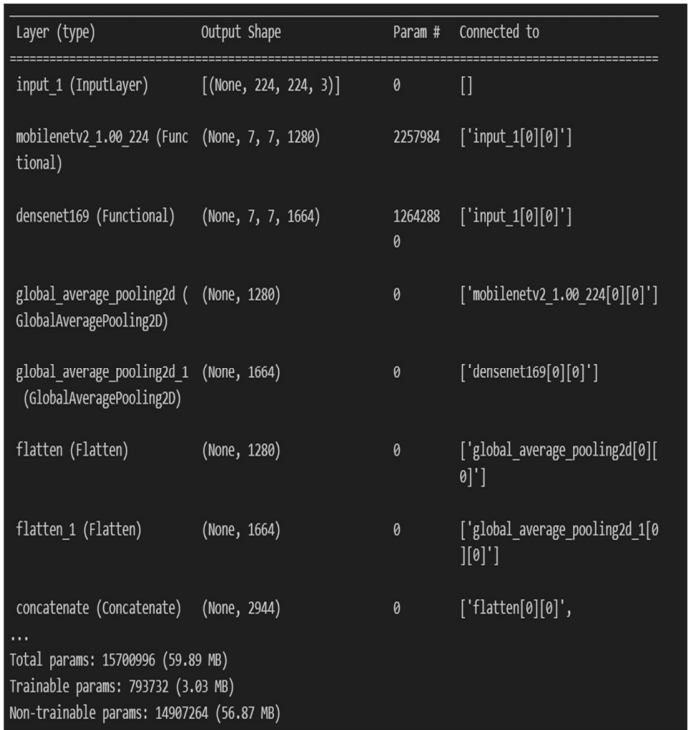


Project Development Phase Model Performance Test

Date	7 November 2023
Team ID	Team-592616
Project Name	Detecting Covid-19 from Chest X-Rays using Deep Learning Techniques
Maximum Marks	10 Marks

Model Performance Testing:

Project team shall fill the following information in model performance testing template.

S.No	Parameter	Values	Screenshot
1.	Model Summary	<p>Total params: 15700996 (59.89 MB)</p> <p>Trainable params: 793732 (3.03 MB)</p> <p>Non-trainable params: 14907264 (56.87 MB)</p>	 <pre> Layer (type) Output Shape Param # Connected to ===== input_1 (InputLayer) [None, 224, 224, 3] 0 [] mobilenetv2_1.00_224 (Func (None, 7, 7, 1280) 2257984 ['input_1[0][0]'] tional) densenet169 (Functional) (None, 7, 7, 1664) 1264288 ['input_1[0][0]'] 0 global_average_pooling2d ((None, 1280) 0 ['mobilenetv2_1.00_224[0][0]'] GlobalAveragePooling2D) global_average_pooling2d_1 (None, 1664) 0 ['densenet169[0][0]'] (GlobalAveragePooling2D) flatten (Flatten) (None, 1280) 0 ['global_average_pooling2d[0][0]'] flatten_1 (Flatten) (None, 1664) 0 ['global_average_pooling2d_1[0][0]'] concatenate (Concatenate) (None, 2944) 0 ['flatten[0][0]', ... Total params: 15700996 (59.89 MB) Trainable params: 793732 (3.03 MB) Non-trainable params: 14907264 (56.87 MB) </pre>

2.	Accuracy	<p>Training Accuracy - 88.10%</p> <p>Validation Accuracy - 90.17%</p>	<pre>Epoch 1/20 1058/1058 [=====] - 249s 236ms/step - loss: 0.4361 - accuracy: 0.8395 - val_loss: 0.3077 - val_accuracy: 0.8922 Epoch 2/20 1058/1058 [=====] - 251s 237ms/step - loss: 0.4205 - accuracy: 0.8438 - val_loss: 0.3229 - val_accuracy: 0.8837 Epoch 3/20 1058/1058 [=====] - 249s 236ms/step - loss: 0.3966 - accuracy: 0.8528 - val_loss: 0.2901 - val_accuracy: 0.8956 Epoch 4/20 1058/1058 [=====] - 253s 239ms/step - loss: 0.3929 - accuracy: 0.8562 - val_loss: 0.2808 - val_accuracy: 0.9000 Epoch 5/20 1058/1058 [=====] - 251s 237ms/step - loss: 0.3720 - accuracy: 0.8663 - val_loss: 0.3046 - val_accuracy: 0.8963 Epoch 6/20 1058/1058 [=====] - 249s 235ms/step - loss: 0.3756 - accuracy: 0.8613 - val_loss: 0.2865 - val_accuracy: 0.8993 Epoch 7/20 1058/1058 [=====] - 248s 234ms/step - loss: 0.3676 - accuracy: 0.8663 - val_loss: 0.2687 - val_accuracy: 0.9067 Epoch 8/20 1058/1058 [=====] - 252s 238ms/step - loss: 0.3562 - accuracy: 0.8711 - val_loss: 0.2726 - val_accuracy: 0.9060 Epoch 9/20 1058/1058 [=====] - 250s 237ms/step - loss: 0.3587 - accuracy: 0.8724 - val_loss: 0.2813 - val_accuracy: 0.9003 Epoch 10/20 1058/1058 [=====] - 252s 238ms/step - loss: 0.3440 - accuracy: 0.8772 - val_loss: 0.2735 - val_accuracy: 0.9081 Epoch 11/20 1058/1058 [=====] - 252s 238ms/step - loss: 0.3395 - accuracy: 0.8765 - val_loss: 0.2656 - val_accuracy: 0.9041 Epoch 12/20 1058/1058 [=====] - 251s 238ms/step - loss: 0.3380 - accuracy: 0.8789 - val_loss: 0.2549 - val_accuracy: 0.9121 Epoch 13/20 1058/1058 [=====] - ETA: 0s - loss: 0.3332 - accuracy: 0.8810Restoring model weights from the end of the best epoch: 1058/1058 [=====] - 251s 237ms/step - loss: 0.3332 - accuracy: 0.8810 - val_loss: 0.2542 - val_accuracy: 0.9119 Epoch 13: early stopping</pre> <p>67/67 [=====] - 15s 218ms/step Accuracy: 90.17%</p>
3.	Confidence Score (Only Yolo Projects)	-NA-	-NA-

Summary:

Layer (type)	Output Shape	Param #	Connected to
input_1 (InputLayer)	(None, 224, 224, 3)	0	[]
mobilenetv2_1.00_224 (Functional)	(None, 7, 7, 1280)	2257984	['input_1[0][0]']
densenet169 (Functional)	(None, 7, 7, 1664)	12642880	['input_1[0][0]']
global_average_pooling2d (GlobalAveragePooling2D)	(None, 1280)	0	['mobilenetv2_1.00_224[0][0]']
global_average_pooling2d_1 (GlobalAveragePooling2D)	(None, 1664)	0	['densenet169[0][0]']
flatten (Flatten)	(None, 1280)	0	['global_average_pooling2d[0][0]']
flatten_1 (Flatten)	(None, 1664)	0	['global_average_pooling2d_1[0][0]']
concatenate (Concatenate)	(None, 2944)	0	['flatten[0][0]',
...			
Total params: 15700996 (59.89 MB)			
Trainable params: 793732 (3.03 MB)			
Non-trainable params: 14907264 (56.87 MB)			

Training Accuracy:

```
Epoch 1/20
1058/1058 [=====] - 249s 236ms/step - loss: 0.4361 - accuracy: 0.8395 - val_loss: 0.3077 - val_accuracy: 0.8922
Epoch 2/20
1058/1058 [=====] - 251s 237ms/step - loss: 0.4205 - accuracy: 0.8438 - val_loss: 0.3229 - val_accuracy: 0.8837
Epoch 3/20
1058/1058 [=====] - 249s 236ms/step - loss: 0.3966 - accuracy: 0.8528 - val_loss: 0.2901 - val_accuracy: 0.8956
Epoch 4/20
1058/1058 [=====] - 253s 239ms/step - loss: 0.3929 - accuracy: 0.8562 - val_loss: 0.2808 - val_accuracy: 0.9000
Epoch 5/20
1058/1058 [=====] - 251s 237ms/step - loss: 0.3720 - accuracy: 0.8663 - val_loss: 0.3046 - val_accuracy: 0.8963
Epoch 6/20
1058/1058 [=====] - 249s 235ms/step - loss: 0.3756 - accuracy: 0.8613 - val_loss: 0.2865 - val_accuracy: 0.8993
Epoch 7/20
1058/1058 [=====] - 248s 234ms/step - loss: 0.3676 - accuracy: 0.8663 - val_loss: 0.2687 - val_accuracy: 0.9067
Epoch 8/20
1058/1058 [=====] - 252s 238ms/step - loss: 0.3562 - accuracy: 0.8711 - val_loss: 0.2726 - val_accuracy: 0.9060
Epoch 9/20
1058/1058 [=====] - 250s 237ms/step - loss: 0.3587 - accuracy: 0.8724 - val_loss: 0.2813 - val_accuracy: 0.9003
Epoch 10/20
1058/1058 [=====] - 252s 238ms/step - loss: 0.3440 - accuracy: 0.8772 - val_loss: 0.2735 - val_accuracy: 0.9081
Epoch 11/20
1058/1058 [=====] - 252s 238ms/step - loss: 0.3395 - accuracy: 0.8765 - val_loss: 0.2656 - val_accuracy: 0.9041
Epoch 12/20
1058/1058 [=====] - 251s 238ms/step - loss: 0.3380 - accuracy: 0.8789 - val_loss: 0.2549 - val_accuracy: 0.9121
Epoch 13/20
1058/1058 [=====] - ETA: 0s - loss: 0.3332 - accuracy: 0.8810Restoring model weights from the end of the best epoch: 7.
1058/1058 [=====] - 251s 237ms/step - loss: 0.3332 - accuracy: 0.8810 - val_loss: 0.2542 - val_accuracy: 0.9119
Epoch 13: early stopping
```

Validation Accuracy:

```
67/67 [=====] - 15s 218ms/step
Accuracy: 90.17%
```

Classification Report:

	precision	recall	f1-score	support
COVID	0.91	0.82	0.86	723
LUNG_OPACITY	0.90	0.88	0.89	1202
NORMAL	0.89	0.95	0.92	2038
PNEUMONIA	0.94	0.88	0.91	269
accuracy			0.90	4232
macro avg	0.91	0.88	0.90	4232
weighted avg	0.90	0.90	0.90	4232

Confusion Matrix:

	COVID	LUNG_OPACITY	NORMAL	PNEUMONIA
COVID	595	46	77	5
LUNG_OPACITY	30	1052	120	0
NORMAL	28	68	1931	11
PNEUMONIA	0	0	31	238