

# Machine learning with Python-

## ECL443

### Major Project





# Problem statement

Classification of plant leaves into their plant species and whether healthy or diseased. A real time prediction using IP Webcam Mobile App was devised.

Plants Considered:

- Guava
- Pomegranate
- Lemon
- Mango

Data collection for testing was done from the premises of boy's hostel canteen.



# Model Architecture

**Convolutional Layers :** These layers extract features from images, and they become deeper and wider as you go deeper into the network.

**Depthwise Separable Convolutions:** EfficientNet uses efficient depthwise separable convolutions to reduce parameters and computations, consisting of depthwise convolutions.

**Squeeze-and-Excitation Blocks:** These blocks help the model focus on important features by adaptively recalibrating channel-wise responses.

**Inverted Residual Blocks:** These blocks introduce non-linearity and feature reuse for better representation without adding much complexity.

**Widths, Depths, and Resolution:** The model's "B3" designation indicates its specific size, determined by scaling depth, width, and resolution from a baseline architecture.

**Resolution Scaling:** EfficientNet can handle different image sizes without retraining, making it versatile for various tasks.

**Efficient Scaling:** EfficientNet balances model size and computational cost using a compound scaling method, achieving good performance across a range of tasks.

# Training Dataset



Gauva (P3)	-diseased : 100%	<div></div>	142/142	[00:19<00:0
0, 7.47files/s]				
Gauva (P3)	-healthy : 100%	<div></div>	277/277	[00:37<00:0
0, 7.43files/s]				
Lemon (P10)	-diseased : 100%	<div></div>	77/77	[00:10<00:0
0, 7.58files/s]				
Lemon (P10)	-healthy : 100%	<div></div>	159/159	[00:20<00:0
0, 7.68files/s]				
Mango (P0)	-diseased : 100%	<div></div>	265/265	[00:35<00:0
0, 7.52files/s]				
Mango (P0)	-healthy : 100%	<div></div>	170/170	[00:22<00:0
0, 7.59files/s]				
Pomegranate (P9)	-diseased : 100%	<div></div>	272/272	[00:36<00:0
0, 7.45files/s]				
Pomegranate (P9)	-healthy : 100%	<div></div>	287/287	[00:38<00:0
0, 7.46files/s]				

number of classes in the processed dataset= 8  
the maximum files in any class in train\_df is 201 the minimum files in any class in train\_df is 54  
train\_df length: 1154 test\_df length: 248 valid\_df length: 247

# Collected Testing Dataset:

Lemon (P10)-diseased



Lemon (P10)-diseased



Lemon (P10)-healthy



Lemon (P10)-healthy



Lemon (P10)-healthy



Lemon (P10)-healthy



Mango (P0)-diseased



Mango (P0)-diseased



Mango (P0)-diseased



Mango (P0)-diseased





# Collected Dataset:

Gauva (P3)-diseased



Gauva (P3)-diseased



Gauva (P3)-diseased



Gauva (P3)-diseased



Gauva (P3)-diseased



Gauva (P3)-diseased



Gauva (P3)-healthy



Gauva (P3)-healthy



Gauva (P3)-healthy



Gauva (P3)-healthy



Gauva (P3)-healthy



Gauva (P3)-healthy



Gauva (P3)-healthy



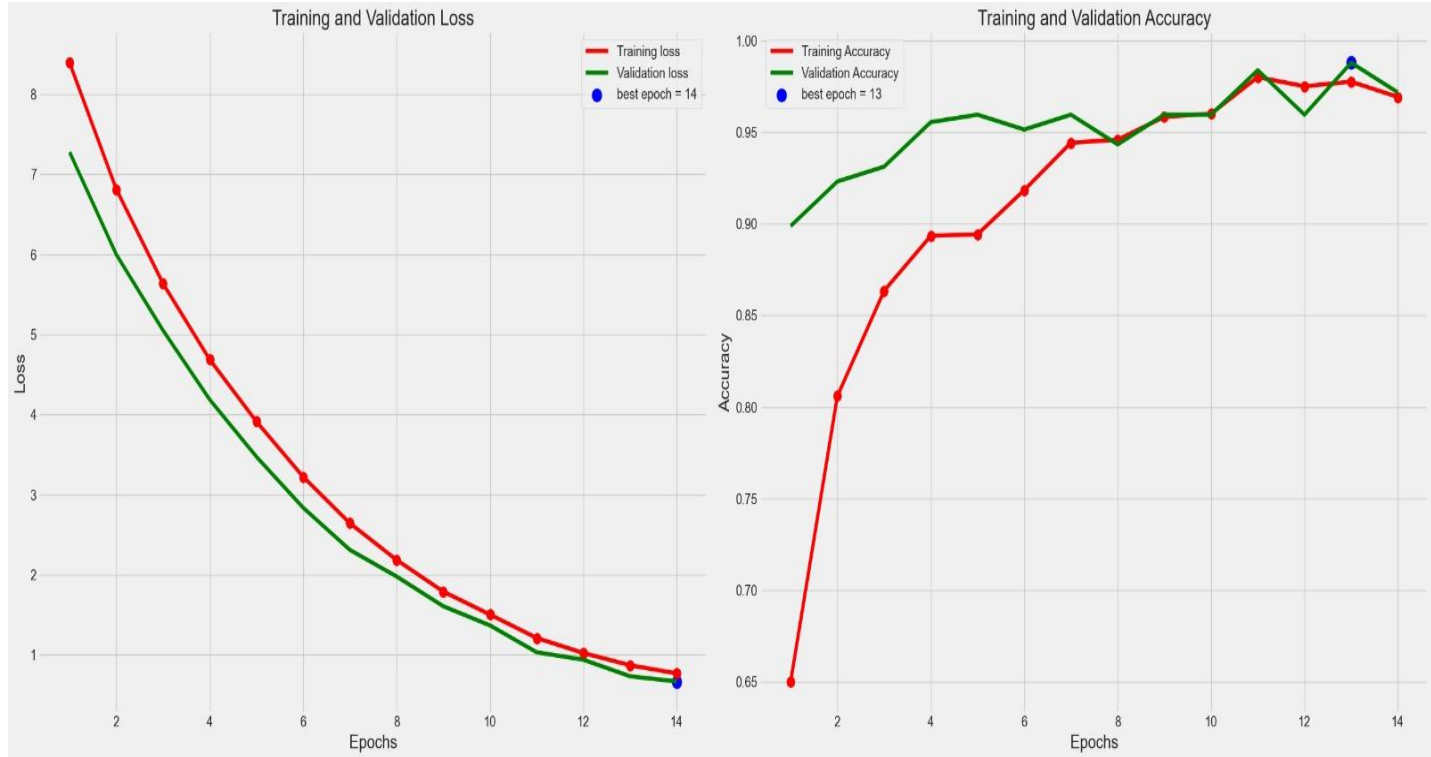
Lemon (P10)-diseased



Lemon (P10)-diseased



# Training & Validation plots



Actual



# Report for testing of given Testing dataset:

## Classification Report:

	precision	recall	f1-score	support
Gauva (P3)-diseased	1.0000	1.0000	1.0000	21
Gauva (P3)-healthy	1.0000	1.0000	1.0000	42
Lemon (P10)-diseased	1.0000	0.9091	0.9524	11
Lemon (P10)-healthy	0.9600	1.0000	0.9796	24
Mango (P0)-diseased	1.0000	1.0000	1.0000	40
Mango (P0)-healthy	1.0000	1.0000	1.0000	26
Pomegranate (P9)-diseased	1.0000	1.0000	1.0000	41
Pomegranate (P9)-healthy	1.0000	1.0000	1.0000	43
accuracy			0.9960	248
macro avg	0.9950	0.9886	0.9915	248
weighted avg	0.9961	0.9960	0.9959	248

Actual



# Report for testing of collected Testing dataset:

## Classification Report:

	precision	recall	f1-score	support
Gauva (P3)-diseased	0.5000	0.1667	0.2500	6
Gauva (P3)-healthy	0.5714	0.5714	0.5714	7
Lemon (P10)-diseased	0.2000	0.5000	0.2857	4
Lemon (P10)-healthy	0.3333	0.2500	0.2857	4
Mango (P0)-diseased	0.0000	0.0000	0.0000	5
Mango (P0)-healthy	0.0000	0.0000	0.0000	4
Pomeranate (P9)-diseased	0.0000	0.0000	0.0000	4
Pomeranate (P9)-healthy	0.3636	0.8000	0.5000	5
accuracy			0.3077	39
macro avg	0.2460	0.2860	0.2366	39
weighted avg	0.2808	0.3077	0.2637	39

# Real Time Prediction:

