Journal of Informatics Education and Research
ISSN: 1526-4726
Vol 5 Issue 1 (2025)

DEVELOPMENT OF PLANT SCANNER MODEL WITH IMAGE PROCESSING FOR SMART AGRO-MANAGEMENT

Dr. Amit K. Patil,
Professor,
School of Management
Pimpri Chinchwad University
amit.patil@pcu.edu.in
Prof. Ankur Srivastava
Associate Professor,
School of Management
Pimpri Chinchwad University
ankur.srivastava@pcu.edu.in
Dr. Rajkamal Upadhyaya
Assistant Professor,
School of Management
Pimpri Chinchwad University
rajkamal.upadhyaya@pcu.edu.in

ABSTRACT
Agricultural industry is one of the growing areas in the interdisciplinary management domain. With the modern technologies, agricultural management is turning in to smart farming. One of most prominent technology is image processing and internet of things which can be an evolutionary strategy for agricultural management. Plant and crop diseases are the key areas which hampers the overall yield. Hence, in this paper presents the plant disease identification model with image processing as a plant scanner system. The image processing can store, compare and analyze the type of infections and accordingly farmers and/or consultants can suggest the corrective actions.

KEYWORDS: image processing, smart agriculture, plant disease management

1. INTRODUCTION
Discovering disease is probably a crucial to prevent agricultural deficits. The purpose of this task is to develop an application program method that, by artificial means, discovers and categorizes disease [1]. Farming is the more principal and fundamental resource to supply nationwide income of several parts of the world incorporating India. Ailments in plants/crops are the severe triggers in deteriorating the formulation amount and level of quality, which effects in overall economy cutbacks. Consequently, recognition of the ailments in plants is extremely essential. Plant disease symptoms are obvious in different parts of plants. On the other hand, plant leaves are very frequently utilized to diagnose the disease. Computer vision as well as soft computing approaches is applied by many analysts to computerize the recognition of plant diseases by applying leaf images. [2]. Computer vision types that can identify plant diseases in the area may be important methods for disease administration and resistance reproduction. Producing plenty of data to train these types of models is complicated, even so, seeing that merely trained specialists can effectively determine manifestations. In this study, research explains and executes a two-step technique for producing a significant volume of high-quality training statistics with nominal expert input [3].

Universal food surveillance has turned into an extremely essential investigation target. This is credited to the truth that food is a fundamental demand of human beings and so it's enough resource to satisfy the demand of humans' needs to be ascertained. Plant diseases have, on the other hand, been among the key challenges terrifying the sufficient resource of food to humans. The fast diagnosis of such conditions can help in their effective supervision, consequently planning considerable variations among success and damage of crops in farmlands influenced by these kinds of plant diseases [4].Plant pathogens; also triggering fungal disorders; symbolize linked biotic hassle reasons dependable for vital crop yield deficits. Their particular impairment possibilities are predicted concerning crops concerning 16 and 18% worldwide. The control of fungal diseases that relay intensely on some sort of chemical substances can cut down pathogen induced potential yield cutbacks by 32%. To thoroughly manipulate this control potential, chemical crop security procedures have to be implemented structured on invasion circumstance and time frame, which also maps the criteria of integrated crop security [5].

2. LITERATURE REVIEW

According to the author, several feature extraction techniques with many machine learning algorithms were utilized to sort out plant conditions founded on leaf graphics. Imaginaries aspects were taken out by employing visible-near infrared spectroscopy in the domain of articulation with quadratic discriminant analysis group criteria to discover Huanglongbing in citrus orchards [6]. Author has presented an image-based grain plant disease distinction strategy employing color functionality only. Author have investigated 14 unique color spots and removed 4 features from every color route, contributing to 172 aspects [7]. According to the author, analog recognition of crop conditions is both equally meticulous and erroneous, signifying it is only possible in compact farming. In contrast, automated disease recognition is considerably more correct and requires less time as well as labor [8].As per research by author(s), quick and new strategies for the appropriate breakthrough of conditions support growers in producing considerably better options and effective regulation actions. Convolution Neural Networks (CNN) as well as Recurrent Neural Network (RNN) have been proven their effectiveness in many areas and it has lately shifted in the domain of crop disease distinction and recognition. The goal of author's analysis task is to produce a Deep Learning Model for the disease distinction and its fast auguration to assist farmers in plantain tree cultivation [9].

The Internet of Things (IoT) is a large network that links a significant set of dispersed processing systems to forecast and notify end users of real time incidences. Smart things are gadgets that possess fundamental processing capabilities. An exclusive sign, including a name label for gadget data and an address for conversation, separates smart gadgets [10].The use of Artificial Intelligence (AI) is apparent in the arena of farming. The farming area gives various concerns in front of analysts associated with soil characteristics, pest supervision, water sources, post-harvest administration, expertise gap in growers, and modern technological know-how. To defeat these kinds of issues, AI can play a crucial part [11].

Crop monitoring and administration start out with growing and continue with seeing advancement, gathering up crops, crop storage, and the conveyance of crops. It is summed up as the workout that strengthens the development and production of farming products. Top to-bottom understanding of a category of plants, as suggested by their planning and prospering soil type, will undoubtedly build crop produce. To redesign the yield's effectiveness in a way that it facilitates both growers and the country, the author has to implement the advancement that analyzes the characteristics of crops and so give suggestions [12].

3. RESEARCH METHODOLOGY

Nowadays, people can observe that because of the raising chart of the populace, presently there is a substantial requirement of food and grains and so it is only satisfied by the farming. It is merely the sphere that is needed and positions itself in the best situation to accomplish the requirements of every single person of the nation, so that they can endure and appreciate their existence.

Agriculture areas also support the nation to make them better in term of association with various other nations. All the foods and grains that we consume are managed by pesticides and insecticides that cause harm to our physique and are not good for our wellness. To avoid the harmful impact of pesticides and insecticides, if we choose organic food option then the crop management of organic needs to be controlled for various diseases identification at the early stage. So, the proposed methodology uses a new image analysis model which can detect the plant disease at an early stage. The deep learning image extraction methodology is shown in Fig.1 below.

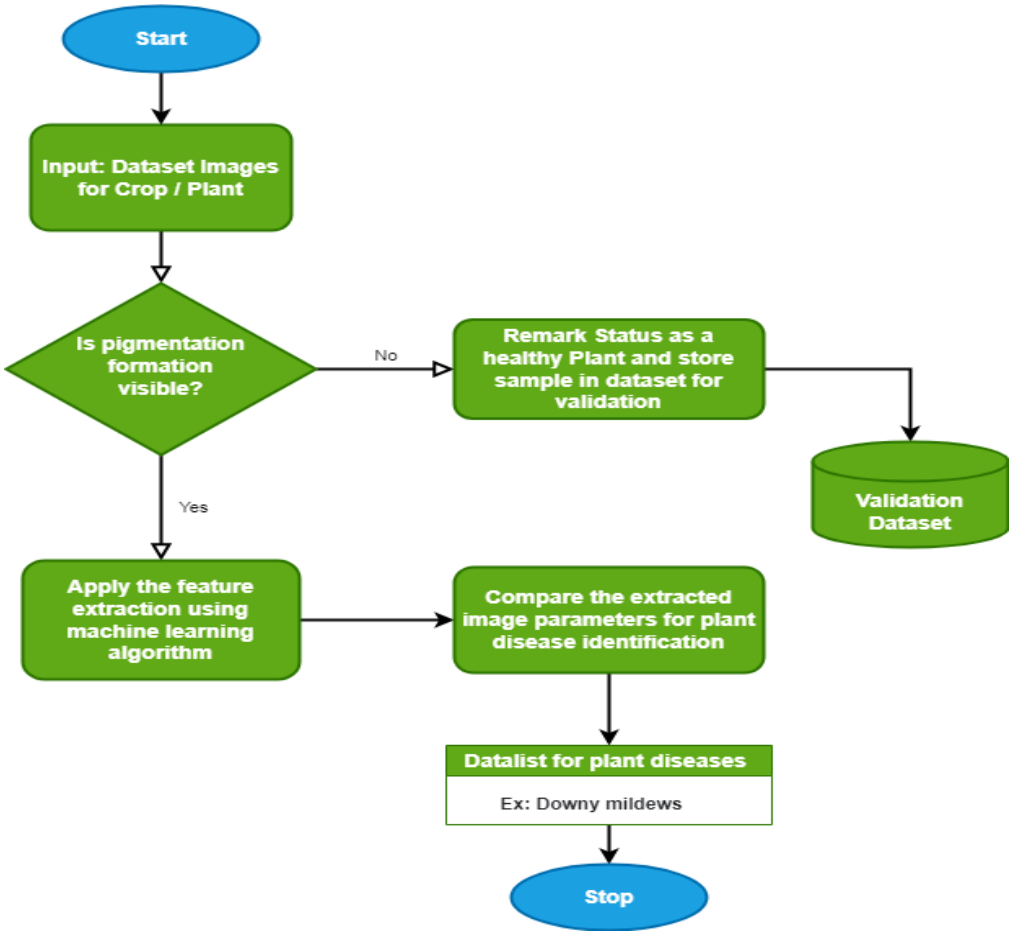

Fig. 1: Proposed Methodology

The proposed methodology takes input image of leaves from the dataset. The features like leaf dot / pigments are classified as per the historic images stored with disease names.

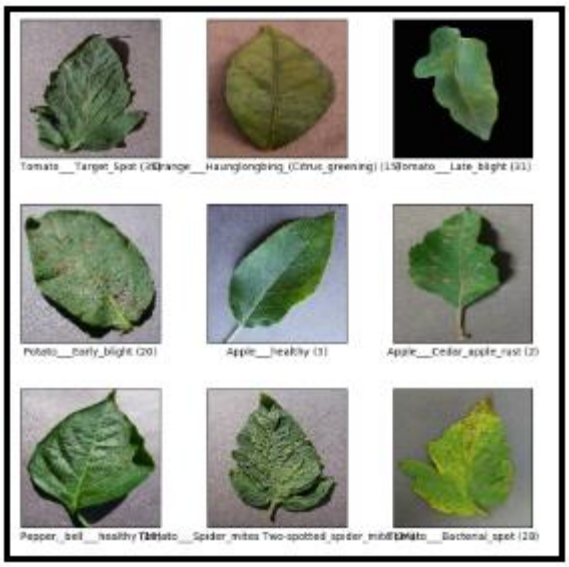

Fig. 2: Training and Validation Sample

The comparison of testing image sample and healthy parameters are compared and classified as per the signs of diseases. This will be helpful for identification of organic plant and/or crop classification. The machine learning algorithms with deep learning training and validation can enhance the execution speed.

4. RESULTS AND ANALYSIS

As per the referred dataset, the following plant diseases are identified by the machine learning algorithm with training and validation using deep learning CNN for image augmentation. Refer Fig. 3 below.

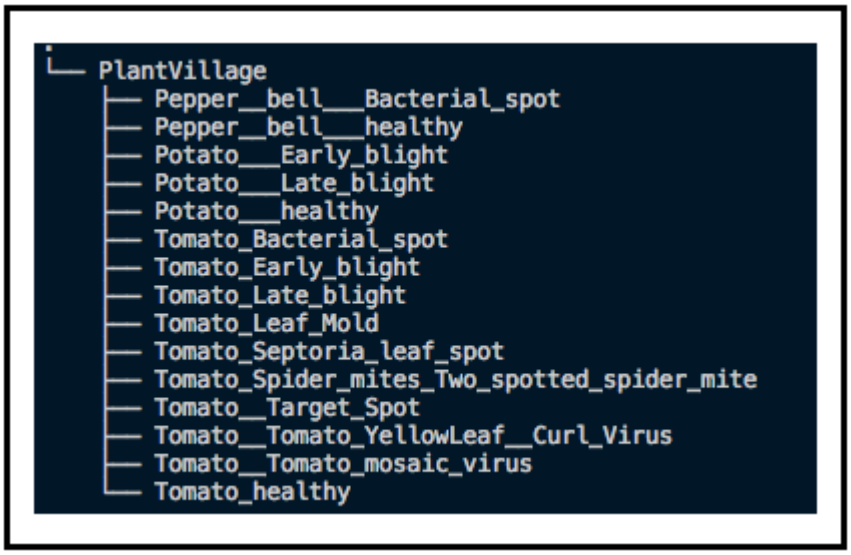

Fig. 3: Plant disease tree

The stored results can be referred as a future dataset analysis for organic farming. As pepper bell, potato and tomato are most quickly infecting plants, for organic farming this can be analyzed using leaf scanner plug-in system.

5. CONCLUSION

The paper presented the most innovative plant scanner for analysis of organic plant health condition. Such plant scanner with image processing using machine learning and deep learning can be a useful tool for organic farming where fertilizers are not used. So, organic crops and plants can be a healthier option with early identification of plant diseases. The future development can be in the area of other dataset development for many parts of the plant as roots, shoots, baby leaves, time line for disease spread and vegetable fruits scanning, etc. This can be even used for sugarcane scanning as a batch scanning with consideration of agricultural pandemic situation.

REFERENCES:

[1] Devaraj, Abirami, et al. (2019). "Identification of plant disease using image processing technique." 2019 International Conference on Communication and Signal Processing (ICCSP). IEEE.

[2] Vishnoi, Vibhor Kumar, Krishan Kumar, and Brajesh Kumar(2021). "Plant disease detection using computational intelligence and image processing." Journal of Plant Diseases and Protection, Springer, 128: 19-53.

[3] Wiesner-Hanks, Tyr, et al (2019). "Millimeter-level plant disease detection from aerial photographs via deep learning and crowdsourced data." Frontiers in Plant Science 10: 1550.

[4] Adedoja, Adedamola, Pius Adewale Owolawi, and Temitope Mapayi (2019). "Deep learning based on nasnet for plant disease recognition using leave images." 2019 international conference on advances in big data, computing and data communication systems (icABCD). IEEE,

[5] Picon, Artzai, et al(2019). "Crop conditional Convolutional Neural Networks for massive multi-crop plant disease classification over cell phone acquired images taken on real field conditions." Computers and Electronics in Agriculture 167: 105093.

[6] Kamal, K. C., et al(2019). "Depthwise separable convolution architectures for plant disease classification." Computers and Electronics in Agriculture, Elsevier, 165: 104948.

[7] Shrivastava, Vimal K., and Monoj K. Pradhan(2021). "Rice plant disease classification using color features: a machine learning paradigm." Journal of Plant Pathology 103: 17-26.

[8] Orchi, Houda, Mohamed Sadik, and Mohammed Khaldoun(2022). "On using artificial intelligence and the internet of things for crop disease detection: A contemporary survey." Agriculture 12.1: 9.

[9] Nandhini, M., et al(2022). "Deep Learning model of sequential image classifier for crop disease detection in plantain tree cultivation." Computers and Electronics in Agriculture, Elsevier, 197: 106915.

[10] Swaminathan, Bhuvaneswari, et al(2022). "IoT-Driven Artificial Intelligence Technique for Fertilizer Recommendation Model." IEEE Consumer Electronics Magazine 12.2: 109-117.

[11] Sharma, Ruchika, Nagesh Kumar, and Brij Bhushan Sharma(2022). "Applications of artificial intelligence in smart agriculture: a review." Recent Innovations in Computing: Proceedings of ICRIC 2021, Volume 1: 135-142.

[12] Khan, Rijwan, Niharika Dhingra, and Neha Bhati(2022). "Role of artificial intelligence in agriculture: A comparative study." Transforming Management with AI, Big-Data, and IoT. Cham: Springer International Publishing,73-83.