International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Detection of Plant Diseases Using Machine Learning Techniques

Cheruvu Nagalakshmi Govardhini

GMR Institute of Technology Razam, vizainagaram, Andhra Pradesh, PIN-532127, India

A B S T R A C T

Due to adding population day by day, people's need for food, apparel and sanctum has been increased. Above all, people need energy to perform a task, so a healthy, nutritional diet should be followed to make up the necessary energy. Hence, the need for food is growing everyday.We know that, the first source of food is shops. still, crop yields are declining daily.One of the reasons behind the diurnal drop in crop affair is crop diseases.These ails may be brought on by bacteria, contagions, or fungi.while, Homemade discovery of factory conditions takes a lot of time and energy and requires experts to identify them. As crop conditions aren't linked in proper time, the life span of them will be docked. emotional results have been attained in the field of splint- grounded image categorization thanks to the development of precise approaches. Out of them a machine literacy approach provides a good result, that's by using factory conditions discovery ways. This paper presents image processing, image segmentation using k- means clustering, point birth followed by bracket using KNN, SVM algorithms.

Key words: Image processing, k-mean clustering algorithm , GLCM , Classification, SVM, KNN.

1. Introduction

Agriculture is vital to one's survival. A crucial to why husbandry is important to business and society is its affair — from producing raw accoutrements to contributing to the global force chain and profitable development.Agriculture provides utmost of the world's food and fabrics, In discrepancy to the agrarian sector, every other assiduity has served from new technologies in some way. But, Because of technological improvements similar as detectors, widgets, outfit, and information technology, ultramodern granges and agrarian operations operate veritably else from those just a many decades ago. substantially, there are numerous ways developed in detecting and prognosticating factory conditions. one of them is through image processing and machine literacy. Image processing is a system of performing operations on an image in order to ameliorate it or prize useful information from it. It's a type of signal processing in which the input is an image and the affair can be an image or image characteristics features.Image processing is significant in a number of Deep Learning- grounded Computer Vision operations, where similar preprocessing can significantly ameliorate model performance. In this paper we're using MATLAB software and some algorithms to reuse an image.

Machine literacy(ML) is a type of artificial intelligence(AI) that allows software operations to come more accurate at prognosticating issues without being explicitly programmed to do so.Machine Learning algorithms use literal data as input to prognosticate new affair values.Machine literacy is the field of study that gives computers the capability to learn without explicitly programmed.ML is one of the most investigative technologies that one would have come across.As it's apparent from the name, it gives the computer that makes it more analogous to mortal The capability to learn.Here we're using machine literacy because it's substantially used for vaccination and bracket and as it's recommended to prognosticate the factory conditions at the early stage of in the field of husbandry is essential to feed the food to the overall population but it's unfortunate to prognosticate the complaint at the early stage of the crops. The main end of this paper involves enhancement of delicacy in detecting conditions by being machine literacy ways. The input we're taking is an image and the affair which we get is the detected complaint and it's classified group.

2. Literature Review

- This paper's main aim is to study on different leaf diseases which are not yet been studied so this proposes an algorithm of KNN classifier and SVM classifier.
- The process is firstly some images with 568x1020 pixels have taken and given as an input to preprocessing phase to get gray scale image. Then,region based k-mean segmentation is applied to divide the image into useful segments then features are extracted which are given as an input to further process known as classification which shows the disease name by classifying it in one category. all the process is divided into two main phases those are Testing and Training phase.
- This paper has tested on 5 rare diseases, Early blight , Mosaic virus, Down mildew , White fly , Leaf miner etc.
- The main aim of this paper is that classifying and detecting of diseases using KNN classifier is more accurate because in this work that classifier has detected 5 diseases with 98.56% accuracy compared to SVM classifier which detected 2 diseases with less accuracy and also has some errors with it.

- This paper addresses this issue with the goal of developing picture preparing calculations that can recognize issues in yields from pictures, based on shading, surface, and shape to naturally recognize sicknesses or other conditions that may influence harvests and give the rancher quick and exact answers with the assistance of SMS.
- This paper provides a method for detecting plant diseases early and precisely by combining various image processing techniques and a simulated neural network (ANN).
- The purpose of this paper is to develop a fundamental infection recognition framework for plant ailments.
- This work comprises several implementation phases, including datasets creation, feature extraction, classifier training, and classification.
- To categorize photos of diseases and healthy images, the produced datasets are jointly trained using random forest.
- In order to extract visual features, this research uses HOG (Histogram Of An Oriented Gradient).
- Three component descriptors are utilized in HOG, an element descriptor used in image processing for the purpose of object detection.

✓ HUelements

✓ Haralik components

✓ Color Histogram

- This study includes stages such as preprocessing, feature extraction, classifier training, and classification. Image preprocessing is the process of reducing the size of all images to a uniform size. The next step is to extract features from a preprocessed image using HOG.
- According to this study, Using Random forest classifier, the model was trained using 160 images of papaya leaves with less datasets with accuracy of 70% when compared to other machine learning approaches such as SVM, Gaussian, and Naive Bayes.
- The primary goal of this study is to use a Random forest classifier to determine if a leaf is infected or healthy.

3. Methodologies

3.1-

In this paper ,the proposed methodology follows 4 basic steps.They are:

A. Pre-Processing Phase:

The model uses matlab picture preparing library plant leaf image is as an input which is further converted to gray scale using GLCM technique.

B. Image Segmentation:

The Image segmentation technique is applied which will segment the image on the basis of their properties.In this work,the region based k-mean segmentation technique is applied.

C. Feature Extraction:

In this stage we have to extract the valuable sections.Diverse features are picked to depict the distinctive properties of the leaves using GLCM algorithm

D. Classification:

In the classification stage, the co-event highlights for the leaves are extracted and contrasted and then compared it similarly to put away in the feature library.the main classifiers used here are SVM and KNN classifiers

✓ Out of 2 algorithms KNN has shown 98.56% accuracy by detecting most affected area among all 4 detected diseases

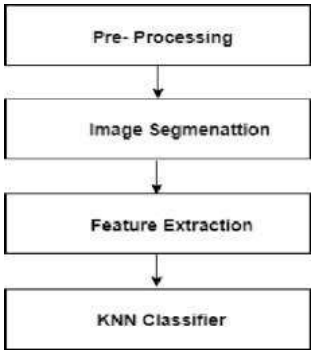


Figure 1: flow chart of classification some algorithms or ways and classifiers used are

3.1.1 k- mean segmentation or k- mean clustering algorithm

K Means is a clustering algorithm.Clustering algorithms are unsupervised algorithms means that there's no labeled data available. It's used to identify different classes or clusters in the given data grounded on how analogous the data is.

Then, in this work, K- means clustering divides the splint image into four corridor/ cluster from which one or further corridor may contain the complaint which indicates that the splint is infected by multiple conditions.

3.1.2 KNN classifier

KNN is a Supervised machine literacy fashion. K- NN algorithm assumes the similarity between the new case/ data and available cases and put the new case into the order that's utmost analogous to the available orders.

Then, datasets are subordinated to 2 phases a) Training dataset b) Testing dataset

Then, in this work, After Doing testing through KNN Classifier it shows exact complaint name for any number of splint diseases.the average delicacy produced by this fashion is98.56.

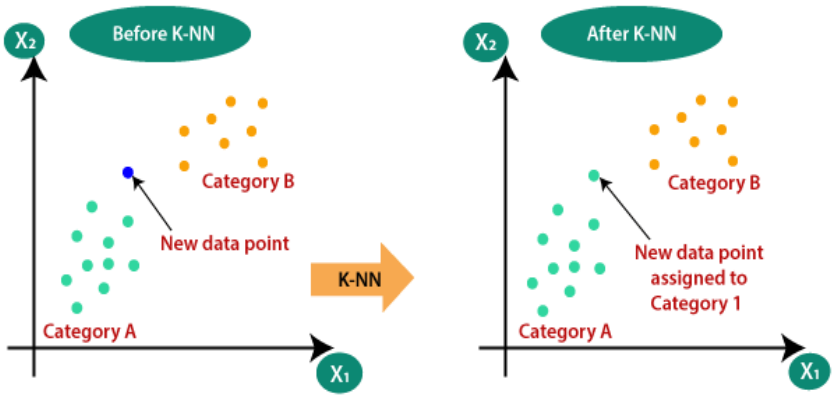


Figure 2: KNN classifier

3.2-

In another paper, the proposed methodology follows 5 introductory steps.They are

A. Image Acquisition

First stage of factory complaint discovery system is image acquistion. High quality factory images can be acquired using digital cameras, scanners or drones

B. Annoted Dataset

Knowledge Grounded datasets to be created for captured images with different classes.

C. Image Processing

Ameliorate some image features important for farther processing. Segmentation process is used to partition the factory image in colorful parts. This can be used for the birth of diseased area in splint, stem or root of factory from background.

Birth

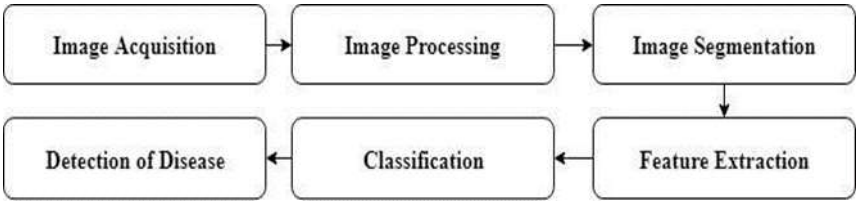
D. Feature Extraction

Birth of Colour, shape and texture point of complaint part of the factory can be done.using slate position Co-occurrence Matrix(GLCM), Blend vision and machine intelligence etc

E. Classification

Eventually, any of the machine literacy ways can be used to classify the colorful conditions in shops.

Figure 3: flow chart of classification



Some algorithms used in this work are:

3.4.1. Support Vector Machine (SVM):

Support vector machine algorithm finds a hyperplane that distinctly classifies the data points. The hyperplane is an N-dimensional space (the number of features -N) which helps to classify the values.There are various methods to find a hyperplane in order to separate two data points but we need to find an optimal hyperplane which has a maximum margin (there should be a maximum distance between two points of both the classes). it produces 88% accuracy by detecting diseases like bacterial spot,Early blight,Late blight.

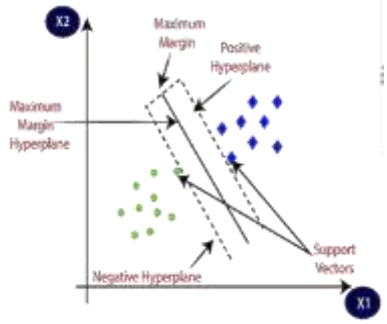


Figure 4: SVM classifier

4. Results

SNO	Methodology	Accuracy
1	K-Nearest Neighbour classifier	98.56%
2	Random Forest	70.6%
3	Conventional Neural Network (CNN)	96.5%
4	Support Vector Machine(SVM)	88%
5	NN-based classifiers	96.5%

PAPER	AUTHOR	METHOD	RESULT
[1]	S. Ramesh	KNN classifier	This paper has tested on 5 rare diseases, Early blight,Mosaic virus, Down mildew , White fly , Leaf miner etc.The main aim of this paper is that classifying and detecting of diseases using KNN classifier is more accurate because in this work that classifier has detected 5 diseases with 98.56% accuracy compared to SVM classifier which detected 2 diseases with less accuracy and also has some errors with it.
[2]	U. Shruthi, V. Nagaveni	Random forest classifier	In this paper, the author used Random forest classifier, the model was trained using 160 images of papaya leaves with less datasets with accuracy of 70% when compared to other machine learning approaches such as SVM, Gaussian, and Naive Bayes. The primary goal of this study is to use a Random forest classifier to determine if a leaf is infected or healthy.

[3]	J. Shirahatti, R. Patil and P. Akulwa	CNN classifier	This paper explained how Farmers gathered information earlier and data through the use of information technology and precision agriculture to make the best decisions for a high yield from the farm Ultimately, according to this review, CNN classifier detects more diseases than other classifiers with an average accuracy of 96.3%.
[4]	P. Panchal, V. C. Raman and S. Mantr	SVM classifier	In this paper,The algorithms were tested on three diseases: Early Blight, Late Blight, and Bacterial Spot.This paper discusses many ways for automated computerised disease detection in plants, which can be accomplished using picture segmentation and classification methods. As a consequence of analysing the results, the random forest approach delivers reliable identification of plant leaf diseases while requiring minimal computer complexity
[5]	Daniya, T., and S. Vigneshwari	NN classifier	The main point made here is that classification utilising machine learning methods such as NN-based classifiers in detecting plant diseases has a higher accuracy of 95.5%.The primary goal of this work is to survey and summarise the detection of rice plant diseases using image processing and machine learning approaches.Various segmentation algorithms were used to retrieve the diseased leaf picture of a rice plant.The strategies discussed in this study assist researchers in overcoming the many difficulties that directly or indirectly influence society.

5. Conclusion

Several options are now made possible by technology advancements in plant diagnostics However, when compared to other fields of production, there are still hurdles in making novel approaches available on a broad scale. It is worth emphasising in this regard that not only can preexisting and smart technologies like machine learning approach aid scientists in the fight against pandemic diseases,by detecting the diseases in proper time.Finally, the primary goal of this paper was to propose improvements to current classification algorithms for plant leaf disease detection using machine learning, which is supported by the KNN classifier, which outperforms the SVM classifier.In future, plant diseases may be predicted than detection which helps in retreiving the life of plant backwithout delay. There may be many approaches to solve this, like deep learning with various algorithms.

REFERENCES

1. S. Ramesh et al., "Plant Disease Detection Using Machine Learning," 2018 International Conference on Design Innovations for 3Cs Compute Communicate Control (ICDI3C), 2018, pp. 41-45, DOI: 10.1109/ICDI3C.2018.00017.
2. U. Shruthi, V. Nagaveni and B. K. Raghavendra, "A Review on Machine Learning Classification Techniques for Plant Disease Detection," 2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS), 2019, pp. 281-284, DOI: 10.1109/ICACCS.2019.8728415.
3. J. Shirahatti, R. Patil and P. Akulwar, "A Survey Paper on Plant Disease Identification Using Machine Learning Approach," 2018 3rd International Conference on Communication and Electronics Systems (ICCES), 2018, pp. 1171-1174, DOI: 10.1109/CESYS.2018.8723881.
4. P. Panchal, V. C. Raman and S. Mantri, "Plant Diseases Detection and Classification using Machine Learning Models," 2019 4th International Conference on Computational Systems and Information Technology for Sustainable Solution (CSITSS), 2019, pp. 1-6, DOI: 10.1109/CSITSS47250.2019.9031029.
5. Daniya, T., and S. Vigneshwari. "A review on machine learning techniques for rice plant disease detection in agricultural research." system 28.13 (2019): 49-62
6. Jubin Dipakkumar Kothari (2018). Plant Disease Identification using Artificial Intelligence: Machine Learning Approach. International Journal of Innovative Research in Computer and Communication Engineering, 7(11), 11082-11085.
7. Ferentinos, Konstantinos P. "Deep learning models for plant disease detection and diagnosis." Computers and electronics in agriculture 145 (2018): 311- 318.
8. Saleem, Muhammad Hammad, Johan Potgieter, and Khalid Mahmood Arif. "Plant disease detection and classification by deep learning." Plants 8.11 (2019): 468.
9. ur Rahman, Hidayat, et al. "A comparative analysis of machine learning approaches for plant disease identification." advancements in life

sciences 4.4 (2017): 120-126.

10. Ahmed, Kawcher, et al. "Rice leaf disease detection using machine learning techniques." 2019 International Conference on Sustainable Technologies for Industry 4.0 (STI). IEEE, 2019.
11. Akulwar, Pooja. "A recommended system for crop disease detection and yield prediction using machine learning approach." Recommender System with Machine Learning and Artificial Intelligence: Practical Tools and Applications in Medical, Agricultural and Other Industries (2020): 141-163.
12. Yang, Xin, and Tingwei Guo. "Machine learning in plant disease research." March 31 (2017):
13. Shrivastava, Vimal K., and Monoj K. Pradhan. "Rice plant disease classification using color features: a machine learning paradigm." Journal of Plant Pathology 103.1 (2021): 17-26.
14. Trivedi, Jay, Yash Shamnani, and Ruchi Gajjar. "Plant leaf disease detection using machine learning." International conference on emerging technology trends in electronics communication and networking. Springer, Singapore, 2020.