

Tomato Plant Leaf Disease Detection Using Convolutional Neural Network

Radhika Dakhore¹, Shahjadi Sheikh², Aishwarya Masar³, Aniket Zade⁴, Prof. Aditya Bakshi⁵

U.G. Students, Department of Computer Science and Engineering^{1,2,3,4}

Assistant Professor, Department of Computer Science and Engineering⁵

Jawaharlal Darda Institute of Engineering and Technology, Yavatmal, Maharashtra, India

Abstract: *Identification of the plant diseases is the key to preventing the losses in the yield and quantity of the agricultural product. Health monitoring and disease detection on plant is very critical for sustainable agriculture. In This synopsis discussed the methods used for the detection of Tomato plant diseases using their leaves images. The automatic identification and diagnosis of tomato leaves diseases are highly desired in field of agriculture information. Recently Deep Convolutional Neural networks (CNN) has made tremendous advances in many fields, close to computer vision such as classification, object detection, segmentation, achieving better accuracy than human-level perception. In spite of its tremendous advances in computer vision tasks, CNN face many challenges, such as computational burden and energy, to be used in mobile phone and embedded systems. In this study, we propose an efficient smart mobile application model based on deep CNN to recognize tomato leaf diseases. To build such application, our model has been inspired from Mobile Net CNN model and can recognize the 10 most common types of Tomato leaf disease. Trained on tomato leaves dataset, to build our application 7176 images of tomato leaves are used in the smart mobile system, to perform a Tomato disease diagnostics.*

Keywords: *Deep learning, Convolutional Neural networks, Tomato leaf disease detection, Smart Web Application.*

I. INTRODUCTION

Image processing is the process of transforming an image into a digital form and performing certain operations to get some useful information from it. It is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. Today, many people in India are farmers and depend on agricultural production. Agriculture industry can go through a major production and economic losses which is caused by the plant diseases. This disease management is a challenging task. There are several diseases which are going to affect the production of crops. Before it will affect on some basic operation of plant body such land areas. The proposed methodology consists of three major steps data acquisition, preprocessing and classification as photosynthesis, transpiration, pollination, fertilization, germination etc. It is necessary to detect and control such types of diseases in a specific time period which is at their initial state. These diseases created due to the pathogens such as fungi, bacteria and viruses. The disease caused due to these organisms is characterized by different visual symptoms that could be observed in the leaves or stem of a plant. For that farmers require continuous monitor the plant body which is time consuming process. There is a need of some method to detect diseases on the plant in early stages. The detection and classification of leaf disease accurately is the key to prevent the agriculture loss. Automatic detection of various diseases can be detected with the help of image processing. A crucial role is played by the image processing in detection of plant disease since it provides best results and reduces the human efforts. The image processing could be used in the field of agriculture for several applications. It includes detection of diseased fruit, leaf or stem, to



measure the infected area by the disease, to determine the color of the affected area. The degradation of the quantity and quality of the product is affected due to the plant disease. The naked eye observation is done by the experts for the detection and identification of the plants. This detection and identification is time consuming in huge farms or. The images used for the implementation of the proposed methodology were acquired from a publicly available dataset called Plant Village, as mentioned earlier. In the next step, the images were re-sized to a standard size before feeding it into the classification model. The final step is the classification of the input images with the use of a slight variation of the deep learning convolutional neural network (CNN) standard model called the LeNet which consists of the convolutional, activation, pooling and fully connected layers. It is used in many research areas such as image processing, image restoration, speech recognition, natural language processing and bioinformatics.

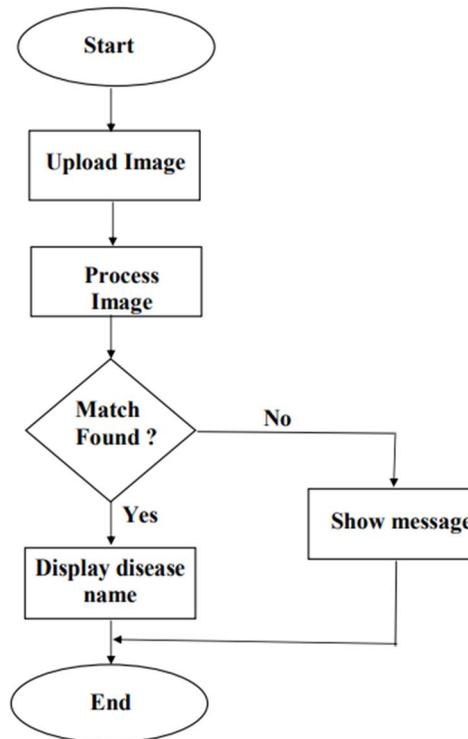
II. METHODS AND MATERIAL

This paper has been completed on the basis of the information gathered from various sources. Internet, various research papers and articles have been surveyed for the purpose of gathering and understanding information

III. RESULTS AND DISCUSSION

The main purpose of the development phase is to transform the system design created in the design phase into a working information system that meets all documented system requirements. Finally, the operating system enters the testing phase. Now let's take a look at the frameworks, tools and technologies that are being used in our developed system along with all the features and functionalities that comes prebuilt with them.

Now let's see flowchart, which led to the development of the application. All these different design representations are what enabled the successful development of our end product i.e. our application "R3B: Tomato Plant Leaf Disease Detection". These designs help us to understand the concept of the overall application and what goes inside it during its functioning that enables it to provide all the mentioned services effectively. In this way the design part of the software development life cycle helped us to understand the requirements and convert it into a graphical representation.



IV. CONCLUSION

Protecting Tomato crops in organic farming is not an easy task. This depends on a thorough knowledge of the tomato crop being grown and possible pests, pathogens and weeds. The proposed methodology uses a convolutional neural network model to classify tomato leaf diseases obtained from the Plant Village dataset. The architecture used is a simple convolutional neural network with minimum number of layers to classify the tomato leaf diseases into 3 different classes. Different learning rates and optimizers could also be used for experimenting with the proposed model as a part of the future work. It could also include experimentation with newer architectures for improving the performance of the model on the train set. Thus, the above mentioned model can be made use of as a decision tool to help and support farmers in identifying the diseases that can be found in the tomato plant. With an accuracy of 94-95% the methodology proposed can make an accurate detection of the leaf diseases with little computational effort.

REFERENCES

- [1]. M. Akila, P. Deepan Assistant Professor, Department of CSE Arasu Engineering College Kumbakonam, "Detection and Classification of Plant Leaf Diseases by using Deep Learning Algorithm", International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Published by, www.ijert.org ICONNECT - 2k18 Conference Proceedings Volume 6, Issue 07 Special Issue – 2018
- [2]. Melike S ardogan, Adem Tuncer, Yunus Ozen Department of Computer Engineering Yalova University Yalova, Turkey, "Plant Leaf Disease Detection and Classification based on CNN with LVQ Algorithm", 978-1-5386-7893-0/18/\$31.00 2018 IEEE, (UBMK'18) 3rd International Conference on Computer Science and Engineering 382
- [3]. Rajashree Patil, Dr. Sampada Gulvani Assistant Professor, Associate of Computer Science, Vivekanand College, Kolhapur, India Department of Computer Application, Bharati Vidyapeeth Institute of Management, Kolhapur, India "Plant Disease Detection Using Neural Network : A Review", © 2019 JETIR February 2019, Volume 6, Issue 2 www.jetir.org (ISSN-2349-5162)
- [4]. Hareem Kibriya, Rimsha Rafique, Wakeel Ahmad, S.M Adnan Department of Computer Science University of Engineering and Technology Taxila, Pakistan, "Tomato Leaf Disease Detection Using Convolution Neural Network", Proceedings of 2021 18th International Bhurban Conference on Applied Sciences & Technology (IBCAST) Islamabad, Pakistan, 12 - 16 January, 2021
- [5]. <https://en.wikipedia.org/wiki/TensorFlow>
- [6]. <https://en.wikipedia.org/wiki/Keras>
- [7]. <https://fastapi.tiangolo.com>
- [8]. https://www.tensorflow.org/tfx/tutorials/serving/rest_simple