AI-based diagnostic system

COVID-19 disease

10cm

Dataset

This dataset consists of a posteroanterior (PA) view of chest X-ray images comprising Normal, Viral, and CVOID-19 affected patients. There are total 1709 CXR images.

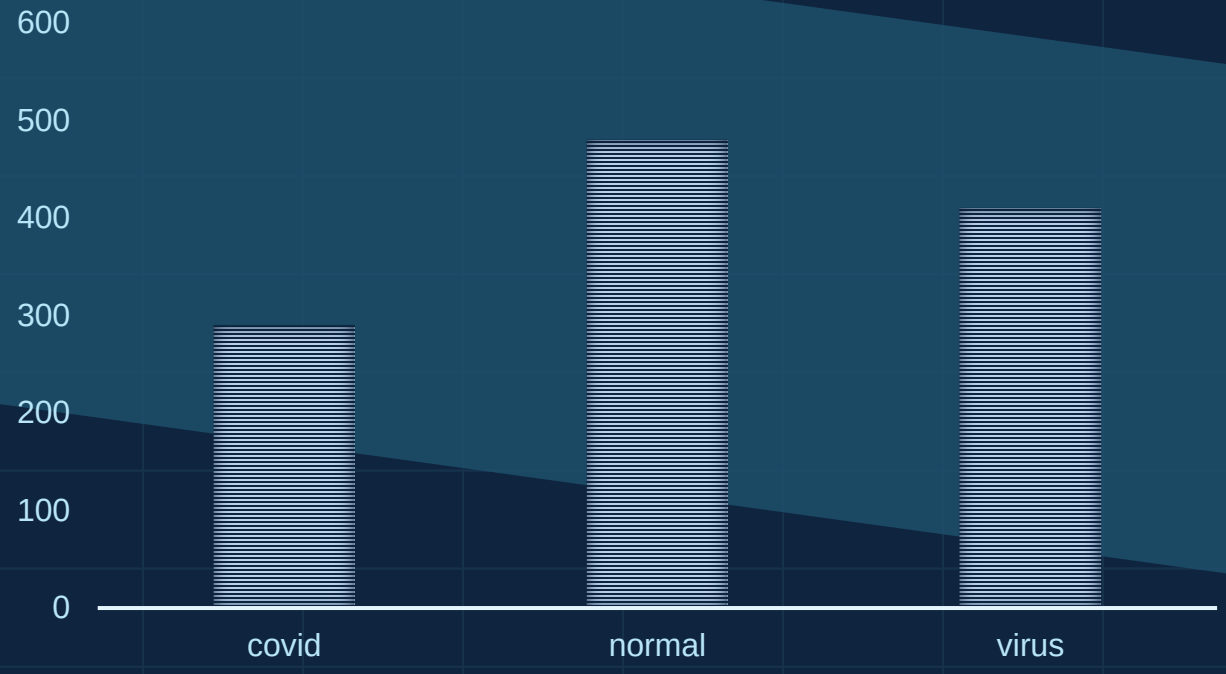
Dataset

Data columns: 2 columns (Image, Label).

Train Data: Image 1196 non-null with label.

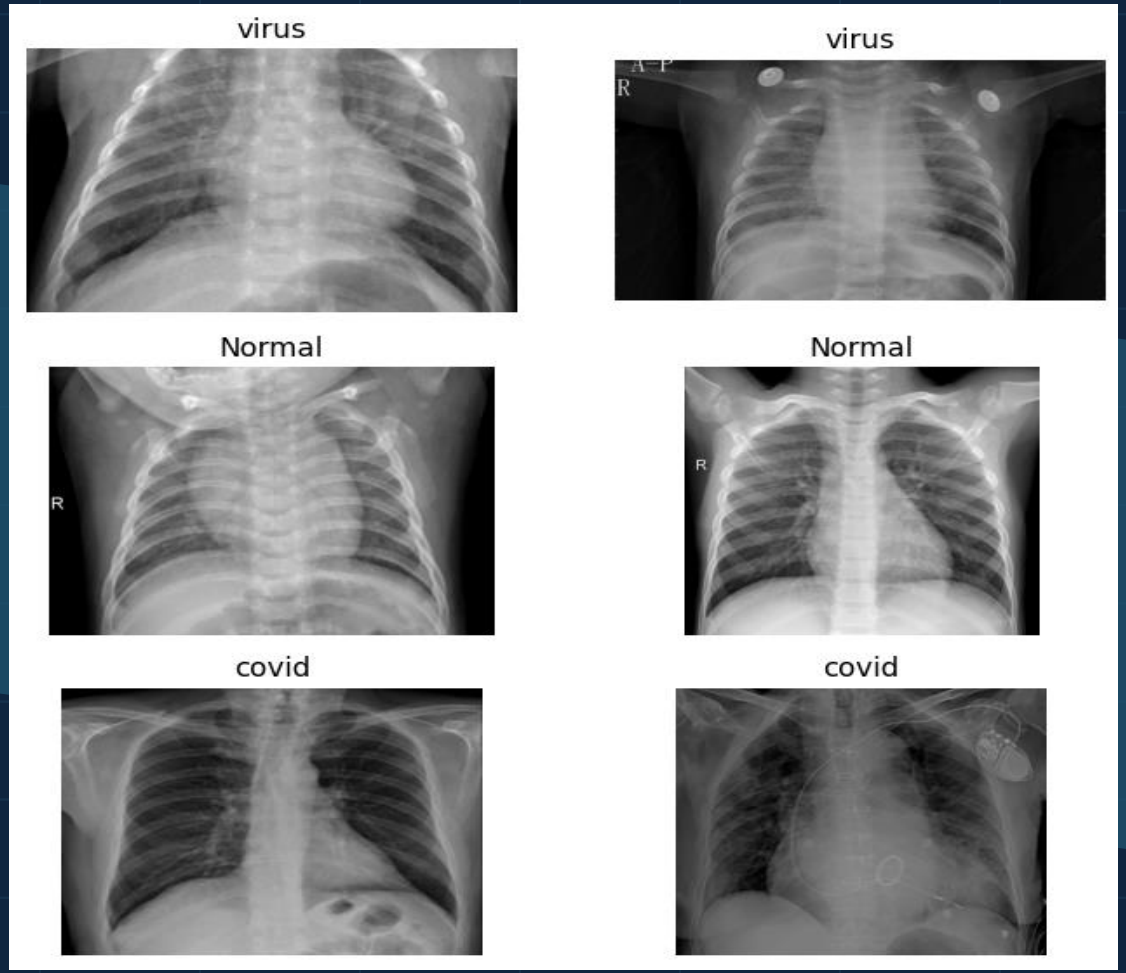
Test Data: Image 513 without label.

Dataset



10cm

Dataset



10cm

CNN Model

Processing Data

Split dataset to train (958) and validation Data (238).

Image width and Hight: 224

Image generator with color rescale.

Data augmentation for training data

10cm

Model structure

Compile with “Adam” optimizer and 'categorical_crossentropy’ loss function and accuracy matrices.

Fit for 30 epochs and early stop in 21.

Layer (type)	Output Shape	Param #
conv2d_4 (Conv2D)	(None, 222, 222, 32)	896
max_pooling2d_4 (MaxPooling2D)	(None, 111, 111, 32)	0
conv2d_5 (Conv2D)	(None, 109, 109, 64)	18496
max_pooling2d_5 (MaxPooling2D)	(None, 54, 54, 64)	0
conv2d_6 (Conv2D)	(None, 52, 52, 128)	73856
max_pooling2d_6 (MaxPooling2D)	(None, 26, 26, 128)	0
conv2d_7 (Conv2D)	(None, 24, 24, 128)	147584
max_pooling2d_7 (MaxPooling2D)	(None, 12, 12, 128)	0
flatten_1 (Flatten)	(None, 18432)	0
dense_2 (Dense)	(None, 512)	9437696
dense_3 (Dense)	(None, 3)	1539

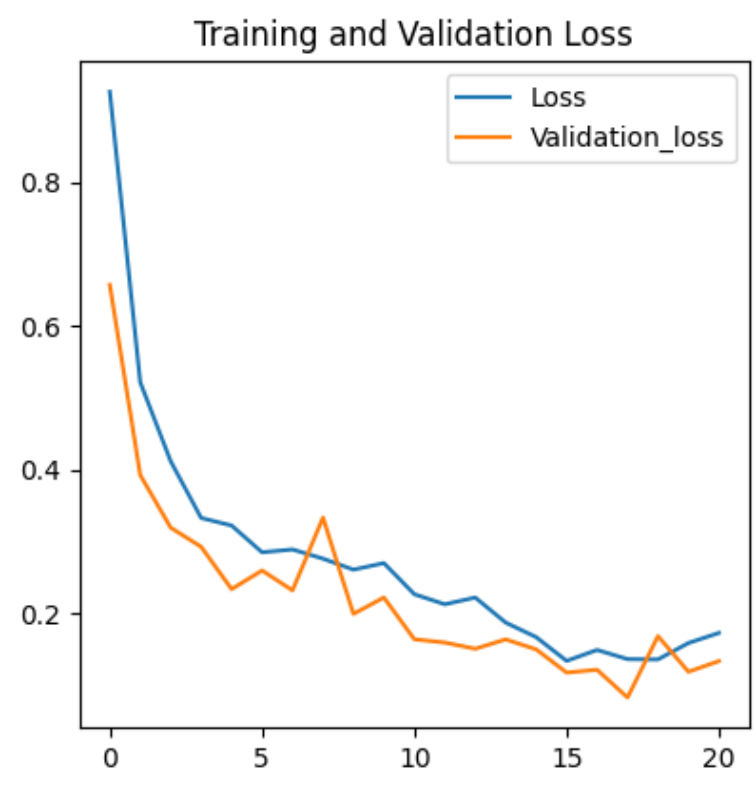
Total params: 9680067 (36.93 MB)
Trainable params: 9680067 (36.93 MB)
Non-trainable params: 0 (0.00 Byte)

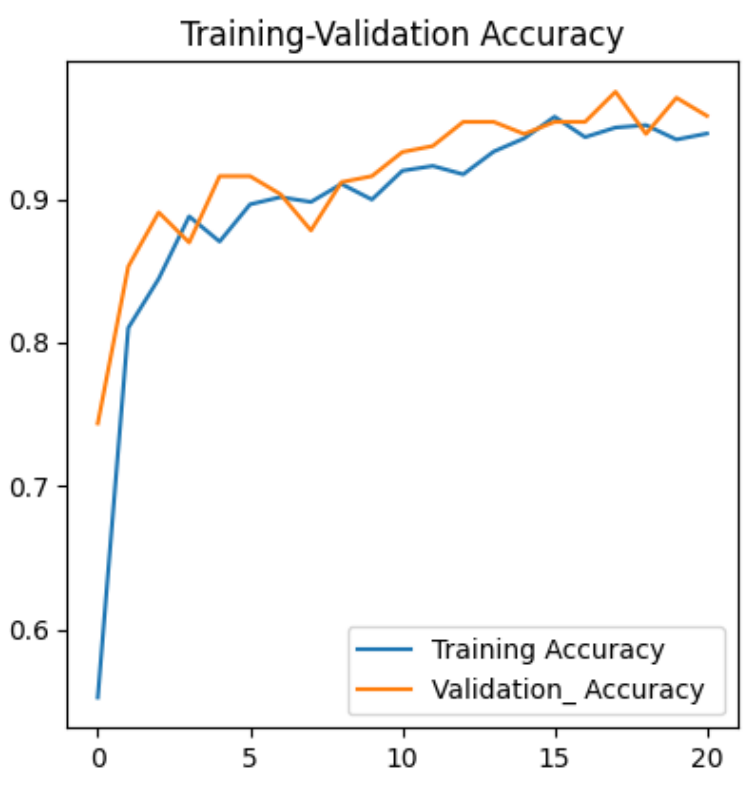
10cm

95%

CNN Validation accuracy score

Result


Training and Validation Loss
Loss
Validation_loss
0.8
0.6
0.4
0.2
0
5
10
15
20


Training-Validation Accuracy
0.9
0.8
0.7
0.6
Training Accuracy
Validation_ Accuracy
0
5
10
15
20

Result

		precision	recall	f1-score
covid	0	0.98	1.00	0.99
normal	1	0.99	0.95	0.97
virus	2	0.94	0.98	0.96
accuracy				0.97
macro avg		0.97	0.97	0.97
weighted avg		0.97	0.97	0.97

10cm

MobileNet-V2 Model

Processing Data

Split dataset to train (958) and validation Data (238).

Image width and Hight: 224

Image generator with preprocessing function mobilenet.preprocess_inputData

10cm

Model structure

Compile with “Adam” optimizer with learning_rate=0.0001 and 'categorical_crossentropy’ loss function and accuracy matrices.

Fit for 30 epochs and early stop in 25.

Layer (type)	Output Shape	Param #
input_2 (InputLayer)	[(None, 224, 224, 3)]	0
mobilenetv2_1.00_224 (Functional)	(None, 7, 7, 1280)	2257984
dense (Dense)	(None, 7, 7, 512)	655872
dropout (Dropout)	(None, 7, 7, 512)	0
dense_1 (Dense)	(None, 7, 7, 128)	65664
dropout_1 (Dropout)	(None, 7, 7, 128)	0
dense_2 (Dense)	(None, 7, 7, 64)	8256
dropout_2 (Dropout)	(None, 7, 7, 64)	0
dense_3 (Dense)	(None, 7, 7, 32)	2080
global_average_pooling2d (GlobalAveragePooling2D)	(None, 32)	0
dropout_3 (Dropout)	(None, 32)	0
dense_4 (Dense)	(None, 3)	99

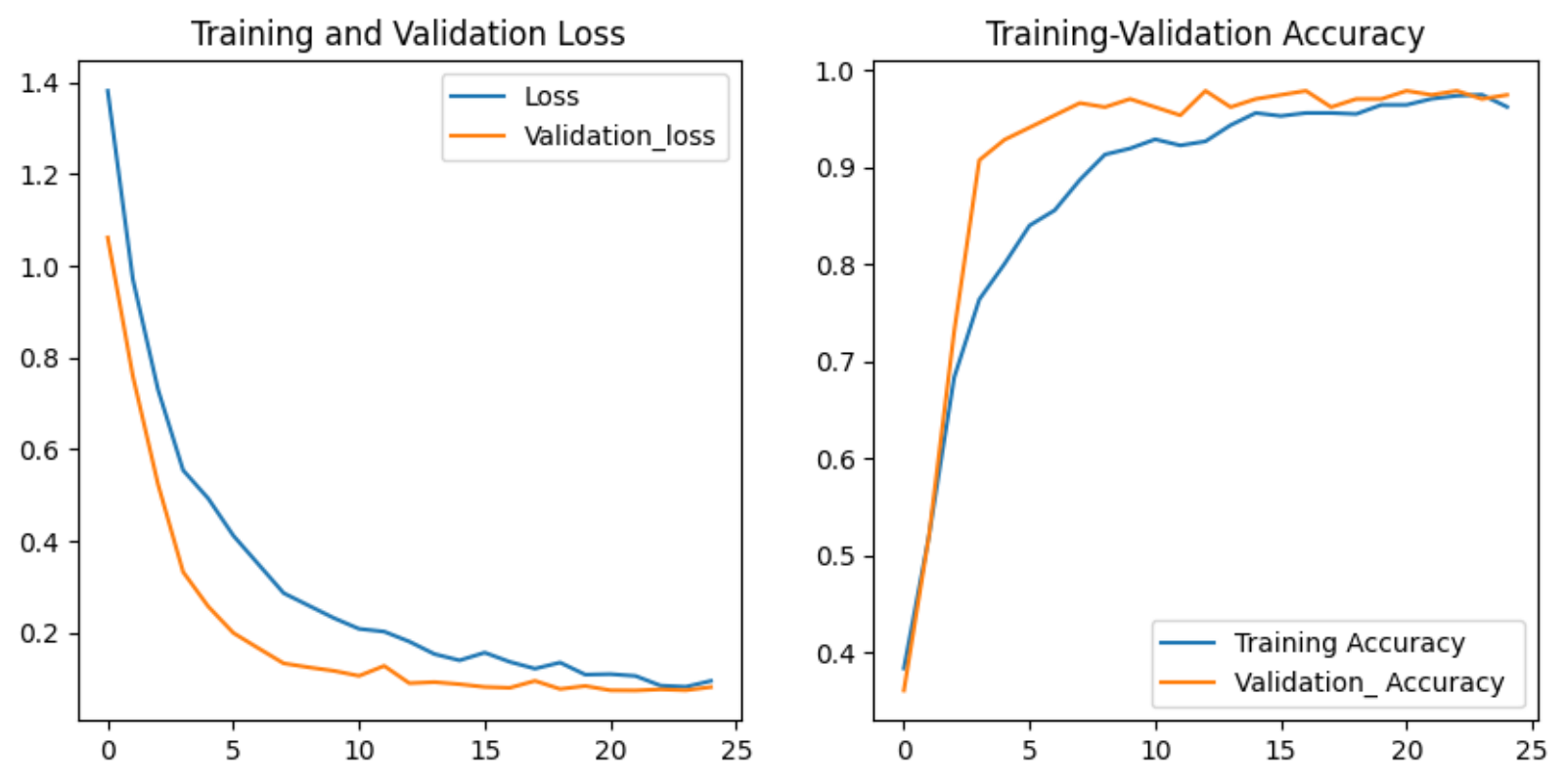
Total params: 2989955 (11.41 MB)
Trainable params: 731971 (2.79 MB)
Non-trainable params: 2257984 (8.61 MB)

10cm

97%

MobileNet-V2 Validation accuracy score

Result


Training and Validation Loss
Loss
Validation_loss
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
5
10
15
20
25
Training-Validation Accuracy
Training Accuracy
Validation_ Accuracy
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0
5
10
15
20
25

MobileNet fine Tuning

Layers	• Fine-tune from 130 layer onwards
learning_rate	• 0.0001
fine_tune_epochs	• 6

10cm

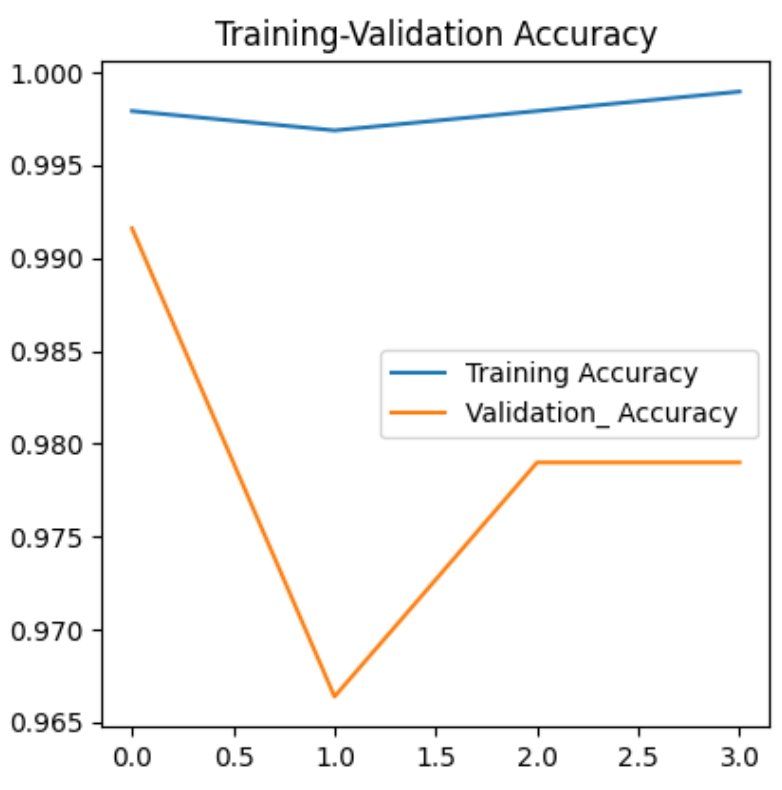
99%

MobileNet-V2 Validation accuracy score

10cm

Result


Training and Validation Loss
Loss
Validation_loss
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.0
0.5
1.0
1.5
2.0
2.5
3.0


Training-Validation Accuracy
Training Accuracy
Validation_ Accuracy
1.000
0.995
0.990
0.985
0.980
0.975
0.970
0.965
0.0
0.5
1.0
1.5
2.0
2.5
3.0

Thank YOU!

10cm