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Crop Disease Prediction System

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[1]***Abstract*--Technology has taken over every sector to help mankind have their best work to be helped by it, while in the field of agriculture, there are still many things and problems that a person can reduce to a possible extent by using the growing tech- nology. Our project 'CROP DISEASE PREDICTION SYSTEM' extends a helping hand as a solution to the most common problem farmers face, namely crop diseases, unawareness of them, not being able to take early action towards it and safeguarding the crop. Addressing this as the central point of our project will extend great support to farmers and gardeners in the early detection of their crop's illness and will also have a tailor-made solution for the same. Our project is designed with simplicity in mind. The steps for the process will be very easy to perform, and it will go like this. First, the person needs to upload an image of the plant's affected area, which primarily will be the leaves. Now in the next step, the project's internal model based on the dataset that we have provided will analyze the image and draw results based on any reference of disease from the dataset. Finally, after calculating the disease, it will show us the symptoms, name of the potential disease and treatment options. Our project is a derivative of machine learning capabilities and based on the traditional CNN model. With a very good scope of expanding further with new learning's and feed**

I.INTRODUCTION

To introduce our project we will start from the basics of it which include a front-end interface, and a backend dataset with a trained machine learning model based on a traditional convolutional neural network which is being implemented using Python and libraries like 'pandas',' and torch.nn' etc.

Existing systems include traditional plant disease detection methods like physical visual inspection which is mostly done by farmers only and is not efficient due to its time-consuming nature, lack of knowledge in farmers and error-prone nature. Another method includes laboratory testing which offers us accurate results by performing DNA tests and pathogen tests but it is very costly, time-consuming and not scalable to reach everyone easily.

So the problem statement is clear which is "The early detection and prediction of plant disease ensures their proper health, reduces loss and promotes healthy agriculture". Our project uses machine learning and image recognition to provide an efficient, accurate and accessible solution for the same. The end goal is to provide a simple yet efficient solution to this problem which will include a web application that allows us to predict the disease which affects a particular plant/crop by uploading the image of the affected part and providing the solution for it.

II. OBJECTIVES

- Develop an image-based crop disease prediction model with high classification accuracy.
- The goal of this project is to predict the disease which affects a particular plant/crop by uploading

the image of the affected part.

- Train the model on a large dataset of plant disease images.
- Achieve high accuracy in predicting plant diseases.
- Create a user-friendly web interface for image upload and disease prediction.
- Offer actionable insights for treatment and preventive measures.
- Enable real-time accessibility through web-based deploy- ment.

III. LITERATURE SURVEY

Considering our project in mind,, if we look at the applications of artificial intelligence and machine learning over the recent years, we can see that they have gained significant momentum improving themselves.

If we talk about existing systems, “Plantix” a commercial mobile application has already integrated machine learning to offer us real-time plant disease identification for farmers, showing us a practical roadmap to implement our idea. According to an article published in Wikipedia CNN which stands for convolutional neural networks is a type of feedforward neural network that learns features via filter optimization. This type of deep learning network has been applied to process and

make predictions from many different types of data including text, images and audio.

Despite these advancements, there comes a set of challenges like maintaining such a large dataset, image quality issues like (quality, size, blurred images), and misclassification of diseases that look somewhat identical in dataset samples. So to a possible extent, we managed to create our application. It follows a user-friendly approach along with high-resolution preprocessing, real-time analysis and solution-oriented results.

IV. METHODOLOGY

Our project solely lies on convolutional neural networks, which works as shown in the figure:

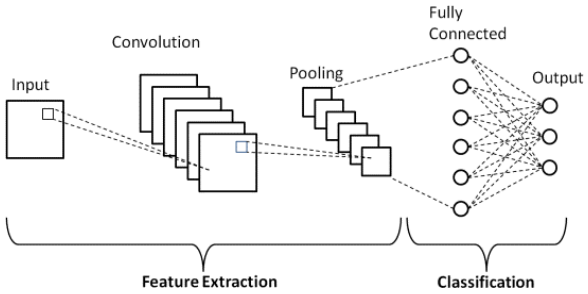

Fig. 1. CNN Model

Here is how each of the following layer works for our project:

Input layer: It takes the photo of a leaf as an input, and resizes it to 224 × 224 pixels and normalizes it.

Convolution Layer: It then applies filters and researches on the image extracting important features like colour pattern, spot on leaf or any other symptoms of disease.

Pooling layer: It now reduces the size of the feature map while keeping the important information intact.

Fully connected layer: It now takes all the features given by previous layers and combines them. Now it classifies the predictions according to the disease class it belongs to.

Output Layer: It now shows the final name of the disease from the data set along with the treatment features written for it.

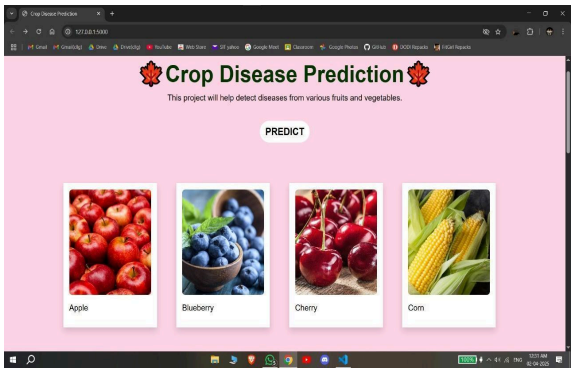

Fig. 2. HomePage

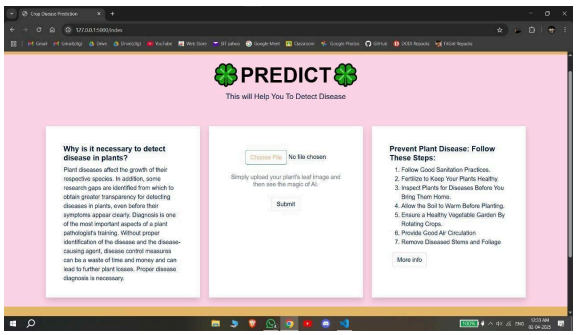

Fig. 3. User interface for uploading leaf image

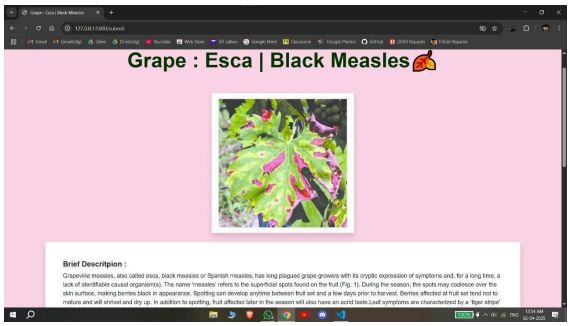

Fig. 4. Prediction result displayed with treatment tips

IV. Implementation

A. Technology Stack

- **Frontend**: HTML, CSS, JavaScript
- **Backend**: Python, Flask
- **ML Libraries**: TensorFlow, Keras, OpenCV
- **Deployment**: AWS/GCP (Future scope)

B. System Features

- Upload the image of the leaf for analysis.
- Real-time prediction and search analysis happens.
- Disease description and treatment solutions are given..
- User friendly and Secure UI is being used.

V. Results and Evaluation

In our project the dataset for CNN model has been through intensive testing and to demonstrate that we monitored the training accuracy and loss over many epochs which is shown in the graph below.

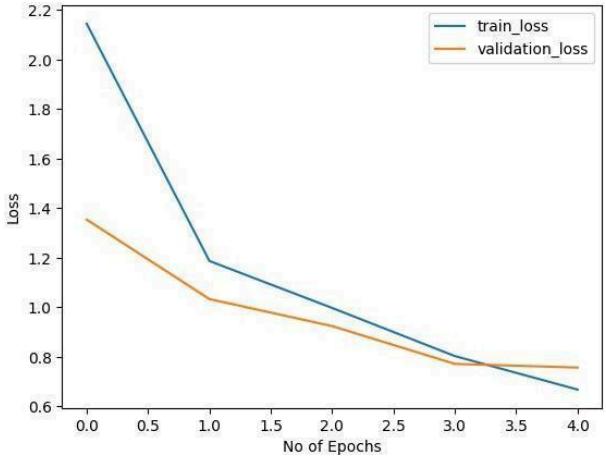

Fig. 5. CNN Model Test graph

The graph is visualizing the training and validation loss of a model.

X-axis (Epochs): Shows how many times the model has been fed with the entire dataset.

Y-axis (Loss): Measures the prediction error, so lower values mean better performance.

Blue Line (Training Loss): Represents how the model is learning from the training data—loss decreases as training progresses.

Orange Line (Validation Loss): Shows performance on unseen data which helps check generalization.

VI. Future Enhancements

While our current system functions well, we have planned several improvements to enhance its usability and perfor- mance:

- **IoT Integration:** We aim to connect with field sensors to collect live environmental data (e.g., humidity, temperature) for better context-aware predictions.
- **Mobile Application:** Developing a mobile app will make it easier for farmers to click photos and receive predictions instantly, even in remote areas.
- **Offline Functionality:** For areas with poor internet ac- cess, we plan to embed the model within the mobile app so it works without requiring connectivity.
- **Voice and Language Support:** Future versions will include support for regional languages and voice commands to make it accessible for a wider user base.
- **Expanded Dataset:** Including more crops and different disease types to increase the scope and applicability of the system.

VII. CONCLUSION

The Crop Disease Prediction System offers an intelligent, quick, and scalable approach to disease detection in agriculture. By allowing users to upload leaf images and receive instant disease predictions, the system empowers farmers to take timely actions.

It reduces dependency on manual inspections, saves time, and minimizes unnecessary use of pesticides. The use of deep learning, particularly the ResNet50 model, has shown great promise in detecting multiple diseases accurately. Although the system has some limitations, future improvements will make it even more robust and accessible to a larger farming community.

Acknowledgment

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REFERENCES

[1] R. Sharma, V. Patel, and A. Mehta, "CNN-Based Model for Real-Time Plant Disease Detection," *IEEE Access*, vol. 11, pp. 55673–55683, 2023.

[2] S. Gupta and P. Bansal, "Vision-Based Plant Leaf Dis- ease Detection Using Deep Convolutional Networks," Computers and Electronics in Agriculture*, vol. 199,p. 107147, 2022.

[3] J. Zhao, H. Liu, and Y. Wang, "Lightweight Deep Learn- ing Framework for Plant Disease Recognition on Mobile Devices," *Computers in Biology and Medicine*, vol. 162, p. 106818, 2023.

[4]X. Liu and Z. Ma, "Transformer-Based Model for Multi- Class Plant Disease Classification," *Expert Systems with Applications*, vol. 233, p. 120012, 2024.

[5]A. Singh, N. Verma, and R. Yadav, "Ensemble Learning Approaches for Plant Leaf Disease Detection," *Journal of Ambient Intelligence and Humanized Computing*, vol. 14, pp. 1423–1436, 2023.

[6]K. Patel and M. R. Jain, "Benchmark Dataset for Multi- class Plant Disease Detection Using Leaf Images," *Data in Brief*, vol. 50, p. 109638, 2023.

[7]M. Rahman, M. F. Hossain, and R. Islam, "Deep Learn- ing for Plant Disease Classification Using EfficientNet,"Journal of King Saud University – Computer and Information Sciences*, vol. 34, no. 7, pp. 3924–3932, 2022.v

[8]G. S. Rao and S. S. Reddy, "A Comprehensive Survey on Deep Learning Approaches for Plant Disease Diagnosis,"*Artificial Intelligence Review*, vol. 57, pp. 1125–1158, 2024.

[9]B. Thapa, Y. Kim, and D. Lee, "Attention-Based CNN- LSTM Hybrid Model for Plant Disease Classification,"Computers and Electronics in Agriculture*, vol. 204, p. 107489, 2023.

[10] Q. Wang and M. Chen, "GAN-Based Data Augmenta- tion for Improving Plant Disease Detection Accuracy," Neural Computing and Applications, vol. 35, pp. 17813–17825, 2023.

[11]H. Yang, F. Lin, and W. Zhang, "Precision Agriculture Using AI: Smart Plant Disease Detection via UAV and Deep Learning," *Computers and Electronics in Agricul- ture*, vol. 194, p. 106778, 2022.

[12]S. Kar and A. Sarkar, "Vision Transformer for Robust Plant Disease Classification," *Pattern Recognition Let- ters*, vol. 165, pp. 50–57, 2023.

[13]N. Goyal and S. Agrawal, "Mobile-Based Plant Leaf Disease Detection Using Real-Time Deep Learning,"*Sustainable Computing: Informatics and Systems*, vol. 36, p. 100739, 2022.

[14]R. Yadav and M. K. Jha, "Explainable AI in Plant Disease Detection Using Grad-CAM with CNNs," *Applied Soft Computing*, vol. 136, p. 110067, 2023.

[15]L. Zhou and J. Feng, "Multi-Task Deep Learning Model for Simultaneous Disease and Severity Prediction in Plants," *Computers and Electronics in Agriculture*, vol. 210, p. 107792, 2024.

[16] D. Rajasekhar, M. Rafi D, S. Chandre, V. Kate, J. Prasad and A. Gopatoti, "An Improved Machine Learning and Deep Learning based Breast Cancer Detection using Thermographic Images," 2023 Second International Conference on Electronics and Renewable Systems (ICEARS), Tuticorin, India, 2023, pp. 1152-1157, doi: 10.1109/ICEARS56392.2023.10085612.

[17]V., Kate, A., Bansal, C., Pancholi, C. and Patidar, A. (2025). Explainable AI Framework for Precise and Trustworthy Skin Cancer Diagnosis. In Proceedings of the 3rd International Conference on Futuristic Technology - Volume 2: INCOFT; ISBN 978-989-758-763-4; ISSN 3051-7680, SciTePress, pages 260-267. DOI: 10.5220/0013590500004664