AUTOMATED AI BASED PLANT DISEASE PREDICTION AND CURABILITY REMEDY SUGGESTIONS TO FARMERS

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Abstract—

Farmers, consumers, the environment, and the global economy are all at risk from plant diseases. In India alone, viruses and pests destroy 35 percent of field crops, forcing farmers to lose money indiscriminate application of Pesticides are also a severe health risk because many of them are poisonous. These negative consequences canbe prevented if the condition is caught early.

Detection, crop surveillance, and tailored treatments are all part of the process. Agricultural professionals diagnose the majority of diseases by looking at the symptoms. Outward signs and symptoms Farmers, on the other hand, have limited access to professionals. Our project is the first collaborative and comprehensive platform for automated manufacturing. Farmers Disease Prediction and Curability Remedy Suggestions Farmers can quickly and reliably diagnose diseases and provide treatment by capturing the afflicted plant sections a smart phone app can be created. It is possible to diagnose in real time. Enabled with the most recent The AI model (Xception model) was trained with big disease datasets in tests. Plant pictures self-collected from various farms over a period of time were used to construct databases. The automated CNN model was used to diagnose the test photos. The findings were confirmed. The accuracy of illness detection was over 95%.attained. Our solution is a disease-fighting tool that is unique, scalable, and easy to use. It may be used to control a variety of agricultural crop plants and can be implemented as Farmers and experts can use a cloud-based program to help them make environmentally sustainable decisions.

INTRODUCTION

Visual inspection of plant tissue by qualified professionals has long been used to identify the severity of plant diseases. The deep learning success in image-based plant disease recognition prompted this work, which proposes deep learning models for image-based automatic diagnosis of plant disease severity.

As a result, our project is the world's first integrated and collaborative platform for automated disease prediction and cure recommendations to farmers. By capturing diseased plant sections and using a mobile app, farmers may quickly and correctly identify illnesses and acquire treatments. The most recent Artificial Intelligence (AI) algorithms allow for real-time diagnosis. The AI model (CNN) was trained in our trials with massive disease datasets built with plant photos collected over months from multiple farms. The results of the automatic CNN model were validated after they were used to diagnose test photos.

1] TITLE: On Using Artificial Intelligence and the Internet of Things for Crop Disease Detection: A Contemporary Survey

Academic Editors: Gniewko Niedbała and Sebastian Kujawa Published: 22 December 2021

AUTHOR: Houda Orchi , Mohamed Sadik and Mohammed Khaldoun
DESCRIPTION:

This paper provides a current summary of research in the field of disease identification of various crops utilising machine learning, deep learning, image processing techniques, the Internet of Things, and hyperspectral image analysis that has been conducted during the last decade. In addition, a comparison of numerous methodologies for detecting agricultural diseases was carried out. In addition, this paper examines the various problems that must be solved as well as alternative solutions. Following that, numerous solutions to these problems are offered. Finally, this research gives a forward-looking perspective that promises to be a highly useful and important resource for crop disease researchers.

[2] TITLE: An Artificial Intelligence and Cloud Based Collaborative Platform for Plant Disease Identification, Tracking and Forecasting for Farmers
***2018 IEEE International Conference on Cloud Computing in Emerging Markets (CCEM),* 2018, pp. 49-56, doi: 10.1109/CCEM.2018.00016.**
AUTHOR: Kaushik Kunal Singh
DESCRIPTION:

The article presented in this study is an innovative, scalable, and accessible technology for disease control of a variety of agricultural crop plants that may be used as a Cloud-based service by farmers and specialists for environmentally sustainable crop production.

[3]TITLE: Detection and classification of rice diseases: An automated approach usingtextural feature January 2019Mehran University Research Journal of Engineering and Technology 38(1):239-250

DOI:10.22581/muet1982.1901.20

AUTHOR: Komal Bashir, Mariam Rehman, Mehwish Bari

DESCRIPTION:

For the identification and categorization of illnesses in diverse plants, image processing techniques are frequently used. Image processing is complicated by the plant's structure and the appearance of the disease on the plant. This study uses an image-processing approach based on SVM (Support Vector Machine) to investigate and categorise three rice crop illnesses. The procedure is divided

into two phases: training and illness prediction. Using a trained classifier, the method detects illness on the leaf. The proposed research study maximises the efficiency of SVM parameters (gamma, nu). The proposed method achieved 94.16 percent accuracy, 5.83 percent misclassification rate, 91.6 percent recall rate, and 90.9 percent precision, according to the results. These results were compared to image processing approaches described in the literature review.

By adding image processing and collaborative elements, the results produced can aid in the creation of a successful software solution. This may make it easier for farmers and other organisations to make informed decisions in order to safeguard rice harvests from significant harm. In light of the outcomes of this study, the given technique could be a viable option for incorporating image processing techniques into KM (Knowledge Management) systems.

[4]TITLE: Performance of deep learning vs machine learning in plant leaf disease detection

AUTHOR: R.Sujatha, Jyotir MoyChatterjee, NZJhanjhi, Sarfraz NawazBroh School of Information Technology & Engineering, Vellore Institute of Technology, Vellore, India

DESCRIPTION:

Plants are considered essential because they are the primary source of energy for humanity, as well as having nutritional, medicinal, and other benefits. Plant diseases can impact the leaf at any period between crop farming, resulting in massive crop output losses and economic market value. As a result, in the farming industry, identifying leaf disease is critical. It does, however, necessitate a lot of work, a lot of prep time, and a lot of plant pathogen knowledge. Various machine learning (ML) and deep learning (DL) methods for detecting plant diseases have been created and tested by various researchers, and in many cases, they have yielded considerable results in both cases.

In this paper, we compare the performance of ML (Support Vector Machine (SVM), Random Forest (RF), Stochastic Gradient Descent (SGD)) and DL (Inception-v3, VGG-16, VGG-19) in terms of citrus plant disease diagnosis, motivated by their previous research. The disease classification accuracy (CA) we obtained through experimentation is pretty impressive, as DL methods outperform ML methods in disease identification in the following ways: VGG-19–87.4 percent > Inception–v3–89 percent > VGG-16–89.5 percent > RF–76.8% > SGD–86.5 percent > SVM–87 percent > VGG-19–87.4 percent > Inception–v3–89 percent > VGG-16–89.5 percent We may deduce from the results that RF produces the least CA, whereas VGG-16 produces the most CA.

[5] **TITLE: "CNN based Leaf Disease Identification and Remedy Recommendation System," 2019 3rd International conference on Electronics, Communication and Aerospace Technology (ICECA), 2019, pp. 395-399, doi: 10.1109/ICECA.2019.8821872**.

AUTHOR: V. Suma, R. A. Shetty, R. F. Tated, S. Rohan and T. S. Pujar,

DESCRIPTION:

Agriculture is one field that has a significant impact on human lives and economic condition. Agricultural products are lost due to poor management. Farmers do not have a good understanding of illness, so they produce less. Kisan call centres are accessible, although they do not provide assistance 24 hours a day, seven days a week, and communication might be problematic at times. Farmers who are unable to correctly explain disease over the phone must see an image of the diseased area. Despite the fact that photographs and videos of crops provide a better view and agro scientists can provide a

better solution to handle concerns related to healthy crops, farmers are not educated.

It is important to note that if a crop's productivity is poor, the crop's ability to provide good and healthy nutrition is jeopardised. Because to advancements in technology, equipment are now capable of recognising and detecting plant illnesses. Recognizing disease early on can help to speed up treatment and reduce the impact on harvest. As a result, the focus of this work is on plant disease identification utilising an image processing approach. The convolution system and semi-supervised approaches are utilised to characterise crop species and determine the disease status of four unique classes using an open dataset of 5000 images of unhealthy and solid plants.

[6] TITLE: A Mobile-Based System for Detecting Plant Leaf Diseases Using Deep Learning

July 2021

DOI:10.3390/agriengineering3030032

AUTHOR:Ahmed Abdelmoamen,Gopireddy Harshavrdhan Reddy

DESCRIPTION:

Plant infections are one of the most serious issues confronting the global agriculture sector. Crop diseases account for one-third of crop output losses in the United States each year. Despite its relevance, crop disease diagnosis by optical inspection of plant leaf symptoms is difficult for farmers with limited resources. To reduce crop agriculture losses, there is an urgent need for significantly enhanced crop disease detection, monitoring, and forecast. In this context, computer vision combined with Machine Learning (ML) holds a lot of potential for enhancing crop monitoring at scale. This research describes a mobile-based system that uses machine learning to automate the identification of plant leaf diseases. For identifying 38 disease types, the created system leverages Convolutional Neural Networks (CNN) as the underlying deep learning engine.

For training, verifying, and testing the CNN model, we gathered an imaging dataset of 96,206 images of plant leaves from healthy and sick plants. Farmers can photograph sick plant leaves using the user interface, which is built as an Android mobile app. The disease category is then displayed, along with the confidence %. This approach is supposed to provide farmers with a better possibility to maintain their crops healthy by reducing the usage of incorrect fertilisers that could stress the plants. Finally, we assessed our system's performance using a variety of measures such as classification accuracy and processing time. Our algorithm has a 94 percent overall classification accuracy in recognising the 38 most prevalent disease classes in 14 crop types.

2. Experimental workflowAnalysis

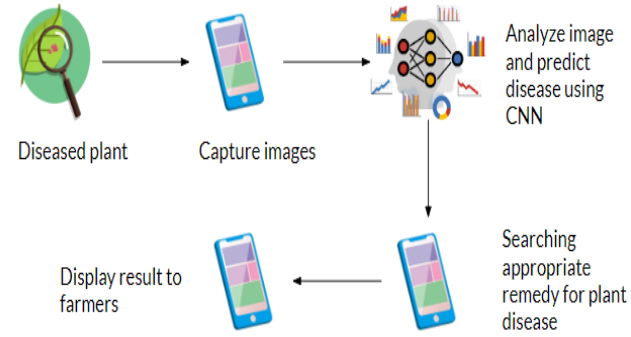

Fig 2.1 work flow of proposed system

We implemented and tested this application in real time, where we took a diseased plant and captured the image of the diseased plant with the smart phone device then after that the image is analyzed and the disease is predicted using CNN .Then the predicted disease is displayed to the farmers in the smart phone .After the disease is displayed the remedy for that plant disease is searched and it is also displayed in the smart phone

3. ModuleDescription

3.1 Dataset collection:

The PlantVillage dataset consists of 54303 healthy and unhealthy leaf images divided into 38 categories by species and disease. The original datasetis not available from the original source (plantvillage.org), therefore we getthe unaugmented dataset from a paper that used that dataset and republished
it.

3.2 Training module code:

The required libraries are imported and the images from the dataset are processed into their numeric forms and then by using the pretrained xception model the required result is calculated.

3.3 Deployment:

The trained TensorFlow model on the disk will convert into TensorFlow Lite file format (.tflite) using the TensorFlow Lite converter. Then the converted file is used in the mobile application.

4. ImplementationandResult

The proposed system successfully detects plant disease, it labels them and also shows its accuracy. The model also gives suggestions to overcome the issues and when the person with the camera is approaching the object.

- This is the image that we have given into the application to scan for diseases

Fig 6.1 Diseased Plant

- After uploading the image into the app now we get the name of the disease along with an option to search for remedy.

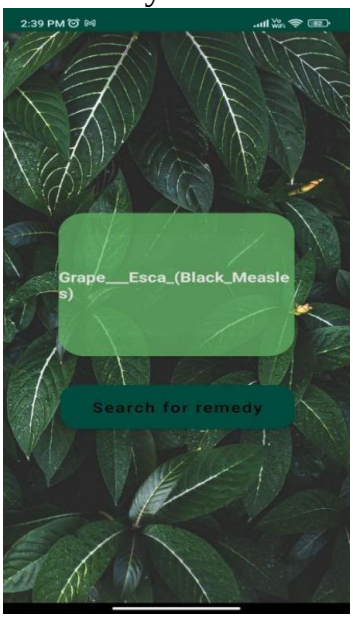

Fig 6.2 Detected Disease

- After clicking on the search for remedy button the app redirects to a google page in the browser where the results are shown to find remedy for the disease.

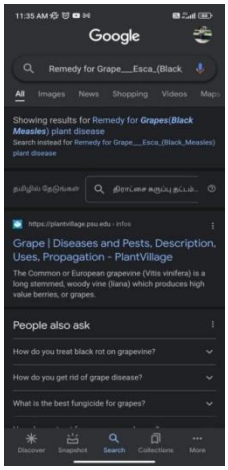

Fig 6.3 Search for Remedy

5.Conclusion

Plant diseases are serious food security hazards that must be addressed before the entire field is lost. Farmers, on the other hand, are frequently unable to discern between symptoms that are similar yet indicate different diseases. This will lead to incorrect or excessive fertiliser application. To mitigate this loss and guide farmers with video lectures, we use Convolutional Neural Networks (CNN) several layers of ANN termed Deep Learning Algorithms. This can be done with the help of a mobile application. "Not all farmers utilise it, but some do."

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PROPOSED SYSTEM

The proposed CNN Deep learning model for image classification and identification of plant disease which is less fast and accurate. It consists of a mobile app and trained model with a predictor. When the farmer takes a picture of the plant which gets affected were classified using the CNN model and by using the descriptive process it gives the suggestion to the farmer which pesticide should be used and how much it required.

ADVANTAGES

Performance of the system is increased because of using a single shot detection algorithm.

There is no need for any additional requirement of hardware instead the user mobile camera is used for image capturing.