PROJECT REPORT

ON

Cotton Plant Disease Classification

# Submitted by

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COTTON PLANT DISEASE CLASSIFICATION

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## ABSTRACT

In India, Agriculture performs an crucial position because of the speedy growth of population

and elevated in demand for meals. consequently, it desires to growth in crop yield

One main effect on low crop yield is disease as a result of bacteria, virus and fungus.

it could be averted through the usage of plant illnesses detection strategies. device studying methods may be used for diseases identity because it particularly observe on data themselves and offers priority to effects of positive project.

This paper gives the ranges of widespread plant sicknesses detection system and comparative examine on gadget mastering classification strategies for plant disease detection.

in this survey it discovered that Convolutional Neural network gives excessive accuracy and detects greater quantity of illnesses of multiple vegetation.

Agriculture is critical to the increase of each united states of america. Cotton and different predominant vegetation fall into the coins crops. Cotton is suffering from most of the diseases that purpose enormous crop damage. Many sicknesses have an effect on yield through the leaf. Detecting ailment early saves crop from similarly damage. Cotton is at risk of numerous illnesses, including leaf spot, goal spot, bacterial blight, nutrient deficiency, powdery mould, leaf curl, and many others. correct sickness identity is important for taking effective measures. Deep getting to know within the identification of plant ailment performs an important role.

The proposed model based on meta facts learning is used to pick out numerous cotton leaf sicknesses appropriately. We amassed cotton leaf photos from the sphere for this look at. The dataset incorporates 2385 photos of wholesome and diseased leaves. the dimensions of the dataset was increased with the help of the facts augmentation method. The dataset was trained on custom CNN, VGG16 and our proposed model: the meta deep examine leaf disease identity model. A meta gaining knowledge of approach has been proposed and implemented to provide an awesome accuracy and generalization. The proposed version has outperformed the Cotton Dataset with an accuracy of ninety eight.fifty three%.

keywords: CNN, VGG16, system gaining knowledge of, DEEP mastering, statistics analysis.

### 

**INTRODUCTION**

The agriculture enterprise plays an essential position in producing revenue and meeting the meals demand of the people. Agriculture is below intense stress due to growing meals call for. a country with suitable agricultural land has a giant advantage in assembly its meals requirement and in contributing to the economic system by exporting agricultural merchandise to different countries.

As the world’s population grows, so does the demand for meals. Crop ailment is an vital problem in agriculture, as it reasons widespread crop damage.

Crop disease is the most serious threat to agriculture, ensuing in low yields and decreasing meals first-class and amount. Cotton is an crucial coins crop that facilitates produce natural fiber.

The sizable contribution of the cotton crop is making cloths. It permits the textile enterprise to grow. besides other factors, plant safety is important in cotton production. often a country is not able to deliver sufficient food to satisfy demand because of sickness inside the agriculture zone.

The conventional method of figuring out crop sicknesses is tough for reliable crop assessment. The traditional approach to figuring out crop diseases begins with the employment of a site professional who visits the web site and observes the crop the use of optical inspection.

the use of conventional techniques to diagnose the disorder inside the crop will not provide an accurate assessment. Plant illnesses produce both qualitative and quantitative losses. Researchers have these days focused their attention on the agriculture industry to discover crop sicknesses the usage of automated techniques. A automatic approach for figuring out plant sickness. might be extra accurate, much less steeply-priced, and faster. Plant diseases value the agriculture industry a number of cash international. Crop ailment management is vital for ensuring meals quality and amount.

Problem Statement

Since cotton crop is the economically noteworthy crop, this crop adds plenty of importance to the economy of state due to its excessive market rate. preventing the yield from the attack of pests and bugs should be our prime difficulty so that it will result in high earnings, wholesome crop yield and much less yield loss.  
Even after looking after crop yield, because of climate situations or a few other motives if it receives affected by any pests or bugs then, putting off that sickness is another essential component. So, to reduce a lot of these efforts we're going to broaden the machine in order to now not most effective come across the ailment present on the leaf of cotton plant, however it'll additionally advise the products with the intention to assist the farmers to remove that gift disorder from that plant. With the help of modern-day era named deep mastering, that's nothing however a subset of artificial intelligence, we are able to be developing this internet software.  
This challenge will also consist of any other characteristic named Farmkart, with the intention to help the farmer to get to understand about the distinct agricultural products to be had at a couple of marketplace locations.

## TECHNOLOGY USED

### CNN

Convolutional Neural Networks (CNNs) provide superior picture classification, object recognition, segmentation, and retrieval outcomes, making them one of the most efficient learning methods for visual content comprehension.

An advanced form of artificial neural network known as a convolutional neural network substitutes the mathematical operation known as convolution for generic matrix multiplication in at atleast one of its layers. They are employed in image processing and recognition since they were created primarily to process pixel data.

#### VGG16

VGG16 refers back to the VGG version, also known as VGGNet. it's far a convolution neural network (CNN) version assisting sixteen layers.

The VGG16 model can acquire a test accuracy of ninety two.7% in ImageNet, a dataset containing extra than 14 million education pics throughout 1000 object instructions. it's far one of the top models from the ILSVRC-2014 opposition.

VGG16 is a convolution neural internet (CNN ) architecture which turned into used to win ILSVR(Imagenet) competition in 2014. it is taken into consideration to be one of the superb vision version architecture till date.

VGG16 is a type of CNN (Convolutional Neural community) that is considered to be one of the fine pc vision fashions thus far.VGG16 is object detection and classification algorithm that's capable of classify 1000 photographs of one thousand special categories with 92.7% accuracy. it is one of the popular algorithms for photograph class and is straightforward to apply with transfer learning..

### GOOGLE COLAB AND TOOLS

we've got used diverse information science related libraries like keras, tensorflow, sklearn, opencv, matplotlib, numpy and so forth. For the cause of constructing keras version we've got used sequential modelling technique.

The facts is available on the colab server. path variable will study the pictures from the path one by one. every photograph is examine using opencv library. eventually, the pictures are resized with dyadic photograph processing. the trails of the pix also tell about the class of every photograph that is extracted and saved in a variable referred to as label.

CNN makes use of the layers for picture processing. If the photograph having the multiple items then the CNN recognizes the edges and classify the image accordingly.

#### DATASET USED

Our dataset contains 2384 pix of cotton leaves separated into seven instructions (healthy, Leafspot, Nutrient Deficiency, Powdery mildew, target spot, Verticillium Wilt, and Leaf curl)..

The images have been captured at exceptional timings i-e. morning, noon, and evening.

For capturing leaf photos, a vivo V21 cellular changed into used. The authentic length of the snap shots was 3120 × 4160. The real discipline contained more than one leaves along with some background noise together with weeds. The photograph turned into cropped manually to extract a leaf. After amassing the photos, the subsequent step was to put off any unwanted noise. to finish the dataset, this operation was completed manually.

To generate a very last dataset, image pre-processing techniques have been used, which include rescaling, image enhancement, and evaluation enhancement. The dataset became annotated through agriculture professionals, who categorized every photo in keeping with the sickness it consists of.

finally, the dataset changed into divided into education and take a look at units for model training. We only used 20% of the facts for the test set. exclusive instructions of sicknesses are shown in figures, which consist of healthful, Leafspot, Nutrient Deficiency, Powdery mould, goal spot, Verticillium Wilt, and Leaf curl. one-of-a-kind leaf suggests diverse leaf diseases. In some figure we indicates healthy photograph. a few are displaying suggests Leaf spot.

## DISEASE RECOGNIZATION



### LITERATURE REVIEW

Before doing this work, we have a tendency to test and check out to recognise a few source paper work in order that we are capable of do our paintings appropriately. The paper which we generally tend to test before starting this paintings is added right here as literature review. during reviewing those papers it's far clear that for illness detecting, classifying and measurement exclusive forms of real model is added by using researcher. For plant disease detection, class and dimension properly innumerable revolutionary techniques are installed via researcher and their work aestival is enclosed throughout this section.

This paintings is formulated on Convolutional Neural community to become aware of cotton plant leaf diseases. It gives greater capable manner to become aware of contamination created via bacteria and environmental consequences. disorder detection at a number one degree on crop is a difficult mission for farmers in which physical presence is a ought to. disease reputation at the crop are very vital. there are numerous picture processing algorithms to be had for disorder identification based on picture type like KNN, SVM, Random wooded area, artificial Neural community and CNN. in advance picture category algorithms like face reputation important to pay interest at where the face is located in an image this key hard is conquer by using CNN and the functions of an photograph are intensely processed at every layer. each disorder on crop has diverse systems which can be eliminated at each layer of the convolution community.

Table 1. Comparison of classification techniques

|  |  |  |  |
| --- | --- | --- | --- |
| Classificatio nTechnique | Culture | No.o f Disease | Result |
| SVM  Classifier | Citrus [1] | 2  diseases | 95% of genuine acceptance rate. |
| Grape [2] | 2  diseases | Averageaccuracy88.89%. |

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Oil palm [3] | 2  diseases | | 97% accuracy for Chimaera an 95% accuracy for Anthracnose disease. |
| Potato [4] | 2  diseases | | Accuracy 90%. |
| Tea [5] | 3  diseases | Accuracy 93%. | | |
| Soybean [6] | 3  diseases | | Accuracy is approximately 90% |
| ANN  Classifier | Not Mentioned [8] | 5  diseases | | Accuracy around 93%. |
| Cucumber [9] | 2  disease s | | Increased accuracy |
| Pomegrana te[10] | 4  disease s | | Accuracy around 90% |
| Groundnut [11] | 4  disease s | | Accuracy97.41%. |
| KNN  Classifier | Sugarcane [13] | 1  disease | | Accuracy95%[13] |
| Cotton [14] | 1  disease | | Accuracy 82.5%[14] |
| Fuzzy Classifier | Wheat [16] | 1  disease | | Disease detection accuracy 88%and recognition of disease type accuracy56%. |
| CNN  Classifier | Peach, Cherry, Pear, Apple and Grapevine [17] | 13  diseases | | Average accuracy 96.3%. |
| 14 crops  [18] | 26  diseases | | Accuracy99.35%. |
| Soybean [19] | 3  diseases | | Accuracy99.32%. |
| 25 plants  [20] | 58  diseases | | Accuracy 99.53%[20] |

consistent with reference no [3] the research outlines the deep getting to know version a good way to classify exceptional

pictures present in dataset in line with the different illnesses present on the cotton leaf or plant. The research labeled each of them into three special classes and people categories are as follows:

1.Bacterial Blight ailment

2.Spider would possibly disorder

3.Sucking and chewing pest ailment.

In which studies cope with approximately 1200 photographs from which about six hundred pictures had been used to teach the CNN structure.

in line with reference [2], the research proposed work that exposes a complicated computing era that has been evolved to help the farmer to take advanced selection about many aspects of crop improvement manner. appropriate evaluation and prognosis of crop disease within the discipline is very crucial for accelerated manufacturing. They used pesticides advice which is given to farmer to ensure their crop and reduce the yield loss.

in keeping with reference [1] in the research of identifying and diagnosing cotton ailment, the pattern of sicknesses essential part in that, diverse functions of pics are extracted viz. The colour of real leaf, there are so many illnesses happened on the cotton leaf so the leaf coloration is likewise unique for exceptional sickness, also there are various different functions related to form of snap shots, additionally there are one of a kind shape of holes present at the leaf of the photo. generally, the leaf of infected picture has elliptical shape of holes, taking this factor into the consideration, the studies tried to stumble on the ailment gift on cotton leaf or vegetation which may be categorized into exclusive classes as given via reference no [3] which might be,

1.Bacterial blight disorder

2.Spider may ailment

3.Sucking and chewing pest disease.

According to reference [4] within the studies of figuring out the cotton leaf lesions the use of deep gaining knowledge of strategies, the studies used two distinctive algorithms including GoogleNet and Renet50, each the algorithms had been proper to do the paintings of detecting the disease present on the cotton leaf, however their accuracies were bit less than that of anticipated accuracy.

according to reference [5] within the studies of detection of disorder of cotton leaf, the research was targeted on using exceptional method named, ok-suggest clustering which comes under the roof of gadget learning algorithms. The accuracy of that set of rules become about around 80%.

Information collection and Sampling method: We Divided information into teach-Validation-check split, version education perform on training set and check the overall performance on validation set, will take a look at model overall performance on check set as soon as we finalize the version based on validation performance. we've collected cotton leaf photos on diverse open source Gitub repositories, and randomly break up pictures into respective folders.

Below is the Data Statistics of each class: Training Data Statistics:

* diseased cotton leaf – 288 Images
* diseased cotton plant – 815 Images
* fresh cotton leaf – 427 Images
* fresh cotton plant – 421 Images

## The detection of disorder on a leaf is achieved in number of steps. firstly the original authentic-shade photograph transformation is finished into HSV which is a coloration descriptor structure in which hue thing is used for similarly evaluation. subsequent, inexperienced shade masking is executed with the aid of assigning 0 or a few heritage cost to the inexperienced pixel which isn't always our part of interest. therefore segmentation is performed and beneficial segments are acquired which incorporates sizeable amount of records.

## FUTURE SCOPE

In future we are able to increase sickness dataset for come across more disorder. work on accuracy that could enhance consumer result and give the ideal insecticides or pesticides to the consumer additionally we built for cellular friendly app so procedure done on cloud. That one factor can benefit of person due to the fact any tool they have got the technique can paintings.

In destiny the proposed approach will be implemented on mobile products constantly watch and recognize a huge form of plant disease statistics. additionally within the future, a dialogue platform for farmers could be blanketed to investigate the cutting-edge developments in numerous disease.

the principle challenge at the same time as developing an item detection model on deep gaining knowledge of was to acquire a massive number of education 86f68e4d402306ad3cd330d005134dac photographs with unique shapes, sizes, extraordinary backgrounds, light intensity, and orientations in extraordinary classes.

consequently, destiny researchers have to attempt to encompass an answer for such demanding situations of their paintings and now not handiest become aware of but additionally propose remedies for sicknesses and pests. Ethiopia released the satellite tv for pc in 2019, and that is the high-quality initiative for the destiny researcher to get right of entry to remote-getting access to high-resolution satellite pix to train high-performance deep getting to know technique-based model.

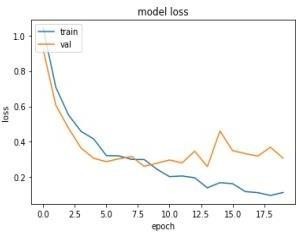
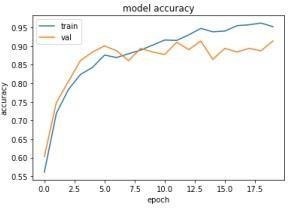
### inside the destiny we enlarge our paintings with many extra pictures and works with many other categories of sickness so that you can helps to many farmers to discover the diseases

### inside the cotton leaves.

### RESULT AND DISCUSSION

Model Accuracy has been elevated via growing variety of epochs. in this paintings 100 epochs adopted based totally on which could gain 96.6% accuracy here it indicates that prediction end result whilst the model is predicted from scratch. within the below discern, effects verify that the model initialized with the pretrained weights indicates better accuracy with 99% than the version educated from the scratch.

CNN Graph:



The term “accuracy” refers to the ability to classify diseases appropriately. For example, we

may have many images of diseased leaves or cotton plants. We are classifying the diseased leaf or plant by utilizing the classifier. We may be able to obtain accurate results through classification.

The rate of getting the correct output is accurate. Accuracy is calculated with accuracy in

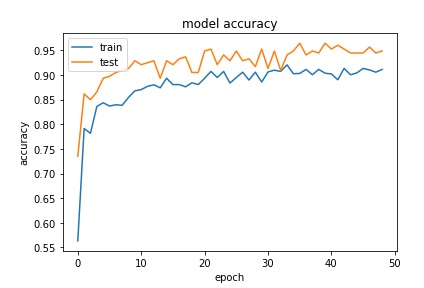
percentage = 100\* ((Number of correct classified leaves or plants) / (Total number of leaves or

plants in Datasets))

The following graph in figure 8 shows the CNN model accuracy for the training and testing dataset.

VGG 16 Graph:

Chart, histogram

Description automatically generated

### to research the performance of the model, the closing end result is done using parameters such as ok-fold go-validation the usage of 10 folds.

### RGB-colored photo dataset with augmentation offers 15% excellent performance for the model.

### The researchers used the transferred mastering CNN model and the grayscale dataset executed 98.6% accuracy [6].

### but, coloration is the primary and maximum decisive function in cotton detection and class; consequently, using a colored dataset takes a long time to teach the model to add performance although it's far a complicated layer.

### CONCLUSION

### A web-based gadget has been successfully applied for crop disorder detection for cotton leaves the use of a Convolutional Neural network.

### The Convolutional neural community has been developed with 3 hidden layers to classify the cotton leaf ailment images. The machine efficaciously methods enter from the person and affords output inside the shape of disorder detected. supplied sufficient information is available for education, deep mastering techniques are capable of recognizing plant leaf illnesses with excessive accuracy. India is a rustic with a rich history of agriculture.

### therefore, our work would help farmers to save you plant illnesses, increase productivity and profit. Our destiny paintings pursuits at an. This system may be prolonged to some other crop having the provision of enough huge datasets for that crop. a number of other illnesses can be protected for detection. The internet interface can also involve a forum for formers to have discussions regarding the contemporary traits they are facing in specific illnesses. The set of rules will assist the end person to segregate the inflamed crop based on percent of infection to take preventive measures at as early stage as feasible. The algorithm will help in minimizing using insecticides thereby enhancing the environment and ecological balance. The proposed work has sizeable programs to help the Indian farmers in early identity of cotton crop diseases.

### A comparative examine is finished on five varieties of system studying classification strategies for popularity of plant disorder is executed in this review.

### SVM classifier is utilized by many authors for class of sicknesses while as compared with other classifiers. The result indicates that CNN classifier detects extra range of illnesses with excessive accuracy.

### In future, other category techniques in device learning like choice timber, Naïve Bayes classifier can be used for disease detection in plants and in the sense of helping farmer an automatic detection of all forms of illnesses in crop to be detected.

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