A Review on Different Plant Disease Detection Techniques

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Why Plant disease detection?

- Agricultural productivity highly influences the economy of any country,especially in India where agriculture makes up about 20% of the country's GDP.
- In such situations, if the plant is affected by diseases and it is not treated properly at the right time, it will lead to economic losses and also increases the global food problem.

- To prevent this from happening, plant diseases must be detected and treated early so as to prevent serious consequences.
- We can make use of technologies like image processing and deep learning to successfully detect the diseases affecting the plant in the early stages.
- **In our approach, we use the technique of Convolutional Neural Network classify the different diseases that affect the plants. Our model is successfully able to classify the diseases mentioned in the Apple, Tomato, Potato and Corn subsets of the Plant_ Pathology_2020_fgvc7 dataset with a good accuracy rate.**

Introduction

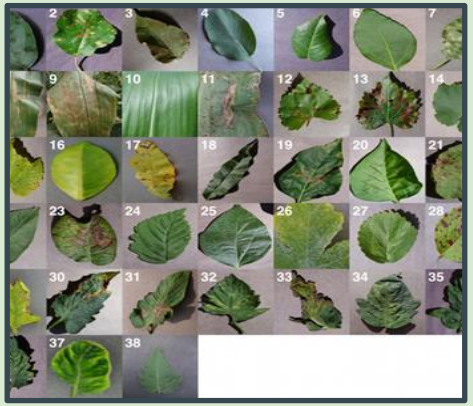
- Plant disease detection can be easily classified into 4 basic types:

1. Healthy
2. Scrab,
3. Rust,
4. Multiple disease.

Healthy

Rust

Multiple Diseases



Scrab

How are we going to detect?

1. We visualize one leaf image over channel distribution i.e red, blue, green channels and visualize targets.
2. By Image Processing and augmentation we under go into four steps namely: canny edge detection, flipping, convolution, and blurring of the image.
3. The models that are used are EfficentNet model, Efficient NoiseStudent model and Densenet model to train our Convolutional Neural Networks (CNN). Our model display the results with the help of Exploratory Data Analysis (EDA) which is very easy to analyze.

Aim

1. Our main aim is to present a novel method for detection and classifying plant disease from leaf images.

2. Our approach leverages on the recent success of Convolutional Neural Networks (CNN) with Exploratory Data Analysis (EDA) with deep learning modules on leaf disease detection problems.

Objectives

The proposed novel deep convolutional neural network architecture, will be consciously designed

To efficiently classify given images into different diseases:

- Healthy
- Scrab
- Rust
- Multiple disease

To be lightweight in order to make it possible to be used on machines with limited computational power.

Literature Survey

Tabular Summary of Literature Survey

S.N	Author Name	Title & Year of Publishing	Algorithm used	Accuracy
1	N.Gobalakrishnan *et al.*	"A Systematic Review on Image Processing and Machine Learning Techniques for Detecting Plant Diseases", 28-30 July 2020	-	-
2	Sammy V. Militante	"Plant Leaf Detection and Disease Recognition using Deep Learning", 3-6 October 2019	Convolutional Neural Networks	96.5%
3	Abdul Hafiz Bin Abdul Wahab *et al.*	"Detecting diseases in Chilli Plants Using K-means Segmented Support Vector Machine", 27-29 July 2019	K-means clustering and Segmented SVM Image Classification Algorithm	Aprrox 90% for chilli plants and 57.1% for cucumber mosaic1
4	Suma V *et al.*	"CNN Based Leaf Disease Identification and Remedy Recommendation System", 12-14 June 2019	Convolutional Neural Networks	99.32%

5	Praveen Kumar Joshi, Anindita Saha	“Detection and Classification of Plant Diseases using Soft Computing Techniques” , 17-18 May 2019	Support Vector Machine(SVM)	100%, 60%, 80% and 85% respectively to detect Bacterial Spot, Septoria Leaf Spot, Leaf Mold and Average Mold.
6	Md. Arifur Rahman	“Improved Segmentation Approach for Plant Disease Detection” , 3-5 May 2019	Deep neural network	99.25%
7	Sharath D M *et al.*	“Image based Plant Disease Detection in Pomogrenate Plant for Bacterial Blight”, 4-6 April 2019	Canny Edge Detection	-
8	S.Santhana Hari *et al.*	“Detection of plant disease by leaf image processing convolutional neural network”, 30-31 March 2019	Convolutional Neural Network	86.2%
9	Santhosh Kumar.S, B.K Raghavendra	“Diseases Detection of Various Plant Leaf Using Image Processing Techniques”, 15-16 March 2019	-	-
10	Mercelin Francis, C Deisy	“Disease Detection and Classification in Agricultural Plants using Convolutional Neural Networks- A Visual Understanding”, 7-8 March 2019	Convolutional Neural Network	88.7%

11	Endang Suryawati *et al.*	“Deep Structured Convolutional Neural Network for Tomato Disease Detection”, 27-28 October 2018	Convolutional Neural Network	84.58%, 91.52%, 89.68 and 95.24 for Baseline, AlexNet, VGGNet and GoogleNet respectively.
12	Melike Sardogan *et al.*	“Plant Leaf Disease Detection and Classification based on CNN with LVQ algorithm”, 20-23 September 2018	CNN with Learn Vector Quantization(LVQ)	86%
13	Huu Quan Cap *et al.*	“A Deep Learning approach for On-site Plant Disease Detection”, 9-10 March 2018	Convolutional Neural Network	78.0%
14	Mrs.Divya Unni *et al.*	“Detection of unhealthy plant leaves using image processing and genetic algorithms with Arduino”, 6-10 January 2018	-	-
15	Halil Durmus *et al.*	“Disease Detection on the leaves of the Tomato Leaves by using Deep Learning”, 7-10 August 2017	Convolutional Neural Network	95.65% for AlexNet and 94.3 for SqueezeNet
16	Mrunmayee Dhakate, Ingole A B	“Diagnosis of Pomogrenate Plant Disease using Neural Network”, 16-19 December 2015	K-means clustering	100%, 83.33%, 85.71%, 83.33%, 100% and 87.5% for Good Fruit, Fruit Spot, Bacterial Blight, Fruit Rot, Good Leaf and Leaf Spot respectively.

Proposed Work

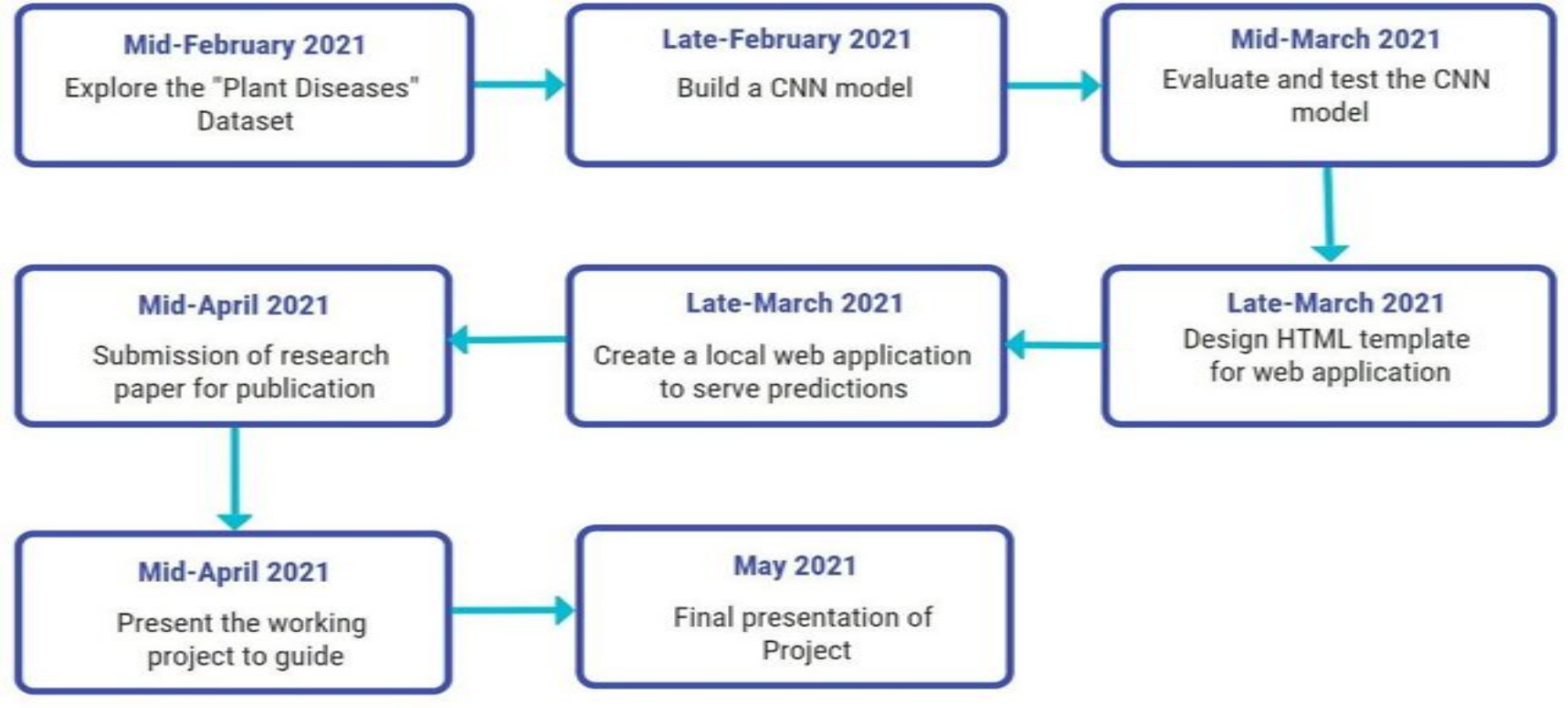
We have chosen our current work to overcome the following issues:

- Developing the Plant Disease Detection technique to identify features of leaf under uneven lighting conditions.
- Improving the performance rate of the model for recognizing the diseases in the leaf.
- Making the model database independent.
- Use of Max pooling which is very similar to convolution
- Use of ReLU activation function which helps introduce non-linearity in the neural network, thus increasing its capacity of model the image data.

With the constraints of:

- Latency
- Interpretability
- Accuracy

Plan of Action from Phase 1 to Phase 2



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Conclusion

The people around the world rely on the agricultural sector as one of the most important sectors where crops are the basic need for food. Early recognition and detection of these diseases are crucial to the agricultural industry. This model has achieved its goal to detect and recognize different plant varieties and plant diseases using convolutional neural networks. The trained model can be used to test real-time images to detect and recognize plant diseases.

An additional plant variety and different types of plant diseases may be included in the existing dataset to increase the trained models. Other CNN architectures may also use different learning rates and optimizers for experimenting the performance and accuracy of the model. With a good accuracy rate, the proposed model can assist farmers to detect and recognize plant diseases.

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THANKYOU