taken.

ARCHITECTURE OF THE PROPOSED CROP DISEASE DETECTION SYSTEM

In figure 1, the architecture of proposed crop disease detection system has depicted. In figure 1, Image processing steps for detecting plant illnesses have given. The entire procedure is broken down into three stages.

1. Users produce input photographs on an Android device or upload them to our web application.

2. Separation Picture segmentation, image enhancement, and colour space conversion are all examples of pre-processing. First, a filter is applied to the digital picture of the image. Then, for each image, create an array. Each image name is converted to a binary field using the scientific term for Binaries' Diseases.

CNN classifiers are programmed to recognize illnesses in different plant classes. The Level 2 results are used to activate a classifier that has been trained to classify various plant illnesses

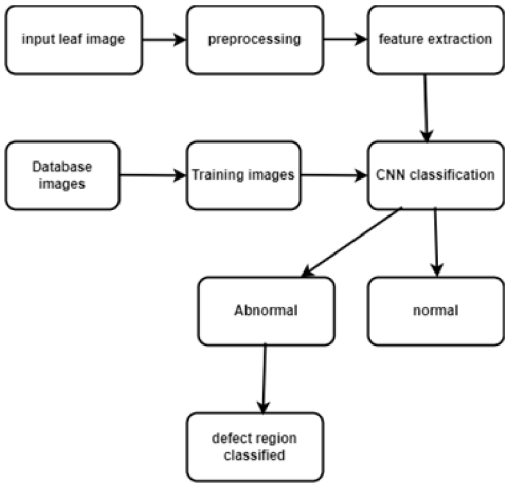

Figure 1: Image Processing Steps

Training Process

The amplitude of F at any pair of coordinates (x, y) is called the intensity of that picture at that place. An image is defined as a two-dimensional function, F(x,y), where x and y are spatial coordinates. A digital image is one in which the x, y, and amplitude values of F are all finite. To put it another way, an image can be defined as a two-dimensional array with rows and columns. A digital image is made up of a limited number of elements, each of which has a specific value at a specific

position. Picture elements, image elements, and pixels are all terms used to describe these elements. A pixel is the most common unit of measurement for the elements of a digital image. BINARY IMAGE– As the name implies a binary image has only two pixel elements: 0 and 1, where 0 denotes black and 1 denotes white. Monochrome is another name for this image. BLACK AND WHITE IMAGE– a BLACK AND WHITE IMAGE is an image that exclusively has black and white colors. COLOR FORMAT OF 8 BITS– This is the most well-known image format. Grayscale Image is a type of image that contains 256 different shades of colour. In this format, 0 represents black, 255 represents white and 127 represents grey. COLOR FORMAT OF 16 BITS– This is a colour image format. It contains 65,536 distinct colours. High Color Format is another name for it.

$$f(x,y) = \begin{bmatrix} f(0,0) & f(0,1) & f(0,2) & \dots & f(0,N-1) \\ f(1,0) & f(1,1) & f(1,2) & \dots & f(1,N-1) \\ . & . & . & & . \\ . & . & . & & . \\ . & . & . & & . \\ f(M-1,0) & f(M-1,1) & f(M-1,2) & \dots & f(M-1,N-1) \end{bmatrix}$$

- ACQUISITION– It could be as basic as being given a digital image to work with. The major tasks are: a) scaling
- b) Color transformation (RGB to Gray or vice-versa)
- IMAGE ENHANCEMENT– It is one of the most basic and appealing aspects of Image Processing, and it is also used to extract some hidden elements from an image. It is subjective.
- Picture RESTORATION– This likewise has to do with making an image appealing, but it is more objective (Restoration is based on mathematical or probabilistic model or image degradation).
- COLOR IMAGE PROCESSING– This section covers pseudocolor and full colour image processing, as well as colour models that can be used in digital image processing.
- WAVELETS AND MULTI-RESOLUTION PROCESSING– This is the foundation for portraying images in a variety of ways.

Overlapping Fields with Image Processing

Following figure 2 depicts the different methods of image processing**.**

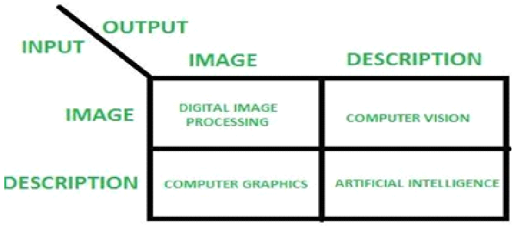

Figure 2: Overlapping Fields with Image Processing

According to block 1, if the input is an image and the output is an image, the process is known as digital image processing. Computer Vision is defined as an input that is an image and an output that is some kind of information or description, according to block 2. Computer graphics, according to block 3, is when the input is a description or code and the output is an image. According to block 4, if the input is a description, keywords, or code, and the output is a description or keywords, it is referred to as Artificial Intelligence. Secure and efficient system. The study showed the advantages of this method in addressing problem in land grading. The advantage of support vector regression is to avoid difficulties of using linear function in large input samples space and optimization of a complex problems transformed into simple linear function optimization. SVM calculation has a regularization parameter, which stays away from over-fitting.

CNN Algorithm

CNN analyses the picture piece by piece. Highlights are the pieces that CNN looks for. CNNs are better at seeing closeness than complete picture coordinating plans when it comes to finding harsh element matches in two photographs in similar places. Each component resembles a little version of a larger image, a two-dimensional cluster of attributes. Figure 3 depicts the diagram of CNN. The CONVOLUTIONAL LAYER is the first layer of a CNN network, and it is the main building block that handles the majority of the computational work. Filters or kernels are used to convolve data or images. The second layer is the ACTIVATION LAYER, which uses the ReLu (Rectified Linear Unit). In this stage, we use the rectifier function to increase the CNN's non-linearity. Different things that are not linear to each other are used to create images. The third layer is the POOLING LAYER, which incorporates feature down sampling. It is applied to each layer in the three-dimensional volume. The FULLY CONNECTED LAYER, which involves Flattening, is the final step. The complete pooling feature map matrix is converted into

a single column, which is then supplied to the neural network for processing.

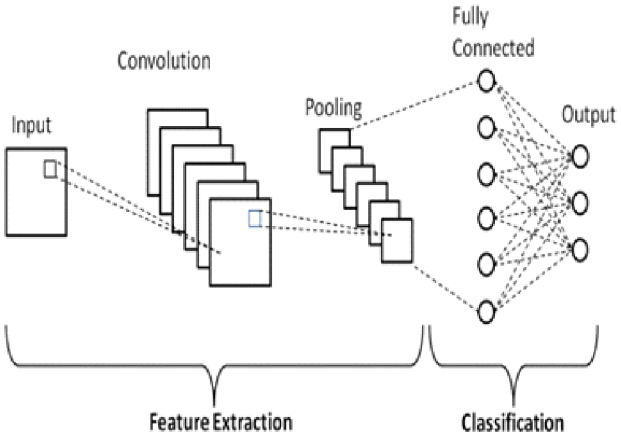

Figure 3: Block Diagram Of CNN

SYSTEM OUTPUTS

Figure 4 depicts the screen output of this project.

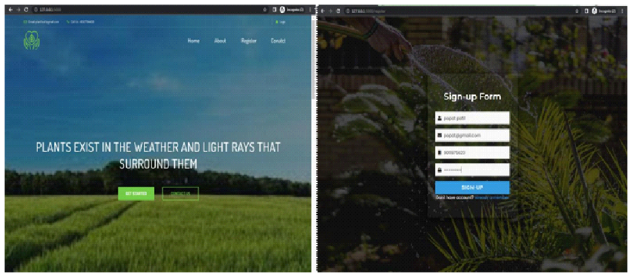

Figure 4. Screenshot of GUI (Home Page and Sign Up form)

In figure 5, the loss values on training and validation are shown. In figure 6, the accuracy of the proposed crop disease detection has shown. Figure 7 is used to show the output showing the disease on tomato leave.

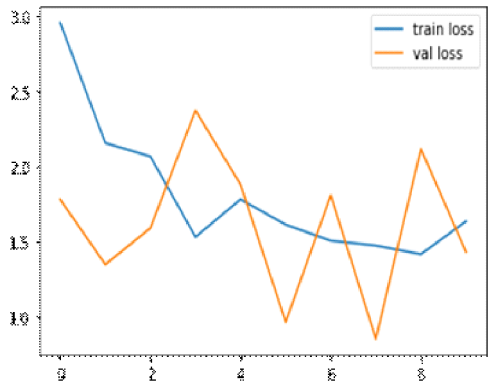

Figure 5: Training loss and Validation loss values

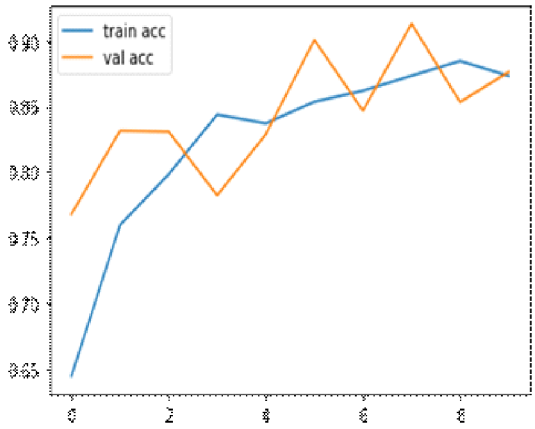

Figure 6: Train Accuracy and Accuracy

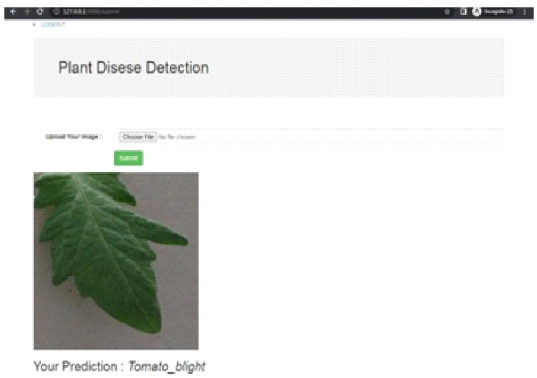

Figure 8: Screenshot of Actual Output Displayed on the user interface

CONCLUSIONS

In this paper, crop disease detection systems have proposed suing convolutional neural network. According to our observations, the scope is still open for the Outcome enhancement. During the research that we carried out, it is noted that the algorithm used for most of the A unified approach is not used by writers where all the variables are involved. It is possible to use the effect on crop yield simultaneously to estimate crop yield. The outcome can also be strengthened by using a neural network approach.

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