



COVID-DETECTION USING CNN

DEEP LEARNING ASSIGNMENT REPORT

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APPROACH TAKEN

PROBLEM STATEMENT

The objective of this project is to identify whether a person is COVID + given his X-ray image (posteroanterior view) available and ready to be feeded to the model.

DATA COLLECTION

For Covid positive x-ray images, I used a standard open dataset from IEEE hosted on github ([Link](#)) and for the normal x-ray images I used a Kaggle Dataset ([Link](#)).

STEPS TAKEN:

- A metadata file is available in the covid positive dataset which gives us a lot of data about the patient, in that dataset I cross-referenced the image using a function and filtered out only the images where RT-PCR test came out as positive after testing and only the posteroanterior view of the images as in Normal X-ray dataset we have only posteroanterior images.
- Total number of images Came out to be 220.
- Since the count was less, 70:30 ration for train and validation purposes were followed.
- Model Building:
 - a. Model was a traditional CNN with 3 ConV layers, all having pooling layers and ReLU as activation function. A dropout of 0.25 has been added to all the three dense layers in order to remove overfitting. The output layer has a single neuron unit with sigmoid function.
 - b. The model has been compiled using binary crossentropy with optimization algo as ADAM.
 - c. The summary of model can be seen below:

Layer (type)	Output Shape	Param #
=====		
conv2d_8 (Conv2D)	(None, 222, 222, 32)	896
conv2d_9 (Conv2D)	(None, 220, 220, 64)	18496
max_pooling2d_6 (MaxPooling2	(None, 110, 110, 64)	0
dropout_8 (Dropout)	(None, 110, 110, 64)	0
conv2d_10 (Conv2D)	(None, 108, 108, 64)	36928
max_pooling2d_7 (MaxPooling2	(None, 54, 54, 64)	0

dropout_9 (Dropout)	(None, 54, 54, 64)	0
conv2d_11 (Conv2D)	(None, 52, 52, 128)	73856
max_pooling2d_8 (MaxPooling2	(None, 26, 26, 128)	0
dropout_10 (Dropout)	(None, 26, 26, 128)	0
flatten_2 (Flatten)	(None, 86528)	0
dense_4 (Dense)	(None, 64)	5537856
dropout_11 (Dropout)	(None, 64)	0
dense_5 (Dense)	(None, 1)	65
=====		
Total params: 5,668,097		
Trainable params: 5,668,097		
Non-trainable params: 0		

- Image augmentation: Since we have very less count of images in the train and test dataset, we need to do the image augmentation. Horizontal flip and zoom range of 0.2 was used to generate variety and give a model a chance to learn better.
- Results:

- a. First trial was with 15 epochs where we received the following results:

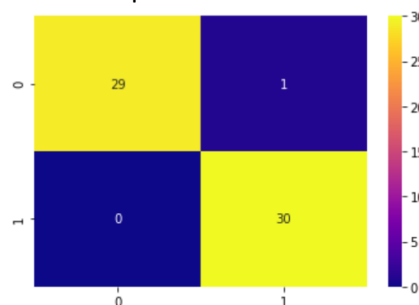
```
Epoch 15/15 4/4 [=====] -
23s 6s/step - loss: 0.1493 - accuracy: 0.9417 -
val_loss: 0.1470 - val_accuracy: 0.9667
```

Which is quite good.

- b. Next the model was tested against images with pneumonic symptoms and normal X-ray images where we got result as below:

```
Training Loss & Accuracy: [0.03196219727396965,
0.9937499761581421]
Validation Loss & Accuracy: [0.07270810753107071,
0.9833333492279053]
```

- Next the model was saved with h5 format.
- A heat-map of confusion matrix was built to visualize the results better:



Recall	1.0
Precision	0.96