Automatic Segmentation of COVID-19 CT Images using Deep Learning Models

Introduction:

The pandemic of coronavirus disease 2019 (COVID-19) is spreading all over the world. Medical imaging such as X-ray and computed tomography (CT) plays an essential role in the global fight against COVID-19, whereas the recently emerging artificial intelligence (AI) technologies further strengthen the power of the imaging tools and help medical specialists. Accurate segmentation of lung and infection in COVID-19 CT scans plays an important role in the quantitative management of patients. Most of the existing studies are based on large and private annotated datasets that are impractical to obtain from a single institution, especially when radiologists are busy fighting the coronavirus disease.

Objective: Propose 2D segmentation Deep Learning Models for COVID-19 CT Dataset.

Group: This project can be done by groups of **three students** (maximum)

Evaluation criteria: You must evaluate the dice coefficient, hausdorff distance between ground truth segmentation map and predicted segmentation.

You must check statistically analysis (p-value, Pearson correlation coefficients and A Bland–Altman plot) between predicted and ground truth segmentation surface area and also draw ROC and AUC curves.

You must write a report on your proposed method with complete description of proposed model, data-preprocessing , data generation steps with **prediction visualization** and also either provide the performance result in table form or some plot form.

You must submit a five to ten pages report in word or pdf form and code (preprocessing, data generator, and model description code) in the following email address with student(s) name and student(s) ID:

engr.qayyum@gmail, Abdul.Qayyum@u-bourgogne.fr, Fabrice.Meriaudeau@u-bourgogne.fr

Deadline : June 10 th, 23:59 pm!

Dataset: 20 lung CT scans from; Annotations include left lung, right lung and infections. This is a multiclass segmentation.

You can download datasets from the following links:

https://gitee.com/junma11/COVID-19-CT-Seg-Benchmark

http://medicalsegmentation.com/covid19/

further description of this dataset can be found in the following link:

https://arxiv.org/pdf/2004.12537.pdf

Software: You can use Keras backend with TensorFlow or Pytorch library for developing your deep learning models.

For Data preprocessing : skimage, open-CV, nibabel, Simpleitk

https://nipy.org/nibabel/, https://simpleitk.org/, https://scikit-image.org/

Note: Data extraction code (base code) will be provided.

Note: You may check the following useful link that consisted of list of publications, dataset description about COVID19

https://github.com/HzFu/COVID19_imaging_AI_paper_list