

# LIAM- Logistic and Intelligent Agricultural model for Phytopathology Identification

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## ABSTRACT

In agricultural sector the most challenging that farmers faced are the pests that affect the daily crops. Thus, farmers can find the diseased plant for up to a limit. Sometimes they don't even recognize with their bare eyes. So, in order to avoid all these things, a model is created named LIAM (Logistic & Intelligent Agricultural Model) to classify these diseased plants and predict the disease that are commonly occurred to plants. This model is based on Machine learning (ML) and will classify the desired plant into several layers as it uses Convolutional Neural Network (CNN) which basically, takes a part of a matrix and iterate into several layers. Thereby as we train this model as much as we can it will work as better efficiency and also normally this will basically be open source but as for farmers or home users may not know these technologies to use. So, we have an additional interface to link the model with that, so as to input the data into it to get the desired result. Finally, the model will predict the disease as we input the data with top accuracy.

**Key words:** Artificial Intelligence (AI), Convolutional Neural Network (CNN), Machine Learning (ML), Pytorch.

## 1. INTRODUCTION

### 1.1 Machine Learning Overview

Machine Learning is nothing but a machine learning by itself and performs way better than a human performance. Here we need to train a model as much as we can in order to gain the maximum

accuracy and thereby machine will itself learn when a data is given into. Many software tools can be used to do Machine Learning such as Tensorflow, Keras, Pytorch etc.

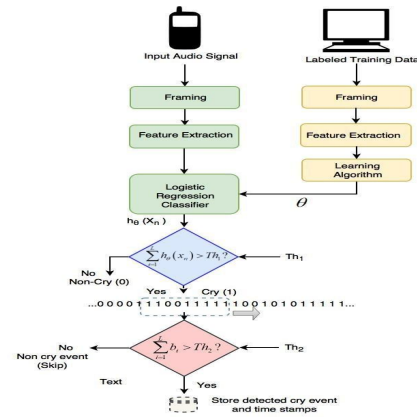


Figure 1: ML Block Diagram

So as per the figure1, it absolutely reflects that our model needs an input of around 1,50,000 images of plant and these inputs will be given and based on that data's are split into train and validation set.

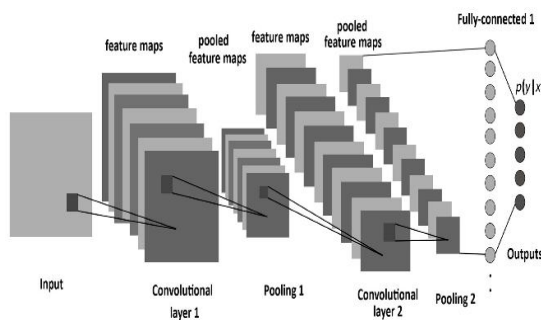
Then it will extract the required features and converted into vector forms in order for the machine learning to perform [10]. Then it will take a part of the image and started to do Convolutional Neural Network in which that particular portion will be off vector forms and those vector form will be taken and iterated into several layers to gain the output.

The specialty of CNN is that it is one of the parts of Neural Networks where it contains N layers and each layer output will be an efficient one. Here as we are extracting features in all layers, some of them may be lose or not even considered. But this

CNN have a specialty of back propagation to unwanted features that we left [9]. During back propagation the unwanted features are again iterated into layers by layers to gain the output so that no part of features is left and finally we can classify the input and produce the output contain what disease that the desired plant has.

### 1.2 CNN Overview

Convolutional Neural Networks (CNN) is one of the advanced and efficient technique used in classification process. This method takes an input image in the format of vector and takes a unit cell of that image and started to iterate different layers of that image, called convolutional layers [1]. This layer again undergoes several layers and further produce the output. This will go in several neural patterns. Finally getting a classified version (Figure 2).



**Figure 2:** CNN Block Diagram

## 2. MOTIVATION

As of advancement in technologies is getting wider our CNN will clearly classifies finely and gives us a delicate and accurate output. Since we have lots of old-fashioned technologies for classification but by using latest technologies and when this get applied to important and needy field like agriculture simplifies the way of manual power of farmers and also can be applied to all other people [1].

Since farmers doesn't know this much of technologies and also for the other users will much difficult if we just have an open source type. Instead our model will also be linked to an interface in such a way that, for a farmer he can give to some respective area for check if his desired crop have a disease or not and for other users like

those who undertake their own vegetable garden can use this interface as such they just want give the input to obtain the desired result.

## 3. LITERATURE SURVEY

**Table 1:** Literature review

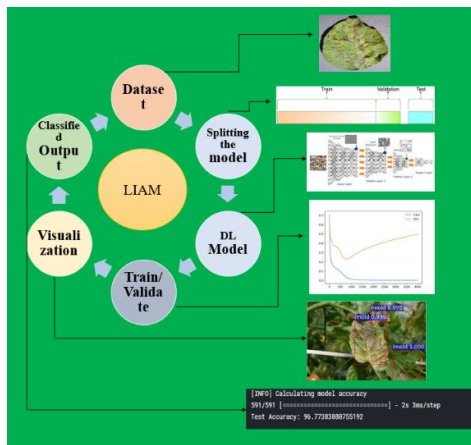
SL NO.	TITLE	PROS	CONS
1	An image processing & neural network-based approach for detection & classification of plant leaf diseases	blight, late blight, powdery-mildew and Septoria are the 4 features which they classified	<ul style="list-style-type: none"> <li>Procedures are large</li> <li>Time consuming when taken for iterations</li> </ul>
2	Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features	Classified based on texture features	It doesn't get that much accuracy when classified with texture feature
3	Fast and Accurate Detection and Classification of Plant Diseases		<ul style="list-style-type: none"> <li>Give only accuracy of 84%</li> <li>Uses heavy mathematical equation</li> </ul>
4	Image Thresholding Using Weighted Parzen-Window Estimation		<ul style="list-style-type: none"> <li>Clustering based on pixels and weights</li> <li>Uses heavy mathematical equation</li> </ul>
5	Implementation of RGB and Grayscale Images in Plant Leaves Disease Detection		<ul style="list-style-type: none"> <li>It gives o/p of RGB is better for classification of identifying disease</li> <li>Accuracy is low</li> </ul>

Table1 is comparison of LIAM with other techniques used for prediction of plant diseases happening in agricultural fields. The review is about the technique and accuracy of that model to predict the desired disease.

Other techniques use different procedure either in different step by step or by mathematical steps in order to attain the result and also accuracy wise each have a variation of accuracy but in our model, we used latest technology to classify the disease [5].

## 4. PROPOSED APPROACH

The proposed model named LIAM- Logistic and Intelligent Agricultural Model used for identification of phytopathology. Here it's a Machine Learning model trained to reach top accuracy. This model contains a dataset of 1,50,000 images from the Kaggle dataset. This dataset undergoes several processes called splitting of data, the architectural model or Deep learning model, Train and validate model, visualisation, finally producing he desired output.



**Figure 3:** Block Diagram of LIAM

In Figure 3, splitting the data into test and validation set are the initial parts. Separating data into training and testing sets is an important part of evaluating data mining models. Typically, when you separate a data set into a training set and testing set, most of the data is used for training, and a smaller portion of the data is used for testing [7]. Then we make the images as in form of vector form in order for the Neural Networks to perform the effective feature extraction. Here the images can't be given as raw instead they are formatted to vector form because CNN take input as raw csv that is the vector form in order for execution. As a part of the vector form is taken because CNN is the most advanced part in which it can take a small portion and iterate into multi-layers in which it keeps on extraction into several hidden layers. Each hidden layer has an output to produce so as to give input the next layers.

So as features are extracted [2], those which are unwanted gets eliminated. But actually, it's not happening in CNN because, those unwanted parts are stored later on as the addition of vectors for a negative value. In order to avoid that negative value CNN back propagates back to these unwanted features and also again apply the same effect again so as to gain the final output [8]. This is a great advantage if machine learning in use of neural networks won't waste any features as moving on. Finally, as features are extracted, thereby gaining a top accuracy and also along with classified disease as output. Its main merits are that can identification of plant diseases undetectable by naked eye, giving an approximate of 96% and also giving us a precise diagnosis.

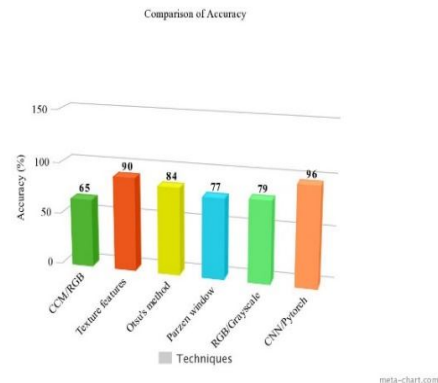
## 5. TEST CASES

**Table 2:** Test cases

TCID	Leaves tested	Expected result	Actual result	Status
1	Fruit Leaves (diseased)	Desired disease name	Display disease name	Successful
2	Fruit leaves (healthy)	Healthy	Display healthy	Successful
3	Vegetable leave (diseased)	Desired disease name	Display disease name	Successful
4	Vegetable leave(healthy)	Healthy	Display healthy	Successful
5	Grain leave(diseased)	Desired disease name	Display disease name	Successful

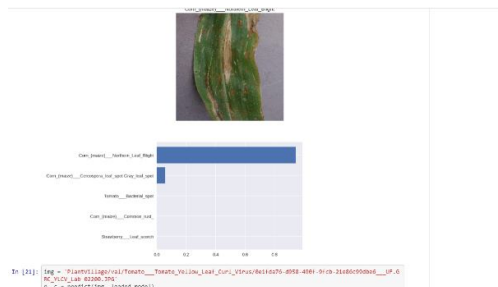
In Table 2, it can be understandable that the model accepting what kind of inputs, such as fruits (Figure6), grains (Figure4), vegetable (Figure5). Here it will analyse the input and produce the exact disease that crop has and also its related graph. For the sake, the model also accepts the good crop images for testing, so that prediction is right or not.

## 6. EXPERIMENTAL RESULTS

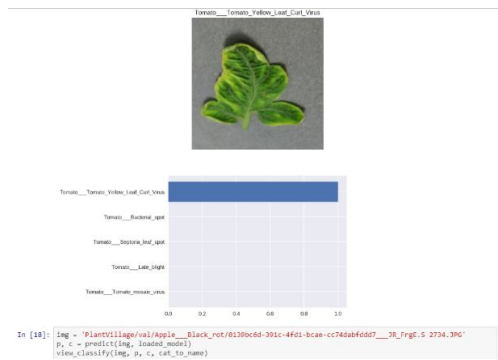


**Figure 4:** Result Analysis

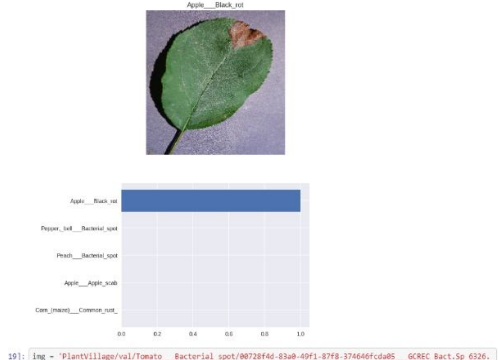
Figure 4 gives an overview comparison of LIAM [3]. with respect to other methods that we take and the result is that LIAM [4]. is much more efficient in the case of accuracy and also in the implementation process.



**Figure 5:** Output of LIAM (corn maize)



**Figure 6:** Output of LIAM (tomato)



**Figure 7:** Output of LIAM (apple)

## 7. CONCLUSION AND FUTURE SCOPE

The Results presented in this section are related to training with the whole database containing both original and augmented images. As it is known that convolutional networks are able to learn features when trained on larger datasets, results achieved when trained with only original images will not be explored. After fine-tuning the parameters of the network, an overall accuracy of 96% was achieved. Furthermore, the trained model was tested on each class individually. Test was performed on every image from the validation set. As suggested by

good practice principles, achieved results should be compared with some other results.

In addition, there are still no commercial solutions on the market, except those dealing with plant species recognition based on the leaf's images. In this model, an approach of using deep learning method was explored in order to automatically classify and detect plant diseases from leaf images [6]. The complete procedure was described, respectively, from collecting the images used for training and validation to image pre-processing and augmentation and finally the procedure of training the deep CNN and fine-tuning. Different tests were performed in order to check the performance of newly created model. Future scope is that to make the system portable that is to make it accessible via different mediums like android, iOS, website etc. reduction in training time. It will be even more flexible in order to work on different platforms and also finally produce even more accuracy.

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## REFERENCES

- [1] Garima Tripathi, Jagruthi Save, **An Image Pcessing And Neural Network Based ApproachFor Detection And Classification Of Plant Leaf Disease**, IJCET, Volume 6, pp. 14-20, Issue 4, April (2015).
- [2] Arivazhagan Selvaraj, Newlin Shebiah, **Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features**, CIGR, Vol. 15, March (2013).

- [3] H. Al-Hiary, S. Bani-Ahmad, M. Reyalat, M. Braik and Z. ALRahamneh, **Fast and Accurate Detection and Classification of Plant Diseases**, IJCA, Vol. 17, March 2011.
- [4] Wan Shung, Wan Shitong, **Image Thresholding using weighted Parzen window estimation**, Journal of Applied Science, Vol. 8, August 2011.
- [5] K. Padmavati, K. Thangadurai, **Implementation of RGB and Grayscale Images in Plant Leaves Disease Detection**, IJST, Vol. 9, February 2016
- [6] Shima Ramesh , Ramachandra Hebbbar , Niveditha M. ,Prasad Bhat N. ,Shashank N , Vinod PV. , **Plant Disease Detection Using Machine Learning**,ICD13C, August 2018
- [7] Meghana Govardhan ; Veena M B, **Diagnosis od plant disease using random forest**, GCAT, October 2019
- [8] Anubha Pearline Sundara Sobitha Raj, Sathiesh Kumar Vajravelu, **Dual Deep learning architecture for plant species**, IET, Vol13, July 2019
- [9] Alaa Adel Araby , Mai Mohamed Abd Elhameed ,Nada Mohamed Magdy ,Loa'a Ahmed Said ,Nada Abdelaal ,Yomna Tarek Abd Allah ,M. Saeed Darweesh , Mohamed Ali Fahim ,Hassan Mostafa, **Smart IOT monitoring system for agriculture and predictive analysis**, MOCAST, July 2019