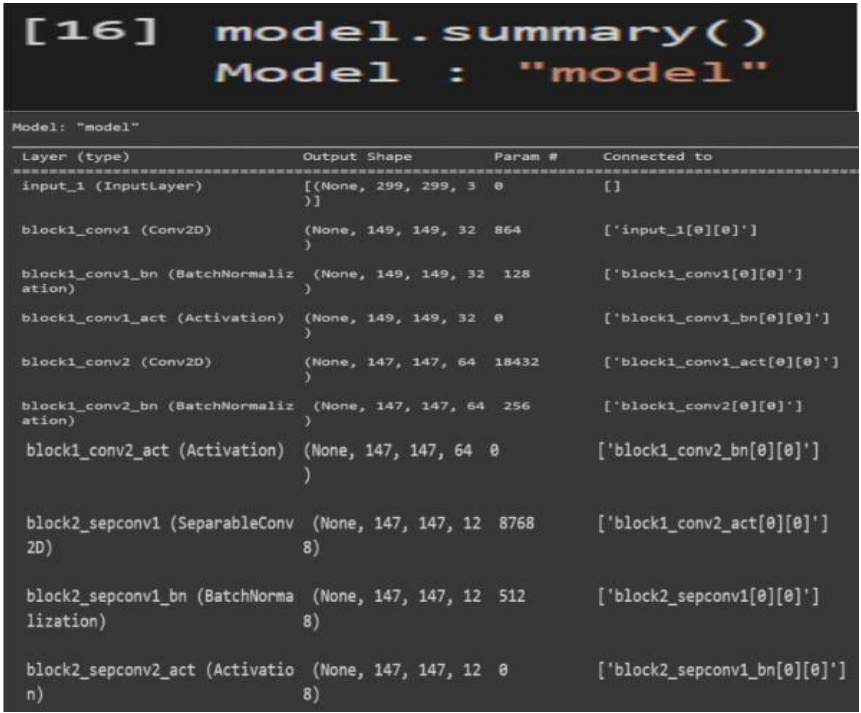


**Project Development Phase**  
**Model Performance Test**

Date	17 November
Team ID	PNT2022TMID48260
Project Name	Deep learning fundus image analysis for early detection of diabetic retinopathy
Maximum Marks	10 marks

### Model performance testing:

s.no	Parameter	values	screenshot
1.	Model summary		 <pre> [16] model.summary() Model : "model"  Model: "model" ----- Layer (type)                 Output Shape         Param #       Connected to ----- input_1 (InputLayer)         [(None, 299, 299, 3  0                         )]                         [] block1_conv1 (Conv2D)        (None, 149, 149, 32  864                         )                         ['input_1[0][0]'] block1_conv1_bn (BatchNormaliz                         ation)                         (None, 149, 149, 32  128                         )                         ['block1_conv1[0][0]'] block1_conv1_act (Activation)  (None, 149, 149, 32  0                         )                         ['block1_conv1_bn[0][0]'] block1_conv2 (Conv2D)        (None, 147, 147, 64  18432                         )                         ['block1_conv1_act[0][0]'] block1_conv2_bn (BatchNormaliz                         ation)                         (None, 147, 147, 64  256                         )                         ['block1_conv2[0][0]'] block1_conv2_act (Activation)  (None, 147, 147, 64  0                         )                         ['block1_conv2_bn[0][0]'] block2_sepconv1 (SeparableConv                         2D)                         (None, 147, 147, 12  8768                         8)                         ['block1_conv2_act[0][0]'] block2_sepconv1_bn (BatchNorma                         lization)                         (None, 147, 147, 12  512                         8)                         ['block2_sepconv1[0][0]'] block2_sepconv2_act (Activatio                         n)                         (None, 147, 147, 12  0                         8)                         ['block2_sepconv1_bn[0][0]'] </pre>

		-	<div> <div> <div>block2_sepconv2 (SeparableConv2D)</div> <div>(None, 147, 147, 128)</div> <div>17536</div> <div>['block2_sepconv2_act[0][0]']</div> </div> <div> <div>block2_sepconv2_bn (BatchNormalization)</div> <div>(None, 147, 147, 128)</div> <div>512</div> <div>['block2_sepconv2[0][0]']</div> </div> <div> <div>conv2d (Conv2D)</div> <div>(None, 74, 74, 128)</div> <div>8192</div> <div>['block1_conv2_act[0][0]']</div> </div> <div> <div>block2_pool (MaxPooling2D)</div> <div>(None, 74, 74, 128)</div> <div>0</div> <div>['block2_sepconv2_bn[0][0]']</div> </div> <div> <div>batch_normalization (BatchNormalization)</div> <div>(None, 74, 74, 128)</div> <div>512</div> <div>['conv2d[0][0]']</div> </div> <div> <div>add (Add)</div> <div>(None, 74, 74, 128)</div> <div>0</div> <div>['block2_pool[0][0]', 'batch_normalization[0][0]']</div> </div> <div> <div>block3_sepconv1_act (Activation)</div> <div>(None, 74, 74, 128)</div> <div>0</div> <div>['add[0][0]']</div> </div> <div> <div>block3_sepconv1 (SeparableConv2D)</div> <div>(None, 74, 74, 256)</div> <div>33920</div> <div>['block3_sepconv1_act[0][0]']</div> </div> <div> <div>block3_sepconv1_bn (BatchNormalization)</div> <div>(None, 74, 74, 256)</div> <div>1024</div> <div>['block3_sepconv1[0][0]']</div> </div> <div> <div>block3_sepconv2_act (Activation)</div> <div>(None, 74, 74, 256)</div> <div>0</div> <div>['block3_sepconv1_bn[0][0]']</div> </div> <div> <div>block3_sepconv2 (SeparableConv2D)</div> <div>(None, 74, 74, 256)</div> <div>67840</div> <div>['block3_sepconv2_act[0][0]']</div> </div> <div> <div>block3_sepconv2_bn (BatchNormalization)</div> <div>(None, 74, 74, 256)</div> <div>1024</div> <div>['block3_sepconv2[0][0]']</div> </div> <div> <div>conv2d_1 (Conv2D)</div> <div>(None, 37, 37, 256)</div> <div>32768</div> <div>['add[0][0]']</div> </div> <div> <div>block3_pool (MaxPooling2D)</div> <div>(None, 37, 37, 256)</div> <div>0</div> <div>['block3_sepconv2_bn[0][0]']</div> </div> <div> <div>batch_normalization_1 (BatchNormalization)</div> <div>(None, 37, 37, 256)</div> <div>1024</div> <div>['conv2d_1[0][0]']</div> </div> </div>
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			<div> <div>add_1 (Add)</div> <div>(None, 37, 37, 256) 0</div> <div>['block3_pool[0][0]', 'batch_normalization_1[0][0]']</div> </div> <div> <div>block4_sepconv1_act (Activation)</div> <div>(None, 37, 37, 256) 0</div> <div>['add_1[0][0]']</div> </div> <div> <div>block4_sepconv1 (SeparableConv2D)</div> <div>(None, 37, 37, 728) 188672</div> <div>['block4_sepconv1_act[0][0]']</div> </div> <div> <div>block4_sepconv1_bn (BatchNormalization)</div> <div>(None, 37, 37, 728) 2912</div> <div>['block4_sepconv1[0][0]']</div> </div> <div> <div>block4_sepconv2_act (Activation)</div> <div>(None, 37, 37, 728) 0</div> <div>['block4_sepconv1_bn[0][0]']</div> </div> <div> <div>block4_sepconv2 (SeparableConv2D)</div> <div>(None, 37, 37, 728) 536536</div> <div>['block4_sepconv2_act[0][0]']</div> </div> <div> <div>block4_sepconv2_bn (BatchNormalization)</div> <div>(None, 37, 37, 728) 2912</div> <div>['block4_sepconv2[0][0]']</div> </div> <div> <div>conv2d_2 (Conv2D)</div> <div>(None, 19, 19, 728) 186368</div> <div>['add_1[0][0]']</div> </div> <div> <div>block4_pool (MaxPooling2D)</div> <div>(None, 19, 19, 728) 0</div> <div>['block4_sepconv2_bn[0][0]']</div> </div> <div> <div>batch_normalization_2 (BatchNormalization)</div> <div>(None, 19, 19, 728) 2912</div> <div>['conv2d_2[0][0]']</div> </div> <div> <div>add_2 (Add)</div> <div>(None, 19, 19, 728) 0</div> <div>['block4_pool[0][0]', 'batch_normalization_2[0][0]']</div> </div> <div> <div>block5_sepconv1_act (Activation)</div> <div>(None, 19, 19, 728) 0</div> <div>['add_2[0][0]']</div> </div> <div> <div>block5_sepconv1 (SeparableConv2D)</div> <div>(None, 19, 19, 728) 536536</div> <div>['block5_sepconv1_act[0][0]']</div> </div> <div> <div>block5_sepconv1_bn (BatchNormalization)</div> <div>(None, 19, 19, 728) 2912</div> <div>['block5_sepconv1[0][0]']</div> </div> <div> <div>block5_sepconv2_act (Activation)</div> <div>(None, 19, 19, 728) 0</div> <div>['block5_sepconv1_bn[0][0]']</div> </div> <div> <div>block5_sepconv2 (SeparableConv2D)</div> <div>(None, 19, 19, 728) 536536</div> <div>['block5_sepconv2_act[0][0]']</div> </div>
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			<div>block5_sepconv2_bn (BatchNorma (None, 19, 19, 728) 2912 ['block5_sepconv2[0][0]'] lization)</div> <div>block5_sepconv3_act (Activatio (None, 19, 19, 728) 0 ['block5_sepconv2_bn[0][0]'] n)</div> <div>block5_sepconv3 (SeparableConv (None, 19, 19, 728) 536536 ['block5_sepconv3_act[0][0]'] 2D)</div> <div>block5_sepconv3_bn (BatchNorma (None, 19, 19, 728) 2912 ['block5_sepconv3[0][0]'] lization)</div> <div>add_3 (Add) (None, 19, 19, 728) 0 ['block5_sepconv3_bn[0][0]', 'add_2[0][0]']</div> <div>block6_sepconv1_act (Activatio (None, 19, 19, 728) 0 ['add_3[0][0]'] n)</div> <div>block6_sepconv1 (SeparableConv (None, 19, 19, 728) 536536 ['block6_sepconv1_act[0][0]'] 2D)</div> <div>block6_sepconv1_bn (BatchNorma (None, 19, 19, 728) 2912 ['block6_sepconv1[0][0]'] lization)</div> <div>block6_sepconv2_act (Activatio (None, 19, 19, 728) 0 ['block6_sepconv1_bn[0][0]'] n)</div> <div>block6_sepconv2 (SeparableConv (None, 19, 19, 728) 536536 ['block6_sepconv2_act[0][0]'] 2D)</div> <div>block6_sepconv2_bn (BatchNorma (None, 19, 19, 728) 2912 ['block6_sepconv2[0][0]'] lization)</div> <div>block6_sepconv3_act (Activatio (None, 19, 19, 728) 0 ['block6_sepconv2_bn[0][0]'] n)</div> <div>block6_sepconv3 (SeparableConv (None, 19, 19, 728) 536536 ['block6_sepconv3_act[0][0]'] 2D)</div>
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			block6_sepconv2_bn (BatchNorma (None, 19, 19, 728) 2912 ['block6_sepconv2[0][0]'] lization)
			block6_sepconv3_act (Activatio (None, 19, 19, 728) 0 ['block6_sepconv2_bn[0][0]'] n)
			block6_sepconv3 (SeparableConv (None, 19, 19, 728) 536536 ['block6_sepconv3_act[0][0]'] 2D)
			block6_sepconv3_bn (BatchNorma (None, 19, 19, 728) 2912 ['block6_sepconv3[0][0]'] lization)
			add_4 (Add) (None, 19, 19, 728) 0 ['block6_sepconv3_bn[0][0]', 'add_3[0][0]']
			block7_sepconv1_act (Activatio (None, 19, 19, 728) 0 ['add_4[0][0]'] n)
			block7_sepconv1 (SeparableConv (None, 19, 19, 728) 536536 ['block7_sepconv1_act[0][0]'] 2D)
			block7_sepconv1_bn (BatchNorma (None, 19, 19, 728) 2912 ['block7_sepconv1[0][0]'] lization)
			block7_sepconv2_act (Activatio (None, 19, 19, 728) 0 ['block7_sepconv1_bn[0][0]'] n)
			block7_sepconv2 (SeparableConv (None, 19, 19, 728) 536536 ['block7_sepconv2_act[0][0]'] 2D)
			block7_sepconv2_bn (BatchNorma (None, 19, 19, 728) 2912 ['block7_sepconv2[0][0]'] lization)
			block7_sepconv3_act (Activatio (None, 19, 19, 728) 0 ['block7_sepconv2_bn[0][0]'] n)
			block7_sepconv3 (SeparableConv (None, 19, 19, 728) 536536 ['block7_sepconv3_act[0][0]'] 2D)
			block7_sepconv3_bn (BatchNorma (None, 19, 19, 728) 2912 ['block7_sepconv3[0][0]'] lization)
			add_5 (Add) (None, 19, 19, 728) 0 ['block7_sepconv3_bn[0][0]', 'add_4[0][0]']

			<pre>add_11 (Add)                (None, 10, 10, 1024  0      ['block13_pool[0][0]',                                 )      'batch_normalization_3[0][0]']  block14_sepconv1 (SeparableCon (None, 10, 10, 1536 1582080 ['add_11[0][0]'] v2D)                )  block14_sepconv1_bn (BatchNorm (None, 10, 10, 1536 6144  ['block14_sepconv1[0][0]'] alization)          )  block14_sepconv1_act (Activati (None, 10, 10, 1536  0      ['block14_sepconv1_bn[0][0]'] on)                  )  block14_sepconv2 (SeparableCon (None, 10, 10, 2048 3159552 ['block14_sepconv1_act[0][0]'] v2D)                )  block14_sepconv2_bn (BatchNorm (None, 10, 10, 2048 8192  ['block14_sepconv2[0][0]'] alization)          )  block14_sepconv2_act (Activati (None, 10, 10, 2048  0      ['block14_sepconv2_bn[0][0]'] on)                  )  flatten (Flatten)           (None, 204800)      0      ['block14_sepconv2_act[0][0]']  dense (Dense)               (None, 5)          1024005  ['flatten[0][0]']  ===== Total params: 21,885,485 Trainable params: 1,024,005 Non-trainable params: 20,861,480</pre>
			<pre>block8_sepconv1_act (Activatio (None, 19, 19, 728) 0      ['add_5[0][0]'] n)  block8_sepconv1 (SeparableConv (None, 19, 19, 728) 536536  ['block8_sepconv1_act[0][0]'] 2D)  block8_sepconv1_bn (BatchNorma (None, 19, 19, 728) 2912  ['block8_sepconv1[0][0]'] lization)  block8_sepconv2_act (Activatio (None, 19, 19, 728) 0      ['block8_sepconv1_bn[0][0]'] n)  block8_sepconv2 (SeparableConv (None, 19, 19, 728) 536536  ['block8_sepconv2_act[0][0]'] 2D)  block8_sepconv2_bn (BatchNorma (None, 19, 19, 728) 2912  ['block8_sepconv2[0][0]'] lization)  block8_sepconv3_act (Activatio (None, 19, 19, 728) 0      ['block8_sepconv2_bn[0][0]'] n)</pre>

2.	Accuracy	Training Accuracy -  Validation Accuracy -	<pre># fit the model  r = model.fit_generator(     training_set,     validation_data=test_set,     epochs=30,     steps_per_epoch=len(training_set)//32,     validation_steps=len(test_set)//32 )</pre> <p>Epoch 1/30 3/3 [=====] - 58s 17s/step - loss: 12.1428 - accuracy: 0.3229 Epoch 2/30 3/3 [=====] - 50s 14s/step - loss: 10.8191 - accuracy: 0.5521 Epoch 3/30 3/3 [=====] - 51s 16s/step - loss: 9.6766 - accuracy: 0.4688 Epoch 4/30 3/3 [=====] - 51s 16s/step - loss: 7.3417 - accuracy: 0.5833 Epoch 5/30 3/3 [=====] - 49s 14s/step - loss: 5.9892 - accuracy: 0.5208 Epoch 6/30 3/3 [=====] - 47s 14s/step - loss: 4.0807 - accuracy: 0.6771 Epoch 7/30 3/3 [=====] - 49s 15s/step - loss: 3.9948 - accuracy: 0.6562 Epoch 8/30 3/3 [=====] - 49s 15s/step - loss: 4.0479 - accuracy: 0.6250 Epoch 9/30 3/3 [=====] - 50s 15s/step - loss: 4.3574 - accuracy: 0.6458 Epoch 10/30 3/3 [=====] - 50s 15s/step - loss: 3.7197 - accuracy: 0.6146 Epoch 11/30 3/3 [=====] - 47s 14s/step - loss: 5.1180 - accuracy: 0.5625</p>
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			<pre> Epoch 12/30 3/3 [=====] - 48s 14s/step - loss: 2.5951 - accuracy: 0.7188 Epoch 13/30 3/3 [=====] - 51s 15s/step - loss: 3.6282 - accuracy: 0.7083 Epoch 14/30 3/3 [=====] - 47s 14s/step - loss: 3.2756 - accuracy: 0.7083 Epoch 15/30 3/3 [=====] - 40s 15s/step - loss: 4.7868 - accuracy: 0.6795 Epoch 16/30 3/3 [=====] - 49s 14s/step - loss: 2.7478 - accuracy: 0.7604 Epoch 17/30 3/3 [=====] - 47s 14s/step - loss: 4.2101 - accuracy: 0.5417 Epoch 18/30 3/3 [=====] - 48s 14s/step - loss: 4.3796 - accuracy: 0.6875 Epoch 19/30 3/3 [=====] - 54s 17s/step - loss: 5.3032 - accuracy: 0.5312 Epoch 20/30 3/3 [=====] - 50s 15s/step - loss: 3.7652 - accuracy: 0.7083 Epoch 21/30 3/3 [=====] - 48s 14s/step - loss: 2.8421 - accuracy: 0.7812 Epoch 22/30 3/3 [=====] - 48s 15s/step - loss: 2.7402 - accuracy: 0.6979 Epoch 23/30 3/3 [=====] - 49s 15s/step - loss: 2.7817 - accuracy: 0.6771 Epoch 24/30 3/3 [=====] - 49s 15s/step - loss: 3.3278 - accuracy: 0.7083 Epoch 25/30 3/3 [=====] - 49s 14s/step - loss: 3.9974 - accuracy: 0.6354 Epoch 26/30 3/3 [=====] - 48s 14s/step - loss: 2.6000 - accuracy: 0.6979 Epoch 27/30 3/3 [=====] - 48s 15s/step - loss: 3.0479 - accuracy: 0.6979 Epoch 28/30 3/3 [=====] - 47s 14s/step - loss: 1.9773 - accuracy: 0.7708 Epoch 29/30 3/3 [=====] - 49s 14s/step - loss: 2.6960 - accuracy: 0.7292 Epoch 30/30 3/3 [=====] - 47s 14s/step - loss: 2.5824 - accuracy: 0.7708 </pre>
3.	Confidence Score(Only Yolo Projects)	Class Detected - Confidence Score -	NA

