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Integrated Plant Health Monitoring System

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Abstract: In agriculture, detecting plant diseases is a difficult task. It is time consuming and require highly knowledgeable individuals to identify diseases. Plants are often at risk of disease that will result in social and economic losses. Many diseases are starting to emerge on plant leaves. If the disease is not recognised in early stage, it might result in serious damages to the plant. The current way of identifying plant disease is an inspection performed by a specialist who must monitor the plants on a constant basis. But costs increase with the size of the farm. In the existing system, Support vector machine algorithm technique is used to predict an infected plant disease with 80 percent of accuracy. In such types of conditions, to achieve a high degree of accuracy and to reduce the difficulty of time, the proposed system contains a comparative study on different machine learning algorithms to predict the disease and build a system that will easy to use by anyone. This system uses computer vision and deep learning strategies. Using the Image Processing technique system will get a picture of the leaf of an infected plant and turn it into a grey scale image. The system will give suggestions on the features and characteristics of various types soils for plant growth without any infection using deep learning techniques. The system uses a different deep learning algorithm to improve its accuracy in diagnosis of plant diseases and offer a suggestion.

Keywords: Computer vision, Gray scale image, Image Processing, Deep learning, Neural networks, Support Vector Machine.

I. INTRODUCTION

Crops are susceptible to a variety of recognised illnesses, and tonnes of plants are lost as a result. This can be avoided by early diagnosis of plant diseases at the appropriate time. It will help to address the difficult economic conditions facing the country's farmers. Technology has improved people's lives nowadays. With the help of a standard camera, one can easily click photos of affected parts and upload them to the system you receive a specific disease and provides direct treatment with an insecticide if necessary. Most plants are infected with various fungal and bacterial diseases. Great population growth and climatic conditions create plant diseases. Therefore, to develop a fast and effective predictor model for Plant Disease Detection. It will familiarize the CNN network with the development of a professional forecasting model that will accurately differentiate the affected image of the plant.

Farmers have limited access to agricultural experts who can examine crop images and provide advice. Farmers frequently receive delayed expert responses to their questions. It's too late, and those who live in remote areas are also affected. When it comes to obtaining assistance via the internet, there are some challenges. The ability to connect can be a significant factor. In the process of cultivation, manual disease detection is a time-consuming process. Thus, however necessitates experts monitor crops on a regular basis to see if there are any problems. In large farms, this can be prohibitively expensive. Evolves in the field of machine vision technology, agriculture is a diverse field that has received little attention. The motivation behind the proposed system is to build the cost-efficient system, which will use to detect diseases of more plants species as compare to the existing system with high accuracy rate and provides remedies on it.

II. BACKGROUND

Plants significance in the world has grown over time. Plant discoveries in medicine, energy production, and recent concerns about global warming reduction have long been a significant part of science and technology. A reduction in global plant cover raises the risk of increased global warming and the challenges that come with it. The need to develop a cutting-edge convolutional system that supports image detection technology and plant disease classification has prompted a slew of research projects to equip scientists with the necessary knowledge. When necessary, image detection could be used to distinguish healthy leaves from unhealthy leaves.
Convolutional neural networks (CNNs) provide differences between plant images that aid in determining any abnormalities that may exist in plants in the wild. According to the background research, the scanning of images depicting healthy and unhealthy plants provides a basis for comparison by scientists in this field.

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Garima Shrestha, Deepikha, Majolica, Das.k, et al. [1], "CNN Disease Diagnosis", In this paper, proposes a new model for deep evolution accurate prediction and identification networks for apple leaves. The Proposed Paper can automatically detect the transaction of different characters with the highest level of accuracy. A total of 13,689 images were also created technical assistance for image processing such as PCA oscillation. In this page, the percentage of accuracy in the test set is 88.80% without overstatement there is still room for improvement as the remaining 12.20% is covered. In the future apple leaf prediction function, other Deep Learning modes such as FCNN, R-CNN, and SSD can be used. The function can be extended developing an app where one can know the solution of plant disease.

Trimi Neha Tete, Sushma Kamlu, et al. [3] "Plant Disease Diagnosis Using Threshold, K-Mean Cluster and ANN Algorithm", here are the various classification techniques for the diagnosis of different plant diseases. 84.80% accuracy in test set This paper also discusses classification methods for plant disease classification. Various inputs, k- Statistics show real photos followed by threshold release and K-means collection of different images. However, the k-means integration requires significant clarity about multiple collection centres this process provides a more efficient result compared to the limit and provides excellent result for a different set of data.

Sachin D. Khirade, A. B. Patil, et al. [4] "Diagnosis of Plant Diseases Through Graphic Processing ", here for accurate detection and classification of the plant disease given in paper and Made using image processing. The accuracy rate is 90.01%, here various classification strategies have been discussed the diseased part of the plant. They also discussed removing the Feature and segregation techniques to exclude features of diseased leaves as well classification of plant diseases.

Kiran R. Gavhale, and U. Gawande, et al. [9] "The Research Framework for the Plant Leaves International Journal of Pure and Applied Mathematics Special Issue 882 for diagnostics using Imaging Processing Techniques," , here they review and summarize the techniques for processing several images plant species that have been used to identify plant diseases. Great plant disease detection strategies by BPNN, SVM, K-means clustering, and SGDM. In this Paper the accuracy of 89 percentage. These methods are used analysing the leaves of healthy and diseased plants. Also, they elaborated on the impact of background data on the resulting image, the improvement of the clarity strategy plant leaf diseases, as well as ongoing automated strategy automation monitor plant leaf diseases under real field conditions. Their review suggests that this diagnostic method shows a positive effect with the ability to detect plant leaf diseases and certain limitations. So, there is a field of development in existing research.

III. METHODOLOGY

- Data Collection: The system uses the Plant Leaf Images Dataset. The database contains 70303 healthy and unhealthy leaf shapes divided into 38 categories by species and diseases. We have analysed more than 70,000 images of plant leaves with scattered labels from 38 classes and we tried to predict disease category. It will resize the image to 256 × 256 pixels, make it performance and model predictions in that pressed image.

- Data Pre-processing: Images will be resized to make it even clearer 240 *240.The image will be processed by sound and location filtering to remove the unwanted part.

- Photo Acquisition: Photographs of the leaf of the plant will be taken with camera. This image is in RGB form (Red, Green, and Blue). the RGB leaf colour rendering structure will be built, and then, the independent colour space conversion of the colour conversion structure will work.
- Pre-image processing: To remove audio from an image or other output, a separate preview strategic consideration. Cutting a picture i.e. cutting a leaf image to get an interesting photo site. Photo smoothing will be done using a smooth filter. Image enhancement will be done to enhance the brightness. RGB images in Gray images using colour conversion

- Image Segmentation: Datafication means the division of an image into a different part of having the same features or similarities. Distinguishing different methods, such as the Otsu 'method and the k-methods, can be used. Combining, converting RGB image into HIS model, and so on.

- Feature Extraction: Colour, texture, morphology, edges etc. features which can be used in diagnosing plant diseases. Leaf posture means how colour is distributed in the image, hardness of picture. It can also be used to identify infected plant areas.

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- Training model: Once the model has been developed, the model will be trained using the Kaggle database. The model will be trained using pyTorch.

- Model Testing: The accuracy of the model will be assessed with the help of the database. Web Application development: A good responsive web application will be developed using Flask web framework in Python.HTML, CSS, JavaScript implemented. It used for frontend development. The user will upload a leaf image and visualize output using the frontend.

- Server-Side Processing: When the image will be uploaded by the user, the application will pre-process the image and a trained model will predict whether the plant you have a disease or not.

CNN Algorithm

Convolutional Neural Network is an effective algorithm used in various applications such as handwritten digital recognition, visual recognition, and image classification. It is a special type of multi-layer neural network which highlights important features in images with minimal processing and usability to separate the images. CNN is designed in such a way that it uses local relationships to integrate specific structures and reduce the number of hyperparameters and thus improve the normal distribution of the back feed training. CNN models combine weights into smaller kernel filters for convenience learning model. The main building block used to build CNN buildings is this layer of convolution.

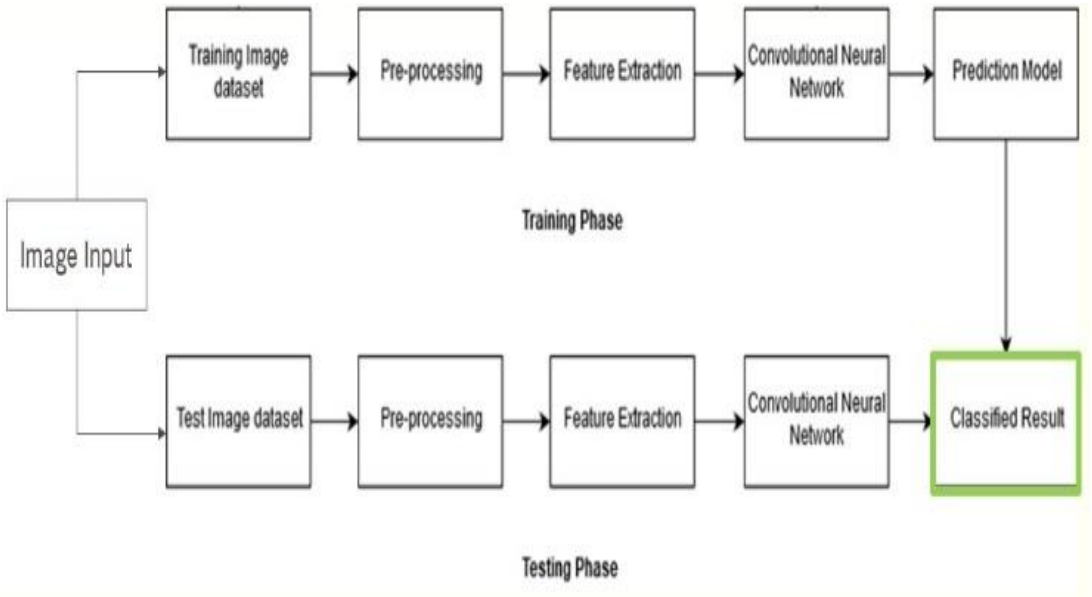

Fig 1 Block Diagram

CNN Algorithm Steps

- Step 1: Choose a Dataset.
- Step 2: Prepare Dataset for Training.
- Step 3: Create Training Data.
- Step 4: Shuffle the Dataset.
- Step 5: Assigning Labels and Features.
- Step 6: Normalising X and converting labels to categorical data.
- Step 7: Split X and Y for use in CNN
- Step 8: Define, compile and train the CNN Model
- Step 9: Accuracy and Score of models

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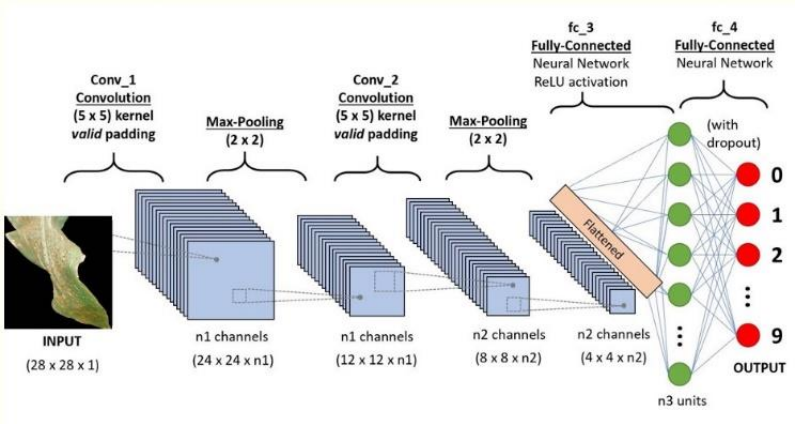

Fig 2. CNN Working

IV. RESULTS

- The Module is helpful and trained for learning the detection of disease from the specified inputs.
- Module has interactive GUI which is understandable to any user.
- The module is divided into four sub modules as upload image, show image, clean image and prediction for image dataset. The visualization of each and every sub module is clear and easy to understand for any user.
- Each sub module performs its specified functions as upload the dataset from system by opening window, show dataset shows the uploaded dataset, clean dataset shows the cleaned dataset and after all the functioning it predicts the result according to the features as leaf is diseased or not.
- In GUI user uploads the image and then after clicking the prediction it will shows the Prediction and Solution for disease. Refer given figure

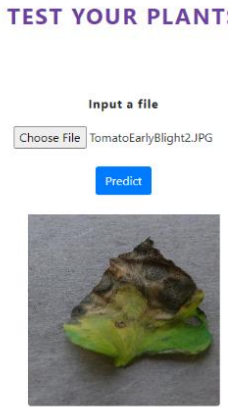

Fig 3. User Interaction

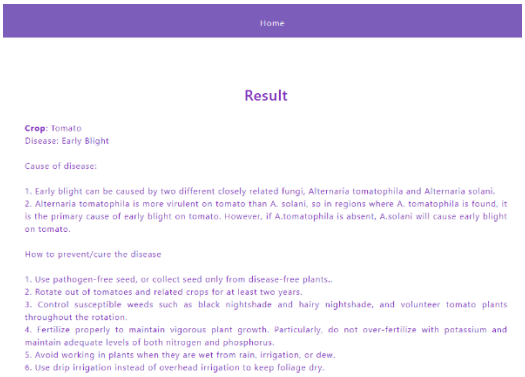

Fig 4. Result

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From above Figures we can see how workflow of user interaction works. In figure 2 user can give leaf images as inputs. Input images are 256px*256px. In figure 4 User gets results where they get disease name and solution for the leaf disease.

Accuracy vs Epochs

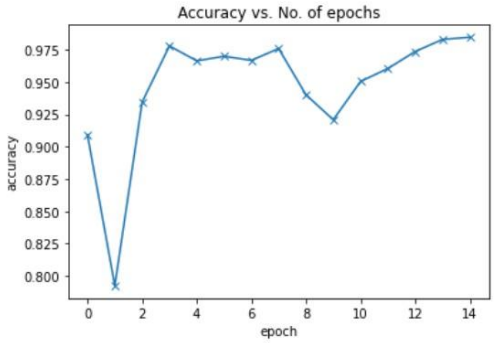

Fig 5. Accuracy vs Epochs

In this graph, predicted the accuracy for CNN ranges from 0 to 14 epochs. When a smaller number is utilised to train the model, the maximum feasible leaf disease detection accuracy is achieved. When epoch is 14 it utilised to prepare the model, the maximum leaf disease detection accuracy is attained.

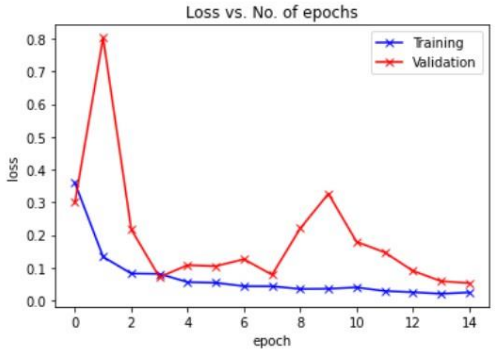

Fig 6. Loss vs Epochs

The training loss is a metric that measures how well a deep learning model matches the training data. In above graph it shows the training and validation loss for every epochs. At 14th epochs we get minimum loss.

V. CONCLUSION

This paper studies plant diseases using CNN based on Deep Learning. In module can be used effectively by farmers as it provides quick information about plant disease. And it reduces the rash, the rise that causes the most loss of crops and pastures and endangering the lives of vulnerable farmers. As Compared to the standard plant diagnostic program, this program has benefited 98.43 percent accuracy. The addition and transfer of learning in this case will not prove to be beneficial to the model, helping CNN develop more credibility

REFERENCES

[1] Garima Shrestha, Deepsikha , Majolica Das,k ” Plant Disease Detection Using CNN”,2020 IEEE
[2] Sumit Kumar, Veerendra Chaudhary, Ms. Supriya Khaitan Chandra , ”Plant Disease Detection Using CNN” 2020 Turkish Journal of Computer and Mathematics Education
[3] Trimi Neha Tete ,Sushma Kamlu,”Detection of Plant Disease Using Threshold, K- Mean Cluster and ANN Algorithm” , 2017 2nd(I2CT)
[4] Sachin D. Khirade ,A. B. Patil ”Plant Disease Detection Using Image Processing”,2015 International Conference on Computing Communication Control and Automation
[5] Dr.K.Thangadurai, K.Padmavathi, “Computer Vision image Enhancement For Plant Leaves Disease Detection”, 2014 World Congress on Computing and Communication Technologies.

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[6] Anand R., S. Veni, and J. Aravinth "An application of image processing techniques for detection of diseases on brinjal leaves using k-means clustering method." Recent Trends in Information Technology (ICRTIT),2016
[7] He, Kaiming, et al. "Deep residual learning for image recognition." Proceedings of the IEEE conference.
[8] K.Padmavathi, and K.Thangadurai,"Implementation of RGB and Gray scale images in plant leaves disease detection comparative study,"
[9] Kiran R. Gavhale, and U. Gawande, "An Overview of the Research on Plant Leaves International Journal of Pure and Applied Mathematics Special Issue 882 Disease detection using Image Processing Techniques," IOSR J. of Compu.Eng.

