

Project Title: COVID-19 Detection on X-Ray images.

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Batch: DL-1

Model: Sequential

1. Introduction:

The novel Coronavirus also called COVID-19 originated in Wuhan, China in December 2019 and has now spread across the world. It has so far infected around 30 million people and claimed approximately 940,651 lives overall. As the number of cases are rapidly increasing, most of the countries are facing shortage of testing kits and resources. AI is already transforming many different fields. One such field is the area of Medical Diagnosis through accurate clinical computer-aided diagnosis (CAD) systems. The limited quantity of testing kits and increasing number of daily cases encouraged us to come up with a deep learning model that can aid radiologists and clinicians in detecting COVID-19 cases using chest X-rays.

2. Model Architecture:

The model used in this project was built by sequential model. Sequential is a CNN model which is the easiest way to build a model in Keras. It allows you to build a model layer by layer. We use the 'add ()' function to add layers to our model. Our first 2 layers are Conv2D layers. These are convolution layers that will deal with our input images, which are seen as 2-dimensional matrices.

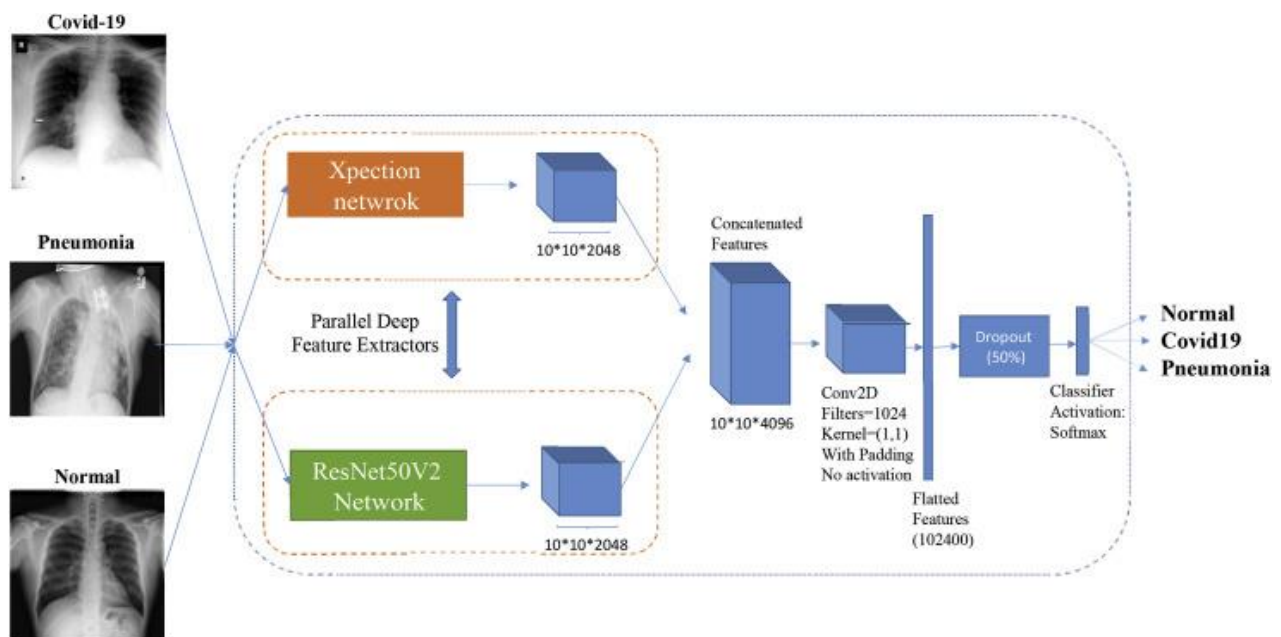


Figure 1: sequential Model

Model: "sequential"

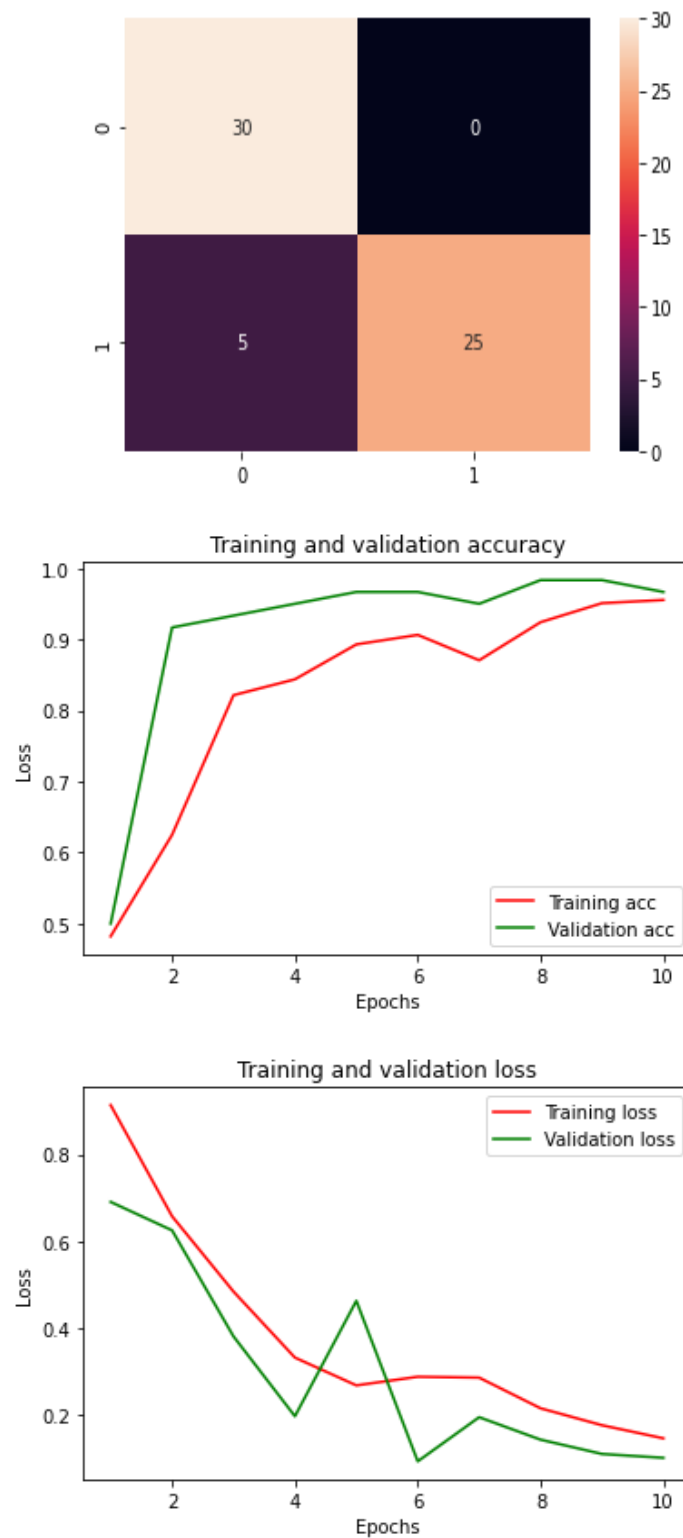
Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 222, 222, 32)	896
conv2d_1 (Conv2D)	(None, 220, 220, 64)	18496
max_pooling2d (MaxPooling2D)	(None, 110, 110, 64)	0
dropout (Dropout)	(None, 110, 110, 64)	0
conv2d_2 (Conv2D)	(None, 108, 108, 64)	36928
max_pooling2d_1 (MaxPooling2D)	(None, 54, 54, 64)	0
dropout_1 (Dropout)	(None, 54, 54, 64)	0
conv2d_3 (Conv2D)	(None, 52, 52, 128)	73856
max_pooling2d_2 (MaxPooling2D)	(None, 26, 26, 128)	0
dropout_2 (Dropout)	(None, 26, 26, 128)	0
flatten (Flatten)	(None, 86528)	0
dense (Dense)	(None, 64)	5537856
dropout_3 (Dropout)	(None, 64)	0
dense_1 (Dense)	(None, 1)	65
Total params: 5,668,097		
Trainable params: 5,668,097		
Non-trainable params: 0		

Figure 2: Model Summary

I applied a CNN Model, which I had trained on a COVID-19 Radiography dataset containing Chest X-Rays, for detecting COVID-19 & achieved ~98% accuracy on the validation set with respect to Radiologist's clinical findings.

3. Dataset:

The name of the dataset used is 'COVID-19 Radiography dataset containing Chest X-Rays'. There are 5,863 of images (JPEG) and 2 categories (Covid/Normal) in the dataset. It is for detecting COVID-19 & achieved ~98% accuracy on the validation set with respect to Radiologist's clinical findings. The confusion matrix, the training & validation loss and accuracy curves obtained are as shown below.



The data set link is as :

https://drive.google.com/drive/u/0/folders/1JdTkg9B4Xh1VDunwoCf_sO0r4-mYarhS

4. Libraries:

- **Python:**

Python is an interpreted high-level general-purpose programming language. It is dynamically-typed and garbage-collected. Python is widely used in multiple domains such as data science, machine learning and deep learning.

- **Tensorflow:**

Tensorflow is an open-source library for machine learning and deep learning. It is mainly used for training and inference of deep neural networks. It was developed by Google Brain Team for internal Google research and production.

- **NumPy:**

NumPy is a Python library used for working with arrays. It was developed by Travis Oliphant in 2005. NumPy provides array object which is 50x faster than traditional Python lists. Matplotlib:

- **Matplotlib:**

It is a comprehensive library for creating static, animated and interactive visualizations with Python.

- **Seaborn:**

Seaborn is a visualization library for statistical graphics plotting in Python. It is based on Matplotlib. It provides a high-level interface for drawing attractive and informative statistical graphics.

5. Results:

The model achieved test accuracy of ~96 % over test images.



Radiologist: COVID-19 +ve
CNN Model: COVID-19 +ve



Radiologist: COVID-19 +ve
CNN Model: COVID-19 +ve



Radiologist: COVID-19 -ve
CNN Model: COVID-19 -ve



Radiologist: COVID-19 -ve
CNN Model: COVID-19 -ve

6. Conclusion:

Prediction of diseases is a vital process. It should be treated very carefully. A false diagnosis can result in death of patients. This task can be done efficiently by using deep learning. This project gave satisfactory results for prediction of Covid-19 but there is still room for improvement. The code for this project is available on GitHub:

<https://github.com/manishkumarray/COVID-19-Detection-on-X-Ray-Images>