IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 2, May 2022
Impact Factor: 6.252

Potato Plant Disease Detection using Deep Learning

Aniket Gahiware[1], Nikhil Bawake[2], Bhushan Dhage[3], Lokesh Ahir[4], Prof. V. K. Abang[5]
Students, Department of Computer Engineering[1,2,3,4]
Professor, Department of Computer Engineering[5]
Amrutvahini College of Engineering, Sangamner, Maharashtra, India
Savitribai Phule Pune University, Pune, Maharashtra, India

Abstract: *Agriculture is one of the essential sectors for the survival of humankind. Farmers who grow potatoes are facing a lot of economical losses every year because of diseases that happened to a potato plant and if a farmer can detect the disease early then it can save lots of waste and can prevent the ecnomic loss. At the same time, digitalization touching across all the fields that became easier to handle various difficult tasks. Adapting technology as well as digitalization is very crucial for the field of agriculture to benefit the farmer as well as the consumer. Due to adopting technology and regular monitoring, one can able to identify the diseases at the very initial stages and those can be eradicated to obtain a better yield of the crop. In this document, a methodology was proposed for the detection as well as the classification of diseases that occur for the potato plants. For this scenario, the openly accessible, standard, and reliable data set was considered which was popularly known as Plant Village Dataset. There are basically two types of Diseases in potato plant. 1) Early Blight (caused by fungus). 2) Late Blight (caused by small microorganism). For Image Processing and training of model CNN (Convolutional Neural networks) is used. For data cleaning and preprocessing tf dataset and augmentation is used etc.*

Keywords: Image Processing, CNN, Deep Learning, tf Dataset, Augmentation, Fast API, Machine Learning

I. INTRODUCTION

Agriculture is an essential sector in countries like India as those countries' economy directly or indirectly dependent on agriculture. Farmers who grow potatoes are facing a lot of economical losses every year because of diseases that happened to a potato plant and if a farmer can detect the disease early then it can save lots of waste and can prevent the economic loss. There are a lot of significant crops exist in India, one among them is Potato. More than three-fourths of the population of India consumes potato daily at the same time it is one of the popular yielding crops in India. Yet, the yield of the potato crop can be diminished due to various diseases such as late blight and early blight. The crops can be protected from the various animals by providing proper protection for the field and this issue can be solvable. The next major issue is weather conditions which will not be in the control of humans, humans can only pray for better weather conditions to obtain a better crop. Finally, The major issue which is very crucial to protect the crop from various diseases as these diseases can impact the complete growth and yield of the crop. If one can able to identify these diseases in time, then the crop can be protected using appropriate fertilizers. It is really important for a farmer to know before whether the plant is affected by any diseases or not.

So to make easy, we have implemented a Deep learning project which is based on Convolutional Neural networks and train that model on out trained data set and will measure the accuracy of our test data set. For preprocessing tf data set is used.

II. LITERATURE SURVEY

Monzurul Islam et al. 2017[1] proposed an approach that combines the processing of images and machine learning to allow leaf image disease to be diagnosed. This has been an automated system that categorizes potato plant diseases as well as unaffected leaves from the public image, known as 'Plant Village'. The mentioned segmentation process and classification process through support vector machine methodology displays classification of images about 300 and the accuracy of the proposed model about 95%. Thus, the proposed approach offers a way for the automatic diagnosis of plant diseases on a huge scale. The multiclass SVM image segmentation is used for designing a system that is automated and easy to use. For primary diseases in potatoes such as Late Blight and Early Blight, a little computational effort is identified. The approach would provide framers with viable, reliable, and successful methodology and time-saving processes for disease

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 2, May 2022
Impact Factor: 6.252

identification. Harshal Waghmare and Radha Kokare 2016[2] proposed technologies for plant disease detection analysis and pattern detection of the leaf texture. This work is based on the method of detection of grapes leaf disease. The device is used as input and segmentation on a single plant leaf after context removal is carried out. The image segmentation of the diseased component is then analyzed using a high-pass for the leaf. Special sectional leaf texture is obtained. Locally based fractal features nature invariant provides a good model of texture. The texture would be different for each independent illness. The texture pattern then extracted is graded by multiclass SVM. Multiclass SVM implementations are formulated to identify the diseases observed in grape plants for the processing of DSS (Decision Support Systems) automated and farmers, easily available. The Scheme performs segmentation and examination of a single leaf and the diseased portion of the leaf is observed by the high pass filter. A fractal-based retrieval of segmented leaf texture function that is invariant locally in nature and the strong texture module then provides. The texture removed pattern is then classified as an SVM designation for multiclass in groups who are healthy or ill classes respectively. The study concentrates on major widely encountered diseases grasses are downy mildew & black red. The recommendation approach quickly provides farmers with guidance from agricultural experts with 96.6 percent of ccuracy.

Shima Ramesh and Mr. Ramachandra Hebbar et al. 2018[3] uses techniques in leaf-based image detection approaches that have impressive findings that have been shown. Random forest is included in this article for the detection of healthy and bad leaves for creating data sets. Our paper contains several phases Identifying dataset, function extraction, Identifying dataset, function extraction, classifier, and classification preparation. The data sets generated diseased and stable leaves are trained jointly under Random forest for the grouping of bad and healthy videos. Extracting image properties we use the histogram oriented gradient(HOG). In general, the use of machine learning to train wide available data sets provides us with a simple way of detecting the occurring disease in plants. The model has been trained with Random Forest Classifier 160 papaya leaves images. The model can be categorized with an approximate 70 percent accuracy. Accuracy can be increased with a good number of images and using other local characteristics with global characteristics For example SIFT (Scale Invariant Feature Transform), SURF (Speed Up Robust Features), and DENSE along with BOVW (Bag Of Visual Word). Mrs. Shruthi U et al. 2019 [4] proposed machine learning methods to classify diseases and it applies mainly to data and It prioritizes itself and the performance of those tasks. This paper demonstrates the phases of general identification of plant diseases and the machine learning method on comparative research is for plant disease identification such as the acquisition of image-set, processing of the obtained data in the image-set, segmentation of the data in the image-set, feature extraction, and classification of images in image-set based on the extracted features and patterns identified. This survey shows that the Convolutional Neural Network high accuracy and more number of multiple disease crops. Rajleen Kaur and Dr. Sandeep Singh Kang 2015[5] proposed for automatic disease detection and disease part of the plant leaf images and also crop agriculture production. It's achieved with computer advancement technology that allows agriculture to develop production. SVM is the latest classifier of the neural network approach and problem for the detection of accuracy. SVM is introduced in this article contains two datasets; one is a data collection for training and dataset of the train. The original image is first taken and used for processing. It offers, secondly, image pixels in black and background and hue section and saturation section is separated. Third, disease diagnosis and the unhealthy component are identified and a stable portion is segmented from it. This work also provides a percentage of the region where diseases arise and give us the disease name.

As the image results the region impacted is 5.56%. This work gives accuracy which is stronger than the proposed results of the algorithm. Pooja V et al. 2017[6] proposed machine learning techniques for classification and disease detection and uses tools of image processing. Firstly, it captures the damaged region in the image and later it performs image processing. Segments in that image are generated and it recognized interested area and extraction of features is done. At last, through SVM results are sent and get new results. Disease classification is done by a support vector machine, methodology provides the best results than previously used techniques.

2.1. Dataset and System Description

The collected data from an openly accessible database of images: 'Plant Village' that consists of diseased as well as healthy images about 54,606 from the total crop species about 14. From that particular database, potato species-related data was considered to implement the proposed framework. The obtained dataset consists of 300 potato plant leaves which were categorized into

They are as follows:

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 2, May 2022
Impact Factor: 6.252

- The leaves having a disease called Late Blight
- The leaves having a disease called Early Blight
- The leaves are in a healthy state

The database of images consists of healthy leaves about 100 and disease affected leaves about 200. The database of images was divided into two databases such as the training database and the testing database. The training database consists of 70% of the image database i.e., 210 images and the testing database consists of the remaining 30% of the image database i.e, 90 images. The proposed framework was implemented on the operating system windows 10 with the processor of Intel®Core TM i3-8130U CPU @ 2.20 GHz – 2.21GHz with RAM of 8 GB. The framework was implemented using Python. The major phases of the detection of diseases from the plant leaves are image segmentation, feature extraction, and classification. Each of these phases will be discussed in the later sections.

2.2. Image Segmentation

The data considered are colored images and this phase is essential to separate the infected regions from the existing plant leaves

2.3 Feature Extraction

When image segmentation was done and obtained the region of interest. From this region of interest, the features will be obtained. The feature set for the complete data set will be very huge. So, the important features need to be extracted for the scenario of classification. Feature extraction can also be considered as a dimensionality reduction process as it extracts the important information from a complete feature set such that no information misses out. It also speeds up the learning and generalization of the process. The features extracted using the concept of the Gray Level Co-occurrence Matrix using various statistical metrics.

III. RESULT

Category Name	Precision (%)	Recall (%)	F1-score (%)	Accuracy (%)
Late Blight	91.07	95.41	93.29	94.71
Early Blight	98.36	94.71	96.43	96.84
Healthy	98.93	98.62	98.76	96.43
Overall	96.12	96.25	96.16	95.99

IV. CONCLUSION AND FUTURE WORK

Digitalization increasing across all the fields and it is high time to adopt digitalization into the field of agriculture as well to obtain better protection in terms of growth and yield. Keeping this intention as the motivation for the proposed model to detect and classify the affected and unaffected leaves of potato. The proposed framework able to achieve an accuracy of 95.99%. Yet, this accuracy needs to be improved. The existing work further can be extended by using artificial neural

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 2, May 2022
Impact Factor: 6.252

networks, particularly, convolutional neural networks. These days, a lot of research related to images is happening based on CNN methodologies to obtain better and reliable accuracy. The concept of activation functions, batch normalizations, convolutional layers, and fully connected layers are playing a key role in CNN architectures to attain better accuracy. recast were instead based upon the weather of the past four or five days, the bias of the functional regression model could likely be reduced. However, this would require much more computation time along with retraining of the weight vector w,so this will be deferred to future work.

ACKNOWLEDGMENT

We would prefer to give thanks the researchers likewise publishers for creating their resources available. We are conjointly grateful to guide, reviewer for their valuable suggestions and also thank the college authorities for providing therequired infrastructure and support.

REFERENCES

[1]. M. Islam, A. Dinh, K. Wahid, and P. Bhowmik, Detection of potato diseases using image segmentation and multiclass support vector machine 2017, Can. Conf. Electr. Comput. Eng., 8–11.

[2]. H. Waghmare, R. Kokare, and Y. Dandawate, Detection and classification of diseases of Grape plant using opposite color Local Binary Pattern feature and machine learning for automated Decision Support System 2016, 3rd Int. Conf. Signal Process. Integ. Networks, 513–8.

[3]. S. R. Maniyath et al., Plant disease detection using machine learning 2018, Proc. 2018 Int. Conf. Des. Innov. 3Cs Comput. Commun. Control., 41–5.

[4]. U. Shruthi, V. Nagaveni, and B. K. Raghavendra, A Review on Machine Learning Classification Techniques for Plant Disease Detection 2019, 2019 5th Int. Conf. Adv. Comput. Commun. Syst., 281–4.

[5]. R. Kaur and S. S. Kang, An enhancement in classifier support vector machine to improve plant disease detection, Proc. 2015 IEEE 3rd Int. Conf. MOOCs, Innov. Technol. Educ.,135–40.

[6]. V. Pooja, R. Das, and V. Kanchana, Identification of plant leaf diseases using image processing techniques 2018, Proc.- 2017 IEEE Technol. Innov. ICT Agric. Rural Dev., 1, 130–3.

[7]. J. P. Shah, H. B. Prajapati, and V. K. Dabhi, A survey on detection and classification of rice plant diseases 2016, 2016 IEEE Int. Conf. Curr. Trends Adv. Comput.

[8]. A. Akhtar, A. Khanum, S. A. Khan, and A. Shaukat, Automated plant disease analysis (APDA): Performance comparison of machine learning techniques 2013, Proc - 11th Int. Conf. Front. Inf. Technol. FIT 2013, 60–5.

[9]. Z. N. Reza, F. Nuzhat, N. A. Mahsa, and M. H. Ali, Detecting jute plant disease using image processing and machine learning 2017, 2016 3rd Int. Conf. Electr. Eng. Inf. Commun. Technol.

[10]. S. Kaur, S. Pandey, and S. Goel, Plants Disease Identification and Classification Through Leaf Images: A Survey 2019, Arch. Comput. Methods Eng., 26, 507–30.

[11]. S. Ramesh and D. Vydeki, Rice blast disease detection and classification using machine learning algorithm 2018, Proc.- 2nd Int. Conf. Micro-Electronics Telecommun. Eng., 255–9.

[12]. Suresh V, Gopinath D, Hemavarthini M, Jayanthan K, and Mohana Krishnan, Plant disease using image processing 2020, IJERT, 9, 78-82.

[13]. Kiani, E., & Mamedov, T. (2017). Identification of plant disease infection using soft-computing: Application to modern botany. Procedia Computer Science, 120, 893–900. https://doi.org/10.1016/j.procs.2017.11.323