MSc Vibot/Computer Vision/MAIA

UNIVERSITÉ DE BOURGOGNE

Automatic segmentation of COVID-19 CT Images

By

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A Project under the guidance of

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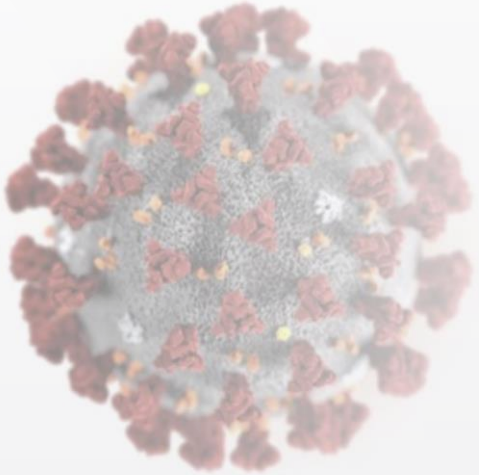
Outline

- Introduction
- Context and purpose
- Program
- Demo
- Reference

Introduction



- The pandemic of coronavirus disease 2019(COVID-19) is spreading all over the world.
- Accurate segmentation of lung and infection in COVID-19 CT scans plays an important role in the quantitative management of patients.

Pre-processed the data

- 20 lung CT scans from; Annotations include left lung, right lung and infections.
- Data was converted from .nii.gz to .png with the patients
- Image and mask were resized to 384*384
- Mask were one hot encoded to be used for segmentation.

Train the model

- Trained EfficientNet–B4 model using colab GPU.

```
Wed Jun 10 19:50:11 2020
+-----------------------------------------------------------------------------+
| NVIDIA-SMI 440.82       Driver Version: 418.67       CUDA Version: 10.1     |
|-------------------------------+----------------------+----------------------+
| GPU  Name        Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp  Perf  Pwr:Usage/Cap|         Memory-Usage | GPU-Util  Compute M. |
|===============================+======================+======================|
|   0  Tesla P100-PCIE...  Off  | 00000000:00:04.0 Off |                    0 |
| N/A   46C    P0    28W / 250W |      0MiB / 16280MiB |      0%      Default |
+-------------------------------+----------------------+----------------------+

+-----------------------------------------------------------------------------+
| Processes:                                                       GPU Memory |
|  GPU       PID   Type   Process name                             Usage      |
|=============================================================================|
|  No running processes found                                                 |
+-----------------------------------------------------------------------------+
```

Result

```
Epoch 1/10
176/177 [============================>.] - ETA: 9s - loss: 0.3276 - dice_coef: 0.5086 /usr/local/lib/python3.6/dist-packages/keras/utils/data_utils.py:616: UserWarn
  UserWarning)
177/177 [==============================] - 1911s 11s/step - loss: 0.3270 - dice_coef: 0.5092 - val_loss: 0.1649 - val_dice_coef: 0.7420
Epoch 2/10
177/177 [==============================] - 1231s 7s/step - loss: 0.1773 - dice_coef: 0.6904 - val_loss: 0.1032 - val_dice_coef: 0.8466
Epoch 3/10
177/177 [==============================] - 1268s 7s/step - loss: 0.1282 - dice_coef: 0.7705 - val_loss: 0.0809 - val_dice_coef: 0.8927
Epoch 4/10
177/177 [==============================] - 1202s 7s/step - loss: 0.1069 - dice_coef: 0.8094 - val_loss: 0.0694 - val_dice_coef: 0.9070
Epoch 5/10
177/177 [==============================] - 1183s 7s/step - loss: 0.0896 - dice_coef: 0.8410 - val_loss: 0.0384 - val_dice_coef: 0.9374
Epoch 6/10
177/177 [==============================] - 1174s 7s/step - loss: 0.0732 - dice_coef: 0.8740 - val_loss: 0.0284 - val_dice_coef: 0.9385

Epoch 00006: ReduceLROnPlateau reducing learning rate to 0.00010000000474974513.
Epoch 7/10
177/177 [==============================] - 1208s 7s/step - loss: 0.0621 - dice_coef: 0.8913 - val_loss: 0.0249 - val_dice_coef: 0.9491
Epoch 8/10
177/177 [==============================] - 1191s 7s/step - loss: 0.0593 - dice_coef: 0.8953 - val_loss: 0.0228 - val_dice_coef: 0.9554
Epoch 9/10
177/177 [==============================] - 1178s 7s/step - loss: 0.0582 - dice_coef: 0.8975 - val_loss: 0.0226 - val_dice_coef: 0.9556
Epoch 10/10
177/177 [==============================] - 1171s 7s/step - loss: 0.0568 - dice_coef: 0.8997 - val_loss: 0.0220 - val_dice_coef: 0.9533
--- Time taken to train : 3.0 hours ---
```

DEMO of Testing

```
[ ]
```

```
100%|██████████| 680/682 [02:11<00:00,  4.27it/s]Uniques in label and predicted [0 1 2 3]
680
images



100%|██████████| 681/682 [02:12<00:00,  4.29it/s]Uniques in label and predicted [0 1 2 3]
681
masks



100%|██████████| 682/682 [02:12<00:00,  5.15it/s]Uniques in label and predicted [0 1 2 3]
Done!
/content/drive/My Drive/datacovd19/test/result
```