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Plant Disease Detection with Remedial Solution

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Abstract
Agriculture sector as well as organic farming is playing vital role in 21st Century. The traditional methods of plant disease detection is cost effective as well as time consuming process.so this project aims for a web application which acts as user-friendly application for the farmers and supports the organic farming where they can capture the images of leaves and instantly they receive the name of the disease along with the description of disease and prevention methods of plant disease. To make the application user-friendly for the uneducated farmers also we have added the feature called supplements which gives the image of the fertilizer that the farmer have to use for the Plant disease. By clicking on the buy product option the farmer can also buy the fertilizer that they want according to the quantity that they need for the farms. So these web application use the Convolutional neural networks (CNN) technology, feature extraction extracts into many layers and identify the disease.

Keywords: *Convolutional Neural Networks (CNN); Feature extraction*

1. Introduction
In the current world the farmers are investing a lot of money for the fertilizer and for detecting the plant disease. This application makes the farmers to identify the plant disease in an easiest way and reduces the cost. The description and preventive measures of the disease helps the farmer more efficiently. Since it also has the supplements option the farmers can easily buy the fertilizers. The fertilizers that are available in the website are the organic fertilizer which leads to the better environment and better health.

2. Literature Survey
[1] It employs in the process called feature extraction when you are capturing the image of the leaf image preprocessing takes place as well as the feature extraction which separates the leaf in many layers. It uses the CNN technology where the preprocessing and feature extraction takes place.[2] The key component of proposed system includes the capturing the image and uses the CNN algorithm later the plant disease is detected.[3]In this application you should capture the image which particular resolution mostly the image with high resolution is preferred moreover the image dimensions is also considered then this images are incorporated into the CNN algorithm so that the plant disease is detected. [4] This application whenever you are using and capturing since we have use the image with high resolution with particular dimensions the image should be added to dataset after adding in the dataset when you see the option of the choose file in AI Engine then the image that you wanted to detect the disease can be selected. [5] This paper proposes a Deep Learning-based approach where you capture the image and if the similar type of the image is present in the dataset if its matches with the plant leaves in the dataset it will be showing that disease. More over if the image with no leaf or with uneven background is given then the application cannot identify the disease so this application recommends to use the best devices to capture the

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images of leaves.

3. Proposed System

In our proposed system the application first captures the image of the leaf and detects the plant disease. It uses the CNN technology where the set of images of leaves are trained and stored in the dataset [6]. We are able to show the images of leaves and images of the supplements since these fertilizer images are also stored in the form of dataset. This makes application to work more faster and helps the application to find the disease in an easier way, his system uses CNN technology so the CNN algorithm is written in the CNN model file, the backend of the application also has the ipynb file where we combine all the csv files and CNN model as well as the python code to identify the disease of the leaf, shown in Figure 1.

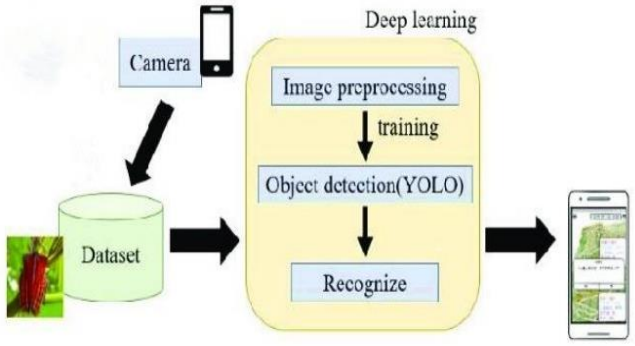

Figure 1 Architecture of The System

After capturing the images, the backend code and the CNN technology is used so that the image processing takes place and the feature extraction takes place so that the early detection of the plant disease happens. In the existing systems there was a long process the farmers used blindly used some fertilizer according to the weather conditions but the disease might be caused due to some pest. This proposed system helps to cure the disease in early stages and the used of organic fertilizer leads to less crop damage and earlier process of finding the disease includes the satellite process which is a time consuming process .So this application provides a user friendly application for farmers just by capturing the image of the leaf the all the details will be in your mobile.

4. Implementation

4.1 Plant Detection Module

Our System uses dataset consisting of 39 classes of plant leaf images [7-10]. This dataset contains total of 61,486 images, shown in Figure 2. It contains three directories for training, validation and testing data. There are 36584 images for training,15679 for validation and rest for testing. This System uses Deep Learning for plant disease detection based on images of a leaf of a plant.

Apple_scab	Corn_gray_leaf_spot	Orange_haungl ongbing	Raspberry_healthy	Tomato_late_blight
Apple_black_rot	Corn_common_rust	Peach_bacterial_spot	Soybean_healthy	Tomato_leaf_mold
Apple_cedar_apple_rust	Corn_northern_leaf_blight	Peach_healthy	Squash_powdery_mildew	Tomato_septoria_leaf_spot
Apple_healthy	Corn_healthy	Pepper_bacterial_spot	Strawberry_healthy	Tomato_spider_mites_two-spotted_spider_mite
Bckground_without_leaves	Grape_black_rot	Pepper_healthy	Strawberry_leaf_scorch	Tomato_target_spot
Blueberry_healthy	Grape_black_measles	Potato_early_blight	Tomato_bacterial_spot	Tomato_mosaic_virus
Cherry_powdery_mildew	Grape_leaf_blight	Potato_healthy	Tomato_early_blight	Tomato_yellow_leaf_curl_virus
Cherry_healthy	Grape_healthy	Potato_late_blight	Tomato_healthy	

Table 1. 39 different classes of plant leaves to predict using CNN

Figure 2 Plant Detection Module

This System uses Deep Learning which is a subset of Machine Learning Algorithms, to detect the plant diseases based on leaf images. Convolutional Neural network (CNN), a type of Deep Learning model is employed to extract the features from the plant leaf images for predicting the disease accurately. It processes images by resizing the images into 224x224 pixels and applying several layers batch normalization, convolution, activation and max pooling. Ultimately, the fully connected layer predicts one of the 39 class categories. Here, a Py Torch open source machine learning Framework and torch libraries are used which helps in creating deep neural networks. This System is designed in such a way that it takes an image file path as an input and the image gets preprocessed. Then it is passed into the trained CNN model to generate the detected plant disease. This system quickly diagnoses the disease

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and provides brief description of that disease. It also offers remedial solutions and supplement recommendations for corresponding plant disease. It allows farmers to upload an image of the leaf and get instant treatment advices like providing the remedies and supplements requires. It also has an option for purchasing the recommended supplements from fertilizer websites. After creating the model, Web Application is created and deployed it on server.

4.2 Image Folder

All the captured plant leaf images are stored in image Folder in .jpg format, Figure 3. We can choose an image file directly from the folder and upload into the System. The details of the plant Diseases and the supplements information are stored in Excel sheets. When a disease is detected, its corresponding information of supplements is generated.

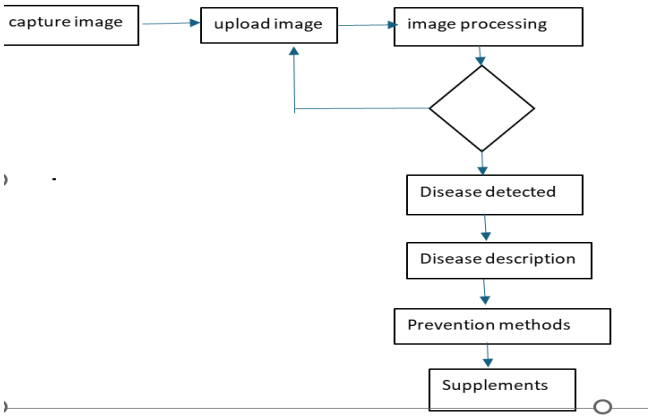

Figure 3 Image Folder

5. Result

Figure 4 Select AI Engine Button to Upload the Image on The Homepage of Web Application

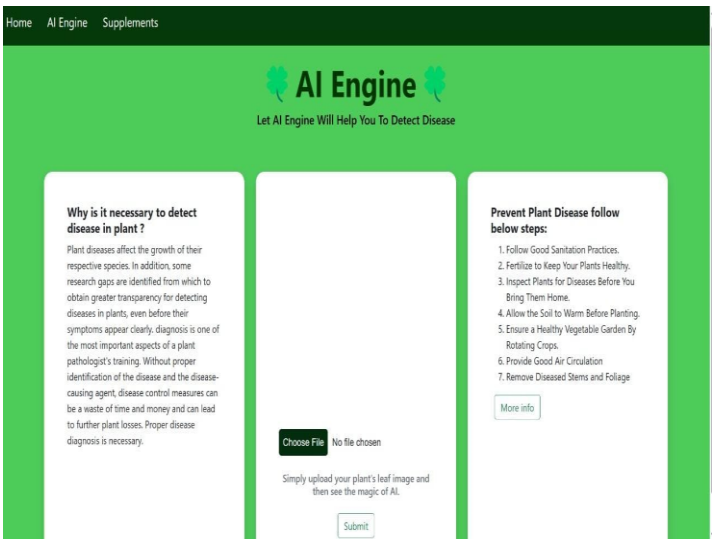

Figure 5 Select Choose File Button to Upload Plant Image and Click on Submit

Figure 6 Detected Plant Disease, Brief Description of Disease and Supplements are provided

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Figure 7 Buy Product Option is Selected Which Redirects to Fertilizer Website

Conclusion

This paper presents a Plant disease detection System that detects plant diseases and provide remedial solutions along with the supplement recommendations, shown in Figure 4, Figure 5, Figure 6 & Figure 7. It helps the farmers to detect the plant disease at an early stage and helps in managing crop health and boosting crop yield. This System makes technology accessible to all the farmers and enhance overall agriculture productivity.

References

[1]. Abadi, M. (2016). "TensorFlow: learning functions at scale," in Proceedings of the 21st ACM SIGPLAN International Conference on Functional Programming, Nara Japan, September 18 - 24, 2016. (Japan: ACM digital library), 1–1. doi: 10.1145/2951913.2976746

[2]. Agarwal, M., Singh, A., Arjaria, S., Sinha, A., Gupta, S. (2020). ToLeD: Tomato leaf disease detection using convolution neural network. Proc. Comput. Sci. 167 (2019), 293–301. doi: 10.1016/j.procs.2020.03.225

[3]. Akbar, M., Ullah, M., Shah, B., Khan, R. U., Hussain, T., Ali, F., et al. (2022). An effective deep learning approach for the classification of bacteriosis in peach leave. Front. Plant Sci. 13. doi: 10.3389/fpls.2022.1064854

[4]. Alzubaidi, L., Zhang, J., Humaidi, A. J., Al-Dujaili, A., Duan, Y., Al-Shamma, O., et al. (2021). Review of deep learning: concepts, CNN architectures, challenges, applications, future directions. J. Big Data 8, 1–74. doi: 10.1186/s40537-021-00444-8

[5]. Anjna, Sood, M., Singh, P. K. (2020). Hybrid system for detection and classification of plant disease using qualitative texture features analysis. Proc. Comput. Sci. 167 (2019), 1056–1065. doi: 10.1016/j.procs.2020.03.404

[6]. Antonellis, G., Gavras, A. G., Panagiotou, M., Kutter, B. L., Guerrini, G., Sander, A. C., et al. (2015). Shake table test of Large-scale bridge columns supported on rocking shallow foundations. J. Geotechnical Geoenvironmental Eng. 12, 04015009. doi: 10.1061/(ASCE)GT.1943-5606.0001284

[7]. Arcaini, P., Bombarda, A., Bonfanti, S., Gargantini, A. (2020). "Dealing with robustness of convolutional neural networks for image classification," in Proceedings - 2020 IEEE International Conference on Artificial Intelligence Testing, AITest 2020. (Oxford, UK: IEEE), 7–14. doi: 10.1109/AITEST49225.2020.00009

[8]. Badrinarayanan, V., Kendall, A., Cipolla, R. (2017). Segnet: A deep convolutional encoder-decoder architecture for image segmentation. IEEE Trans. Pattern Anal. Mach. Intell. 39 (12), 2481–2495. doi: 10.1109/TPAMI.2016.2644615

[9]. Bahrampour, S., Ramakrishnan, N., Schott, L., Shah, M. (2015). Comparative study of caffe, neon, theano, and torch for deep learning. arXiv preprint arXiv:1511.06435 132, 1–9. doi: 10.48550/arXiv.1511.06435

[10]. Barbedo, J. G. A. (2018). ScienceDirect factors influencing the use of deep learning for plant disease recognition. Biosyst. Eng. 172, 84–91. doi: 10.1016/j.biosystemseng.2018.05.013