

Cotton Plant Disease Prediction Using Deep Learning



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ABSTRACT

- The use of **deep learning** models to identify lesions on cotton leaves on the basis of images of the crop in the field is proposed in this article.
 - Its cultivation in tropical regions has made it the target of a wide spectrum of agricultural pests and diseases, and efficient solutions are required. Moreover, the symptoms of the main pests and diseases cannot be differentiated in the initial stages, and the correct identification of a lesion can be difficult for the producer.
 - To help resolve the problem, the present research provides a solution based on deep learning in the screening of cotton leaves which makes it possible to monitor the health of the cotton crop and make better decisions for its management.
 - For this approach, Automatic classifier CNN will be used for classification based on learning with some training samples of that two categories. Finally the simulated result shows that used network classifier provides minimum error during training and better accuracy in classification.
- Keywords:** Plant disease, deep learning, CNN, Classification.



INTRODUCTION

- Cotton is one of the most commercially significant crops used in the textile industry. It is grown in more than a hundred countries throughout the world, and in **Gossypium spp.** It was unsuccessful. because around 2.5 percent of the world's arable land is under cultivation. Cotton is referred to as "**white gold**" and "**The King of Fibers**".
- Using image processing techniques in an agricultural vision system, this study demonstrates how to diagnose cotton plant disease .Automatic plant disease detection is critical because it allows farmers to monitor large fields of crops and detect disease signs as soon as they appear on plant leaves.
- A plant disease is a **physiological abnormality** and it is doomed if it becomes infected with a disease. Some of the symptoms include wilted leaf patches, rots, cankers, and other issues.
- The main goal of this model is to identify and cure the disease in cotton plants. **The CNN model is used to forecast whether or not the plant is sick based on its position on the leaves.** The proposed study employs the ensemble learning concept, which is implemented using a deep learning algorithm. The data is compared after deployment to discover which model is the most accurate.



Literature Survey

- Gokulnath BV and Usha Devi G, [1] The goal of this study was to conduct a survey on the use of machine learning and deep learning techniques to forecast plant disease. This aspect has an impact on plant production when it comes to predicting illness in plants. The machine learning method aids in the detection of plant disease. Random forest, Bayesian network, Decision Tree, Support Vector Machine, and other techniques are used. Plant disease is caused by a variety of circumstances. Plant pathology is primarily concerned with pathogen research. Pathogens and environmental conditions are the two elements that cause plant disease. Viruses, fungus, bacteria, and other microorganisms are examples.
- Azath M. , Melese Zekiwo, and Abey Bruck[2] Deep learning-based image processing was used in this work to diagnose cotton leaf disease and pests. Cotton, also known as gossypiumsapp, is also referred to as "white gold" and "the king of fibres." The goal of this research was to create a model for identifying cotton plants.

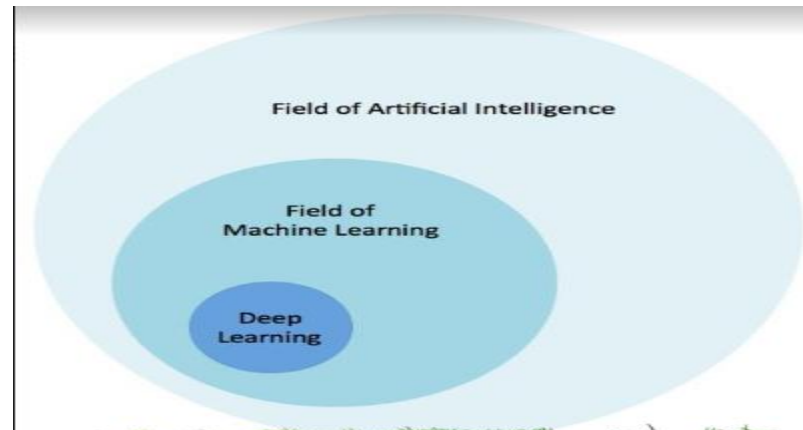


- Kalpesh Shinde, Nishant Dhamale, Sudarshan Dangat and Prof. Anand Khatri[3]The detection of cotton lesions was reported in this work utilizing a deep learning approach. Here, the deep learning technology is used to detect the cotton plant leaf base on crop photos. Each picture is processed and evaluated separately. Here is the diagnosis algorithm. the lesson's casual agent. suggested algorithm for implementing software usage .
- S. Nandhini and K. Ashokkumar[4]Crop disease prediction machine learning from crop leaf picture is the goal of this work. Plant diseases pose a significant threat to food security. The plant illness is detected using a smart phone.
- T Linda J. Thomson a,Sarina Macfadyen b and Ary A. Hoffmann[5] the effect of climate change on natural enemies of natural pests is predicted in this study. Climate change has an impact on plant productivity. Climate change will have an impact on the interactions between plants, natural enemies, and herbivores, demonstrating the difficulty of making predictions.



METHODOLOGY

- **Deep Learning** is a subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called **artificial neural networks**. Deep learning as the technique for learning in neural networks that utilizes multiple layers of abstraction to solve pattern recognition problems.



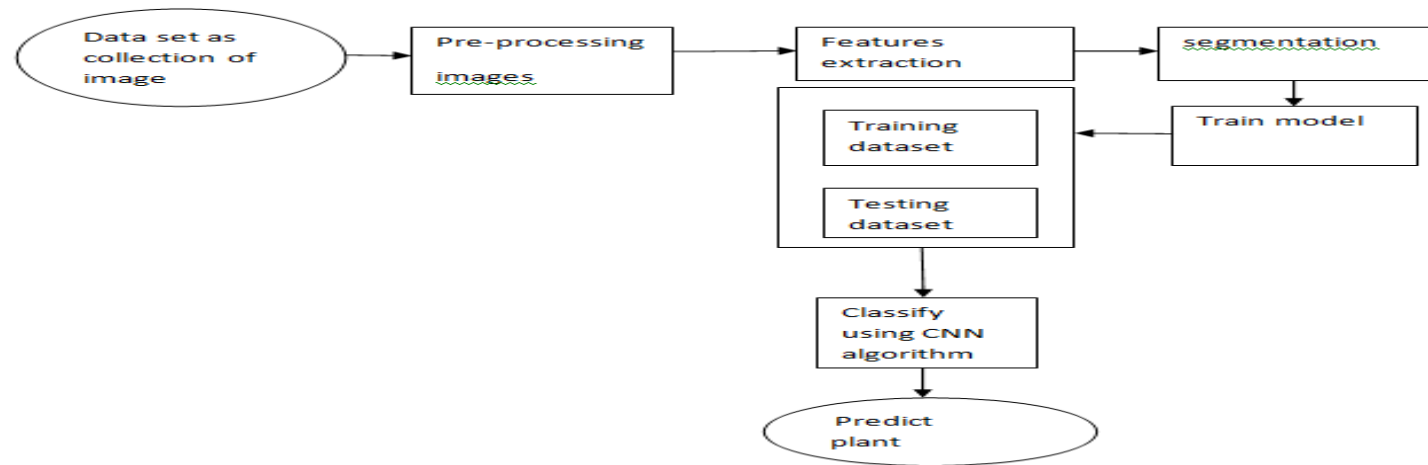
For our study on cotton disease prediction, I created a deep learning model called a **convolution a neural network (CNN)** using the Keras package. First and foremost, why am I using CNN? Because of its excellent accuracy, CNNs are commonly used for picture categorization and recognition. Convolutional Neural Networks specialized for application in images. CNN is mainly used in image analysis tasks like image recognition and Object detection & Segmentation.

- There are three folders in this dataset: train, test, and validation. There are four categories in this dataset: diseased cotton leaf, diseased cotton plant, fresh cotton leaf, and fresh cotton plant.
- Create a web application with **HTML, CSS, , JAVASCRIPT and python flask**. So, now that everything has been completed, I've included some of the output from my web application



The model should be able to distinguish between disease and a fresh leaf. The dataset is divided into two sets of training and testing data. The model should be trained with additional data to obtain reading accuracy. The result from this model can be used to create plant classifications. Modules for diagnosing plant diseases. image collection, pre-image processing, image classification, and separator selection.

Figure 1: Cotton Plant Disease Prediction Methodology



- The steps that require to be followed are:
- **Image collection** :For cotton plant disease prediction, the user must utilize a dataset, and the properties of this dataset are used to train the model.
- **Pre-image processing**:Pre-processing is used to improve picture data by suppressing undesired distortions or enhancing other relevant image properties for later processing. For continuous segmentation, data is processed and sent.
- **Image classification**: The process of splitting an enhanced image into distinct pieces is known as picture segmentation or classification.
- **Separator selection**: We're using CNN at this point to identify and Order the plant leaf diseases (Convolutional Neural Network).



RESULTS AND DISCUSSION

- Based on the dataset provided, the prediction of cotton plant disease using deep learning may be classified as "fresh leaf" or "disease". During training, the network classifier in use provides the least amount of error and the best degree of classification accuracy. The dataset contains images of different leaves that are fresh and diseased.

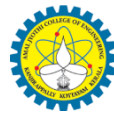


- Many more fusion models were also developed to increase the predictability of to The findings of this study highlight the importance of automated technologies in supporting end users in locating plant diseases without the need for human interaction.



CONCLUSION

- This research describes a strategy for predicting cotton plant disease. A CNN model simulation is used to determine whether or not a plant is infected based on a spot on the leaves. The user first processed the data, then implemented a solution. To extract certain dataset characteristics, we **used transfer learning resnet50**.
- Then Finally, the simulated outcome reveals that **network classifier** in use produces the **least amount of error during training and the highest level of classification accuracy**.
- The dataset may be expanded, and **deep learning algorithms or tools can be used to forecast cotton plant disease**. This work has a lot of potential use in the future.
- **Artificial neural networks (ANN) and convolutional neural networks (CNN)** are the two most commonly used neural network models. **The proposed algorithm will be implemented using software** that can be used during actual field visits to aid in the construction of maps depicting the degree of pest and disease infestation.



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- <https://www.kaggle.com/code/sameer1502/cotton-plants-disease-prediction-using-resnet50/notebook> The model building is the main step in the Cotton Plant Disease Prediction.



THANK YOU

