Covid-19 detection based on X-Ray images

Team members:
Mithun Das
Rakibuzzaman Mahmud
Sarker Miraz Mahfuz
Mutasim Fuad
Mohammad Wasif Islam

Problem statement

- Deep learning approaches have demonstrated their superiority over the classifying images. CNN architecture is one of the most popular deep learning approaches with superior achievements in the medical imaging domain.
- One of the crucial step in fighting COVID-19 is the ability to detect the infected patients early enough, and put them under special care.
- Diagnosis of COVID-19 is typically associated with the symptoms of pneumonia, which can be revealed by X-ray images. We intend to use CNN to classify X-ray images with COVID-19.

Goal/Objective

-   We wanted to do a project involving the current state of the world,
-   Considering huge rate of infection rate and limited number of trained radiologists, automatic methods for classifying COVID-19 X-rays can assist the diagnosis procedure.
-   Inspired by many current machine learning research works on covid-19 , we study the application of deep learning model to classify chest x-ray images based on COVID-19 infection.

Dataset

Finding COVID-19 medical images itself is a challenging task. While there exist large public annotated datasets of chest X-rays, there is no collection of COVID-19 chest X-rays designed to be used for computational analysis.

- **Kaggle CoronaHack -Chest X-Ray-Dataset Dataset**
    - Chest X Ray of Healthy vs Pneumonia (Corona) affected patients infected patients along with a few other categories such as SARS.

- **Covid19-ChestXray-dataset**
    - This the only good quality annotated dataset we found which was also referenced in multiple published papers.
        - Deep-COVID: Predicting COVID-19 from chest X-ray images using deep transfer learning
        - Predicting COVID-19 Pneumonia Severity on Chest X-ray with Deep Learning
        - COVID-Net: a tailored deep convolutional neural network design for detection of COVID-19 cases from chest X-ray images

Data Link: https://github.com/ieee8023/covid-chestxray-dataset

Dataset

- **COVIDx CT-2 Dataset**
    - COVIDx CT-2 Dataset consists of CT-SCAN data of 2837 patients
    - 1958 covid positive.
    - 29 GB of CT-SCAN data.

Data Link: https://www.kaggle.com/hgunraj/covidxct

- **COVID-XRay-5K DATASET**
    - Our main training set, This dataset contains around 5000 images with 84 good quality labeled images.

    - This Dataset is extracted from several publications and also with the help of a board-certified radiologist only X-rays with clear signs of COVID-19 are kept.

Data Link: https://github.com/shervinmin/DeepCovid

Our Final Dataset For training the model

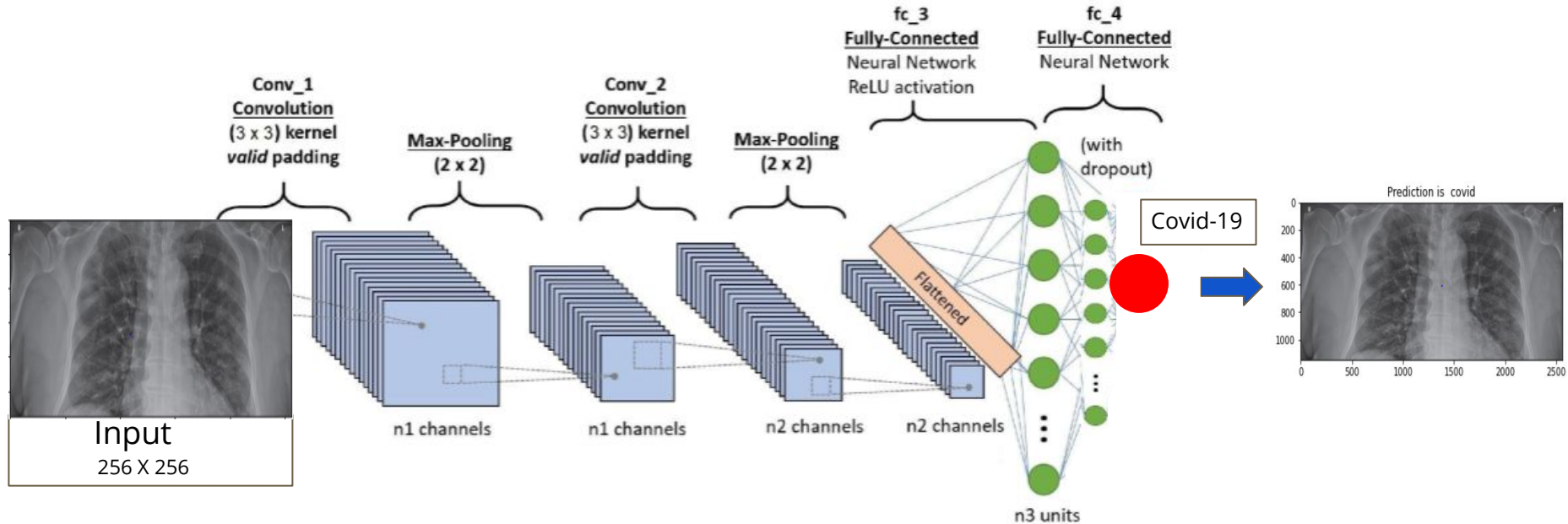| Train dataset	Test dataset
Covid-19 84 Image	**Covid-19** 100 Image
Normal 2000 Image	**Normal** 3000 Image

Dataset preprocessing

Image Augmentation

-   only on covid dataset.

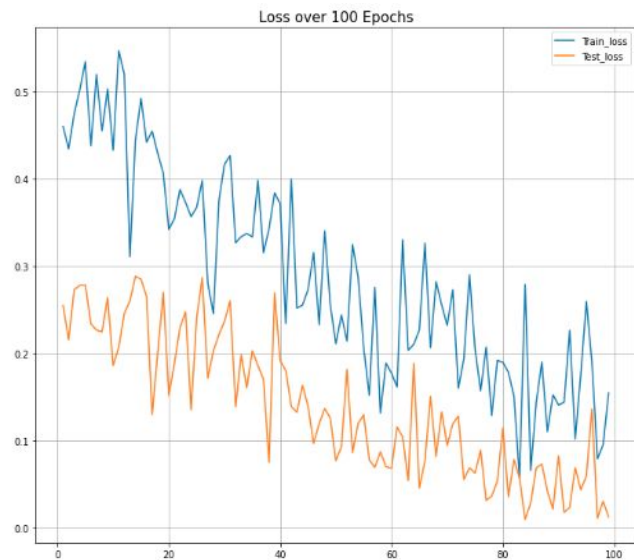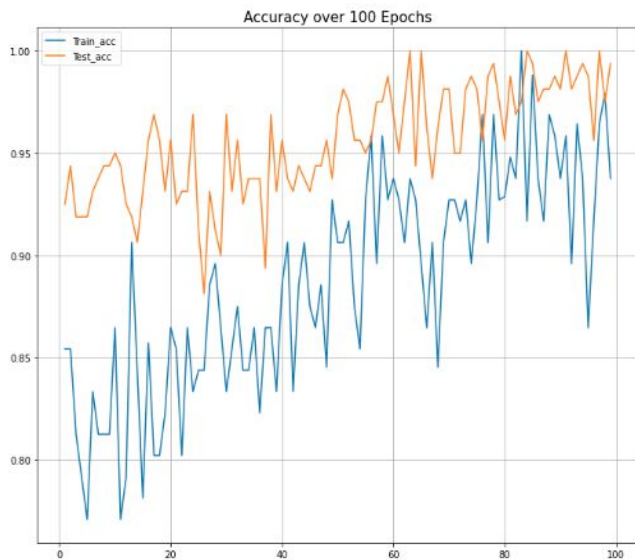| Train dataset	Test dataset
Covid-19 84 Images(242 after Augmentation)	**Covid-19** 100 Images
Normal 994 Images	**Normal** 1573 Images

Model Description

Result

Accuracy: 0.9796

Loss: 0.0574

Evaluation

Three pre-trained Models: *MobileNet*, *ResNet* and *DenseNet*

	Accuracy	Loss
MobileNet	0.69	0.74
ResNet	0.98	0.11
DenseNet	0.96	0.07
Our Model	0.97	0.06

Future work

- With a limited number of the medical dataset, it is difficult for us to estimate how our model will perform in the real world.

- Good quality and annotated CT-Scan images can be a better alternative for the X-ray images.

- With a limited number of COVID-19 image dataset publicly available so far, further experiments are needed on a larger set of cleanly labeled COVID-19 images for a reliable estimation of the accuracy of these models.

Project Link:

Github: https://github.com/Mithunjack/COVID-19-Xray-Image-Classification

Thank you