ISSN: 0974-5823 Vol. 6 No. 3 December, 2021

International Journal of Mechanical Engineering

A Survey on Recognizing Diseases in Crops and Soil using Artificial Intelligence Techniques

Dr. R. Deepalakshmi
Assistant Professor
Interdisciplinary Studies (Computer Applications)
The Tamil Nadu Dr. Ambedkar Law University

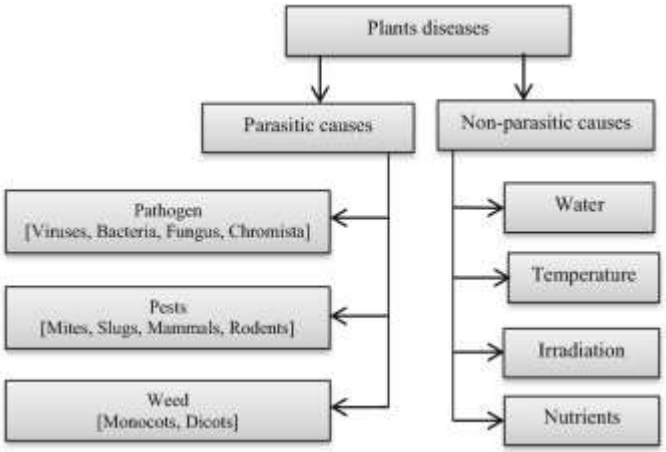
Abstract
This paper aims in explaining testing a condition-monitoring maintenance of plants by using Artificial Intelligence technique and knowledge-based systems. Artificial intelligence not only used for condition monitoring but also used in disease recognition of plants. Affected plants by nature not only affects the plant alone, but also affects the farmers financially and also our environment as the plants is the basic cause of oxygen. This paper surveys how Image processing and Machine Learning helps in identification of disease in plants. Current system limitation is analysed and this would help the researchers how the existing techniques can be used.

Introduction
Fauna and Flora are the best asset to India. Protecting these Fauna and flora becomes a great challenge. There are various reasons in which we need to concentrate in these Fauna and Flora, as India nowadays have an in varied Climatic change, which is affecting the plants. The recent vardha cyclone and more red alerts in different parts of South India, has spoiled the life being of Farmers a lot. This paper concentrates on an overview of how Artificial intelligence can save the agriculture during the worst weather condition.

Literature Survey
Bioinformatics software for Biologists in the genomic era has paved way to predict the climate change that happens. This in turns acts as an alarm to the farmers to save their plants, land and soil. Convergence in the plant genomics and weather is discussed here. Computational tools of plant variations and comparative plant cycle must be applied to gain a useful understanding of any Plants life. Blast2GO tool helps to analyse functionally the various operations available. Authors explains the use of association mapping in understanding traits in crop species. Phylogenetic analyses tools and Bayesian methods tools helps in analysis and prediction in great ways.
Image processing techniques [1] surveys disease which comes under detection and classification of leaf disease. The survey is based on the color of the leaf, threshold. The algorithm which is used are Naives Bayes classifier and Artificial Neural Network. Bera et al. [2] has presented kinds of problems in identification of image processing in rice plant. Different kinds of diseases in rice plant and their identification using image processing and data
Data Cleaning: The sample that is collected must be cleaned and processed. Preprocessing data is done by applying various techinques as mentioned below:

1. Filtering 2. Cropping 3. Color Enhancement.

Data cleaning is done by the image samples and the filter was applied consequently.
The affected parts of a plant will have higher intensity compared to other.



II **Managing Crops**: Crop management systems gives an interface for overall operation of crops including every form of farming. The reason behind using Artificial Intelligence Method in managing crop was initially proposed in 1985 by McKinion and Lemmon in their paper "Expert Systems for Agriculture" [3]. Boulanger in his doctoral Thesis [4] initiated yet another crop management technique. COMAX is an AI technique. COMAX was initially devised by Lemmon for managing cotton crops[5]. Managing citrus crops was proposed by Robinson and Mort to protect from damage of sicily island. Artificial Neural Network Multilayered feed forward was formulated [6]. A multi-layered feed forward artificial neural network based system was formulated by Robinson and Mort to protect citrus crops from frost damage in Sicily island of Italy [10]. Training of the data is much relied on parameters of output. Testing is also done on trained data. The training data has resulted in 96% of accuracy.
III. **Managing Disease Caused by Pests:** Among the overall damage caused by pests, insect pest damage is the major problem leading to financial losses for the farmers. Over many years the Information Technologists have tried to find the solution for the problem that suggests in identifying control measures. Expert systems which are there active is found my many researchers and scientists [11].
IV. **Managing Overall Diseases**: Diseases caused by other means is a matter of concern to the agriculturists. The damaging plant has to be needed care and recovery steps need

to be initated. Artificial Intelligence technique Computer aided design is used to diagnose the disease and suggest control measure. K- means Segmentation algorithm was used to control the overall diseses in plants. [12-18].

V. **Monitoring Storage**: Crops that are harvested also need to be stored and preserved apart from preserving the plants. Monitoring activities and quality check follows the concept of Artificial intelligence. Quality check is done by fuzzy logic. Many AI based techniques are involved for monitoring storage [19-26]

VI. **Managing Soil related issues**: Good soil will produce good crops. Improper soil will result in degraded crops. Artificial intelligence paves way for Artificial related technique like the suitability of land which is selected based on fuzzy logic. Delay in soil management lead to loss of crop and degrading quality. AI based technique is used in scaling the performance of maintenance of soil and irrigated related work. There are many works carried out in fuzzy based system [27-29]. Neural networks deal in effective form of irrigation compared to other algorithms.

VII. **Weed Monitoring** : When more chemicals are applied to the plants, human health will be spoiled a lot. When more herbicides are applied to human health it becomes dangerous. The scalability of the number of herbicides that is to be implanted to plants is got from Artificial Intelligence methods Application of herbicides have a direct implication on human health and environment as well [30].

VIII. **Monitoring Yield**: Though the work is done for planting and maintaining what they yield at the end is more important. The farmer's life is based on what they yield than what they plant. The crop yielding is essential for marketing strategy. Prediction models are framed to calculate the maximum yield of the crop harvesting. Artificial Neural Network based Back Propagation Algorithm can be used for monitoring the yield. If the method of Backpropagation is used, the farmers will have the maximum profit [31].

Conclusion:

Images which are taken digitally are most reliable for recognizing diseases. In this study we have categorised different machine learning techniques which are useful for identifying diseases of different crops. This paper analyses more research articles in the field of application of Artificial Intelligence methods. This would be more helpful to the farmers so that they can save their crops in a better way. Back propagation algorithm, Rule based algorithm and Fuzzy based logic can be applied based on the hierarchy of the crop maintenance.

References

[1] Dhingra G, Kumar V and Joshi H D, "Study of digital image processing techniques for leaf disease detection and classification Mul. T. & App.", Volume 77, issue 15, 2018, 19951-00.

[2] Bera T, Das A, Sil J and Das A K, "A survey on rice plant disease identification using image processing and data mining techniques Emer. Tech. in Dat Min. & Info. Sec." 2019, (pp. 365- 76) Springer Singapore.

[3] J. M. McKinion, H. E. Lemmon. "Expert systems for agriculture," Computers and Electronics in Agriculture, vol. 1 no. 1, 2021, pp. 31-40

[4] A G. Boulanger, "The expert system PLANT/CD: A case study in applying the general purpose inference system ADVISE to predicting black cutworm damage in corn", ‖ Ph.D. Thesis, University of Illinois at Urbana-Champaign, 1983,

[5] H. Lemmon, "Comax: an expert system for cotton crop management," Computer Science in Economics and Management, vol. 3 no. 2, pp. 177-185, 1990.

[6] C. Robinson, N. Mort, "A neural network system for the protection of citrus crops from frost damage." Computers and Electronics in Agriculture, vol. 16 no. 3, pp. 177-187, 1997.

[7] G. M. Pasqual, J. Mansfield, "Development of a prototype expert system for identification and control of insect pests," Computers and Electronics in Agriculture, vol.2 no. 4, pp. 263-276, 1988.

[8] W. D. Batchelor, R. W. McClendon, D. B. Adams, J. W. Jones, "Evaluation of SMARTSOY: An expert simulation system for insect pest management," Agricultural Systems, vol. 31 no. 1, pp. 67-81, 1989. [9] W. D. Batchelor, R. W. McClendon, M. E. Wetzstei, "Knowledge engineering approaches in developing expert simulation systems," Computers and electronics in agriculture, vol.7 no. 2, pp. 97-107, 1992.

[10] M. Mozny, J. Krejci, I. Kott, "CORAC, hops protection management systems," Computers and electronics in agriculture, vol. 9 no. 2, pp. 103-110, 1993.

[11] J. D. Knight, and M. E. Cammell, ―A decision support system for forecasting infestations of the black bean aphid, Aphis fabae Scop., on spring-sown field beans, Vicia faba.," Computers and electronics in agriculture, vol. 10 no. 3, pp. 269-279, 1994.

[12] A. M. G. J. Hanson, A. Joy, J. Francis, ―Plant LeafDisease Detection using Deep Learning and Convolutional Neural Network,‖ International Journal of Engineering Science, vol. 7 no. 3, pp. 5324- 5328, 2017.

[13] F. Hahn, I. Lopez, G. Hernandez, "Spectral detection and neural network discrimination of Rhizopus stolonifer spores on red tomatoes," Biosystems Engineering, vol. 89 no. 1, pp. 93-99, 2004. [14] K. Y. Huang "Application of artificial neural network for detecting Phalaenopsis seedling diseases using color and texture features," Computers and Electronics in agriculture, vol.57 no. 1, pp. 3-11, 2007.

[15] S. S. Sannakki, et al. "Leaf disease grading by machine vision and fuzzy logic," Int. J. of Comp. Tech. and Application, vol. 2 no. 5, pp. 1709-1716, 2011.

[16] H. Al-Hiary, et al., "Fast and accurate detection and classification of plant diseases," Int. J. of Computer Application, vol. 17 no. 1, pp. 31- 38, 2011.

[17] D. Al Bashish, M. Braik, S. Bani-Ahmad, "Detection and classification of leaf diseases using K-means-based segmentation and Neuralnetworks-based classification," Information Technology Journal, vol. 10 no.2, pp. 267-275, 2011.

[18] S. F. Khan, et al., "Dr. Wheat: a Web-based expert system for diagnosis of diseases and pests in Pakistani wheat." In Proc. of the World Congress on Engineering. Vol. 1. 2008.

[19] I. Kavdir, and Daniel E. Guyer, "Apple grading using fuzzy logic," Turkish Journal of Agriculture and Forestry, vol. 27 no.6, pp. 375-382, 2004.

[20] K. Gottschalk, László Nagy, and István Farkas, "Improved climate control for potato stores by fuzzy

controllers," Computers and electronics in agriculture, vol. 40 no. 1, pp. 127-140, 2003.
[21] C. Escobar, and José Galindo, "Fuzzy control in agriculture: simulation software." In Proc. INDUSTRIAL SIMULATION CONFERENCES 2004, pp. 45-49, 2004.
[22] M. Taki, et al., ―Application of Neural Networks and multiple regression models in greenhouse climate estimation,‖ Agricultural Engineering International: CIGR Journal, vol. 18 no. 3, pp.29-43, 2016. [23] Q. Yang, "Classification of apple surface features using machine vision and neural networks," Computers and Electronics in Agriculture, vol. 9 no.1, pp. 1-12, 1993.
[24] K. Nakano, "Application of neural networks to the color grading of apples," Computers and electronics in agriculture, vol. 18 no.2, pp. 105-116, 1997.
[25] G. Capizzi, et al., "A Novel Neural Networks-Based Texture Image Processing Algorithm for Orange Defects Classification," International Journal of Computer Science & Applications, vol. 13 no. 2, pp. 45-60, 2016.
[26] R. Badia-Melis, et al. "Artificial neural networks and thermal image for temperature prediction in apples," Food and Bioprocess Technology, vol. 9 no.7, pp. 1089-1099, 2016.
[27] R. S. Sicat, Emmanuel John M. Carranza, and Uday Bhaskar Nidumolu, "Fuzzy modeling of farmers' knowledge for land suitability classification," Agricultural systems, vol. 83 no.1, pp. 49-75, 2005.
[28] Y. Si, G. Liu, J. Lin, Q. Lv and F. Juan, ―Design of Control System of Laser Leveling Machine Based on Fuzzy Control Theory,‖ In Proc. International Conference on Computer and Computing Technologies in Agriculture (pp. 1121-1127). Springer, Boston, MA.
[29] N. Tremblay, et al., "Development and validation of fuzzy logic inference to determine optimum rates of N for corn on the basis of field and crop features," Precision Agriculture, vol. 11 no. 6, pp. 621-635, 2010
[30] G. M. Pasqual, "Development of an expert system for the identification and control of weeds in wheat, triticale, barley and oat crops," Computers and electronics in agriculture, vol. 10 no. 2, pp. 117-134, 1994.
[31] Russ, et al., "Data mining with neural networks for wheat yield prediction," in proc. Industrial Conference on Data Mining, Springer, Berlin, Heidelberg, 2008.