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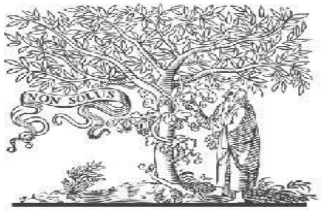

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Diagnosing Plants and Community Support

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ABSTRACT
Agriculture is one field which has a high impact on life and economic status of human beings. Loss in agricultural products occur due to improper management. Lack of knowledge about disease by farmers and hence less production happens. Kisan call centers are available but do not offer service 24*7 and sometimes communication too fail. Farmers are unable to explain disease properly on call need to analysis the image of affected area of disease. Though, images and videos of crops provide better view and agro scientists can provide a better solution to resolve the issues related to healthy crop yet it not been informed to farmers. It is required to note that if the productivity of the crop is not healthy, it has high risk of providing good and healthy nutrition. Due to the improvement and development in technology where devices are smart enough to recognize and detect plant diseases. Recognizing illness can prompt faster treatment in order to lessen the negative impacts on harvest. This paper therefore focuses upon plant disease detection using image processing approach This work utilizes an open dataset of 5000 pictures of unhealthy and solid plants, where convolution system and semi supervised techniques are used to characterize crop species and detect the sickness status of 4 distinct classes. Lack of awareness on what kind of actions to taken and what a kind pesticides and fertilizers to be used for the particular disease.

Keywords: Leaf Disease Detection, Deep Learning, Image Processing, Convolutional Neural Network, Discussion forum.

Introduction

Agriculture is the most important sector of the Indian Economy because India is an agricultural country. More than 80% of people's income depends on agriculture. Leaf disease detection is an important task here because various types of diseases in the crop reduces the overall yield. And for farmers, it is difficult to identify particular disease. We have surveyed various types of vegetable and fruit leaf disease and their detection techniques. There are two main approaches for leaf disease detection: Image processing and Deep Learning. we can notice vegetable and fruit leaves like potato, tomato, apple, a grape with the diseased part. This disease can be easily detected using various deep learning techniques and image processing techniques. Image processing follows steps like Image Acquisition, Image Preprocessing, Image Segmentation, Feature extraction, and Classification. There are also many deep learning methods available to detect different types of leaf disease detection and classify into various categories of leaf disease, such as Bacterial spot, Early blight, Late blight, Mold, Septoria leaf spot, Spider mites, Two spotted spider mite, Target Spot, Mosaic virus, Yellow Curl Virus, and Healthy. The main aim of this paper is to provide survey on various leaf disease detection systems which can improve agricultural production. Disease cycle is a chain of interconnected successive events of a pathogen's infection in a host plant. It usually coincides with the life cycle of the pathogen with a correlation to its host and the environment. Each cycle includes two alternating phases; the parasitic phase and the survival or over-summering or over-wintering phase The distinct events in a disease cycle are very much important as they provide us information

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about how and when we should stop the spread of the disease easily. about other disease cycles by other unknown or less known pathogens can be formulated using the info of one of such cycle. Inoculation is the first contact of a pathogen with its host in a place where infection is possible. The pathogen may be in any of its stages of its life cycle when being inoculated. Most pathogens rely on rain, wind, insects or human to carry them to their host plants. Penetration Pathogens penetrate plant surfaces by direct penetration of cell walls, through natural openings, or thorough wounds. It is to remember that penetration doesn't necessarily cause infection.

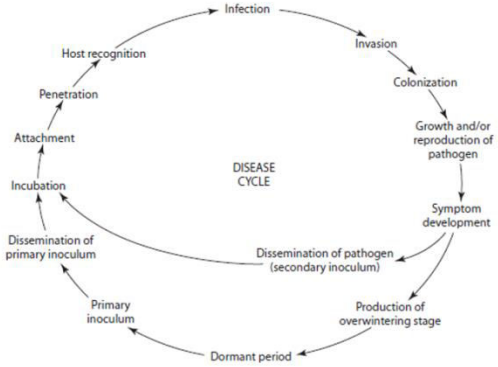

Fig: - Plant disease cycle

There are many cells that can be penetrated but yet not susceptible to infection. In this case, the organism cannot proceed beyond penetration and die without producing disease. Infection When the inoculum starts procuring nutrients from the susceptible tissues of the host, the infection starts. This is the first stage from where the disease starts to develop. As the pathogen devours soluble products from the cell, various symptoms start appearing. The time interval between inoculation and the appearance of disease symptoms is called the incubation period. Dissemination Some pathogens which have motile stages such as nematodes, oomycetes, zoosporic fungi, and bacteria can easily disseminate very short distances on their own power. Fungal hyphae can grow between tissues in contact and sometimes through the soil toward nearby roots for a few to may centimeters. Both of these means of dissemination are quite limited. However, there are some fungi which can expel their spores up to a few centimeter in the wind above their sporophores. Over-seasoning Over-seasoning is an evolutionary developed technique followed by many pathogens to survive the adverse period of their life cycle. It has been developed in the pathogens so that they can complete their life cycle and can spread their infections in the next year. The pathogens may survive this harsh period either as spores, sclerotia like hard over-seasoning structures or as a whole. A Discussion Board forum (online discussion forum) is an area in your online course where information can be shared. Join the discussion forum and get to know others on the course- make new friends. You won't feel isolated if you actively participate in our discussion forums. Your comments are posted and stored for anyone to read and respond to. You won't feel isolated if you actively participate in discussion forums. Your comments are posted and stored for respond to. Others may be able to help you and together you will learn more.

RELATED WORK

After going through all the references, we came to know that everyone is focusing on only single variety of plant and also remedy for the disease is not known to the user. And also, there is no doubt resolving interface for the users. Everyone is using traditional machine learning algorithms for classifying the diseases of plants.

The author Mohanty [1] thought that Crop diseases are a major threat to food security, but their rapid identification remains difficult in many parts of the world due to the lack of the necessary infrastructure. The combination of increasing global smartphone penetration and recent advances in computer vision made possible by deep learning has paved the way for smartphone-assisted disease diagnosis. Using a public dataset of 54,306 images of diseased and healthy plant leaves collected under controlled conditions, we train a deep convolutional neural network to identify 14 crop species

and 26 diseases (or absence thereof). The trained model achieves an accuracy of 99.35% on a held-out test set, demonstrating the feasibility of this approach. Overall, the approach of training deep learning models on increasingly large and publicly available image datasets presents a clear path toward smartphone-assisted crop disease diagnosis on a massive global scale.

The author Jyotsna Bankar [2] claimed that the system based on the Inception-v3 model of TensorFlow platform, in which we use the transfer learning technology to train ananimal classification model on mammals' dataset. The classification accuracy of the model is approximately 95% on given dataset, which is higher than other method available for classification. The future work is to study and develop a more effective and accurate model for image classification. In this paper, based on Inception-v3 model in TensorFlow platform, we use the transfer learning technology to retrain the animal category datasets, which can greatly improve the accuracy of animal classification.

The author Ser Serawork Wallelign [3] said that In this study convolutional neural network is used to detect and classify soybean plant diseases. The Network was trained using the images taken in the natural environment and achieved 99.32% classification ability. This shows the promising ability of CNN to extract important features in the natural environment which is required for plant disease classification. As far as our knowledge this is the first attempt which use the images taken in the wild environment and achieved remarkable performance. The experiments also show that applying data augmentation on the training set improves the performance of the network when the dataset is very small. The effect of dropout and regularization to overcome overfitting also validated. In this study the data sample in each class is unbalanced, i.e., 49.19% of the data is of class 1, 28.13% class 2, 15.96% class 3 and 6.72% class 4. For future work, deep learning methods to solve sample imbalance will be implemented.

The author Santhosh Kumar S [4] in this paper said that Agriculture is a key source of livelihood. Agriculture provides employment opportunities for village people on large scale in developing country like India. India's agriculture is composed of many crops and according to survey nearly 70% population is depending on agriculture. Most of Indian farmers are adopting manual cultivation due to lagging of technical knowledge. Farmers are unaware of what kind of crops that grows well on their land.

BACKGROUND

There are currently a variety of applications available that predict the plant diseases through an image but they are limited to particular plants on which the algorithm is used. Additionally, there is no solution for plant recovery and agricultural experts support to resolve the doubts of farmers.

The proposed model is introduced to overcome all the disadvantages that arise in the existing system. This system will increase the accuracy of the disease detection and it will show the remedy to overcome the disease. It enhances the deep convolutional neural network will increase the performance. Our model is essentially a classifier based on character-level convolutional neural network (CNN) with varying size filters. We use characters as the smallest unit of learning, enabling the model to learn character-level features to overcome the spelling errors and intentional obfuscation in data. Community support where the users of the website can post their queries and get them resolved by the experts of the field. Providing the interface for detecting the diseases of all kinds of plants and their treatments and precautions to be taken care of. By providing users or the farmers flexibility to post their doubts and the experts of the particular domain can interact with the farmer as early as possible to improve crop yield and best techniques cure the diseases and the users are also able to contact with the agricultural experts whenever they required by booking slot

through the website. Can get frequent updates in agricultural related topics which will be helpful to bring awareness among the people. The process of plant disease detection system basically involves four phases. The first phase involves acquisition of images either through digital camera and mobile phone or from web. The second phase segments the image into various numbers of clusters for which different techniques can be applied. Next phase contains feature extraction methods and the last phase is about the classification of diseases. Data flow diagram of users of the system and their sequence of actions can be performed. There can be multiple users and multiple agricultural instructors that means need to maintain data base for the both type of users and relationship among them is many to many. To tackle different varieties of plants there must be need of modifying the algorithm as per the datasets available. The typical flow of the architecture can be like as shown in the below.

METHODOLOGY

Convolution Neural Network model: Convolutional Neural Network (CNN) is used to solve a wide range of visual tasks such as a image classification, object detection, semantic segmentation, and many more. CNN consists of a series of convolutional layers with non-linear activation functions and some down sampling layers. These CNNs are able to capture hierarchical patterns and produce image representations.

Data Collection: For our project, we have focused on 4 different kinds of plants. Each plant is focused on 5 varieties of plant diseases. For each plant approximately there are 500-600 images. Resulting in 2000-2200 images. The image can be selected first and upload in the page. In this project, the leaf disease data set is used for detecting the disease**.** This dataset contains the image of disease leaf and no disease image leaf. The dataset contains all types of leaf.

Data Preprocessing: To ensure that our deep learning model can process the data effectively, we have applied label encoding to the plant diseases. This technique converts the string labels into numerical values, as the model is unable to interpret string labels for prediction. By converting the labels in this way, we are able to input the data into the model more easily and obtain results from the prediction process. This step is to verify the image that uploads in the process. In this verify image, the image can be veified by image color, image path of directory and image size. So, this process can verify that the image is normal or blur. The clarity of image can be verified here.

Feature Extraction: Feature scaling. Feature scaling is a method used to standardize the range of independent variables or features of data. In data processing, it is also known as data normalization and is generally performed during the data pre-processing step.

Feature Scaling or Standardization: It is a step of Data Pre-Processing which is applied to independent variables or features of data. It basically helps to normalize the data within a particular range. Sometimes, it also helps in speeding up the calculations in an algorithm.

Model Training: To train our model, we applied convolution neural network model to the data, and split it into a training set (70%) and a testing set (30%). The model was able to achieve an accuracy of 95-100% on the training data, indicating its ability to accurately identify the different plant diseases.

Evaluating Model Performance: We utilized a testing dataset that included 30% of the total data to assess the efficacy of our model. This gave us the opportunity to evaluate how well the model predicted the appropriate plant disease based on the image input. We discovered that the model's accuracy was quite high, ranging from 95% to 100%. This shows how well the model can categorizes the input and determine the right plant disease. To further evaluate

the model's performance and spot any possible areas for improvement, we may also utilize other performance indicators including accuracy, recall, and F1 score.

RESULTS

System giving accuracy of 95-99 percentage in predicting the disease of various plants. Users of the system can make their posts easily.

CONCLUSION

Convolution neural network is used to detect and classify plant diseases. The Network is trained using the images taken in the natural environment and achieved 99.32% classification ability. This shows the ability of CNN to extract important features in the natural environment which is required for plant disease classification and also solution to the diseases identified. Depending on the dataset we need to change the working of CNN to get best accuracy. By using different versions of Convolutional Neural Networks algorithm, we can classify plant diseases of all varieties of the plants and identify best solution for the cure. Users of the website can share views about their needs and experts of the domain can respond as quickly as possible.

FUTURE ENHANCEMENTS

Future work we look forward to make a new dataset for analysis. We would try to improve the method of analyzing the data from a local dataset application to a web-based application which also uses the camera to capture and analyze the image at an instant. Better result of detection can be obtained with the large database and advance feature of colour extraction.

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