

# Plant Disease Detection and Classification Using Machine Learning Algorithms

P. Meghana<sup>1</sup>, Ms. S. Vijayalakshmi<sup>2</sup>

<sup>1</sup>UG Scholar, Department of Computer Science and Engineering, Saveetha School of Engineering, SIMATS, Chennai, meghana.vajram@gmail.com

<sup>2</sup>Assistant Professor, Department of Computer Science and Engineering, Saveetha School of Engineering, SIMATS, Chennai, vijilak.sse@gmail.com

## Article Info

Volume 82

Page Number: 2146 - 2149

Publication Issue:

January-February 2020

## Abstract

Plants are thought of to be crucial just like the stock of vitality offer to people. Plant sicknesses will affect the leaf whenever among planting and suspect that winds up in tremendous misfortune on the get together of harvest and affordable cost of market. In this way, plant ailment location assumes a significant job in rural field. In any case, it needs immense men, extra time interim and top to bottom information concerning plant ailments. Thus, machine learning is applied to discover infections in plant leaves since it dissects the data from totally various viewpoints, and arranges it into one among the predefined set of classifications. The morphological alternatives and properties like shading, force and measurements of the plant leaves are taken into thought for arrangement. This paper shows a synopsis on changed assortments of plant maladies and diverse grouping procedures in machine learning that are utilized for trademark illnesses in various plant leaves.

## Article History

Article Received: 14 March 2019

Revised: 27 May 2019

Accepted: 16 October 2019

Publication: 12 January 2020

**Keywords:** Machine learning, Classification, unwellness Detection, Support Vector Machine

## 1. Introduction

India might be a brisk creating nation and horticulture is that the spine for the nation's improvement in its beginning time. Be that as it may, farming field faces a few obstacles just as huge misfortune inside the harvest generation. Plant illnesses are one in all the essential purposes behind the misfortune inside the creation and plant leaf malady distinguishing proof is moreover awfully problematic in agribusiness field. Optic system might be an antiquated technique for trademark the ailments that includes huge labor, mistaken, time exceptional and not material for bigger fields. Furthermore, it's frightfully expensive on the grounds that it needs ceaseless perception by the pros. Consequently, machine learning; a solid forecast technique is utilized for identification fluctuated infections of plant leaves brought about by vegetation, bacterium and infection. In any case, disease forecast exploitation arrangement calculations is

by all accounts a problematic undertaking the precision shifts for different info document during this paper, numerous examination commitments related with fluctuated plant leaf illnesses recognition exploitation totally unique characterization calculations are surveyed and compared.

## 2. Classification of Plant Diseases

The leaves of the plant are influenced by fungal, viral and bacterial illnesses which incorporate leaf rust, fine mold, bacterial scourge, Downey build-up, darker spot and so forth. It delineates the order of the bacterial, contagious and viral infections. J. D. Pujari, R. Yakundimath, and A.S.Byadgi applied Artificial Neural Network, Probabilistic Neural Network, and Support Vector Machine for vegetable harvests, business yields and oat crops individually for illness discovery. Balasubramanian Vijayalaxmi and Vasudev Mohan applied Fuzzy-

Relevance Vector Machine classifiers in which the information sources like preparing highlights and the marks are utilized for leaf illness location. X. Wang, M. Zhang, J. Zhu and S. Geng predicted *Phytophthora infestans* ailment determination on tomatoes by utilizing Artificial Neural Networks. Dong Pixia and Wang Xiangdong proposed a methodology called Minimum Distance Classifier for perceiving cucumber leaf illness. S. Arivazhagan, R. Newlin Shebiah, S. Ananthi and S. Vishnu Varthini proposed a calculation for grouping sicknesses of plants including jackfruit, tomato, and so on by utilizing Support Vector Machine classifier.

### 3. Literature Review

**Title:** Co-Expression Analysis of Gene Expression: A Survey of Best Practices

**Author:** Hussain A. Chowdhury, Dhruba K. Bhattacharyya, Jugal K. Kalita

**Year:** 2019

**Description:**

It introduced a review of best practices in the examination of (differential) co-articulation, coexpression systems, differential systems administration, and differential network that can be found in microarrays and RNA-seq information, and shed some light on the investigation of scRNA-seq information too. It has talked about coexpression examination for RNA-seq alongside a correlation of investigation of co-articulation arranges in microarrays versus RNAseq. We examined differential co-articulation and differential systems administration alongside an examination of differential articulation, differential systems administration and differential network. It included numerous devices utilized for examining microarray, RNA-seq, and scRNA-seq information. Figuring out to remake transcriptional organize is additionally talked about. Preprocessing and co-articulation investigation of scRNA-seq information alongside helpful devices and applications are additionally included. It examined natural understanding and practical examination to separate organic data from a lot of given qualities that are recognized through investigation. It exhibited a few suggestions and rules for the investigator.

**Title:** Image of pant disease segmentation model based on pulse coupled neural

**Network with shuffle frog leap algorithm**

**Author:** Xiaoyan Guo, Ming Zhang, Yongqiang Dai

**Year:** 2018

**Description:**

An epic picture division model SFLA-PCNN for plant sicknesses dependent on half breed frog hopping calculation is proposed. Utilizing the weighted whole of cross entropy and picture division smallness as the wellness capacity of SFLA, the picture of potato late scourge malady is taken as a preliminary division picture to locate the ideal setup parameters of PCNN neural. Picture division is a key advance in highlight extraction and infection acknowledgment of plant ailments pictures.

To maintain a strategic distance from the subjectivity of utilizing conventional PCNN (beat coupled neural system) to portion plant sickness picture, another picture division model (SFLA-PCNN) is proposed get the parameters arrangement of PCNN. The weighted entirety of cross entropy and smallness level of picture division is picked as wellness capacity of rearranged frog jump calculation to enhance the parameters PCNN, which could improve the presentation of PCNN. After multiple times nearby emphasis and multiple times worldwide cycle, we get the best parameter arrange. The broad tests demonstrate that SFLA-PCNN model could be utilized to extricate the sore from the foundation viably, which could give an establishment to following ailment analyze.

**Title:** A Smart Phone Image Processing Application for Plant Disease Diagnosis network with shuffle frog leap algorithm

**Author:** Nikos Petrellis

**Year:** 2017

**Description:**

An advanced cell application for plant ailment acknowledgment was exhibited. It depends on picture preparing that investigates the shading highlights of the spots in plant parts. It was assessed on grape maladies with an exactness that surpasses 90% utilizing a little preparing set. Albeit proficient horticulture engineers are liable for the acknowledgment of plant infections, insightful frameworks can be used for their finding in beginning periods. The master frameworks that have been proposed in the writing for this intention are regularly founded on actualities depicted by the client or picture handling of plant photographs in unmistakable, infrared, light and so forth. The acknowledgment of an ailment can frequently be founded on indications like sores or spots in pathetic bits of a plant. The shading, zone and the quantity of these spots can decide, as it were, the malady that has embarrassed a plant. Greater expense sub-atomic examinations and tests can pursue if fundamental. A Windows Phone application is depicted here fit for perceiving vineyard infections through photographs of the leaves with exactness higher than 90%. This application can without much of a stretch be reached out for various plant maladies and diverse PDA stages.

**Title:** Plant Diseases Recognition for Smart Farming Using bModel-based Statistical Features

**Author:** Chit Su Hlaing, SaiMaungMaungZaw

**Year:** 2017

**Description:**

It has indicated the benefits of GP appropriation model for SIFT descriptor and effectively applied in plant malady grouping. Moreover, it proposed highlight accomplishes a decent trade off among execution and grouping precision. Regardless, the actuality that it proposed highlight can effectively demonstrate the SIFT include and applied in plant maladies acknowledgment, it have to attempt to improve our proposed highlight by considering and collaboration with other picture handling techniques. It inquire about is to identify and classify the

plant malady in agrarian space, by executing picture handling systems. It means to propose a creative arrangement of factual surface highlights for characterization of plant illnesses pictures of leaves. The information pictures are taken by different portable cameras. The Scale-invariant element change (SIFT) highlights utilized as surface component and it is invariant to scaling, pivot, commotion and light. However, the precise numerical model of SIFT surface descriptor is excessively mind boggling and take high processing time in preparing and arrangement.

#### 4. Classification

This segment clarifies the order calculations in AI that are utilized for arranging diseases in plant leaves. Its precision relies on the number of tests taken and differs in accordance with the order calculations utilized. The grouping calculations are partitioned into managed and unattended characterization calculations.

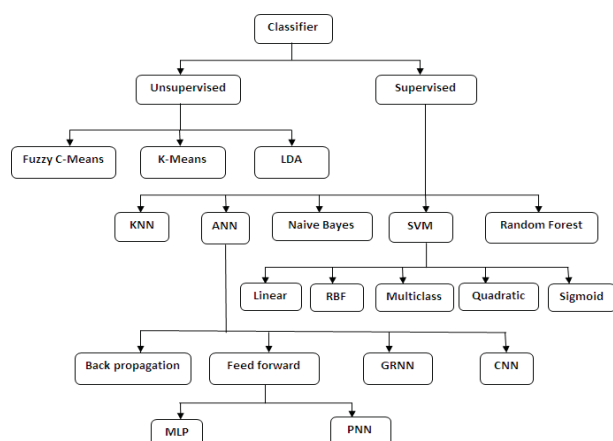


Figure 1: Types of Classification algorithms

#### Unsupervised Classification Algorithms

Fuzzy C-means is an dreary algorithmic program that searches out the bunch focuses that limit a distinction work and to deal with the covered data with productivity. It gives higher winds up in cases any place data is deficient or uncertain, anyway calculation time is longer and it's affectability to clamor. Fuzzy C-means bunch Neural Network[28] comprises of unaided fluffly grouping and administered fake neural systems that encourage in accomplishing extra ideal outcomes with nearly hardly any data sets. K-implies is A dull learning finds the group habitats for each bunch and has no assurance for ideal answer. It's direct to actualize and computationally speedier.

#### Supervised Classification Algorithms

K Nearest Neighbor might be an utilized for applied science estimation and example acknowledgment. It is simple, straightforward, flexible and solid to reedy training information anyway calculation cost is higher. Counterfeit Neural Network utilizes forward engendering

that will be that the core of a neural system. Probabilistic Neural Network might be a feed forward decide that is fantastically speedier and extra right than multilayer perceptron arrange. Summed up Regression Neural Network could be a managed algorithmic guideline utilized for characterization. Convolution Neural Network could be a classification of profound, feed-forward Artificial Neural Network that comprises of information, yield yet as various shrouded layers, convolutional layers, pooling layers, completely associated layers and social control layers. Pooling lessens the spatiality of the choices map by pressure [30] the yield of little locales of neurons into one yield.

#### 5. Proposed System

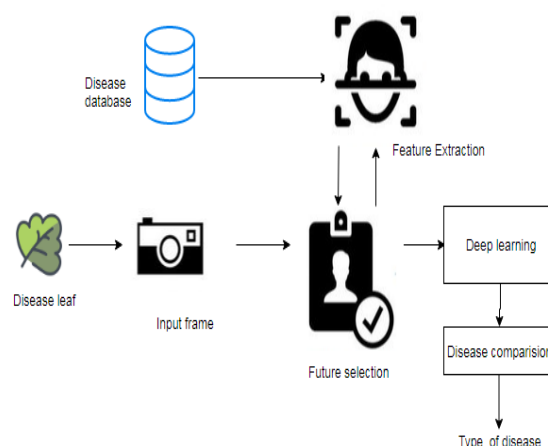


Figure 2: Extraction of diseased plant leaf

- i. To detect the plant leaf diseases and wanted to plan profound learning strategy so an individual with lesser skill in programming ought to likewise have the option to utilize it effectively.
- ii. It proposed system to predicting leaf diseases. It explains about the exploratory examination of our procedure. Samples of images are collected that comprised of different plant diseases like Alternaria Alternata, Anthracnose, Bacterial Blight, Cercospora leaf spot and Healthy Leaves.
- iii. Different number of images is collected for each disease that was classified into database images and input images.
- iv. The primary attributes of the image are relied upon the shape and texture oriented features. The sample screenshots displays the plant disease detection using color based segmentation model.

#### 6. Results and Discussion

It represents the technical implementation in the area of plant disease detection using the technique called image processing. The color, texture and morphological features are most suitable to classify and identify the diseases in plants. The techniques like ANN and SVM are the commonly used classification techniques to find the diseases in plant leaf. This technique helps the farmer to

improve the quality of the crop which helps in improvement of Indian gross domestic product(GDP).

Table 1: Accuracy Values and used Methods

Methods	Accuracy
K-means clustering, basic morphological functions, Naïve Bayesian classifier, color co-occurrence method.	87%
K-means clustering algorithm with SVM, color co-occurrence method.	88.89%
ANN, FUZZY classification, SVM, K-means algorithm, Color co-occurrence method.	94.70%
K-means, GLCM, ANN, SURF, CCM, SVM	95%

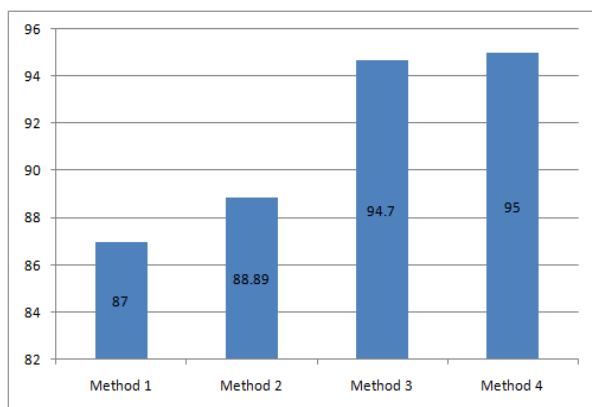


Figure 3: Graph Representation of Accuracy Values

Fig 3 presents the results of all the methods we apply to predict the accurate values. On the basis of accuracy and different methods a graph is plotted with the collected data.

## 7. Conclusion

It focused how image from given dataset (trained dataset) in field and past data set used to predict the pattern of plant diseases using CNN model. This brings some of the following insights about plant leaf disease prediction. As maximum types of plant leaves will be covered under this system, farmer may become acquainted with about the leaf which may never have been cultivated and lists out all possible plant leaves, it helps the farmer in decision making of which crop to cultivate. Also, this framework thinks about the past production of data which will help the farmer get insight into the demand and the cost of various plants in market.

## References

- [1] J. D. Pujari, R. Yakkundimath, and A. S. Byadgi, "Identification and classification of fungal disease affected on agriculture/horticulture crops using image processing techniques," IEEE International Conference on the Computational Intelligence and Computing Research, 2014.
- [2] Balasubramanian Vijayalakshmi and Vasudev Mohan, "Kernel based PSO and FRVM: An automatic plant leaf type detection using texture, shape and color features," Computer and Electronics in Agriculture, vol. 125, pp. 99-112, 2016.
- [3] X. Wang, M. Zhang, J. Zhu and S. Geng, "Spectral prediction of Phytophthora infestans infection on tomatoes using artificial neural network (ANN)," International Journal of Remote Sensing, pp. 1693– 1706, 2008.
- [4] Dong Pixia and Wang Xiangdong, "Recognition of Greenhouse Cucumber Disease Based on Image Processing Technology," Open Journal of Applied Sciences, vol. 3, pp. 27-3, Mar. 2013.
- [5] S. Arivazhagan, R. Newlin Shebiah, S. Ananthi and S. Vishnu Varthini, "Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features," Commission Internationale du Genie Rural(CIGR) journal, vol. 15, no. 1, pp. 211217, 2013.
- [6] Harshal Waghmare, Radha Kokare and Yogesh Dandawate, "Detection and Classification of Diseases of Grape Plant Using Opposite Colour Local Binary Pattern Feature and Machine Learning for Automated Decision Support System," 3rd International Conference on Signal Processing and Integrated Networks (SPIN), 2016.