International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 7.101

Plant Leaf Disease Detection: Review Report

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Abstract: ***Plant leaf disease detection is a crucial aspect of precision agriculture and crop management, helping to prevent crop losses and improves yield quality. Plants are very essential in our life they provide source of energy and overcome the matter of global warming. Plant disease is notable risk of nutrition security. Therefore, timely detection of risk is important. Leaf disease detection using the machine learning is an approach. Machine learning offers a worthy approach for making a classy and automatic algorithm using Convolutional Neural Network (CNN), Artificial Intelligence (AI), Image Processing and video processing, voice processing, Natural Language Processing, etc. This review report provides the comparative analysis of the different machine learning algorithms of diagnosis of different leaf disease.***

Keywords: Machine Learning (ML), Convolutional Neural Network (CNN) [1], Artificial Intelligence (AI), Image Processing

1. Introduction

Machine learning (ML) is the growing field. ML is to catch patterns automatically and reason about the data. Machine learning techniques have been made advanced in the healthcare area. The occurrence of plant diseases has a negative impact on the agricultural field. If the disease detection is not in time, it might affect the food security. Early detection of might help in prevention and control of plant disease. Infected plat leaves usually shows marks or lesion on the leaves, stems, and fruits or at any part of the plant. There are various types of diseases that affect the plants. Each disease or pest conditions shows a unique visible pattern that can be diagnosed using different techniques. Usually leaf of plant are used for identifying the different abnormalities of the plant.

The machine learning algorithms has two phases: (1) Training and (2) Testing. Several studies on ML and DL approached used in agriculture have been evaluated, leaving a gap to comprehensively examine image centered plant disease detection. Most studies contracted on the performance of the CNN i. e. Convolutional Neural Network method.

2. Objective

Following are the objectives of the work:

a) To get the results immediately with just few clicks.
b) Predict the diseases that might affect the plant

3. Literature Review

1) C Jackulin and S. Murugavalli (2022) [2] has introduced a comprehensive review on detection of plant disease using machine learning and deep learning approaches. They gave a comparative report of disease detection using various ML and DL models. Several techniques/mappings were summarized for recognizing the disease symptoms.
2) LILI LI, Shujuan Zhang and Bin Wang (2021) [3] has given a review plant disease detection and classification by deep learning. As per the report deep learning techniques are capable of recognition of plant leaf disease detection with high accuracy.
3) Sai Sharvesh. R, Suresh Kumar. K, and C. J. Raman (2024) [4] has predicted an accurate plant disease detection technique using machine learning.
4) Sunil S, jayashri, Ayesha Siddiqua (2022) [5] has examined on the detection of leaf disease highlighting the limitation of manual visual inspection. They addressed this challenge by utilizing image processing and artificial intelligence algorithm.
5) Marko Arsenovic, Mirjana Karanovic, Andras Andera (2019) [6] Presented a technique of deep learning for detection of disease in plants that could cause damage in crops and agriculture resulting in loss of crop yield.
6) Shafik, ali tufail, Abdallah (2023) [7] has carried out research on Global food security is being threatened by plant pests and diseases. These problems are managed using techniques from AI, machine learning, and deep learning. With an emphasis on hyperspectral images and vision centered methodologies, a systematic literature review examined 1349 publications. But before using AI techniques successfully, there are still several unresolved problems.
7) Dongmo Wilfried, appolinare tagne, Moupojou (2023) [8] has conducted a survey on o United Nations Food and Agriculture Organization's goal to enhance global food production by 70% by the year 2050, a significant challenge arises due to the substantial losses incurred from plant diseases, accounting for one - third of potential growth wasted. In addressing this issue, various plant disease databases have been employed to train deep learning models. Notably, while both Plant Village and PlantDoc contribute valuable data, recent studies have indicated that the Field Plant dataset, consisting of 5, 170 images, outperforms PlantDoc in terms of its efficacy in classifying photographs
8) Vibhor, Krishan Kumar, Brajesh Kumar, Shashank Mohan [9] (2022) has conducted a research work on plant leaf using CNN. Taking the pictures of the plant leaf and applying the CNN model. The model was suitable with the accuracy of 98%.
9) Muhammad Hammad Saleem; , johan potgieter, khalid Mahmood arif [10] (2022) carried a research on plant disease detection using Deep learning based algorithm.

The model gained the accuracy of 93.80%. but the model was not tested with the horticulture.

10) Mahmudul Hassan, Arnab Kumar, michal, Elizabeth [11] (2021) has diagnosed plant diseases by focusing the leaves. The approach utilized deep CNN models for the same. The models replaced the conventional depth - separable convolution technique, thereby it lowers the cost involved in computation and the number of parameters. Training was given to the model by using a dataset which considers 14 categories of plants, 38 categories of illness etc. By employing InceptionV3 an accuracy of 98.42% was obtained while Mobile NetV2, InceptionResNetV2 and EfficentNetB0 attained the accuracy level of 97.02%, 99.11% and 99.56%.

4. Model Description

Through previous studies we came to know CV algorithm is used for detecting the plant illness. Plant illness can be detected by various ways like from color change, spots, deformation etc. changes on the leaves. Due to variations it's difficult to make a system that gives precise result. The extraction features are used for detecting the plant sickness. Machine gaining knowledge of strategies inclusive of SVM, decision tree, or neural network can be hired for this cause.

4.1 Drawbacks of Existing system

For plant disease detection the existing system uses gadgets which needs to be regularly updating for increasing its performance. The models skilled on particular datasets and may have difficulty detecting the problem in flower that might differ from region.

Some systems might require hardware or technical understanding to set up the functions successfully.

Most system requires outstanding snapshots for the accurate disease detection. While taking pictures with high pixels is not always possible.

4.2 Proposed model

- A convolutional Neural Network or CNN or convNet is a deep learning algorithm that can take in an input image, assign importance to various aspects/objects in the image, and be able to differentiate one form the other.
- The pre - processing required in a CNN is much larger as compared to other classification algorithms. While in primitive methods filters are hand engineered, with enough training, CNN have the ability to learn these filters/characteristics.
- The architecture of the CNN is analogous to that of the connectivity pattern on neurons in the human Brain and was inspired by the organization of the visual cortex.

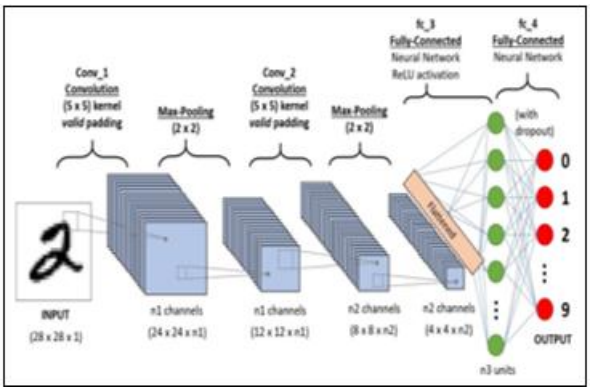

Figure 1: CNN (Convolutional Neural Network)

- A CNN is able to successfully capture the spatial and temporal dependencies in an image through the application of relevant filters.
- The role of the CNN is to reduce the images into a form that is easier to process, without losing features that are critical for getting a good prediction.

5. Conclusion

- The main aim of this plant disease prediction system is to predict the disease on the basis of the information added by the user.
- Its been observed that the majority of the systems are based on the CNN models.
- By detecting the problems in plants at early stage farmers can take appropriate steps to overcome the sickness of the plant.

References

[1] K. G. S. p. A. Sakshi Indolia, "Conceptual Understanding of Convolutional Neural Network - A Deep Learning Approach, " Elevier Ltd., 2018.
[2] J. S. Murugavalli, "Detection of plant disease using machine learning and deep learning approaches, " Elsevier ltd., 2022.
[3] S. Z. B. W. LILI LI, "Plant Disease Detection and Classification by deep learning, " IEEE, 2021.
[4] S. K. K. C. sai Sharvesh R, "An Accurate Plant Disease Detection Technique Using Machine Learning, " research gate, 2024.
[5] J. M. R. V. P. A. S. R. P. Sunil S. Harakannanavar, "Plant leaf disease detection using computer vision and machine learning algorithms, " Science Direct, 2022.
[6] M. K. S. S. A. A. a. D. S. Marko Arsenovic, "solving current limitations of deep learning based approaches for plant disease detection, " mdpi, 2019.
[7] R. A. A. H. M. A. L. C. D. S. A. N. Wasswa Shafik, "A Systematic Literature Review on Plant Disease Detection: Motivations, Classification Techniques, Datasets, Challenges, and Future Trends, " IEEE, 2023.
[8] E. M. A. T. Dongmo Wilfried, "FieldPlant: A Dataset of Field Plant Images for Plant Disease Detection and Classification With Deep Learning, " IEEE Access, 2023.
[9] K. K. B. K. S. M. Vibhor, "Detection of Apple Plant Diseases Using Leaf Images Through Convolutional Neural Network, " Research gate, 2022.

[10] M. H. Saleem and j. p. k. M. a., "A Performance - Optimized Deep Learning - Based Plant Disease Detection Approach for Horticultural Crops of New Zealand, " Muhammad Hammad Saleem; , johan potgieter, khalid Mahmood arif, 2022.
[11] K. m. E. Mahmudul Hassan, "Identification of Plant - Leaf Diseases Using CNN and Transfer - Learning Approach, " MDPI, 2021.
[12] K. K. B. K. S. M. Vibhor, "Detection of Apple Plant Diseases Using Leaf Images Through Convolutional Neural Network, " Research gate, 2022.