



## An Adaptive Model to Classify Plant Diseases Detection using KNN

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### ABSTRACT

Fungi and bacteria can interact synergistically to stimulate plant growth through a range of mechanisms that include improved nutrient acquisition and inhibition of fungal plant pathogens. These interactions may be of crucial importance within sustainable, low-input agricultural cropping systems that rely on biological processes rather than agrochemicals to maintain soil fertility and plant health. Although there are many studies concerning interactions between fungi and bacteria, the underlying mechanisms behind these associations are in general not very well understood, and their functional properties still require further experimental confirmation. This proposal is about automatic detection of Fungi diseases and diseased part present in the leaf images of plants and even in the agriculture Crop production. It is done with advancement of computer technology which helps in farming to increase the production. Mainly there is problem of detection accuracy and in neural network approach support vector machine (SVM) is already exist. In this research proposal, we have discussed the various advantages and disadvantage of the plant Fungi diseases prediction techniques and proposed a novel approach (KNN) for the detection algorithm, a framework of our proposed work is given in this proposal and methodology is included.

**Keywords:** SVM, Enhanced SVM, PCA, KNN Approach, Training Dataset, Train Dataset

### INTRODUCTION

Image classification is aimed at labelling an image into semantic categories such as room, office, mountain, plants etc. It is an important task to classify, organize and understand thousands of images efficiently. Image classification is highly valuable in remote navigation also When some diseases are not visible to naked eye but actually they are present, then it is difficult to detect it with the naked eye. Detection and recognition of diseases in plants using machine learning is very fruitful in providing symptoms of identifying diseases at its earliest [5].

**Plant diseases and its symptoms:** - Detection of plant disease and assessment of the amount on individual plants or in plant populations is required where crop loss must be related to disease, for plant disease surveys.

**Bacterial disease symptoms:**-Bacterial diseases include any type of disease caused by bacteria. Bacteria are a type of microorganism, which are in tiny forms of life that can only be seen with a microscope.

**Fungal disease symptoms:**-Various fungi in the environment cause various types of fungal diseases to the plants. Large number of fungi is not of dangerous types but few types can cause various types of diseases in plant leaves [11].

**Machine learning:**- Machine learning is a scientific discipline of exploring the construction and study

of techniques that allow computer programs to learn from data without explicitly programmed. Machine learning is of two types:-

**Supervised learning :-** In supervised learning, the outputs can be real numbers in regression or class labels in classification. Supervised learning is where you have input variables (X) and an output variable (Y) and you use an algorithm to learn the mapping function from the input to the output.

$$Y = f(X)$$

**Unsupervised learning:** - Unsupervised learning is where you only have input data (X) and no corresponding output variables. The goal for unsupervised learning is to model the underlying structure or distribution in the data in order to learn more about the data.

**Classification techniques:** - Some of the classification techniques used is k-Nearest Neighbor Classifier, Support Vector Machine, ANN (Artificial neural network) and others. In agriculture plant leaf disease classification has wide application in agriculture [14].

**K-nearest Neighbor** K Nearest Neighbor (KNN from currently on) is one in all those algorithms that are terribly easy to know but works unbelievably well in apply. KNN is a non-parametric lazy learning algorithmic program.

**Support Vector Machine** SVM is supervised machine learning approach specifically designed for pattern matching.

**Artificial Neural Network (ANN)** An Artificial Neuron is basically an engineering approach of biological neuron. ANN consists of a number of nodes, called neurons.

**Performance Measures:** - In this paper explains the performance parameters utilized for the purpose of evaluation of the results proposed model.

**Table 5.1: Hypothesis decision parameter entities in type 1 and 2 errors**

	Doesn't Have The Condition (Satisfies Null Hypothesis)	Has The Condition (Does Not Satisfy Null Hypothesis)
<b>Tests Negative (Null Accepted)</b>	True Negative TN or $n_{00}$	False Negative FN or $n_{10}$
<b>Tests Positive (Null Rejected)</b>	False Positive FP or $n_{01}$	True Positive TP or $n_{11}$

Statistical parameters to measure the statistical errors (Type 1 and Type 2) are measured in order to evaluate the overall performance of the proposed model by evaluating the samples by the means of the programming or the manual binary classification. The proposed model evaluation is entirely based upon this statistical analysis.

**True Positive:-**The individual has the condition and tests positive for the condition. It is symbolically defined as  $A = \text{True Positive}$

**True Negative:-**The individual does not have the condition and tests negative for the condition. The individual satisfies the null hypothesis and the test accepts the null hypothesis and symbolically defined as  $B = \text{True Negative}$

**False Positive:-**The individual does not have the condition but tests positive for the condition. The individual satisfies the null hypothesis but the test rejects the null hypothesis and it is symbolically defined as  $C = \text{False Negative}$

**False Negative:-**The individual has the condition but tests negative for the condition the individual does not satisfy the null hypothesis but the test accepts the null hypothesis. It is symbolically defined as  $D = \text{False Positive}$

**Accuracy:-**The percentage of the result success out of the whole results is called accuracy. Accuracy is also known as success rate.

$$\text{Accuracy} = (\text{Correct Results} / \text{Total Results}) * 100$$

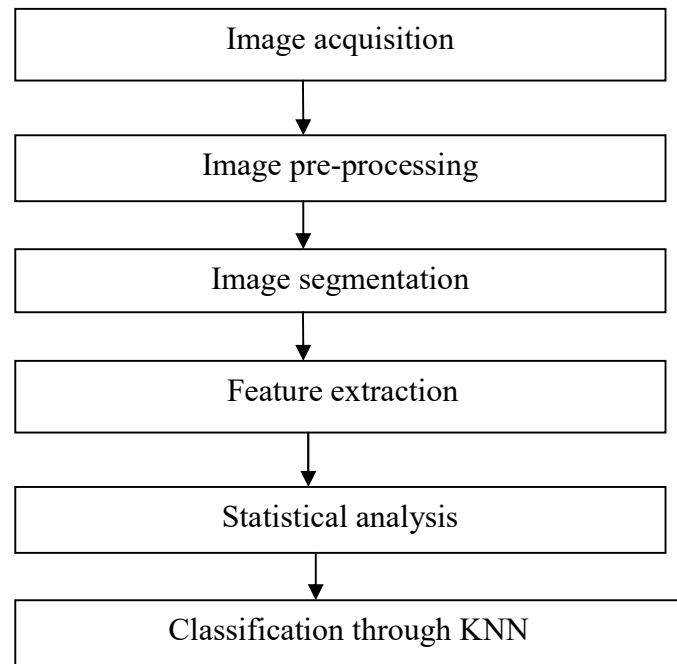
**Proposed approach:** -Indoor scene classification system involves various steps like feature extraction, feature selection, feature vector generation, training and classification

Training data set and testing data set. The training data set are divided into 80% and rest of 20% is test data set.

**Machine learning classifier:**-In this step KNN classifier apply.

Performance parameter: - In this measure apply to check the performance in terms of accuracy.

**Implementation:**-The system begins with the image acquisition process in which the image is loaded in the MATLAB, which has to be used with the new algorithm. The background features extraction method is used to detect and extract the features from the image to perform the further computations. The feature descriptor has to be perfectly fetched out of the loaded image to get the better results. The disease recognition is the process used to identify the disease type by analyzing their feature properties automatically using computer driven algorithms. The KNN mechanism has been used for the disease classification on the basis of training feature set for disease recognition process.



**Fig.4.1 Description of the leaf disease classification phases**

**Data preparation phase**

The data preparation phase involves the gathering the leaf image dataset from available sources. The actual design of the system starts with gathering data for experimentation. The collected images are then transformed into an appropriate format suitable for system design,

**Feature extraction**

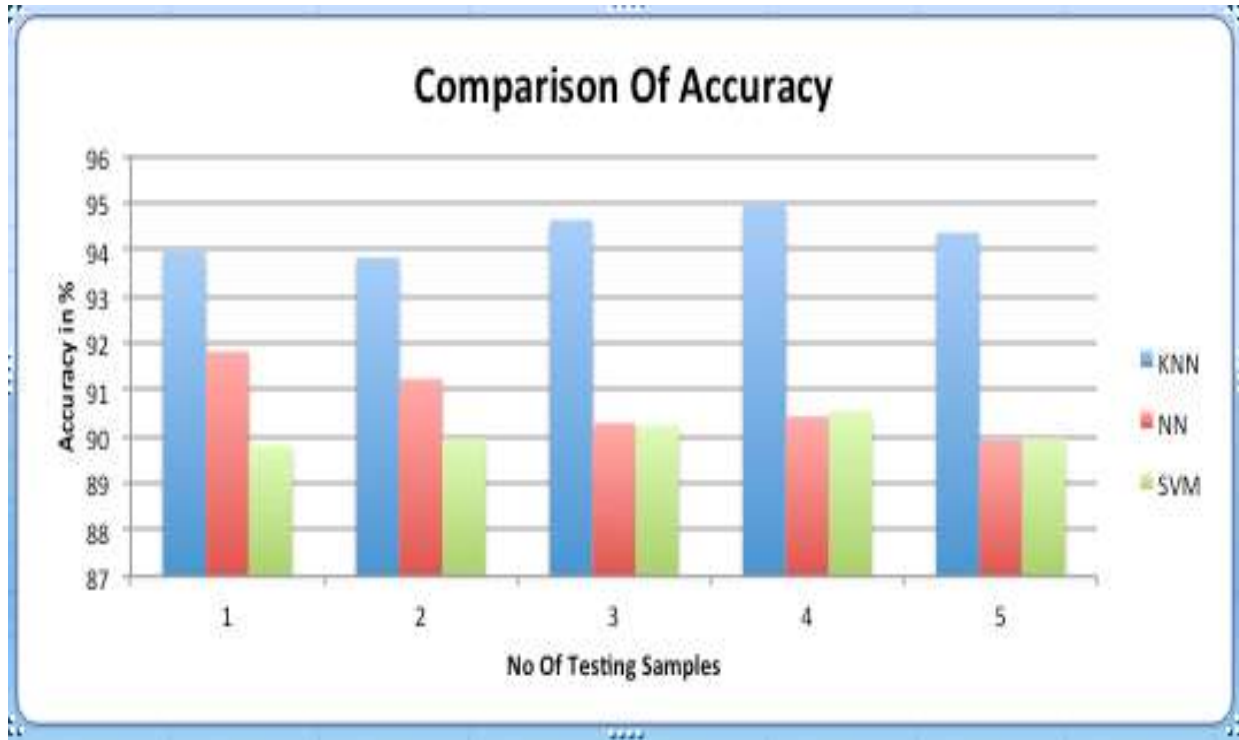
The following is the feature matching and classification algorithm for matching the extracted plant disease image with the different images of same plant, which are taken at different times, from different viewpoints, or by different sensors.

**Training and Testing:**-Firstly, data set spilt into two parts:-

**Result Analysis:** -The results have been obtained from the various experiments conducted over the proposed model. The training dataset has been classified into two primary classes, which primarily defines the given image is verified and the decision logic is returned with the detected category type.

**Table 5.2 Comparison of different classifiers w.r.t accuracy**

Sr. No.	KNN	NN	SVM
1	93.95	91.82	89.8
2	93.83	91.23	89.94
3	94.63	90.28	90.23
4	94.96	90.42	90.54
5	94.36	89.91	89.95

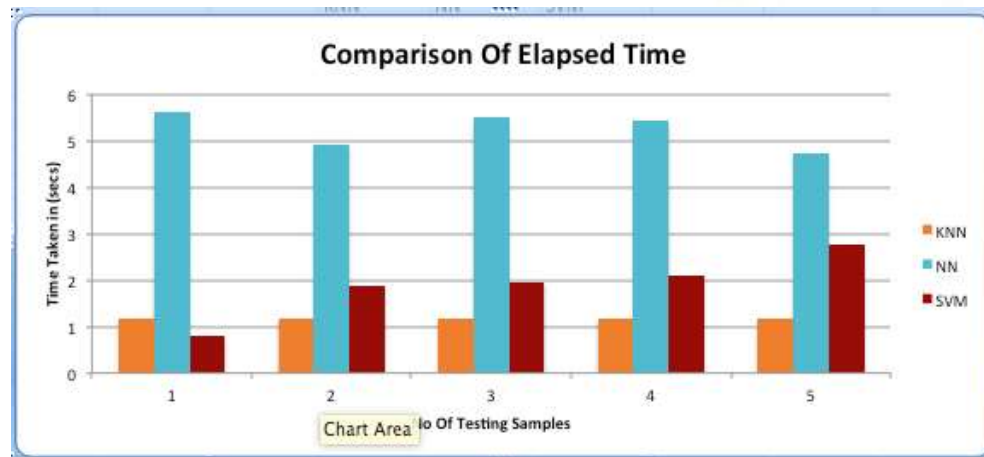


**Fig.5.1 Accuracy Comparison**

Above chart shows the results of accuracy for all different three classifiers and the results. have been obtained by testing the system over dataset many times. And the results have proven that proposed model is far better than other two classifiers that mean the proposed model is more accurate than previous systems.

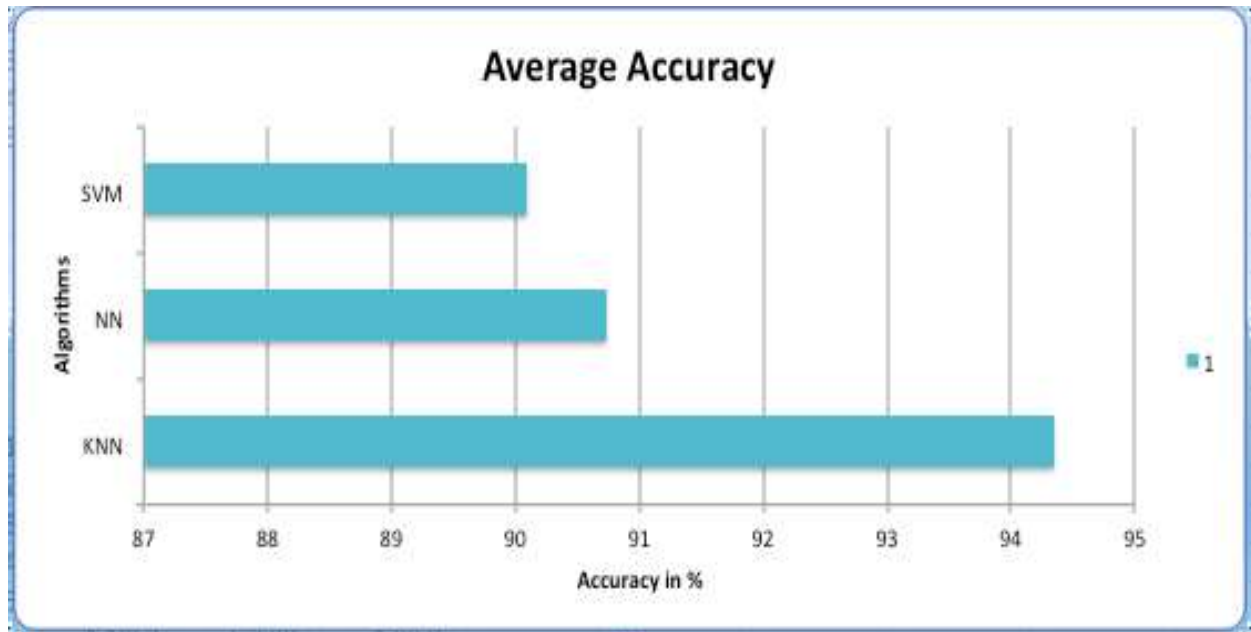
**Table 5.3 Comparison of different classifiers w.r.t time**

Sr. No.	KNN	NN	SVM
1	1.185	5.611	0.807
2	1.19	4.923	1.876
3	1.187	5.513	1.965
4	1.181	5.412	2.105
5	1.183	4.734	2.765



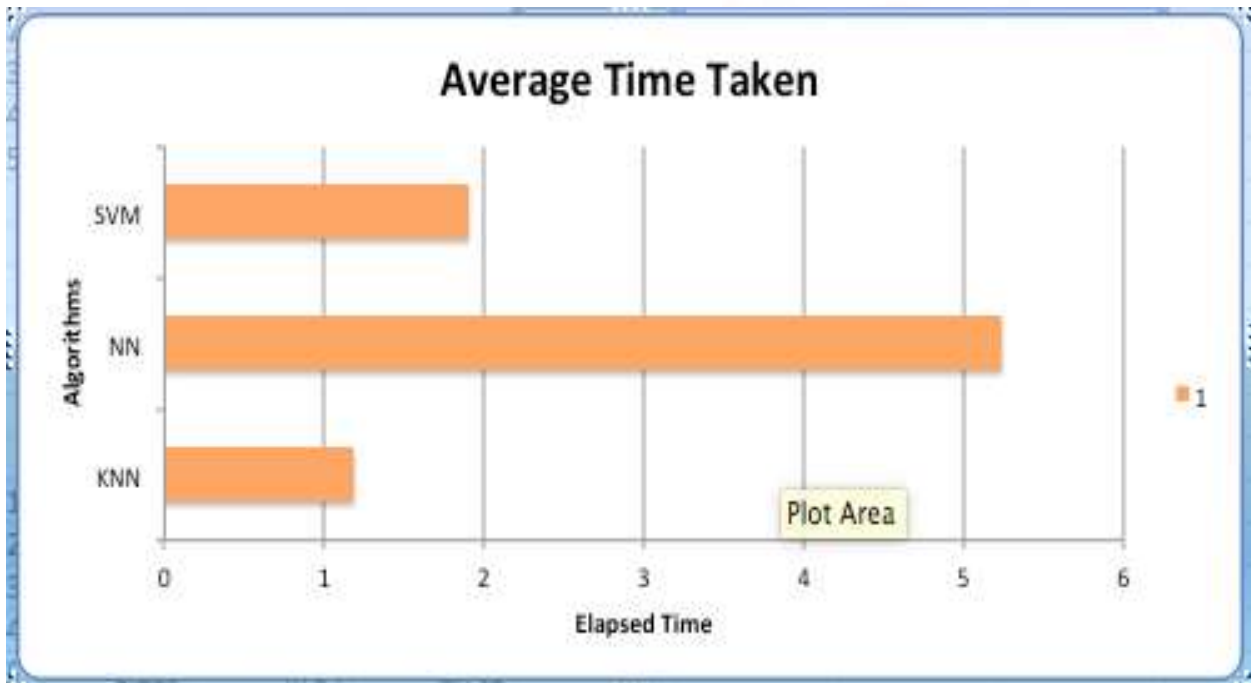
**Fig. 5.2 Total Time Taken By all Three Classifiers**

The above comparison chart for elapsed time for processing and categorize the disease found in the testing image and the results show that KNN has taken less time for computation. It means KNN is faster as comparison to NN and SVM.



**Fig.5.3 Average Accuracy Comparison**

This chart shows the results of average accuracy performed in testing phase.



**Fig.5.4 Average Elapsed Time**

Above graph represents the average time taken by each system in the testing phase.

**Conclusion:** The proposed work is about programmed location of infections and unhealthy part display in the leaf pictures of plants and even in the

agribusiness crop generation. In this exploration work, we will go to examine the different favorable circumstances and disservice of the plant infections forecast procedures and going to propose a novel approach for the recognition calculation. KNN classifier obtains highest result as compared to SVM.

The comparison will be done on accuracy and detection time based parameters and will show that KNN is better than existing SVM. A novel approach for disease prediction of plants based on classification technique is proposed.

**Future Scope:** In the future the proposed model can be improved by using the hybrid low level feature extracted along with the efficient color illumination to find the dual-mode attacks over the images to determine the plant disease in the image data. Also the swarm intelligent algorithm can be utilized for the plant disease recognition in the digital image dataset. Further speed could be focused.

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