Deep Learning Course Assignment Report

CS737

MASTER OF TECHNOLOGY in

COMPUTER SCIENCE AND ENGINEERING

by

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MAY, 2021

Introduction

This report was created to document the procedures and result attained on the course assignment of CS737 Deep Learning.

The aim of the assignment is to develop a deep learning model capable of detecting covid infected lung images from non-infected lung images. We were provided with 1400 images for training the model, out of which 700 images were of covid infected lung images. The remaining 700 were non-infected/healthy images.

Methodology

1. System Specification:
    a. Intel i5-9300H
    b. NVIDIA GTX 1050 4GB
    c. 16GB RAM
    d. Python 3.8
    e. Python Libraries: Keras, Tensorflow, Augmentor

2. Augmentation: The provided sample size being too small to train a deep learning model up to good accuracy and avoid overfitting, I decided to use augmentation to increase the number of sample images. Augmentation is a technique used to artificially expand the dataset by creating modified versions of images in the dataset.

   The python package 'Augmentor' was used for this purpose. This package provides support for offline augmentations, where data is generated and stored to disk first and then loaded to memory only at time of training the model. Images were augmented by rotation, zoom, flip, brightness, distortion, shear with a random probability. A total of 60,000 samples were generated using this process.

3. Model: ResNet50, a version of ResNet model is the final model being submitted. The reason to select this model is that it gave the highest accuracy against test data provided in the assignment. Other models like AlexNet, VGG, CNN were found to give far smaller accuracy. There exist better models, even of ResNet itself, like ResNet101 and ResNet152. But due to hardware limitations like limited memory and huge training time I decided to settle with ResNet50.

4. The model has been trained and saved and can be reused by simply loading the model. Appropriate code for this has also been provided in the code file submitted along with this report.

Result

The following are the results obtained from testing against the unseen data provided as Testing data.

Accuracy: 84%

Precision: 0.84 for covid and 0.84 for non-covid

Recall: 0.85 for covid and 0.83 for non-covid

F1-scored: 0.84 for covid and 0.83 for non-covid

```
              precision    recall  f1-score

         0.0       0.84      0.85      0.84
         1.0       0.84      0.83      0.83

    accuracy                           0.84
   macro avg       0.84      0.84      0.84
weighted avg       0.84      0.84      0.84

PS C:\Users\pcvin>
```

Fig1: Model performance metrics calculated by code.

Confusion Matrix

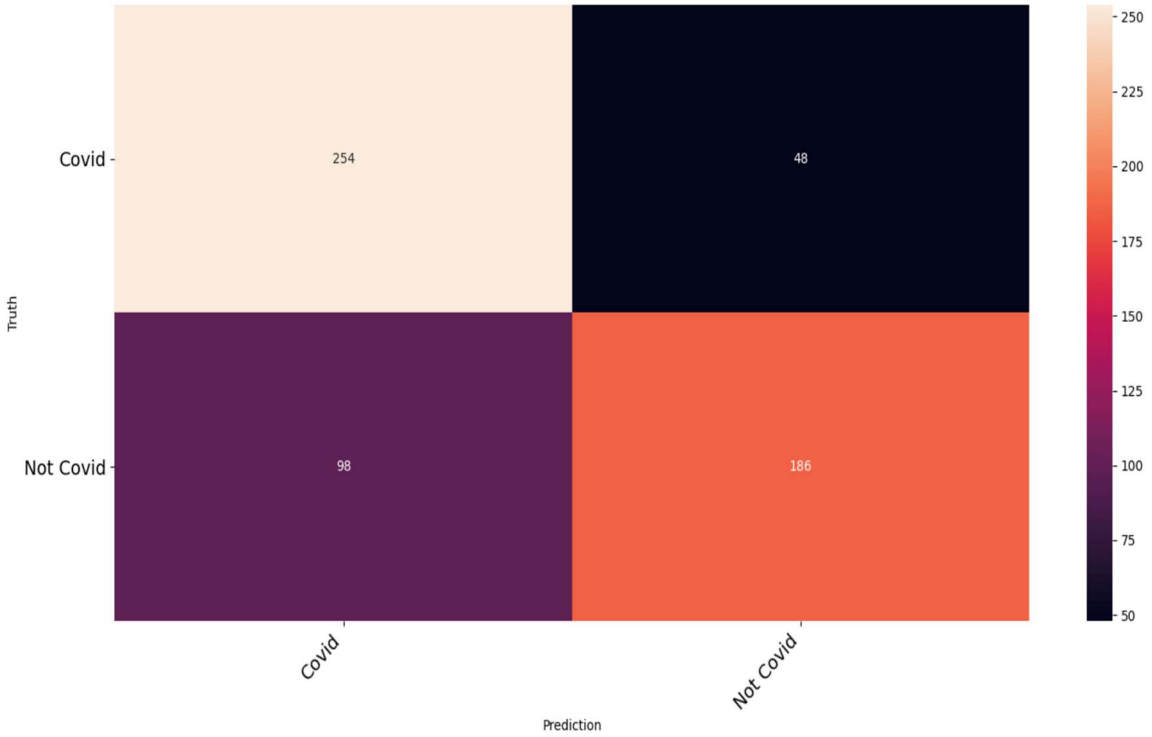

Fig2: Confusion Matrix of my trained model against testing data.

Novelty adopted

Through trial and error was able to generate a particular set of probabilistic values which produced higher accuracy than initial augmentations.

Reference

[1] Augmentor Python library https://augmentor.readthedocs.io/en/master/