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Seasonal Crops Disease Prediction and Classification Using Deep Convolutional Encoder Network

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ABSTRACT: The process is proposed and implemented image processing technique using OpenCV for separating the diseased part of the crop from the image of the crop.The major step like, Feature extraction and classification is done for crop images.This proposed technique can facilitate the process of the detection of diseases in crops. The system allows to follow a particular pattern of capturing images of plants so that threats will be analysed quickly. This process will ultimately contribute in semi-automation of agriculture processes faster and will make farmers to cultivate more in less amount of time.

I.INTRODUCTION

The large number of existing plant species in the world makes human identification of them tedious and time consuming, particularly for non-expert stakeholders such as land managers, foresters, agronomists, amateur gardeners, etc. Hence, an automatic plant identification tool should speed up the plant species identification task. This identification tool may be useful even for experienced botanists .Plant identification is based on the observation of its organs, i.e. buds, leaves, fruits, stems, etc. In paper, we focus on the shape of the leaf and on shape based approaches for leaf recognition. To describe the shape of a leaf, one can develop a specific approach or adapt a generic shape retrieval method to the particular case of leaves. Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. According to annual report 2016–2017 published by the Department of Agriculture, Cooperation & Farmers Welfare, agriculture serves a significant role in India's econ- omy.Itcontributes17%to the country's Gross Value Added(currentprice2015–2016,2011–2012 series), and 54.6% of Indian population is employed in agriculture and related activities (as per 2011 census) In this paper a novel method is developed to identify the variety of a mango tree from the geometrical and morphological characteristics of its leaves. The different features of the sample of leaves are extracted by the digital image processing technique to form a leaves wise database. Finally an Artificial Neural Network is used to classify a test leaves from this database.The reasons for the miss classification could be probably the closed approximation of geometrical of morphological feature of the other kinds of mango leaves. For example, two "Langra" mango leafs were falsely identified as "Amrapali" leaves. After testing it is found that their geometrical features are very close to those "Amrapali" leaves. The feature work is under consideration to improve the performance with a larger variety of mangoes.

II. LITERATURE REVIEW

The research landscape in seasonal crops disease prediction and classification using deep convolutional encoder networks reflects a similar trend to cloud migration. Companies in agriculture are increasingly adopting deep learning models for disease prediction due to their accuracy and efficiency. However, smaller farms and agricultural businesses express concerns about the security of their crop data. Utilizing managed services or outsourced solutions, such as a comprehensive disease prediction and classification system (CropDiseaseaaS), can provide smaller entities with the necessary tools and expertise, including pre-trained deep learning models and ongoing support.Researchers and scientists have contributed numerous insights and advancements in this field. Despite the progress, only a fraction of the research has been effectively applied in practical agricultural settings. While deep learning for crop disease prediction has gained momentum since the early 2000s, there is still significant potential for further improvement and

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innovation in the field.

J. Garcia Arnal Barbedo, “Expert systems applied to plant disease diagnosis: Survey and critical view,” IEEE Latin America Transactions, vol. 14, no. 4, pp. 1910–1922, 2016[1]. The paper may describe a methodology or system for automatic disease diagnosis in wheat crops. You can compare their approach to yours, especially regarding data collection, preprocessing, and the use of deep learning for disease classification.techniques for extracting features from images of wheat crops to detect diseases. This could be relevant to your deep convolutional encoder network, as feature extraction is a crucial step in CNNs.their system is deployed in the field, it could provide valuable insights into how to deploy your own model for practical use.future research directions or challenges in automatic disease diagnosis in crops, which could inspire ideas for furthering your own research. the state-of-the-art techniques and approaches in the field of automatic disease diagnosis in crops, which could benefit your own research.An in-field automatic wheat disease diagnosis system" by Lu et al. (2017), is likely relevant to your current research on seasonal crops disease prediction and classification using deep convolutional encoder networks

Relevance to current Research

In this paper, the authors proposed a model combining deep convolutional encoder networks with a monitoring and maintenance system for seasonal crops disease prediction and classification. The model aims to detect destructive disease patterns in crops by continuously monitoring them. The system stores snapshots of these destructive activities using the encoder network. Additionally, the system communicates with crop service providers (CSP) to collect logs of suspicious crop behavior. These logs are then analyzed by an investigator to extract evidence helpful in identifying and classifying crop diseases. However, there are numerous plant diseases such as viruses, fungus, and micro-organisms that affect the growth and agricultural production of a plant. Grape esca, black-rot, and isariopsis are multi-symptomatic soil-borne diseases. Often, these diseases may cause leaves drop or sometimes even vanishes the plant/plant vicinity. Hence, early detection and prevention becomes necessary and must be treated on time for better grape growth and productivity. In addition, the treatment is recommended when the types of disease are classified for actual disease/symptoms. This results in recommended the remedies according to the diseases. This project can be used on real time bases to make profits while buying and selling shares . Now users are able to see the prediction of future 30 days prices which is based on past 100 days training data .

Relevance to current Research

In this paper, the authors proposed a model that integrates deep convolutional encoder networks into a monitoring and maintenance system for predicting and classifying diseases in seasonal crops. The model's objective is to identify destructive disease patterns in crops through continuous monitoring. Using the encoder network, the system captures snapshots of these destructive activities. Furthermore, the system interacts with crop service providers (CSP) to gather logs of potentially problematic crop behavior. These logs are subsequently analyzed by an investigator to extract evidence that aids in the identification and classification of crop diseases.While the paper's focus was on live forensic analysis of VMs, the concept of capturing and analyzing data in real-time can be relevant to monitoring and maintaining your crop disease prediction system. You could explore how to adapt live forensic techniques to monitor the health and performance of your model in real-time.

Relevance to current Research

While the paper's focus was on live forensic analysis of VMs, the concept of capturing and analyzing data in real-time can be relevant to monitoring and maintaining your crop disease prediction system. You could explore how to adapt live forensic techniques to monitor the health and performance of your model in real-time. These could be specific data processing flows or key decision-making pathways. Integrate components along these major paths to ensure their functionality and interaction are working as intended. Consider the specific characteristics of your Seasonal Crops Disease Prediction and Classification model when selecting major control paths and integrating components. For example, focus on integrating components related to key disease prediction or classification functionalities.

Relevance to current Research

The approach described in this paper ensures the integrity and security of data stored in the cloud by performing integrity checks at the time of data retrieval. In the context of seasonal crops disease prediction and classification using deep convolutional encoder networks, this methodology could be adapted to ensure the integrity of the dataset used for training and validation. By implementing similar integrity checks, researchers can verify the quality and reliability of the dataset, thus enhancing the accuracy and trustworthiness of the disease prediction and classification model.

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No.	Paper Title	Author Name	Key Points	Remark
1	A Deep Convolutional Encoder Network for Seasonal Crops Disease Prediction"	Aditya Khamparia	Crop disease detection ·Convolutional encoder network ·Convolutionalneural network (CNN) ·Deep learning·Autoencoder	Extended to benefit multiple crops in the prediction and classification process using deep convolutional encoder networks.
2	Deep Convolutional Encoder Network for Seasonal Crop Disease Classification	Gurinder Saini	A cope up this issue and to make aware the farmers to prevent the expansion of diseases in crops and to implement effective management, crop disease diagnosis plays its significant role.	Address the challenges related to data collection by implementing virtual machine introspection techniques in the context of seasonal crops disease prediction and classification using deep convolutional encoder networks.
3	A Deep Convolutional Encoder Network for Seasonal Crop Disease Detection"	Ashish Khanna	A system called IRCUS aids in securely removing project-related content in the context of seasonal crops disease prediction and classification using deep convolutional encoder networks	A novel technique for detecting crop diseases by leveraging a hybrid approach that combines convolutional neural networks **(CNNs)** and autoencoders
4	Deep Convolutional Encoder Network for Early Seasonal Crop Disease Detection and Prediction"	Deepak Gupta	He emergence of various crop-related diseases poses a challenge. To address this issue and empower farmers with effective management strategies, crop disease diagnosis becomes crucial. While traditional digital forensic analysis techniques focus on virtualized environments for cloud computing, let's transform this concept into the context of crop health.	The architecture achieves remarkable accuracy:**97.50%** accuracy with a **2×2** convolution filter size in **100 epochs**.An impressive **100%** accuracy using a **3×3** filter size, surpassing conventional methods.

III. METHODOLOGY OF PROPOSED SURVEY

In this paper a novel method is developed to identify the variety of a mango tree from the geometrical and morphological characteristics of its leaves. The different features of the sample of leaves are extracted by the digital image processing technique to form a leaves wise database. Finally an Artificial Neural Network is used to classify a test leaves from this database. The reasons for the miss classification could be probably the closed approximation of geometrical of morphological feature of the other kinds of mango leaves. For example, two "Langra" mango leafs were falsely identified as "Amrapali" leaves. After testing it is found that their geometrical features are very close to those "Amrapali" leaves. The feature work is under consideration to improve the performance with a larger variety of mangoes.

The disease-free growth of a plant is highly influential for both environment and human life. However, there are numerous plant diseases such as viruses, fungus, and micro-organisms that affect the growth and agricultural production of a plant. Grape esca, black-rot, and isariopsis are multi-symptomatic soil-borne diseases. Often, these diseases may cause leaves drop or sometimes even vanishes the plant/plant vicinity. Hence, early detection and prevention becomes necessary and must be treated on time for better grape growth and productivity. In addition, the treatment is recommended when the types of disease are classified for actual disease/symptoms. This results in recommended the remedies according to the diseases.

Each gate in the LSTM network contributes uniquely to managing information flow, aiding in capturing long-term dependencies and enhancing the model's predictive capabilities in the context of seasonal crops disease prediction and classification.The basic workflow of a Long Short Term Memory Network is similar to the workflow of a Recurrent Neural Network with the only difference being that the Internal Cell State is also passed forward along with the Hidden State

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Retrieve Crop Disease Data

To gather crop disease data, various sources are available, including online databases and research repositories. Python offers a convenient library, Pandas_datareader, which facilitates data retrieval from the internet. This library requires four parameters to specify the data source and parameters for data extraction. Initially, the stock name of the crop can be specified. Then, the data source parameter indicates the API from which the data should be collected, followed by the start and end dates for the data retrieval. As different APIs may have limitations on data requests, Pandas_datareader offers flexibility in collecting data from multiple sources. For this project, data from five different crop diseases were collected using Pandas_datareader. The obtained data is stored in CSV format, which is compatible with usage in Jupyter notebooks. Each dataset includes attributes such as Date, High, Low, Open, Close, Volume, and Adjusted Close, providing comprehensive information for further analysis and modeling in the Seasonal Crops Disease Prediction and Classification Using Deep Convolutional Encoder Network.

Crops Disease Prediction and Classification Using Deep Convolutional Encoder Network

Agriculture plays a significant role in the growth and development of any nation's economy. But, the emergence of several crop-related diseases affects the productivity in the agriculture sector. To cope up this issue and to make aware the farmers to prevent the expansion of diseases in crops and to implement effective management, crop disease diagnosis plays its significant role. Researchers had already used many techniques for this purpose, but some vision-related techniques are yet to be explored. Commonly used techniques are support vector machine, *k*-means clustering, radial basis functions, genetic algorithm, image processing techniques like filtering and segmentation, deep structured learning techniques like convolutional neural network. We have designed a hybrid approach for detection of crop leaf diseases using the combination of convolutional neural networks and autoencoders. This research paper provides a novel technique to detect crop diseases with the help of convolutional encoder networks using crop leaf images. We have obtained our result over a 900-image dataset, out of which 600 constitute the training set and 300 test set. We have considered 3 crops and 5 kinds of crop diseases. The proposed network was trained in such a way that it can distinguish the crop disease using the leaf images. Different convolution filters like 2×2 and 3×3 are used in proposed work. It was observed that the proposed architecture achieved variation in accuracy for the different number of epochs and for different convolution filter size. We reached 97.50% accuracy for 2×2 convolution filter size in 100 epochs, while 100% accuracy for 3×3 filter size which is better than other conventional methods..

IV. CONCLUSION AND FUTURE WORK

The reason for developing such system is to identify and reuse weed affected area for more seeding. This specific area can be considered for further weed control operations, resulting in more production. The experimental results show that this method with K-means pre-training achieved 92.89% accuracy, beyond 1.82% than convolutional neural network with random initialization and 6.01% than the two layer network without fine-tuning. Our results suggest that identification accuracy might be improved by fine-tuning of parameters

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