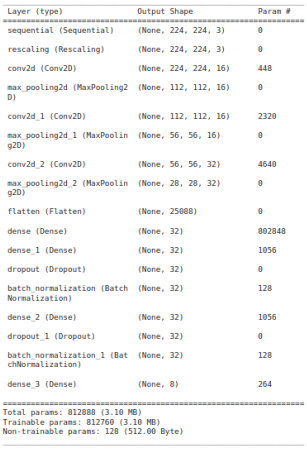
Project Development Phase
Model Performance Test

Date	10 November 2022
Team ID	Team-592327
Project Name	Deep Learning Model For Detecting Diseases In Tea Leaves
Team Members	Saatvik Sumanta Kotamareddi Abigna Abhigyan Ghoshal Denesh L
Maximum Marks	10 Marks

Model Performance Testing:

S.No.	Parameter	Values	Screenshot
1.	Model Summary	**CNN** **Total params: 812888** **Trainable params: 812760** **Non-trainable params: 128** **VGG16** **Total params: 14915400** **Trainable params: 200712** **Non-trainable params: 14714688** **ResNet50** **Total params: 24390536** **Trainable params: 802824** **Non-trainable params: 23587712**	**CNN**  **VGG16**

Layer (type)	Output Shape	Param #
sequential (Sequential)	(None, 224, 224, 3)	0
rescaling (Rescaling)	(None, 224, 224, 3)	0
conv2d (Conv2D)	(None, 224, 224, 16)	448
max_pooling2d (MaxPooling2D)	(None, 112, 112, 16)	0
conv2d_1 (Conv2D)	(None, 112, 112, 16)	2320
max_pooling2d_1 (MaxPooling2D)	(None, 56, 56, 16)	0
conv2d_2 (Conv2D)	(None, 56, 56, 32)	4640
max_pooling2d_2 (MaxPooling2D)	(None, 28, 28, 32)	0
flatten (Flatten)	(None, 25088)	0
dense (Dense)	(None, 32)	802848
dense_1 (Dense)	(None, 32)	1056
dropout (Dropout)	(None, 32)	0
batch_normalization (BatchNormalization)	(None, 32)	128
dense_2 (Dense)	(None, 32)	1056
dropout_1 (Dropout)	(None, 32)	0
batch_normalization_1 (BatchNormalization)	(None, 32)	128
dense_3 (Dense)	(None, 8)	264

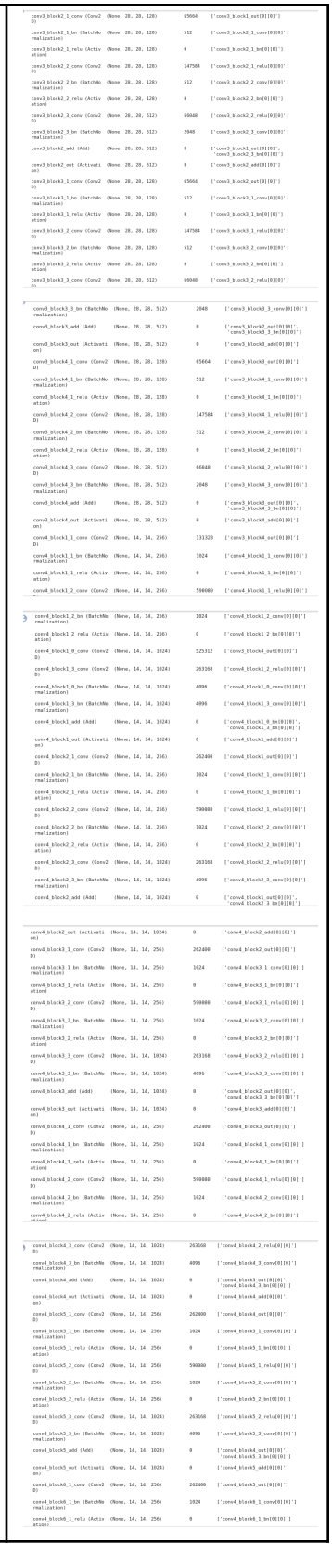
Total params: 812888 (3.10 MB)
Trainable params: 812760 (3.10 MB)
Non-trainable params: 128 (512.00 Byte)

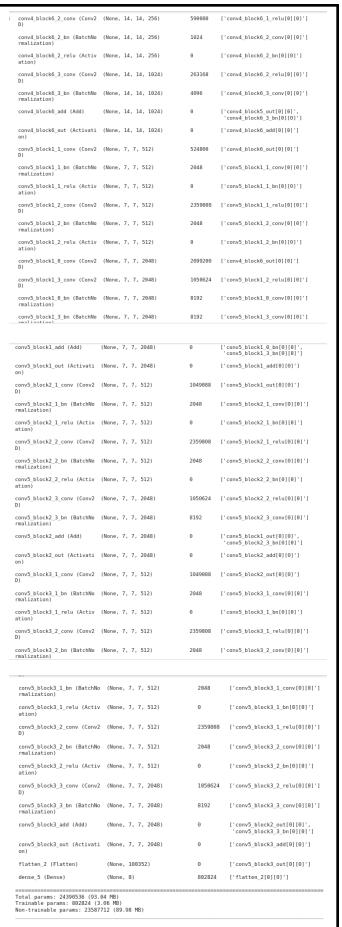
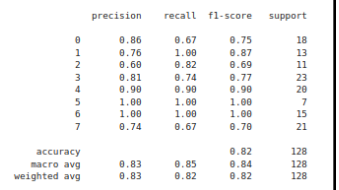
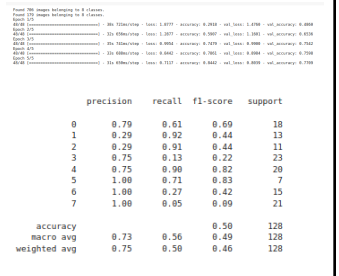
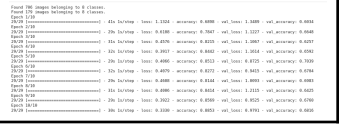
Layer (type)	Output Shape	Param #
input_1 (InputLayer)	[(None, 224, 224, 3)]	0
block1_conv1 (Conv2D)	(None, 224, 224, 64)	1792
block1_conv2 (Conv2D)	(None, 224, 224, 64)	36928
block1_pool (MaxPooling2D)	(None, 112, 112, 64)	0
block2_conv1 (Conv2D)	(None, 112, 112, 128)	73856
block2_conv2 (Conv2D)	(None, 112, 112, 128)	147584
block2_pool (MaxPooling2D)	(None, 56, 56, 128)	0
block3_conv1 (Conv2D)	(None, 56, 56, 256)	295168
block3_conv2 (Conv2D)	(None, 56, 56, 256)	590080
block3_conv3 (Conv2D)	(None, 56, 56, 256)	590080
block3_pool (MaxPooling2D)	(None, 28, 28, 256)	0
block4_conv1 (Conv2D)	(None, 28, 28, 512)	1180160
block4_conv2 (Conv2D)	(None, 28, 28, 512)	2359808
block4_conv3 (Conv2D)	(None, 28, 28, 512)	2359808
block4_pool (MaxPooling2D)	(None, 14, 14, 512)	0
block5_conv1 (Conv2D)	(None, 14, 14, 512)	2359808
block5_conv2 (Conv2D)	(None, 14, 14, 512)	2359808
block5_conv3 (Conv2D)	(None, 14, 14, 512)	2359808
block5_pool (MaxPooling2D)	(None, 7, 7, 512)	0
flatten_1 (Flatten)	(None, 25088)	0
dense_4 (Dense)	(None, 8)	200712

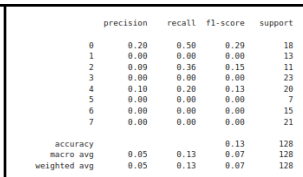
Total params: 14915400 (56.90 MB)
Trainable params: 200712 (784.03 KB)
Non-trainable params: 14714688 (56.13 MB)

ResNet50

Layer (type)	Output Shape	Param #	Connected to
input_2 (InputLayer)	[(None, 224, 224, 3)]	0	[]
conv1_pad (ZeroPadding2D)	(None, 230, 230, 3)	0	['input_2[0][0]']
conv1_conv (Conv2D)	(None, 112, 112, 64)	9472	['conv1_pad[0][0]']
conv1_bn (BatchNormalizati on)	(None, 112, 112, 64)	256	['conv1_conv[0][0]']
conv1_relu (Activation)	(None, 112, 112, 64)	0	['conv1_bn[0][0]']
pool1_pad (ZeroPadding2D)	(None, 114, 114, 64)	0	['conv1_relu[0][0]']
pool1_pool (MaxPooling2D)	(None, 56, 56, 64)	0	['pool1_pad[0][0]']
conv2_block1_1_conv (Conv2 D)	(None, 56, 56, 64)	4160	['pool1_pool[0][0]']
conv2_block1_1_bn (BatchNo rmalization)	(None, 56, 56, 64)	256	['conv2_block1_1_conv[0][0]']
conv2_block1_1_relu (Activ ation)	(None, 56, 56, 64)	0	['conv2_block1_1_bn[0][0]']
conv2_block1_2_conv (Conv2 D)	(None, 56, 56, 64)	36928	['conv2_block1_2_relu[0][0]']
conv2_block1_2_bn (BatchNo rmalization)	(None, 56, 56, 64)	256	['conv2_block1_2_conv[0][0]']
conv2_block1_2_relu (Activ ation)	(None, 56, 56, 64)	0	['conv2_block1_2_bn[0][0]']
conv2_block1_0_conv (Conv2 D)	(None, 56, 56, 256)	16640	['pool1_pool[0][0]']
conv2_block1_3_conv (Conv2 D)	(None, 56, 56, 256)	16640	['conv2_block1_2_relu[0][0]']
conv2_block1_0_bn (BatchNo rmalization)	(None, 56, 56, 256)	1024	['conv2_block1_0_conv[0][0]']
conv2_block1_3_bn (BatchNo rmalization)	(None, 56, 56, 256)	1024	['conv2_block1_3_conv[0][0]']
conv2_block1_add (Add)	(None, 56, 56, 256)	0	['conv2_block1_0_bn[0][0]', 'conv2_block1_3_bn[0][0]']
conv2_block1_out (Activati on)	(None, 56, 56, 256)	0	['conv2_block1_add[0][0]']
conv2_block2_1_conv (Conv2 D)	(None, 56, 56, 64)	16448	['conv2_block1_out[0][0]']
conv2_block2_1_bn (BatchNo rmalization)	(None, 56, 56, 64)	256	['conv2_block2_1_conv[0][0]']
conv2_block2_1_relu (Activ ation)	(None, 56, 56, 64)	0	['conv2_block2_1_bn[0][0]']
conv2_block2_2_conv (Conv2 D)	(None, 56, 56, 64)	36928	['conv2_block2_1_relu[0][0]']
conv2_block2_2_bn (BatchNo rmalization)	(None, 56, 56, 64)	256	['conv2_block2_2_conv[0][0]']
conv2_block2_2_relu (Activ ation)	(None, 56, 56, 64)	0	['conv2_block2_2_bn[0][0]']
conv2_block2_3_conv (Conv2 D)	(None, 56, 56, 256)	16640	['conv2_block2_2_relu[0][0]']
conv2_block2_3_bn (BatchNo rmalization)	(None, 56, 56, 256)	1024	['conv2_block2_3_conv[0][0]']
conv2_block2_add (Add)	(None, 56, 56, 256)	0	['conv2_block1_out[0][0]', 'conv2_block2_3_bn[0][0]']
conv2_block2_out (Activati on)	(None, 56, 56, 256)	0	['conv2_block2_add[0][0]']
conv2_block3_1_conv (Conv2 D)	(None, 56, 56, 64)	16448	['conv2_block2_out[0][0]']
conv2_block3_1_bn (BatchNo rmalization)	(None, 56, 56, 64)	256	['conv2_block3_1_conv[0][0]']
conv2_block3_1_relu (Activ ation)	(None, 56, 56, 64)	0	['conv2_block3_1_bn[0][0]']
conv2_block3_2_conv (Conv2 D)	(None, 56, 56, 64)	36928	['conv2_block3_1_relu[0][0]']
conv2_block3_2_bn (BatchNo rmalization)	(None, 56, 56, 64)	256	['conv2_block3_2_conv[0][0]']
conv2_block3_2_relu (Activ ation)	(None, 56, 56, 64)	0	['conv2_block3_2_bn[0][0]']
conv2_block3_3_conv (Conv2 D)	(None, 56, 56, 256)	16640	['conv2_block3_2_relu[0][0]']
conv2_block3_3_bn (BatchNo rmalization)	(None, 56, 56, 256)	1024	['conv2_block3_3_conv[0][0]']
conv2_block3_add (Add)	(None, 56, 56, 256)	0	['conv2_block2_out[0][0]', 'conv2_block3_3_bn[0][0]']
conv2_block3_out (Activati on)	(None, 56, 56, 256)	0	['conv2_block3_add[0][0]']
conv3_block1_1_conv (Conv2 D)	(None, 28, 28, 128)	32896	['conv2_block3_out[0][0]']
conv3_block1_1_bn (BatchNo rmalization)	(None, 28, 28, 128)	512	['conv3_block1_1_conv[0][0]']
conv3_block1_1_relu (Activ ation)	(None, 28, 28, 128)	0	['conv3_block1_1_bn[0][0]']
conv3_block1_2_conv (Conv2 D)	(None, 28, 28, 128)	147584	['conv3_block1_1_relu[0][0]']
conv3_block1_2_bn (BatchNo rmalization)	(None, 28, 28, 128)	512	['conv3_block1_2_conv[0][0]']
conv3_block1_2_relu (Activ ation)	(None, 28, 28, 128)	0	['conv3_block1_2_bn[0][0]']
conv3_block1_0_conv (Conv2 D)	(None, 28, 28, 512)	131584	['conv2_block3_out[0][0]']
conv3_block1_3_conv (Conv2 D)	(None, 28, 28, 512)	66048	['conv3_block1_2_relu[0][0]']
conv3_block1_0_bn (BatchNo rmalization)	(None, 28, 28, 512)	2048	['conv3_block1_0_conv[0][0]']
conv3_block1_3_bn (BatchNo rmalization)	(None, 28, 28, 512)	2048	['conv3_block1_3_conv[0][0]']
conv3_block1_add (Add)	(None, 28, 28, 512)	0	['conv3_block1_0_bn[0][0]', 'conv3_block1_3_bn[0][0]']
conv3_block1_out (Activati on)	(None, 28, 28, 512)	0	['conv3_block1_add[0][0]']



			
2.	Accuracy	**CNN** **Testing Accuracy: 82%** **VGG16** Training Accuracy - Validation Accuracy - Testing Accuracy- **50%** **ResNet50** Training Accuracy - **88.53%** Validation Accuracy - **68.16%** Testing Accuracy- **13%**	**CNN**  **VGG16**  **ResNet50** 

			
3.	Confidence Score (Only Yolo Projects)	Class Detected - **NA** Confidence Score - **NA**	

Parameters & Accuracy

CNN

Layer (type)	Output Shape	Param #
sequential (Sequential)	(None, 224, 224, 3)	0
rescaling (Rescaling)	(None, 224, 224, 3)	0
conv2d (Conv2D)	(None, 224, 224, 16)	448
max_pooling2d (MaxPooling2D)	(None, 112, 112, 16)	0
conv2d_1 (Conv2D)	(None, 112, 112, 16)	2320
max_pooling2d_1 (MaxPooling2D)	(None, 56, 56, 16)	0
conv2d_2 (Conv2D)	(None, 56, 56, 32)	4640
max_pooling2d_2 (MaxPooling2D)	(None, 28, 28, 32)	0
flatten (Flatten)	(None, 25088)	0
dense (Dense)	(None, 32)	802848
dense_1 (Dense)	(None, 32)	1056
dropout (Dropout)	(None, 32)	0
batch_normalization (BatchNormalization)	(None, 32)	128
dense_2 (Dense)	(None, 32)	1056
dropout_1 (Dropout)	(None, 32)	0
batch_normalization_1 (BatchNormalization)	(None, 32)	128
dense_3 (Dense)	(None, 8)	264

Total params: 812888 (3.10 MB)
Trainable params: 812760 (3.10 MB)
Non-trainable params: 128 (512.00 Byte)

	precision	recall	f1-score	support
0	0.86	0.67	0.75	18
1	0.76	1.00	0.87	13
2	0.60	0.82	0.69	11
3	0.81	0.74	0.77	23
4	0.90	0.90	0.90	20
5	1.00	1.00	1.00	7
6	1.00	1.00	1.00	15
7	0.74	0.67	0.70	21
accuracy			0.82	128
macro avg	0.83	0.85	0.84	128
weighted avg	0.83	0.82	0.82	128

VGG16

Layer (type)	Output Shape	Param #
input_1 (InputLayer)	[(None, 224, 224, 3)]	0
block1_conv1 (Conv2D)	(None, 224, 224, 64)	1792
block1_conv2 (Conv2D)	(None, 224, 224, 64)	36928
block1_pool (MaxPooling2D)	(None, 112, 112, 64)	0
block2_conv1 (Conv2D)	(None, 112, 112, 128)	73856
block2_conv2 (Conv2D)	(None, 112, 112, 128)	147584
block2_pool (MaxPooling2D)	(None, 56, 56, 128)	0
block3_conv1 (Conv2D)	(None, 56, 56, 256)	295168
block3_conv2 (Conv2D)	(None, 56, 56, 256)	590080
block3_conv3 (Conv2D)	(None, 56, 56, 256)	590080
block3_pool (MaxPooling2D)	(None, 28, 28, 256)	0
block4_conv1 (Conv2D)	(None, 28, 28, 512)	1180160
block4_conv2 (Conv2D)	(None, 28, 28, 512)	2359808
block4_conv3 (Conv2D)	(None, 28, 28, 512)	2359808
block4_pool (MaxPooling2D)	(None, 14, 14, 512)	0
block5_conv1 (Conv2D)	(None, 14, 14, 512)	2359808
block5_conv2 (Conv2D)	(None, 14, 14, 512)	2359808
block5_conv3 (Conv2D)	(None, 14, 14, 512)	2359808
block5_pool (MaxPooling2D)	(None, 7, 7, 512)	0
flatten_1 (Flatten)	(None, 25088)	0
dense_4 (Dense)	(None, 8)	200712

Total params: 14915400 (56.90 MB)
Trainable params: 200712 (784.03 KB)
Non-trainable params: 14714688 (56.13 MB)

	precision	recall	f1-score	support
0	0.79	0.61	0.69	18
1	0.29	0.92	0.44	13
2	0.29	0.91	0.44	11
3	0.75	0.13	0.22	23
4	0.75	0.90	0.82	20
5	1.00	0.71	0.83	7
6	1.00	0.27	0.42	15
7	1.00	0.05	0.09	21
accuracy			0.50	128
macro avg	0.73	0.56	0.49	128
weighted avg	0.75	0.50	0.46	128

ResNet50

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conv5_block3_1_bn (BatchNo  (None, 7, 7, 512)           2048      ['conv5_block3_1_conv[0][0]']
rmalization)

conv5_block3_1_relu (Activ  (None, 7, 7, 512)           0         ['conv5_block3_1_bn[0][0]']
ation)

conv5_block3_2_conv (Conv2  (None, 7, 7, 512)           2359808   ['conv5_block3_1_relu[0][0]']
D)

conv5_block3_2_bn (BatchNo  (None, 7, 7, 512)           2048      ['conv5_block3_2_conv[0][0]']
rmalization)

conv5_block3_2_relu (Activ  (None, 7, 7, 512)           0         ['conv5_block3_2_bn[0][0]']
ation)

conv5_block3_3_conv (Conv2  (None, 7, 7, 2048)          1050624   ['conv5_block3_2_relu[0][0]']
D)

conv5_block3_3_bn (BatchNo  (None, 7, 7, 2048)          8192      ['conv5_block3_3_conv[0][0]']
rmalization)

conv5_block3_add (Add)      (None, 7, 7, 2048)          0         ['conv5_block2_out[0][0]',
                                                                   'conv5_block3_3_bn[0][0]']

conv5_block3_out (Activati  (None, 7, 7, 2048)          0         ['conv5_block3_add[0][0]']
on)

flatten_2 (Flatten)         (None, 100352)              0         ['conv5_block3_out[0][0]']

dense_5 (Dense)             (None, 8)                   802824    ['flatten_2[0][0]']

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Total params: 24390536 (93.04 MB)
Trainable params: 802824 (3.06 MB)
Non-trainable params: 23587712 (89.98 MB)
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	precision	recall	f1-score	support
0	0.20	0.50	0.29	18
1	0.00	0.00	0.00	13
2	0.09	0.36	0.15	11
3	0.00	0.00	0.00	23
4	0.10	0.20	0.13	20
5	0.00	0.00	0.00	7
6	0.00	0.00	0.00	15
7	0.00	0.00	0.00	21
accuracy			0.13	128
macro avg	0.05	0.13	0.07	128
weighted avg	0.05	0.13	0.07	128