MANTECH Publications

Journal of Artificial Intelligence, Machine Learning and Soft Computing
Volume 7, Issue 1, January-June 2022

Image based Plant Leaf Disease Identification by Support Vector Machine Learning Technique

Anju Rani[1], Dr. Avinash Sharma[2]
Research Scholar[1], Professor[2]
Department of CSE
Millennium Institute of Technology and Science, Bhopal, India1
Email ID: *researcheye11@gmail.com*

Abstract

Artificial Intelligence offers vast opportunities for application in agriculture; there still exists a lack of familiarity with high tech machine learning solutions in farms across most parts of the world. AI systems also need a lot of data to train machines and to make precise predictions. Tomatoes (Solanum lycopersicum) can be grown on almost any moderately well-drained soil type. This research presents an image based plant leaf disease identification by support vector machine learning technique. Simulation is performed using Python sypder 3.7 version. The overall accuracy is achieved 98% in different plant leaf disease identification.

Keywords: *Sypder, Python, Accuracy, AL, Plant, Disease, Machine Learning.*

INTRODUCTION

The agri-e-number cruncher as a shrewd application assist the brilliant farmer with picking the most appropriate crop and reasonableness dependent on a few reliance factors. The farmer can utilize the savvy number cruncher and simply pick the ideal crop to be developed over his favored inclusion space of homestead. Then, at that point any remaining required data sources dependent on different reliance factors are naturally distinguished and taken by the e-adding machine and gives the assessment results. This yield result gives valuable information on assessment of manures cost/amount, water, seeds, development hardware cost and Work Day endeavors/cost with Work Day exertion circulation on schedule graph of crop life cycle, crop yield alongside extrapolated market cost at the gather time and its productivity. All the required sources of info which are both direct and non-straight in nature are taken by farmer's information base, outer data sources referenced before. The sources of info get prepared by machine learning strategies and produce the assessment with achievability concentrate so the farmer can pick the ideal crop for development.

The crop care administration direction traverses directly from the planting of seeds as start point till the hour of gathering as endpoint.

The complex Organized information examined from IoT sensors from the fields are investigated alongside the information gathered from wellsprings of data locales alongside domain master inputs any place required through Artificial Intelligence methods. After the investigation of complete information, the general restorative thing to do is inferred out of PID (Corresponding Indispensable and Differential) regulator instrument. In like manner, the restorative measures are made aware of the farmer on their PDA to focus on the activity dependent on seriousness and desperation

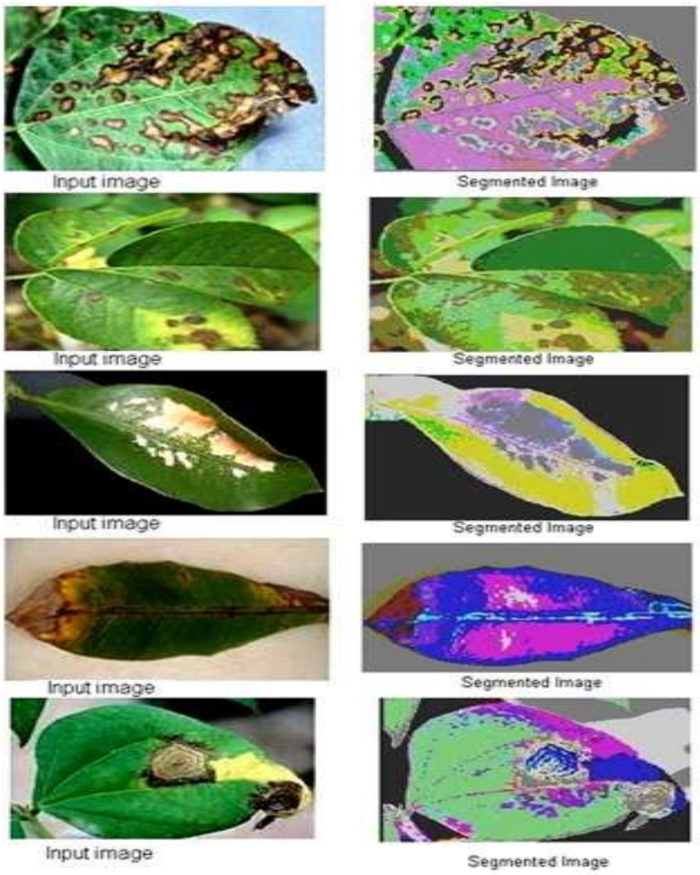

Figure 1: Diseased image with segmented image

Artificial Intelligence offers vast opportunities for application in agriculture; there still exists a lack of familiarity with high tech machine learning solutions in farms across most parts of the world. Exposure of farming to external factors like weather conditions, soil conditions and presence of pests is quite a lot. AI systems also need a lot of data to train machines and to make precise predictions.

METHODOLOGY

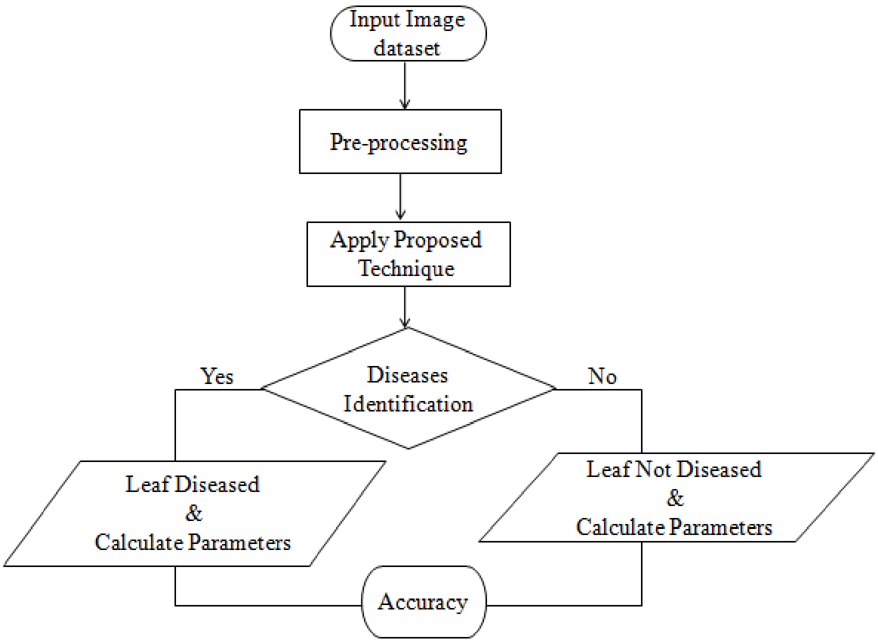

Figure 2: Flow Chart

The proposed methodology is based on the following sub modules-

- Data Selection and Loading
- Data Preprocessing
- Feature Extraction & Feature Optimization
- Splitting Dataset into Train and Test Data
- Classification
- Prediction
- Result Generation

Data Selection and Loading

- The data selection is the process of selecting the data in form of image for detecting the plant spices.
- In this research, the random dataset is used for detecting the plant disease.

Data Preprocessing

- Data pre-processing is the process of removing the unwanted data from the dataset.
- Missing data removal

- Encoding Categorical data
- Missing data removal: In this process, the null values such as missing values and Nan values are replaced by 0.
- Missing and duplicate values were removed and data was cleaned of any abnormalities.
- Encoding Categorical data: That categorical data is defined as variables with a finite set of label values.
- That most machine learning algorithms require numerical input and output variables.

Feature Extraction & Feature Optimization

Spider Monkey Optimization (SMO) is a global optimization algorithm inspired by Fission-Fusion social (FFS) structure of spider monkeys during their foraging behavior.

Classification: Support Vector Machine

Support Vector Machine (SVM) is a supervised calculation that can classify cases by isolating an informational index into at least two classes using a separator. SVM works by: Mapping information to a high-dimensional component space so that information points can be sorted (kernelling), in any event, when the information are not otherwise linearly separable.

SIMULATION AND RESULT DISCUSSION

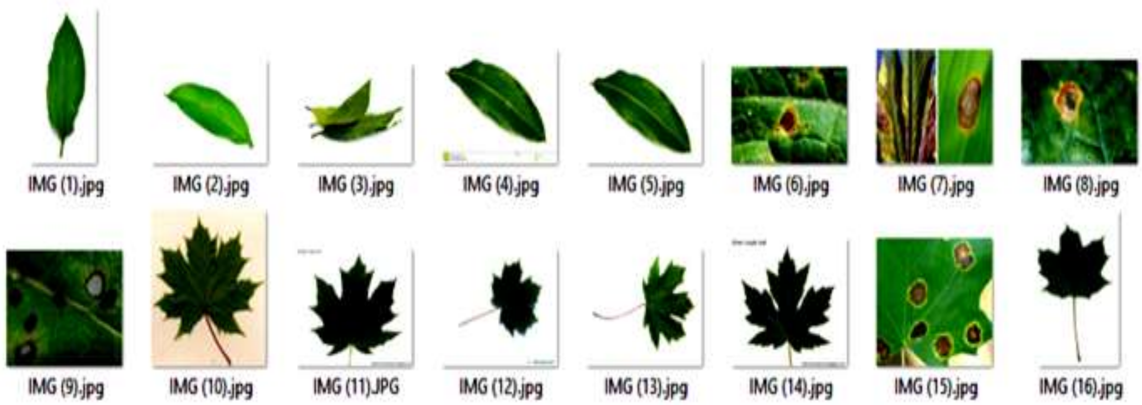

Figure 3: Sample of dataset

Figure 3 is showing the plant leaf image input data. Total 32 images taken with 7 different disease, which includes tomato, banana, ginger, mango, norway maple, onion and paper mulberry.

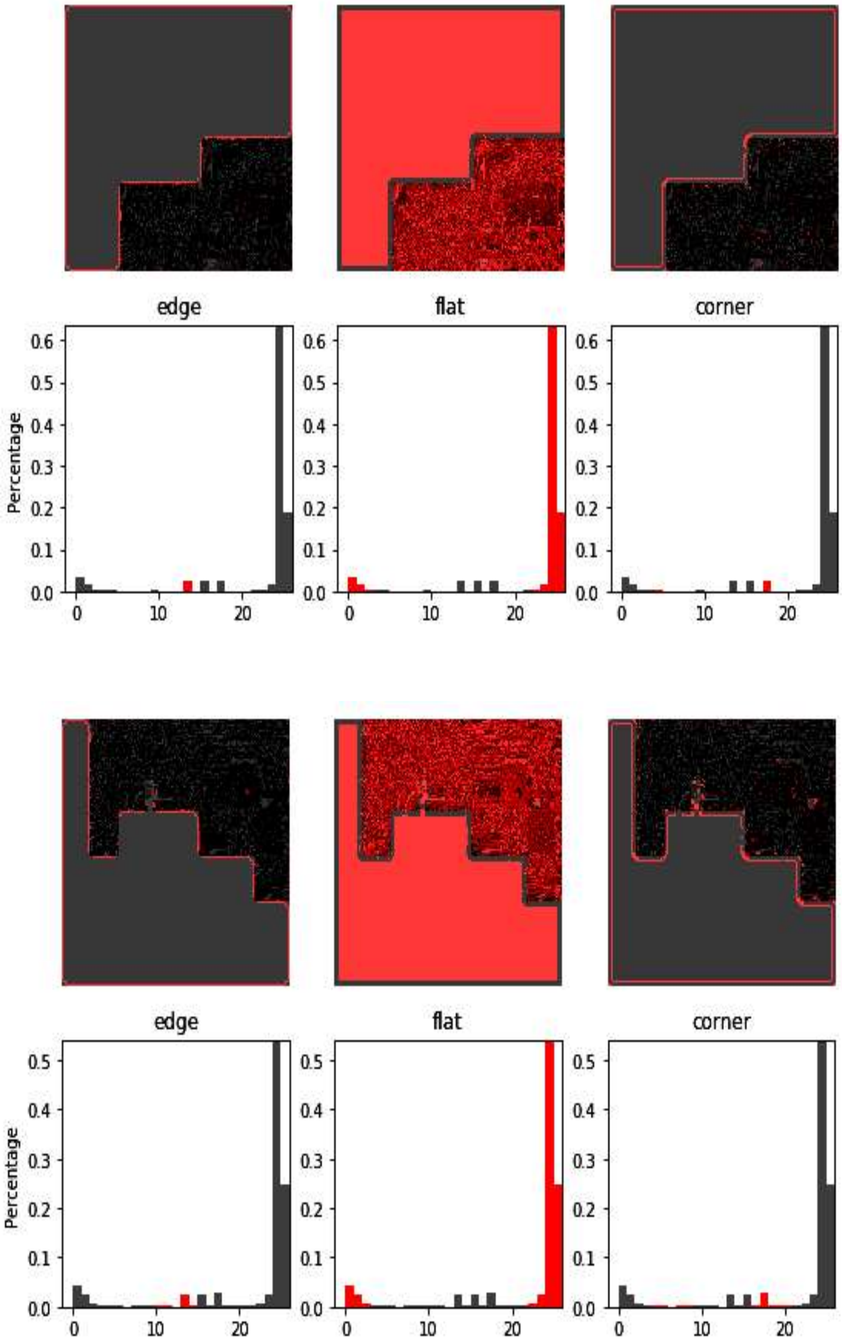

Figure 4: Training of image data

This image data trained by using the image features in terms of edge, flat corner, due to training its learn about various edges, flats and corners at different texture.

Figure 5: Tomato Leaf input original image

Table 1: Simulation Result

Sr. No.	Parameters	Values (%)
1	Accuracy	98
2	Classification error	2
3	Precision	100
4	Recall	96
5	F-measure	97
6	Sensitivity	96
7	Specificity	100

Table 1 is presenting simulation parameters value, which is calculated by the following standard formula-

Precision = True Positive/(True Positive + False Positive)

Recall = True Positive/(True Positive + False Negative)

F1-Score = 2x (precision x recall)/(precision + recall)

Accuracy = (TP + TN)/(TP + TN + FP + FN)

Error Rate = 100 – Accuracy

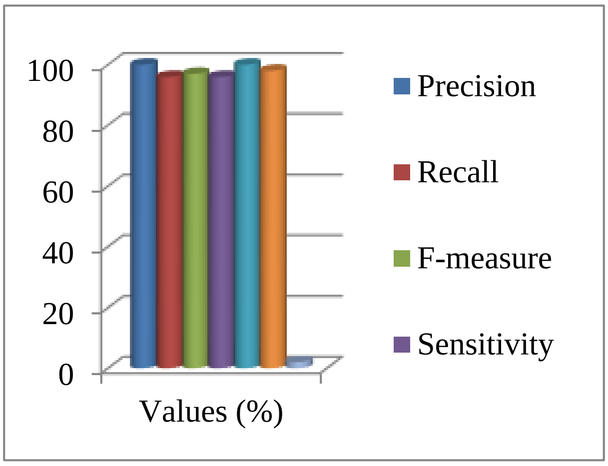

Figure 6: Comparison graph

Table 2: Result comparison

Sr No.	Parameters	Previous Work [1]	Proposed Work
1	Method	Restructured residual dense network model	SVM and SMO
2	Accuracy (%)	95	98
3	Error Rate (%)	5	2

Table 2 is showing the results parameters comparison of the previous work and the proposed work. The accuracy achieved by the proposed approach is 98% while previous it is 95%.

CONCLUSION

This research proposed an adaptive machine learning approach for image based plant leaf disease identification with performance improvement. The spider monkey optimization and support vector machine is used to optimize and identified the plant decease prediction. The accuracy achieved by the proposed approach is 98% while previous it is 95%. Error rate is 2% by the proposed work while 5% by the previous work. Therefore proposed methodology achieved better result than the existing results.

REFERENCES

1. C. Zhou, S. Zhou, J. Xing and J. Song, “Tomato Leaf Disease Identification by Restructured Deep Residual Dense Network,” in IEEE Access, vol. 9, pp. 28822-28831, 2021, doi: 10.1109/ACCESS.2021.3058947.

2. P. K. V, E. G. Rao, G. Anitha and G. K. Kumar, "Plant Disease Detection using Convolutional Neural Networks," 2021 5th International Conference on Trends in Electronics and Informatics (ICOEI), 2021, pp. 1473-1476, doi: 10.1109/ICOEI51242.2021.9453045.

3. D. Varshney, B. Babukhanwala, J. Khan, D. Saxena and A. k. Singh, "Machine Learning Techniques for Plant Disease Detection," 2021 5th International Conference on Trends in Electronics and Informatics (ICOEI), 2021, pp. 1574-1581, doi: 10.1109/ICOEI51242.2021.9453053.

4. C. S, S. Ghana, S. Singh and P. Poddar, "Deep Learning Model for Image-Based Plant Diseases Detection on Edge Devices," 2021 6th International Conference for Convergence in Technology (I2CT), 2021, pp. 1-5, doi: 10.1109/I2CT51068.2021.9418124

5. P. Kanade and J. P. Prasad, "Machine Learning Techniques in Plant Conditions Classification and Observation," 2021 5th International Conference on Computing Methodologies and Communication (ICCMC), 2021, pp. 729-734, doi: 10.1109/ICCMC51019.2021.9418386.

6. H. D. Gadade and D. K. Kirange, "Machine Learning Based Identification of Tomato Leaf Diseases at Various Stages of Development," 2021 5th International Conference on Computing Methodologies and Communication (ICCMC), 2021, pp. 814-819, doi: 10.1109/ICCMC51019.2021.9418263.

7. K. Kirti, N. Rajpal and J. Yadav, "Black Measles Disease Identification in Grape Plant (Vitis vinifera) Using Deep Learning," 2021 International Conference on Computing, Communication, and Intelligent Systems (ICCCIS), 2021, pp. 97-101, doi: 10.1109/ICCCIS51004.2021.9397205.

8. Deepa, R. N and C. Shetty, "A Machine Learning Technique for Identification of Plant Diseases in

Leaves," 2021 6th International Conference on Inventive Computation Technologies (ICICT), 2021, pp. 481-484, doi: 10.1109/ICICT50816.2021.9358797.

9. X. Li and L. Rai, "Apple Leaf Disease Identification and Classification using ResNet Models," 2020 IEEE 3rd International Conference on Electronic Information and Communication Technology (ICEICT), 2020, pp. 738-742, doi: 10.1109/ICEICT51264.2020.9334214.

10. S. Kumar, K. Prasad, A. Srilekha, T. Suman, B. P. Rao and J. N. Vamshi Krishna, "Leaf Disease Detection and Classification based on Machine Learning," 2020 International Conference on Smart Technologies in Computing, Electrical and Electronics (ICSTCEE), 2020, pp. 361-365, doi:10.1109/ICSTCEE49637.2020.9277379.