**VISVESVARAYA TECHNOLOGICAL UNIVERSITY**

**Jnana Sangama, Belagavi-590018, Karnataka**

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**A PHASE-I PROJECT REPORT**

ON

**“Debility in Plants and Fruit Quality Detection”**

*Submitted in partial fulfillment of the requirements for the award of degree of Bachelor of Engineering in*

**COMPUTER SCIENCE & ENGINEERING**

Submitted by

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**An Autonomous Institute**

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**2020-21**



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**CERTIFICATE**

This is to certify that phase I of the project work, entitled “**Debility in Plants and Fruit Quality Detection”** is a bona fide work carried out by

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in partial fulfillment for the award of degree of Bachelor of Engineering in Computer Science & Engineering of the Visvesvaraya Technological University, Belagavi during the academic year 2020-21. It is certified that all the corrections/suggestions indicated for internal assessment have been incorporated in the report. The project report has been approved as it satisfies the academic requirements.

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**DECLARATION**

We, **Kavindra Yadav, Kola Ganesh and Kundan Kumar** hereby declare that the entire phase-I work of the project titled **“Debility in Plants and Fruit Quality Detection”** embodied in this project report has been carried out by us during the 7th semester of BE degree at MVJCE, Bangalore under the esteemed guidance of **Vidyashre DM,** Assistant Professor, Dept. of CSE, MVJCE affiliated to Visvesvaraya Technological University, Belagavi. The work embodied in this dissertation work is original and it has not been submitted in part or full for any other degree in any University.

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**ABSTRACT**

Identification of plant disease and detecting the fruit quality is very difficult in agriculture field. If identification is incorrect then there is a huge loss on the production of crop and economical value of market. Leaf disease detection requires huge amount of work, knowledge in the plant diseases and fruits, and also require the more processing time. So we can use CNN for identification of leaf disease and fruit quality detection. Training of the models will be performed with the use of an open database of 87,848 images, containing 25 different plants in a set of 58 distinct classes of [plant, disease] combinations, including healthy plants.

The reference papers that we are referring to detect only the leaves disease using SVM (Support vector machines). They do not detect the quality of the fruit. We are using CNN (Convolution Neural Network) technique to find the leaf disease and detect the fruit quality.  Convolutional Neural Networks have shown remarkable performance in different recognition and classification tasks. By the application of this approach, we aim to propose a solution for an effective and accurate system that not only achieves better recognition rate than traditional computer vision algorithms, but also detects the fruit quality.

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**Chapter 1**

**INTRODUCTION**

Plant disease diagnosis through optical observation of the symptoms on plant leaves, incorporates a signiﬁcantly high degree of complexity. Due to this complexity and to the large number of cultivated plants and their existing phytopathological problems, even experienced agronomists and plant pathologists often fail to successfully diagnose speciﬁc diseases, and are consequently led to mistaken conclusions and treatments. The existence of an automated computational system for the detection of plant diseases and fruit quality, would oﬀer a valuable assistance to the agronomist who is asked to perform such diagnoses through optical observation of leaves of infected plants. If the system was simple to use, it could also be a valuable tool for farmers in parts of the world lacking the appropriate infrastructure for the provision of agronomic and phytopathological advice. In addition, in the case of large-scale cultivations, the system could be combined with autonomous agricultural vehicles, to accurately and timely locate phytopathological problems throughout the cultivation ﬁeld, using image capturing. All these are, of course, valid under the condition that the system could achieve high levels of performance in detecting and diagnosing speciﬁc diseases in real-life conditions (i.e., in the cultivation ﬁeld), and that it could be operated through an appropriate and easy-to-use.

With the development of computational systems in recent years, and in particular Graphical Processing Units (GPU) embedded processors, Machine Learning-related Artiﬁcial Intelligence applications have achieved exponential growth, leading to the development of novel methodologies and models, which now form a new category, that of Deep Learning. Deep learning refers to the use of artiﬁcial neural network architectures that contain a quite large number of processing layers, as opposed to “swallower” architectures of more traditional neural network methodologies. The now computationally feasible deep learning models have revolutionized sectors such as image recognition, voice recognition, and other similarly complex processes that deal with the analysis of large volumes of data, giving a huge boost to applications that use these processes, like, e.g. self-driving vehicles, machine translation and interpretation, etc.

The introduction of these deep learning techniques into agriculture, and in particular in the ﬁeld of plant disease diagnosis, has only begun to take place in the last couple of years, and to a rather limited extent.

The basic deep learning tool going to be used in this work is Convolutional Neural Networks (CNNs). CNNs constitute one of the most powerful techniques for modeling complex processes and performing pattern recognition in applications with large amount of data, like the one of pattern recognition in images presented a CNNs system for the automated recognition of plants, based on leaves images.

**Chapter 2**

**LITERATURE SURVEY**

* 1. **A review on diagnosis of nutrient deficiency symptoms in plant leaf image using image processing**

**AUTHORS:** S.jeylakshmi and R.radha

Plants and crops require 13 essential mineral nutrients to grow and survive. They acquire these nutrients from the soil. Deficiency of these nutrients affects the growth and quality of the plant/crop. Thus, diagnosing nutrient status of minerals plays a crucial role in agriculture and farming. Nutrient deficiency symptoms in plants/crops would normally be visible in leaves. These symptoms include interveinal chlorosis, marginal chlorosis, uniform chlorosis, necrosis, distorted edges, reduction in size of the leaf etc. Even though similar symptom present in old and young leaves, the deficient nutrient may vary.

The existing methods focus on diagnosing macro nutrient deficiencies Nitrogen, Phosphorous and Potassium etc. This paper does not suggest any algorithm to find the diseases in plants leaves and inspect the quality of the fruits. They have compared various methods used in diagnosing nutrient deficiency symptoms in plants/crops like Histogram Equalization, Multivariate Partial Least Square Method. There is clear idea of which algorithm to be used to detect the leaves diseases and the quality of the fruit.

* 1. **Automatic recognition of plant leaves diseases based on serial combination of two SVM classifiers**

**AUTHORS:** Youssef Es-saady, Ismail El Massi, Mostafa El Yassa, Driss Mammass Abdeslam Benazoun

The concept SVM for classification is used in this system. **SVM** does not perform very well when the data set has more noise .This work finds out the computer system which analyzed the input images using the RGB pixel counting value. This work finds out the computer system which analyzed the input images using the RGB pixel counting values features used and identify disease wise and next using homogenization techniques, Sobel and Canny using edge detection to identify the affected parts of leaf spot. Canny edge detector is that it is time consuming, due to its complex computation. Result is recognition of only plant diseases with low efficiency.

* 1. **Deep Neural Networks Based Recognition of Plant Diseases by Leaf Image Classification**

**AUTHORS:** Sladojevic, Srdjan, Marko Arsenovic, Andras Anderla,Dubravko Culibrk, Darko Stefanovic

The authors have presented the concept of deep convolution neural network (CNN) and fine tuning for the identification of plant leaf diseases. Authors have only considered thirteen different types of dataset images with healthy leaf images for the experimentation. Deep learning based Caffe framework has been used along with the set of weights learned on a very large dataset by authors. One problem that is cited with Caffe is the difficulty to implement new layers. The core of framework developed in C++ and provides command line, Python, and MAT LAB interfaces. Authors have used the 10fold cross validation test for the accuracy assessment. There is a disadvantage because the cross validation process can become a lengthy one. It depends on the number of observations in the original sample.

* 1. **Performance Analysis of Support Vector Machine in Defective and Non Defective Mangoes Classification**

**AUTHORS:** NeerajKumari, DAshutosh Kr. Bhatt, Rakesh Kr. Dwivedi, Rajendra Belwal‖

SVM is used for mangoes classifications for defective and non-defective cases. Here FCM and K-Means algorithms are also used. The drawback of FCM clustering is that its objective function does not take into consideration any spatial dependence among pixels of image and membership function is mostly decided by d(xk,vi). But for FCM, SVM classification results are not so good.SVM is used only for one fruit detection. Accuracy obtained using SVM technology is only 86%.This is better than Faster Region based CNN and ANN, but through CNN we can try getting better results.

* 1. **Using Deep Learning for Image-Based Plant Disease Detection**

**AUTHORS:** Mohanty, Sharada P., David P. Hughes, and Marcel Salathé

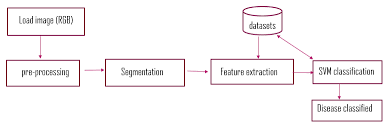
Deep learning based architecture of Alex Net and Google Net have been considered. The depth of Alexnet model is very less and it takes more time to achieve higher accuracy results compared to future models. The limit of divergence of inception module in Google net is less. Training mechanism of transfer learning and training from scratch approaches had been used. Approach is limited to applied dataset and presented approach is not able to detect the leaf diseases if the leaf side changed apart from the front area. The training of the model takes a lot of time (multiple hours on a high performance GPU cluster computer). The model's accuracy is reduced substantially, to just above 31%.

**Chapter 3**

**PROBLEM IDENTIFICATION & PROPOSEDSOLUTION**

**3.1 Existing System**

Adaptive Histogram Equalization was used for improvising the contrast and edges in the input picture. In this approach enhancement characteristic is implemented on over all community pixels and transformation function is derived. Support vector machines were employed for classification of the disease. The SVM classifiers are trained using the images and disease types in the dataset. The features, dataset, and the type of the disease is given as input to the SVM classifier to train and test the data.



**Fig 3.1** Existing system architecture

**3.2 Disadvantages of Existing System**

As mentioned in the above method, Support Vector Machines is being used for classification of diseases. SVM algorithm has several key parameters that need to be set correctly to achieve the best classification results for any given problem. It is effective in that cases where number of dimensions is greater than the number of samples. But this algorithm is not suitable for large data sets because it needs much time for training. It differentiates the two classes appropriately. But it does not perform very well, when the data set has more noise. Besides the support vector classifier works by placing data points, above and below the classifying hyper plane there is no probabilistic explanation for the classification.

**3.3 Proposed System**

The proposed method does not use SVM technique. In the proposed system, New Method uses CNN (Convolutional Neural Network) algorithm as it is more powerful algorithm for classifications. Convolutional Neural Networks have a different architecture. Here every layer is made up of a set of neurons, where each layer is fully connected to all neurons in the layer before. Finally, there is an architecture i.e. a last fully-connected layer — the output layer — that represent the predictions process and obtain the result. The result is displayed to the user through the web interface itself. CNN (Convolutional Neural Network) algorithm is more powerful algorithm for classifications. CNN involves various classes for classifications compared to SVM where classification results are also so good. Besides CNN minimizes the hyper parameters used in the algorithm. As a result it needs not much time for training. The training and testing accuracy of CNN is very high compared to SVM method. That means it is relatively simple, quick to train, and easy to understand.

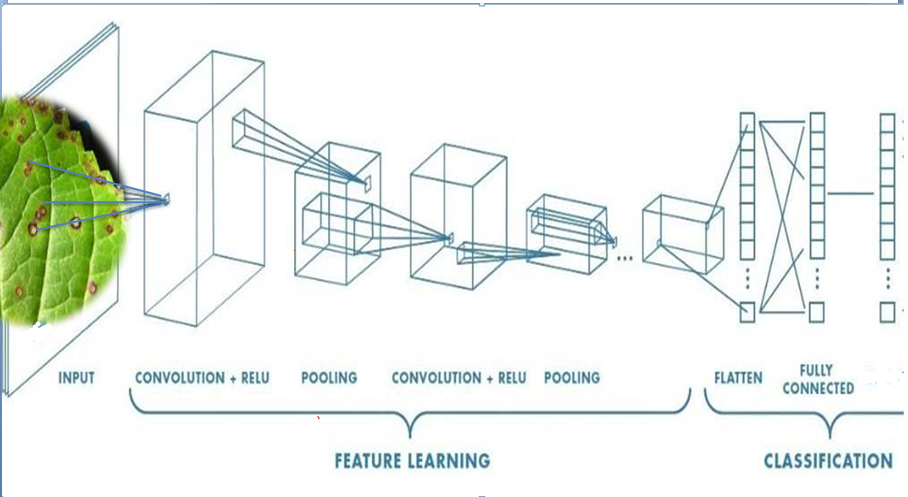


Fig 3.3 Proposed Architechture

**3.4 Advantages of Proposed System**

Our proposed approach makes use of Machine Learning’s Deep Learning algorithms like CNN. Also, the features used are different and minimal compared to the base paper. Proposed system makes whole process simpler.The time consumed while both training and testing when other methods are followed is quite high whereas the proposed method consumes less time .

Along with Plant disease detection we are trying to extend it to also be able to detect the fruits quality in the sense its freshness which can also be done using cnn in the similar manner as the leaf disease detection but we have to data for it differently.Thus we have added this to our work to make it more convenient for the users for whom we are trying to make this software for.

**Chapter 4**

**OBJECTIVES &EXPECTED OUTCOME**

**4.1 Objective**

The main objective of the project is to detect the plant disease and find the quality of the fruit. The leaves disease and fruit quality detection is done using Machine Learning algorithms and the result is displayed on the screen in text format.

**4.2 Scope**

Scope is for working on development of innovative, efficient and fast interpreting algorithms which will help in detecting diseases in plants and would also help in detecting quality of fruits. The proposed system is a software solution for automatic detection and computation of texture statistics for plant leaf diseases. Identification of plants leaves and fruit quality and finding out the disease which play a key role in successful cultivation of plants. To prevent diseases on plants and to inspect the quality of fruits.

**4.3 Methodology**

The user will have to capture the image of leaf or fruit. The input image is first segmented using image processing techniques on the basis of difference in color on the leaf. Then they will be converted to a grayscale image which is then given as an input to the convolutional neural network that is used for classification and detection. After the classification and detection, the result is given the data set consists of two types of leaf images healthy and unhealthy and similar for the fruits.

The way CNN works is at first, the layers are organized in 3 dimensions: width, height and depth. Here, the neurons in one layer do not connect to all the neurons in the next layer but only to a small region of it. Lastly, the final output of the system will be reduced to a single vector of probability scores, organized along the depth dimension. All the components that are needed to build a CNN: Convolution, ReLU and Pooling. Here the output of max pooling is fed into the classifier which is usually a multi-layer perceptron layer. In CNNs these layers are used more than once i.e. Convolution ->ReLU -> Max-Pool -> Convolution ->ReLU -> Max-Pool and so on. Now for the classification part, fully connected layer is used which involves ReLU->Dense->Soft-max and so on.

**4.4 Expected Outcome**

The expected outcome of the project is,

1. Leaf disease is detected.
2. Fruit quality is detected.

**Chapter 5**

**RESOURCE REQUIREMENTS**

* 1. **Hardware Requirements**

Processors : Above Pentium IV 2.4 GHz

Camera : 5 MB(min)

RAM : 4 GB (min)

Storage : 100GB

Standard Devices : Microphone, keyboard, monitor and mouse

* 1. **Software Requirements**

Platform : Above Windows Vista/7

Language : Python

Frontend : HTML, CSS, JavaScript

Backend : Flask server

IDE/tool : Sublime Text, PyCharm/Python 3.6 and above

**REFERENCES**

[1] A review on diagnosis of nutrient deficiency symptoms in plant leaf image using image processing by S.jeylakshmi and R.radha ICTACT journal on image and vídeo processing. May 2017, volume:07, issue:04 ISSN:0976-9102,DOI: 1021917/iji vp.2017.0216.

[2] Automatic recognition of plant leaves diseases based on serial combination of two SVM classifiers by Youssef Es-saady, Ismail El Massi, Mostafa El Yassa,Driss Mammass and Abdeslam Benazoun, 2nd International Conference on Electrical and Information Technologies(ICEIT), IEEE, 2016.

[3] Deep Neural Networks Based Recognition of Plant Diseases by Leaf Image Classification by Sladojevic, Srdjan, Marko Arsenovic, Andras Anderla,Dubravko Culibrk, and Darko Stefanovic Computational Intelligence and Neuroscience 2016 (2016).

[4] Performance Analysis of Support Vector Machine in Defective and Non Defective Mangoes Classification by NeerajKumari, DAshutosh Kr. Bhatt, Rakesh Kr. Dwivedi, Rajendra Belwal‖, International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-8 Issue-4, April 2019.

[5] Using Deep Learning for Image-Based Plant Disease Detection by Mohanty, Sharada P., David P. Hughes, and Marcel Salathé, Frontiers in Plant Science 7 (2016).

[6] A. Fuentes, S. Yoon, S. Kim, and D. Park, “A robust deep-learning-based detector for real-time tomato plant diseases and pests recognition,” *Sensors*, vol. 17, no. 9, p. 2022, 2017.

[7] A. Krizhevsky, I. Sutskever, and G. E. Hinton, “ImageNet classification with deep convolutional neural networks,” *Communications of the ACM*, vol. 60, no. 6, pp. 84–90, 2017.

[8] R. Balodi, S. Bisht, A. Ghatak, and K. H. Rao, “Plant disease diagnosis: Technological advancements and challenges,” *Indian Phytopathology*, vol. 70, no. 3, pp. 275–281, 2017.

[9] F. Martinelli, R. Scalenghe, S. Davino et al., “Advanced methods of plant disease detection. A review,” *Agronomy for Sustainable Development*, vol. 35, no. 1, pp. 1–25, 2015.

[10] A. Johannes, A. Picon, A. Alvarez-Gila et al., “Automatic plant disease diagnosis using mobile capture devices, applied on a wheat use case,” *Computers and Electronics in Agriculture*, vol. 138, pp. 200–209, 2017.

[11] K. P. Ferentinos, “Deep learning models for plant disease detection and diagnosis,” *Computers and Electronics in Agriculture*, vol. 145, pp. 311–318, 2018