Deep Learning (IME/UERJ) – 2023.1
Practice #3 – Implementing the U-Net architecture

Objectives

- You must complete the tasks below and write a detailed report on the changes made on the notebook and the observed accuracies on the test data.
- You should submit as the result of the practice, a document with the report (pdf) and the final notebook (ipynb).

Task #1

Define the architecture of the U-Net model in Section 7 of the notebook.

You may use the following references:

https://towardsdatascience.com/review-u-net-biomedical-image-segmentation-d02bf06ca760

https://towardsdatascience.com/unet-line-by-line-explanation-9b191c76baf5

Task #2

Run the training procedure and evaluate the model.

Change the hyperparameter values (Section 8.1) to improve training convergence speed and final accuracy.

You must evaluate at least 3 different hyperparameter configurations. Consider changing the class weights.

Task #3

Change the data augmentation procedure (Section 6).

The data augmentation procedure coded in the notebook in Section 6 is deprecated in TensorFlow 2.0, according to:

https://www.tensorflow.org/api_docs/python/tf/keras/preprocessing/image

Change the data augmentation procedure to generate new patches by flipping and rotating (by multiples of 90 degrees) the original training patches, using the functions of tf.data.Dataset.

More information can be found at the following tutorial:

https://www.tensorflow.org/tutorials/images/data_augmentation?hl=pt-br

Important remark

For the final, reported results you should train with all the training/validation data (comment/uncomment the code in Section 8.2).