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DISEASE PREDICTION IN BETEL NUT USING CNN

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Abstract: Several diseases have a detrimental influence on the productivity of betel nut crops, which are exacerbated when there is continuous rainfall and high relative humidity. A variety of machine learning-based visual data analysis technologies are currently being employed to look for indicators of the disease. This research presented here is the prediction model and to create a new dataset. This research presented here is about prediction model for predicting disease in betel nut using CNN model. In this we will be discussing about how we can use CNN model for predicting the disease in betel which will help the farmer to decide which type medication need to be applied for that palm tree to reduce that disease at early stage.

Keywords: Machine learning, CNN model, Betel nut diseases

INTRODUCTION

Many farmers in India rely on betel nut production for their livelihoods, which is why India is the world's leading areca nut producer. It is common to find the plantation crop betel nuts (also known as areca nut) throughout Southeast Asia encompassing nations such as India and Malaysia as well as China. Arround 600 million arround world chew betel nut with leaflet. People utilize it on a daily basis as well as in religious and social contexts ceremonies. About 853,000 metric tons of betel nut generated per year on 518,000 Hectares. Betel nut output in India exceeds global levels by more than half.prduced in states like Karnataka, Kerala, Goa, Meghalaya, and other regions It is mostly produced in Assam and West Bengal It's customary in Hinduism for the betel nut to be considered sacred.essential component of worship; without this, worship is ineffective. The betel nut suffers from the same vulnerability as other agricultural commodities to the spread of illness caused by pest insects and the environmentevery season of the year and at every level of its development The betel nut illnesses are as follows foot rot, yellow leaf disease, and fruit rot are common afflictions. decay of the buds, etc. For the production of areca nut crops, the use of chemical fertilizers has become commonplace. owing to a shortage of manpower, which raises costs a disease that causes fruit to decay. The pathogen that causes fruit rot is the Phytophthora spp fungal infection, which causes partial or total defoliation Individual palms may suffer entire crop loss or even death as a result. Disease outbreaks caused by fruit rot often occur 15 to 20 days of rainy season.

Machine learning (ML) refers to the subset of artificial intelligence (AI) which deals with the development of systems that are capable of learning (or improving their performance) from data. Machines and systems that replicate human intellect are referred to as artificial intelligence systems. They are frequently discussed together, but machine learning and AI are not the same thing and should never be used interchangeably. There is a big difference between machine learning and AI, which is why this distinction is so critical. Today, machine learning is all around us, helping us do anything from driving to cleaning. A machine learning algorithm comes into play whenever we connect with financial institutions (such as banks), shop online, or utilize social media. We're only just scratching the surface of what's possible with machine learning and the technology that surrounds it, both of which are fast evolving.

CNN have showed effectiveness in picture classification in recent years. This list includes facial and object recognition. The design of CNN affects their performance. CNN is more advanced now. CNN and research professionals create each cutting-edge network's architecture. Users without CNN experience have trouble constructing optimal CNN structures for their picture classification challenges. Users can't construct their own perfect CNN architectures for picture categorization issues.

RELATED WORKS

Pavan HK el at [1] CNN is a Deep Learning algorithm that takes an image as input, assigns weights and biases to the numerous items in the picture, and then learns how to discriminate between the objects. This model was trained and evaluated using 620 pictures of healthy and diseased arecanuts. Train and test data are 80:20. Categorical cross-entropy is used as a loss function, adam as an optimizer function, and accuracy as metrics. Fifty epochs are used to train the model to optimize accuracy and minimize data loss during validation and testing. The proposed technique for

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diagnosing arecanut disease was 88.46% accurate.Ramesh hegde el at [2] Betel nuts are India's most valuable cash crop. Koleroga, or fruit rot, is the worst disease for betel nuts. A CNN might be used to identify and classify Koleroga, a disease induced by eating areca nuts. CNN training includes beneficial and harmful aspects of areca nuts. The proposed approach might reach 95% to 98% accuracy. Abu sufian el at [4] CNNs are the most advanced approach for classifying images. This section includes CNN-related topics like: In this research, we compared CNN architectures to classify photos. Our investigation showed CNN's progression from LeNet-5 to SENet. Each model has its own characteristics and training needs. We've also compared and contrasted the two models.Joel hasan el at [4] Byproduct of this technique is a dataset for training a neural network for image classification. The dataset was hand-collected on the field. This study reprocessed photos to improve feature extraction. This involves removing reflections, normalizing brightness, removing noise, and masking. The modified photos were then used to build a deep convolutional neural network model to categorize the pictures using the TensorFlow framework. Pooja murali el at [6] SVM, KNN, Decision Tree, and CNN may identify leaf tissue disorders. By uploading a sample photo to the system, an algorithm can determine if it's contaminated. The algorithm will print the illness if the sample is infected; the study's designers used CNN for detection, which had an 86% accuracy rate. Dhanuja K C el at [7] The author used image processing to detect arecanut disease. Method uses image processing. This author graded arecanuts by texture.144 arecanut samples were utilized for the K-Nearest Neighbor (KNN) approach. 49 exceptional, 46 bad, and 49 negative arecanut samples were tested. This data is used for model training and testing.

METHODOLOGY

A. Proposed model:

Collection of data set Model
Model for training data set

B. Dataset:

Betel nuts and their leaves were photographed in a healthy and sickly state for our dataset, which was created to help us detect the many diseases that plague these trees. At a distance of half a meter or less from the subject, the images were taken using a digital camera. In the Shimoga area of Karnataka, the photos were taken of both diseased and healthy arecanuts. All of these photographs were taken with the help of professionals and farmers in the arecanut industry. Each shot depicts either healthy or ill arecanuts, including their leaves and nuts, as well as the trunks of the trees. Illnesses like yellow spots, Mahali/Koleroga and stem bleeding can all be seen on arecanut. Additionally, there are 200 photos of the nutritious betel nut. Before training the model, the pictures are resized using open-cv such that each side has 256 pixels.

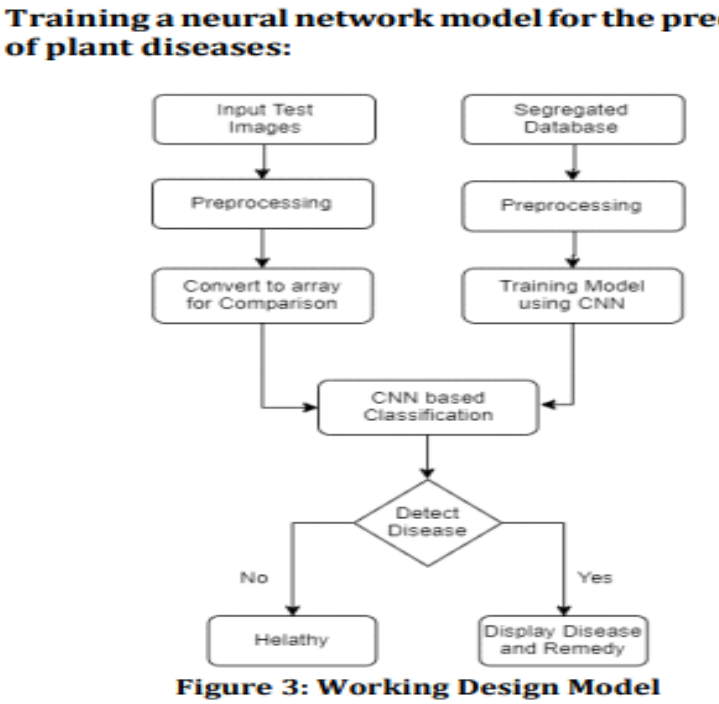

Figure 3: Working Design Model

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Training dataset:

300 healthy and ill photographs were used to test and train the model. We used Augmentation to rotate, shift, zoom, and flip images to offer more training data.Train and test data are 80:20. Model measurements include cross-entropy loss, adam optimizer function, and accuracy. 50 training Epochs achieve high validation and test accuracy with low loss.

```
#Visualize model accuracy
plt.plot(history.history['accuracy'])
plt.plot(history.history['val_accuracy'])
plt.title('Model Accuracy')
plt.ylabel('Accuracy')
plt.xlabel('Epoch')
plt.legend(['Train', 'Val'], loc = 'upper left')
plt.show()
```

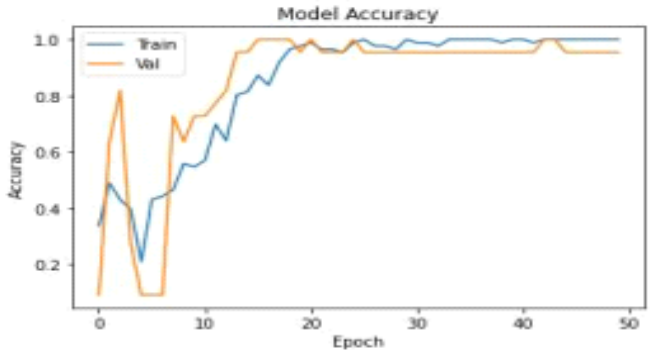

Figure 5: Accuracy v/s Epoch

RESULT

Module prediction result by comparing the input image:

```
[[1.7443990e-18 9.9999988e-01 1.6165437e-13 1.3904564e-07 6.0229122e-10
  1.2653988e-12]]
1
0.9999999
Healthy_Nut
```

CONCLUSION

This article focuses on using convolutional neural networks (CNNs) to identify trunk and leaf anomalies in beetel nut trees. Current research uses 300 images of harmful and healthy betel nuts. The image must be preprocessed before feature extraction, training, and classification. Step 4 is categorization. The suggested approach can diagnose and treat arecanut illnesses as Mahali, Stem Bleeding, and Yellow Leaf Spot.The accuracy of illness diagnosis may vary dependent on imaging quality and disease stage, according to the research. On average, the system should be right 88.46% of the time. As a consequence, the technology encourages farmers to adopt smart farming by allowing them to take preventative and corrective action on their arecanut crop. This capacity allows them to take preventative and remedial action on their arecanut crop. This is done by giving them access to system data, which improves yield decisions.

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