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Crop Leaf Disease Prediction using Machine Learning in India

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Abstract - In India, crop area is largest in the world and produces major crops like wheat, pulses, fruits, rice and vegetables Despite of using modem taming techniques along with traditional, infectious plant diseases is major problem which can be caused by different viruses, fungus and bacteria. This mainly affects crop production as well as crop quality. It is very important to identify diseases at early stage Nowadays, automatic crop de detection has become a important research domain. It helps in detecting the symptoms of the disease when they are found on the e In this paper we will focus on finding the diseases in order to increase crop quality and production effectively. Here, we will focus on r diseases by observing leaves of plants at initial stage using machine learning.

Key Words: Deep CNN, plant disease, image pre-processing, classification, feature extraction.

1. INTRODUCTION

Agriculture is one of the most important sectors of the Indian economy. It is the backbone of the country's development. The biggest problem in agriculture is detecting diseases in plants. In the past, disease detection was done by experienced people. In remote areas it is very difficult for farmers to contact experts. Climate change is also one of the major reasons for plant.

In large farms, if the disease is not recognized at the right time there is a huge loss in agriculture production. In the service center, they cannot see the problem exactly faced by the farmer hence sometimes they may give wrong suggestions to the farmers regarding the plant disease. This may also lead to the destruction of the crop.

Nowadays, there is tremendous growth in the Machine Learning (ML) algorithms, Artificial Intelligence, and Digital Image Processing (DIP) techniques. It is important to identify different diseases in plants at an early stage to help farmers. Therefore, there is a need to integrate these new technologies into today's processes. Crop yield will decrease due to plant diseases.

These diseases cause changes in the plant, damage the plant, affect leaf color and texture, and affect the fruit. There are some similarities between these diseases. So that it is very hard for the farmers to identify the diseases in the plants with their naked eye and they cannot imagine the severity of the disease completely and hence at times it may lead to result in wrong disease detection.

Due to the less experienced or inexperienced farmers, there might be issues in dealing with the diseases of the plants. Hence, there is a necessity to develop modern methods which will assist the farmers to identify the diseases in early stages and provide the solutions to deal with those diseases.

Several studies [1, 2, 5] have proposed various machine learning algorithms as well as image processing techniques for the recognition of the diseases and different classifications of those diseases in the plants. Machine learning algorithms are constructed for image processing and pattern extraction that can reduce classification task accuracy.

In recent, deep learning techniques are mostly used for pattern recognition because they have proven effective in identifying different outlines effectively. DL can automate feature extraction. When compared to other traditional machine learning algorithms the DL reduces the error rate as well as computational time and it achieves a high accuracy rate in the classification task.

The main intention behind our work is to detect the plant diseases and provide solutions to recover from the diseases with the help of the CNN model and to offer solutions to get rid of diseases.

2. RELATED WORK

In the first stage, different machine learning techniques are used to diagnose the disease. All systems follow the steps below. First, images were collected with a Digital camera. The image is then pre-processed using some pre-processing techniques. Experts then extracted important features from these images and used these features as input for classification. The exact classification here depends on the type of image

processing and feature extraction. This is a very difficult and time-consuming process.

In the article [3], the author proposed a good model called Convolutional Neural Network (CNN) model, which is made from tomato leaves obtained from a dataset of different diseases called "Plant Village". CNN uses a pre-trained LeNet architecture to classify diseases in tomato plants into 10 different groups with 94% - 95% accuracy. CNN uses leaf images to detect cucumber leaf diseases.

In their research [4], they found that two dangerous viruses cause leaf damage: melon yellow spot virus (MYSV) and squash yellow mosaic virus (ZYMV). Use CNN. According to the quadruple cross-validation strategy, their method achieved an accuracy of 94.9%.

In the article [6], the authors use two standard architectures, AlexNet and VGG-16, to identify tomato leaf diseases. The authors also used data augmentation to increase the size of their dataset. The author uses alternative studies in his work. The accuracy of these two models is 97.49% and 96%, respectively. In this article, the authors concluded that increasing the number of images directly affects network model performance.

Machine learning techniques such as neural network (ANN), decision trees, K-means, k-nearest neighbor and support vector machine (SVM) used in agricultural research [7,8,9,10].

In this study [11], an automatic crop disease control system was developed using image processing (k-means clustering) and Raspberry PI, which uses email notifications and SMS capabilities to predict the names of diseases and pesticides.

Here [12] a new CNN model similar to Lenet5 is created and the same image processing technique is adopted in the previous work [13]. The architecture of the model has four modules; the first module is a convolutional layer of 20 filters of size 5 × 5, followed by a Relu activation layer and a 2 × 2 step max-pooling layer of size. The second module is a convolutional layer with size 3 × 3 and a max-pooling layer with filters of size 2 x 2. The third module has a convolutional layer with 1000 filters of size. It is 3x3 and in the last module there is a set of 1500 neurons connected. This algorithm was used to solve four types of cucumber diseases.

3. PROPOSED WORK

The main objectives are:

1) To design such system that can detect crop disease and pest accurately.
2) Create database of insecticides for respective pest and disease.
3) To provide remedy for the disease that is detected.

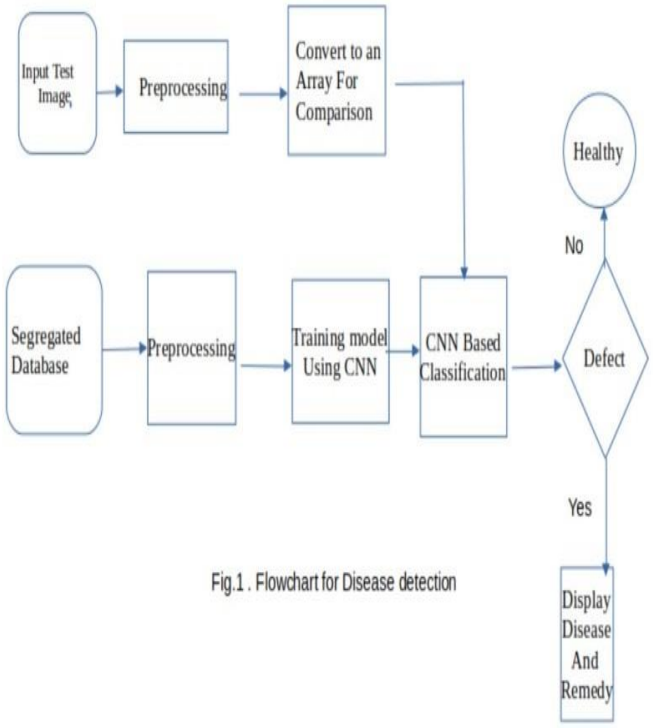

Fig.1 . Flowchart for Disease detection

Preprocessing and training model (CNN): The data is preprocessed, such as image shaping, resizing, and converting to an array. A similar process is performed on the test image. Data was obtained on approximately 32,080 different plant species, and all their images can be used as test images for the software.

A training database is used to train a model (CNN) to recognize test images and the diseases they contain. CNN has different techniques like Condensing, Dropout, boosting, Smoothing, Convolution20, Max Pooling.

Once the model is trained, the software can identify the disease if the plant is present in the data. After successful training and preprocessing comparison of the test image and trained model takes place to predict the disease. Database collection: Initial step for any image processing-based project is acquiring proper database which is valid.

Most of the time the standard database is preferred but in certain circumstances we do not get proper database. In such conditions we can collect the images and can form our own database. the database is accessed from crowd AI which is plant disease classification challenge.

Data available here is not labeled. The first task is to clean and label the database. There is a huge database so basically the images with better resolution: and angle are selected. After selection of images, we should have deep knowledge about the different leaves and the disease they have.

Huge research is done from plant village organization repository. Different types of plant images are studied and after detail study, labeling in done by segregating the images and with different diseases.

4. CONCLUSION

Agriculture is one of the most important sectors in the Indian economy. To have a raise in the economy of any country, there must be a proper production and quality of agriculture products. The prediction of diseases in the crops at early stage is very much important. The developed system can detect disease in plant and provide the remedy that can be taken against the disease. By proper knowledge of the disease and action can be taken at early stage. The proposed system is based on CNN to provide maximum accuracy.

REFERENCES

[1] Akhtar A, Khanum A, Khan SA, Shaukat A (2013) Automated Plant Disease Analysis (APDA): Performance Comparison of Machine Learning Techniques. In: 2013 11th International Conference on Frontiers of Information Technology, {IEEE} Computer Society, Islamabad, pp 60–65.

[2] Al Hiary H, Bani Ahmad S, Reyalat M, Braik M, ALRahamneh Z (2011) Fast and Accurate Detection and Classification of Plant Diseases. International Journal of Computer Applications 17(1):31– 38.

[3] Prajwala TM, Alla Pranathi, Kandiraju Sai Ashritha, et al. "Tomato Leaf Disease Detection using Convolutional Neural Networks". in: 2018 Eleventh International Conference on Contemporary Computing (IC3).

[4] Kawasaki Y, Uga H, Kagiwada S, Iyatomi H (2015) Basic Study of Automated Diagnosis of Viral Plant Diseases Using Convolutional Neural Networks. Advances in Visual Computing: 11th International Symposium, ISVC 2015, Las Vegas, NV, USA, December 14-16, 2015, Proceedings, Part II pp 638–645.

[5] Mokhtar U, El-Bendary N, Hassenian AE, Emary E, Mahmoud MA, Hefny H, Tolba MF, Mokhtar U, Hassenian AE, Emary E, Mahmoud MA (2015) SVMBased detection of tomato leaves diseases. In: Filev D, Jabłkowski J, Kacprzyk J, Krawczak M, Popchev I, Rutkowski L, Sgurev V, Sotirova E, Szynkarczyk P, Zadrozny S (eds) Advances in Intelligent Systems and Computing, vol 323, Springer, Cham, Switzerland, pp 641–652.

[6] Aravind Krishnaswamy Rangarajan, Raja Purushothaman,Aniirudh Ramesh, " Tomato crop disease classification using pre-trained deep learning algorithm", ELSEVIER, International Conference on Robotics and Smart Manufacturing (RoSMa2018).

[7] Machines MSV. /01 23456 1998:0–9.

[8] Chao C, Horng M. The Construction of Support Vector Machine Classifier Using the Firefly Algorithm 2015;2015. doi:10.1155/2015/212719.

[9] Zammit O, Descombes X, Zerubia J, Inria-is A, K-moyennes A. Apprentissage non supervis ´ e des SVM par un algorithme des Kmoyennes entropique pour la d ´ etection de zones brˆ ul ´ ees 2007:11–4.

[10] Zhang C, Pan X, Li H, Gardiner A, Sargent I. A hybrid MLP-CNN classifier for very fine resolution remotely sensed image classification n.d.:1–33.

[11] Shinde PG, Shinde AK, Shinde AA, Borate SP. Plant Disease Detection Using Raspberry PI By K-means Clustering Algorithm 2017:92–5.

[12] Ma J, Du K, Zheng F, Zhang L, Gong Z, Sun Z. Original papers A recognition method for cucumber diseases using leaf symptom images based on deep convolutional neural network. Computers and Electronics in Agriculture 2018;154:18–24. doi:10.1016/j.compag.2018.08.048.

[13] Ma J, Du K, Zhang L, Zheng F, Chu J, Sun Z. A segmentation method for greenhouse vegetable foliar disease spots images using color information and region growing. Computers and Electronics in Agriculture 2017;142:110–7. doi:10.1016/j.compag.2017.08.023