ADL Project - Pneumonia Detection with Chest X-Ray Images

1 Description

Pneumonia is an infection that causes inflammation in one or both of the lungs and may be caused by a virus, bacteria, fungi or other germs. Physician may conduct a physical exam and use chest x-ray, chest CT, chest ultrasound, or needle biopsy of the lung to help diagnose your condition. However, with the scope of project is X-Ray Images.

Figure 1: X-Ray Images for Normal, Bacterial Pneumonia, and Viral Pneumonia

Typically, An X-Ray Image exam will allow Physician to check on lungs, heart, and blood vessels to help determine if one have pneumonia. When interpreting the X-Ray, the radiologist will look for white spots in the lungs (called infiltrates) that identify an infection. Such exams will also help determine if one have any complications related to pneumonia such as abscesses or pleural effusions (fluid surrounding the lungs).

This project aim to identify the infection of Pneumonia by deep learning methods, more specifically focusing on computer vision.

2 Dataset

The dataset is organized into 3 directories (train, test, val) and contains sub-directories for each image category (Pneumonia/Normal). There are 5,863 X-Ray images (JPEG) and 2 categories (Pneumonia/Normal).

Chest X-ray images (anterior-posterior) were selected from retrospective cohorts of pediatric patients of one to five years old from Guangzhou Women and Children's Medical Center, Guangzhou. All chest X-ray imaging was performed as part of patients' routine clinical care.

For the analysis of chest x-ray images, all chest radiographs were initially screened for quality control by removing all low quality or unreadable scans. The diagnoses for the images were then graded by two expert physicians before being cleared for training the AI system. In order to account for any grading errors, the evaluation set was also checked by a third expert.

Download Link:

Dataset

Citation:

Kermany, Daniel; Zhang, Kang; Goldbaum, Michael (2018), "Labeled Optical Coherence Tomography (OCT) and Chest X-Ray Images for Classification", Mendeley Data, V2, doi: 10.17632/rscbjbr9sj.2

3 Task

Train the Convolutional Neural Networks model to classify the X-Ray images for pneumonia and non-pneumonia categories. Major the performance in terms of accuracy and F-score. An Accuracy of 80% on test set is achievable for this task and soft target is in range of 70% and above.

In order to work on this project, any deep learning libraries and frameworks can be used. however followings are the suggestions:

- PyTorch
- Tensorflow
- Keras

Following tools can be used to visualize the results and other insights of experiments:

- TensorBoard
- Weights & Biases

NOTE - Before getting started make sure you have the required packages installed along with a suitable IDE you want to work on. Also if your computer doesn't supports these installations, you can also work on either DGX Cluster (A seprate request required) or Google Colab. Here Google provides computational capacity (to some extent) for running deep learning codes. These are same as Jupyter Notebooks.

4 Deliverables

Following are the deliverables of project for each group:

1. Project source code, trained model, and evaluation script on test set on GitHub repository. The link of GitHub repository needs to share and refer during presentation.
2. 10 Minutes Project Presentation (4 to 5 slides) which typically includes methods, implementation, results, and learning outcome.