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Survey Towards Android Application for Plant Disease Detection using Deep Learning Approach

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Abstract - India is a vast country where agriculture is primary occupation for people. Agriculture produce depends on crop and crop yield produced from farming. Crop yield majorly depends on growth and quality of plants. The plants need to be disease free to have good produce from farming. Taking same into consideration the system is designed to detect the plant disease in plants. The android application is created which is integrated with ai- chat and pesticide recommendation for farmer. The convolutional neural network is used for classification of plant disease. The application helps to recommend the pesticide to be used for specific disease detected. The farmers can use the application for any other query which is designed for chat. The application also includes the plant care calendar which helps farmer for regular plant care through which the growth and quality of plant can be maintained for high accuracy.

***Key Words*:** Android Application, Image Processing, Deep Learning ,Plant Disease, Plant care.

1.INTRODUCTION

The global population is expected to reach 10 billion people by 2050. Therefore, food production must absorb this population growth, although the amount of available arable land is limited. The Food and Agriculture Organization of the United Nations suggests increasing the food supply by 70% to feed the world population by 2050, although approx.- imately one-third of all food is wasted because of plant diseases or disorders. To achieve this goal, researchers have proposed many deep-learning models to help farmers detect dis- eases in their crops as efficiently as possible to avoid yield declines. Loss of crop yield is a major research concern. Plants die if their leaves cannot produce chlorophyll via photo-synthesis because of diseases or disorders.

Artificial Intelligence (AI) has been extensively considered to solve the problem of crop yield loss, particularly in the areas of Computer Vision and Machine Learning. Therefore, many deep Convolutional Neural Networks (CNN) have been proposed by researchers for plant disease identification and classification.

Identification of the plant diseases is the key to preventing the losses in the yield and quantity of the agricultural product. The studies of the plant diseases mean the studies of visually observable patterns seen on the plant. Health monitoring and disease detection on plant is very critical for sustainable agriculture. It is very difficult to monitor the plant diseases manually. It requires tremendous amount of work, expertise in the plant diseases, and require the excessive processing time. Hence, image processing is used for the detection of plant diseases. Disease detection involves the steps like image acquisition, im- age pre-processing, image segmentation, feature extraction and classification. This paper discussed the methods used for the detection of plant diseases using their leaves images. This paper also discussed some segmentation and feature extraction algorithm used in the plant disease detection.

Paper is organized as follows. Section gives the introduction topic with need for plant disease detection and overall graph for plants over world. Section II gives the related work till now in this field for plant disease detection. Section III gives the architecture for the system and includation of more facilities included in the system. Finally, Section V presents conclusion.

2. Body of Paper

1)Plant Disease Detection Using Generated Leaves Based on Double GAN

Double GAN is divided into two stages. In stage 1, we used healthy leaves and unhealthy leaves as inputs. First, the healthy leaf images were used as inputs for the WGAN (Wasserstein generative adversarial network) to obtain the pretrained model. Then, unhealthy leaves

were used for the pretrained model to generate 64*64-pixel images of unhealthy leaves. In stage 2, a super resolution generative adversarial network (SRGAN) was used to obtain corresponding 256*256-pixel images to expand the unbalanced dataset. Finally, compared with images generated by DCGAN (Deep convolution generative adversarial network). The dataset expanded with Double GAN, the generated images are clearer than DCGAN, and the accuracy of plant species and disease recognition reached 99.80% and 99.53%, respectively. The recognition results are better than those from the original dataset [3].

2)Deep Learning Based Automatic Multiclass Wild Pest Monitoring Approach Using Hybrid Global and Local Activated Features

This paper proposes a novel deep learning based automatic approach using hybrid and local activated features for pest monitoring. In the presented method, we exploit the global information from feature maps to build our Global activated Feature Pyramid Network (GaFPN) to extract pests' highly discriminative features across various scales over both depth and position levels. It makes changes of depth or spatial sensitive features in pest images more visible during down sampling. Next, an improved pest localization module named Local activated Region Proposal Network (LaRPN) is proposed to find the precise pest objects' positions by augmenting contextualized and attentional information for feature completion and enhancement in local level. The approach is evaluated on our 7year large-scale pest dataset containing 88.6K images (16 types of pests) with 582.1K manually labelled pest objects. The experimental results show that our solution performs over 75.03% mAP in industrial circumstances, which outweighs two other state-of-the-art methods: Faster R-CNN with mAP up to 70% and FPN mAP up to 72%.[4]

3)Diagnosing Emerging Infectious Diseases of Trees Using Ground Penetrating Radar

The aim of this article is to examine the capabilities of ground penetrating radar (GPR) on evaluating the internal structure of tree trunks and detecting tree decay associated with EIDs. Traditionally used processing schemes tuned for GPR line acquisitions are modified accordingly to be compatible with the new measurement configurations. In particular, a detection framework is presented based on a modified Kirchhoff and a reverse-time migration. Both methodologies are compatible with measurements taken along closed irregular curves assuming a homogeneous permittivity distribution. To that extent, prior to migration, a novel focal criterion is used that estimates the bulk permittivity of the host medium from the measured B-scans. The suggested detection scheme is successfully tested on both numerical and laboratory measurements, indicating that GPR has the potential to become a coherent and practical tool for detecting tree decay associated with EIDs.[5]

4) Crop Recommendation System for Precision Agriculture

In agriculture, data mining is used to analyze various biotic and abiotic factors. Indian agriculture plays an important role in the economy and employment. A common problem among farmers in India is their inability to choose the right crop according to the needs of the soil. As a result, their production faced serious problems. The farmer's problem is solved with precision agriculture. Precision farming is a modern agricultural technology that uses scientific data collected from soil properties, soil type, plant information and recommends suitable crops that the farmer does not have. This reduces product selection errors and increases profitability. In this paper, this problem is solved by proposing a common model that uses majority voting method using random trees, CHAID, K-nearest neighbors and Naive Bayes as learners to reach consensus on the accuracy and efficiency of crops for a given location.[4]

5) Design of fertilization recommendation knowledge base and application

The recommended method for planting involves using formulas to calculate the amount of various nutrients needed during the growing season, selecting the appropriate fertilizer, and scheduling fertilization time. The key to whether it can be widely used lies in whether the structure or parameters of the system can be easily adapted to local agricultural practices. To help solve these problems, it is necessary to have knowledge about the infrastructure and its applications. This article first

uses the object-oriented approach to decompose the model to meet the requirements of C++ programming. Organizations are divided into three groups: non-owners and employees, and are used to transform materials used in composting into software system products. The information that needs to run the model is then divided into four types according to its role and represented according to various rules stored in relational data. Finally, the decision-making engine is designed to use them. It is actually a special computer used to control the local environment and display the rules in the form of some ideas and make suggestions.[1]

6) A Study On Various Data Mining Techniques For Crop Yield Prediction

India is a country where agriculture and agriculture - related industries are the main source of income for its people. Agriculture is the main economy of the country. It is also a country where major disasters such as rain or floods destroy crops. This situation caused farmers to suffer huge economic losses and caused farmers to commit suicide. Pre-harvest crop forecasting, farmers' and government agencies' decision on storage, marketing, price support, minimum transportation quantity, import/export, etc. It can help you make appropriate plans such as: Predicting crop yield is primarily based on soil quality, pH, EC, N, P, K, etc. It requires examining large amounts of data regarding many variables such as. Since crop forecasting involves large amounts of data, this forecast becomes an ideal candidate for data mining. We extract information from large amounts of data through data mining. This article presents research on various data mining methods for predicting crop yield.

7) Web based Recommendation System for Farmers

Since India is an agricultural country, it still practices traditional agricultural methods. Current recommendations for farmers are a one-to-one interaction between farmers and experts, and different experts have different recommendations. With data mining techniques, suggestions can be made to farmers using previous farming practices and business models can be combined with these, resulting in good results for the approver. The article describes the use of data mining to provide farmers with recommendations on crop yield, crop management, and fertilizer identification. Farmers can use the system online and on Android-based mobile devices. [3]

8) A novel framework for potato leaf disease detection using an efficient deep learning model

The proposed algorithm is a novel and first-of-its-kind method that addresses and demonstrates the success of detecting and classifying four diseases in potato leaves. The performance of the algorithm was evaluated in the test and an accuracy of 97.2% was achieved. Many experiments have been conducted to ensure that our proposed method is more consistent and accurate in detecting and classifying potato diseases than current standards.

Title	Algorithm	Description
Plant disease detection using generated leaves based on DobleGAN	CNN	This paper was undertaken to design DoubleGAN for generating plant leaves in order to expand the data set and evaluate the utility of generated leaves by classifica-tion accuracy. GAN has been widely used in the field of image generation. However, at this stage, the various GANs proposed by researchers are mainly used to gener-ate images using sufficient samples.
Plant Disease Detection Using Deep Learning	CNN, DNN	The proposed system tracks the cultivated field on a regular basis. The CNN and DNN algorithms are used to identify crop diseases at an early stage. Machine learning methods are used to train the model, which aids in making appropriate disease decisions.
Plant Disease Detection Using Machine Learning	Artificial Neural Network	The objective of this algorithm is to recognize abnormalities that occur on plants in their greenhouses or natural environment. The image captured is usually taken with a plain background to eliminate occlusion. The algorithm was contrasted with other machine learning models for accuracy. Using Random forest classifier, the model was trained using 160 images of papaya leaves. The model could classify with approximate 70 percent accuracy.
Plant Disease Detection and Classification by Deep Learning	CNN , KNN	In this paper, we have introduced the basic knowledge of deep learning and presented a comprehensive review of recent research work done in plant leaf disease recognition using deep learning. Provided sufficient data is available for training, deep learning techniques are capable of recognizing plant leaf diseases with high accuracy.

3. CONCLUSIONS

The paper states the review for the system with plant disease detection as a base. The proposed system is an android application for farmers where farmers will get their queries solved by chatting with an ai-chatbot, the camera used by farmers to take images will help them detect the disease in the plant and suggest to them the preservatives to be used. The plant care calendar will be added to the Android application to have a regular schedule for plant care. The enhancement of the system, the mobile application will be developed for plant disease detection and recommendations of pesticides will be given for same. We will be adding a calendar for plant care on continuous care for plants.

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REFERENCES

[1] E. Moupojou et al., "FieldPlant: A Dataset of Field Plant Images for Plant Disease Detection and Classification With Deep Learning," in IEEE Access, vol. 11, pp. 35398 -35410, 2023, doi: 10.1109/ACCESS.2023.3263042.

[2] X. Zhu et al., "LAD-Net: A Novel Light Weight Model for Early Apple Leaf Pests and Diseases Classification," in IEEE/ACM Transactions on Computational Biology and Bioinformatics, vol. 20, no. 2, pp. 1156-1169, 1 March-April 2023, doi: 10.1109/TCBB.2022.3191854.

[3] Y. Zhao et al., "Plant Disease Detection Using Generated Leaves Based on DoubleGAN," in IEEE/ACM Transactions on Computational Biology and Bioinformatics, vol. 19, no. 3, pp. 1817-1826, 1 May-June 2022, doi: 10.1109/TCBB.2021.3056683.

[4] L. Liu et al., "Deep Learning Based Automatic Multiclass Wild Pest Monitoring Approach Using Hybrid Global and Local Activated Features," in IEEE Transactions on Industrial Informatics, vol. 17, no. 11, pp. 7589-7598, Nov. 2021, doi: 10.1109/TII.2020.2995208.

[5] I. Giannakis, F. Tosti, L. Lantini and A. M. Alani, "Diagnosing Emerging Infectious Diseases of Trees Using Ground Penetrating Radar," in IEEE Transactions on Geoscience and Remote Sensing, vol. 58, no. 2, pp. 11461155, Feb. 2020, doi: 10.1109/TGRS.2019.2944070.

[6] J. Garcia Arnal Barbedo et al., "Annotated Plant Pathology Databases for Image-Based Detection and Recognition of Diseases," in IEEE Latin America Transactions, vol. 16, no. 6, pp. 1749-1757, June 2018, doi: 10.1109/TLA.2018.8444395.

[7] Zhouqiao Ren, Xiaonan Lu, “Design of Fertilization Recommendation Knowledge Base and Application”, IEEE, 2012.

[8] Omkar Chikane, Nilesh Dumbre, Gitesh More, “System For Agriculture Recommendation Using Data Mining”, IERJ, Dec 2015.

[9] Kiran Shinde, Jerrin Andrei, Amey Oke,“Web Based Recommendation System for Farmers”, IJRITCC, March 2015.

[10] R. Harine Rajashree, C. Kavya, T. Kiruthika, J. Nisha, “Crop Recommendation System for Precision Agriculture”, IEEE, 2016.

[11] Yogesh Gandge, Sandhya, “A Study Of Various Data Mining Techniques For Crop Yield Prediction”, IEEE, 2017. [12] System for agriculture recommendation using data mining, IEEE 2021.

[13] Smart Crop Prediction using IoT and Machine Learning, IEEE 2021.

[14] IoT Based Smart Agriculture System for Grapes, IEEE 2020.

[15] Smart Crop and Fertilizer Prediction System, IEEE 2019.

[16] [10] Mahum, R., Munir, H., Mughal, Z.U.N., Awais, M., Sher Khan, F., Saqlain, M., Mahamad, S. and Tlili, I., 2023. A novel framework for potato leaf disease detection using an efficient deep learning model. *Human and Ecological Risk Assessment: An International Journal*, *29*(2), pp.303-326.

[17] Su L, Xu X, Lu Q, et al. General image classification method based on semi-supervised generative adversarial networks[J]. High Technology Letters, 2019, 25(1):35-41.

[18] Too E C, Yujian L, Njuki S, et al. A comparative study of finetuning deep learning models for plant disease identification[J]. Computers and Electronics in Agriculture, 2018.

[19] Wang K F, Gou C, Duan Y J, et al. Generative Adversarial Networks: The State of the Art and Beyond[J]. Acta Automatica Sinica, 2017, 43(3):321-332.

[20] Xiaoqing W, Xiangjun W, Yubo N. Unsupervised Domain Adaptation for Facial Expression Recognition Using Generative Adversarial Networks[J]. Computational Intelligence and Neuroscience, 2018, 2018:1-10.

[21] Xianlun Tang, Yiming Du, Yuwei Liu, et al. Image recognition with conditional deep convolutional generative adversarial networks [J]. Acta Automatica Sinica, 2018,44(5):855-864(in Chinese).

[22] Yinka-Banjo C, Ugot O A. A review of generative adversarial networks and its application in cybersecurity[J]. Artificial Intelligence Review, 2019(1).

[23] Zeng-Shun Z, Han-Xu G, Qian S, et al. Latest Development of the Theory Framework, Derivative Model and Application of Generative Adversarial Nets[J]. Journal of Chinese Computer Systems, 2018.

[24] Hughes DP, Salathé M. An open access repository of images on plant health to enable the development of mobile disease diagnostics. CoRR abs/1511.08060, 2015

[25] Alec Radford, Luke Metz, Soumith Chintala. Unsupervised Representation Learning with Deep Convolutional Generative Adversarial Networks. arXiv:1511.06434v2 [cs.LG] 7 Jan 2016

[26] Christian Ledig, Lucas Theis, Ferenc Huszar, et al. Photo-Realistic Single Image Super-Resolution Using a Generative Adversarial Network. arXiv:1609.04802v5 [cs.CV] 25 May 2017