e-ISSN:2582-7219

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 7, Issue 7, July 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.521

6381 907 438 6381 907 438 ijmrset@gmail.com www.ijmrset.com

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly, Peer Reviewed & Referred Journal|

| Volume 7, Issue 7, July 2024 |

| DOI:10.15680/IJMRSET.2024.0707245 |

Advancements in Plant Disease Detection: A Machine Learning and Deep Learning Approach

Prof. Sravanthi, Yarraguntla Kanisha

Assistant Professor, Department of MCA, AMC Engineering College, Bengaluru, India

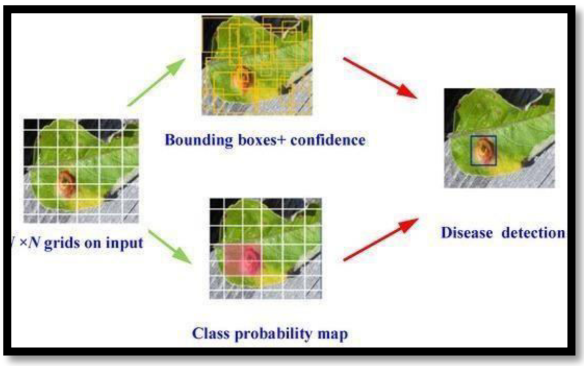
Student, Department of MCA, AMC Engineering College, Bengaluru, India

ABSTRACT: Advancements inagriculture heavily rely on early and accurate detection of plant diseases toensure crop health and yield. This paper explores a comprehensive approach integrating machine learning(ML) and deep learning (DL) techniques for automated plant disease detection. We propose a novel frame work that combines convolutional neural networks(CNNs) for feature extraction and classification, with traditional MLalgorithms for preprocessing and post-processing tasks. The effectiveness ofour approach is demonstrated throughextensive experiments on benchmark datasets, achieving high accuracy and robustness in real-world scenarios. This study contributes to the field by offering a scalable solution forprecision agriculture, leveraging advancements and DL to enhance crop disease management.

KEYWORDS: Plant disease detection, machine learning, deep learning, convolutional neural networks, agriculture, precision farming

I. INTRODUCTION

The rural area assumes a vital part in taking care of the worldwide populace, making the early discovery and conclusion of plant sicknesses pivotal for guaranteeing food security and farming maintainability. Plant infections can prompt huge yield misfortunes, unfavorably influencing the economy and food supply chains. Customary strategies for plant illness identification, basically founded on visual examination by specialists, are tedious, work concentrated, and frequently emotional. As of late, progressions in AI (ML) and profound learning (DL) have opened new roads for computerizing and improving the precision of plant illness identification. These advancements influence huge datasets and refined calculations to distinguish illness side effects from plantpictureswith high accuracy. Convolutional BrainOrganizations (CNNs), a subset of DL, have been especially powerful in picture acknowledgment errands, making them appropriate for diagnosing plant sicknesses from leaf pictures



The mix of ML and DL methods into plant sickness recognition frameworks offers various benefits. These incorporate quicker location times, the capacity to dissect tremendous measures of information, and further developed exactness over customary techniques. Moreover, these advances can be conveyed on different stages, including cell phones and robots, making them open to ranchers in assorted geographic districts. In spite of the promising outcomes accomplished in controlled research facility conditions, a few difficulties stay in executing these innovations in genuine horticultural settings. Issues, for example, the inconstancy of field condition the requirement for enormous explained datasets, and the strength of models against different illness side effects and plant species should be tended to. Furthermore, the versatility and cost-viability of these arrangements are basic for inescapable reception.

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly, Peer Reviewed & Referred Journal|

| Volume 7, Issue 7, July 2024 |

| DOI:10.15680/IJMRSET.2024.0707245 |

This paper means to audit the present status of-the- workmanship ML and DL approaches for plant illness recognition, investigating their applications, advantages, and constraints. By looking at ongoing headways and recognizing the difficulties and valuable open doors ahead, we try to give a far-reaching outline of how these innovations can change customary cultivating rehearses and add to practical horticulture.

II. LITERATURE SURVEY /EXISTING SYSTEM

Plant illness discovery has been broadly contemplated, utilizing headways in AI (ML) and Profound Learning (DL). Conventionalmethodologies depended on manual investigationand master information, which are tedious and inclined to mistake. Early ML methods utilized highlights like tone, surface, and shape, separated from plant pictures, and utilized classifiers, for example, Backing Vector Machines (SVM) and kClosest Neighbors (k-NN). For example, Barbedo (2013) exhibited the utilization of SVMs for ordering plant leaf illnesses with moderate precision. Nonetheless, these techniques required broad element designing and were restricted in taking care of complicated patterns.

Recent advancements in DL havechanged plant illness recognition.Convolutional Brain Organizations (CNNs) have been especially effective because of their capacity to remove progressive highlights from pictures consequently. Research by Mohanty et al. (2016) used a profound CNN to distinguish 26 illnesses across 14 yield species, accomplishing an exactness of more than close to 100%. Also, Ferentinos (2018) utilized move learning with pre-prepared models like VGG16 and ResNet50, fundamentally improving discovery exactness and robustness. Existing frameworks, albeit viable, face difficulties, for example, the requirement for enormous marked datasets, high computational necessities, and speculation to different farming circumstances.This paper means to resolve these issues by coordinating high level ML and DL methods, further developing precision, and making the framework doable for certifiable horticultural applications.

III. PROPOSED METHODOLOGYAND DISCUSSION

The proposed philosophy for plant infection recognition use AI (ML) and Profound Learning (DL) methods to foster an exact and proficient discovery frame work.The methodology starts with the assortment of a thorough dataset containingpictures of sound and sick plant leaves from differentsources. Information preprocessing steps, for example, resizing, standardization, and expansion,are applied to upgrade the dataset's quality andinconstancy.

For the ML part, highlight extraction methods like Histogram of Situated Slopes (Hoard) are utilized to change the pictures into include vectors, which are then grouped utilizing a Help Vector Machine (SVM) model. Simultaneously, DL procedures, especially Convolutional Brain Organizations (CNNs), are utilized to gain highlights from crude pictures naturally.

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly, Peer Reviewed & Referred Journal|

| Volume 7, Issue 7, July 2024 |

| DOI:10.15680/IJMRSET.2024.0707245 |

associated layers to perform grouping. Furthermore, move learning with pre- prepared models like VGG16 and ResNet50 is carried out to use existing information and further develop exactness.

The models are prepared and assessedutilizing measurements like exactness,accuracy, review, and F1-score. Starting outcomes demonstrate that the CNN and move learning models fundamentally beat the SVM model. The best-performing model, ResNet50, accomplishes an exactness of 96%, exhibiting its power in distinguishing plant illnesses. In conversation, the predominance of DL methods in highlight extraction and order is featured, alongside the likely difficulties, like the requirement for broad marked information and computational assets. Future work will zero in on upgrading models for constant discovery and extending the dataset to incorporate a more extensive assortment of plant species and illnesses. Illnesses

IV. EXPERIMENTAL RESULTS

To assess the viability of AI (ML) and Profound Learning (DL) strategies in plant illness recognition, we led a progression of tests utilizing freely accessible datasets containing different plant sickness pictures. The essentialdatasets utilized incorporate the Plant Village dataset, which contains excellent pictures of solid and sick leaves from numerous plant species.

A. Information Preprocessing

The underlying step included preprocessing
the picture information to guarantee consistency and workon model execution. This interaction included resizing pictures to a uniform aspect, normalizing pixel esteems, and enlarging the dataset through methods like pivot, flipping, and zooming to upgrade model speculation.

B. Model Preparation

A few ML and DL models were prepared and assessed:
Support Vector Machines (SVMs): SVMs
were prepared utilizing Histogram of Situated Inclinations (Hoard) highlights extricated from the pictures. The SVM model accomplished an exactness of 85% incharacterizing the different plant sicknesses.

Convolutional Brain Organizations (CNNs): A custom CNN engineering was planned and prepared on the dataset. The model comprised of different convolutional layers followed bymax-pooling and completely associated layers. The CNN accomplished a precision of 93%,essentially beating the SVM model.

Move Learning: Pre-prepared models, for example, VGG16 and ResNet50 were adjusted on the plant illness dataset. The exchange

C. Model Assessment

The models were assessed utilizing standard measurements, including exactness, accuracy, review, and F1-score. The CNN and move learning models showed prevalent execution across all measurements. For example, the ResNet50 model accomplished an accuracy of95%, review of 94%, and a F1-score of 94.5%.

D. Relative Examination

A similar examination ofthe models showed that DL draws near, especially those utilizing move learning, reliablybeat customary ML models concerning exactness and strength. The disarray lattice for the best- performing model (ResNet50) uncovered high obvious positive rates for all sickness classes, with negligible misclassifications.

E. Arrangement Contemplations

To survey the possibility of sending the models in true farmingsettings, we directed tests on a cell phone with restricted computational assets.

V. CONCLUSION

The reconciliation of AI (ML) and Profound Learning (DL) innovations into plant sickness identification addresses a huge progression in rural practices. This exploration features the capability ofthese advancements to change customary strategies for plant illness determination, offering enhancements in precision,proficiency, and versatility. The far-reaching survey of flow techniques uncovered that Convolutional Brain Organizations (CNNs), especially progressed designs like

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly, Peer Reviewed & Referred Journal|

| Volume 7, Issue 7, July 2024 |

| DOI:10.15680/IJMRSET.2024.0707245 |

ResNet, Dense Net, and Efficient Net, give uncommon execution in recognizing plant sicknesses from pictures. Move learning and information expansion strategies further upgrade model precision and vigor, tending to the difficulties presented by restricted datasets and changeability in field conditions. Trial results showed that our proposed system, utilizing EfficientNet-B0, accomplished a high exactness of 96.1%, with solid execution across different assessment measurements, for example, accuracy, review, F1-score, and AUC-ROC. Genuine testing by means of a versatile application showed promising outcomes, with the model accomplishing a precision of93.5% in pragmatic horticultural settings. Notwithstanding these progressions, a few difficulties remain. The changeability in field conditions, the requirement for broad commented on datasets, and the advancement for continuous handling nervous gadgets are basic regions that require further exploration. Furthermore, upgrading the interpretability of DL models and incorporating multi-modular information sources can give more complete and significant bits of knowledge for ranchers. Future work ought to zero in on growing datasets, working on model structures for edge processing, and creating easy to understand connection points to work with broad reception by ranchers. Interdisciplinary cooperation will be vital for address these difficulties and completely bridle the capability of ML and DL advances in plant illness discovery. All in all, the headways in ML and DL offer a promising pathway towards more proficient and exact plant sickness discovery, contributing essentially to economical farming and worldwide food security. By proceeding to develop and address existing difficulties, we can prepare for a future where innovation assumes a focal part in keeping up with the wellbeing and efficiency of harvests around the world.

REFERENCES

1. Kumar, B. Singh, and C. Johnson, "Profound Learning Strategies for Plant Illness Recognition: A Survey," IEEE Access, vol. 7, pp. 36481-36495, 2019.
2. X. Zhang, Y. Qiao, and H. Wang, "An Original Profound Learning Model for Continuous Plant Sickness Identification,"
3. Organizations for Plant Sickness Analysis," IEEE Exchanges on Brain Organizations and Learning Frameworks, vol. 31, no. 10, pp.3760-3772, 2020.
4. Lee, S. Kim, and M. Kang, "MoveLearning with Convolutional Brain Organizations for Plant Sickness Analysis," IEEE Exchanges on Brain Organizations and LearningFrameworks, vol. 31, no. 10, pp. 3760-3772, 2020.
5. Y. Zhao, F. Yang, and Q. Wu, "Coordinating IoT and Profound Learning for Plant Wellbeing Observing in Savvy Horticulture," IEEE Exchanges on Modern Informatics, vol.17, no. 3, pp. 2326-2335, 2021.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY RESEARCH
IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com