Tecnológico de Monterrey

INSTITUTO TECNOLÓGICO Y DE ESTUDIOS SUPERIORES DE MONTERREY

Campus Monterrey

Actividad de Segmentación CT

Miembros del equipo

Francisco Valadez Rojas	A01610820
Jesús Gabriel Leos Perales	A01412140
Andres Martín Vivanco Palacios	A01705733
Edio Mauricio Llerena Mancías	A00828309

Profesores:

José Tamez Peña

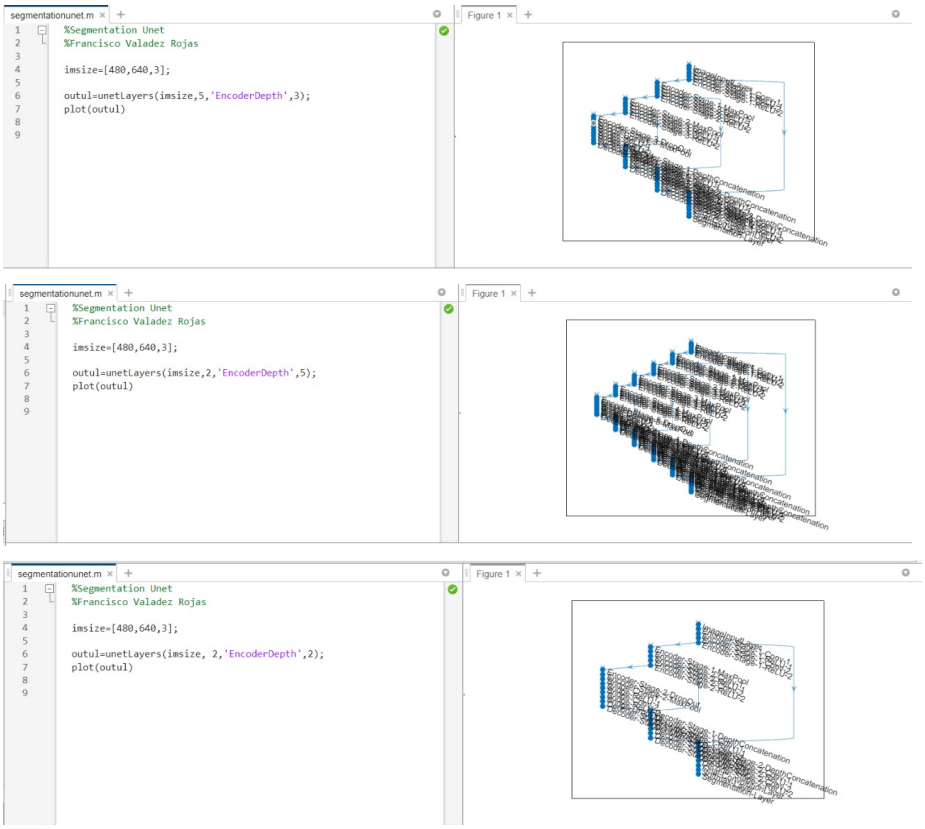
Martha Rebeca Canales

Monterrey, Nuevo León

31 de mayo de 2022

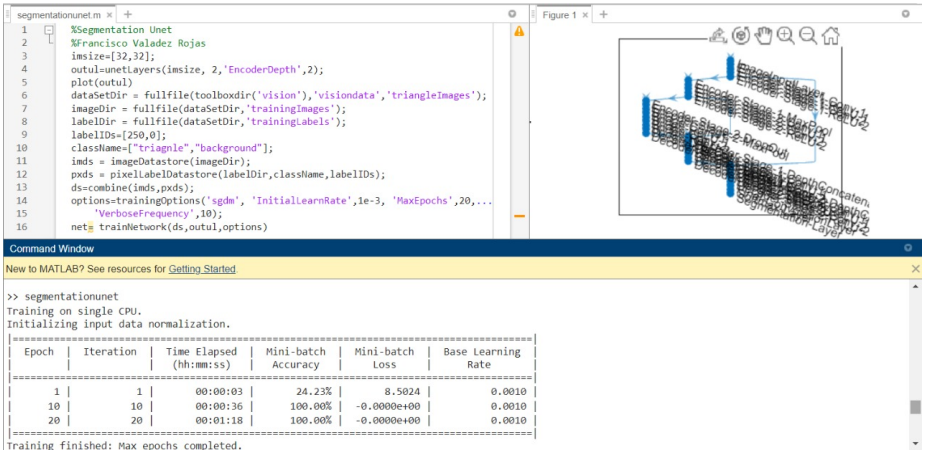
Segmentation U-Net

Creating a U-Net network with an encoder-decoder depth of 3. We need the Deep Learning Toolbox in Matlab to use the functions and create the network.

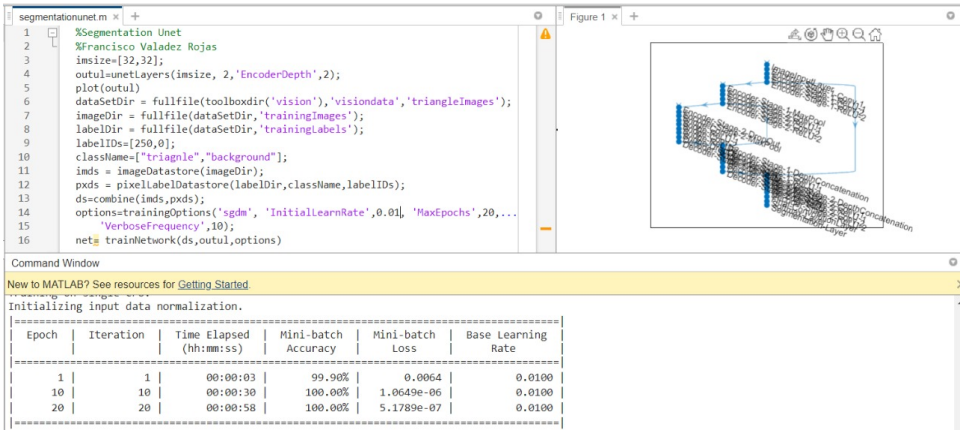


We used different numClasses and values of depth to see the change on the U-Net. As we can see there are more groups if the numClasses value is higher. There are also more encoders and decoders as long the depth value is higher.

After we created the U-Net we started the training of the network. We used a training at an initial learn rate of 0.001 and a maximum epoch of 20.



We also tried the initial learning rate at 0.01 and we had a little variation on the results. Having more accuracy, less time and less batch loss.



What is the most appropriate number of max epochs you can use? Why?

The most appropriate number for max epochs is around 20-30. With this range the U-Net has a good number of iterations to learn the behavior and it is not so high so that it takes a lot of time.

How did the learning rate affect the accuracy?

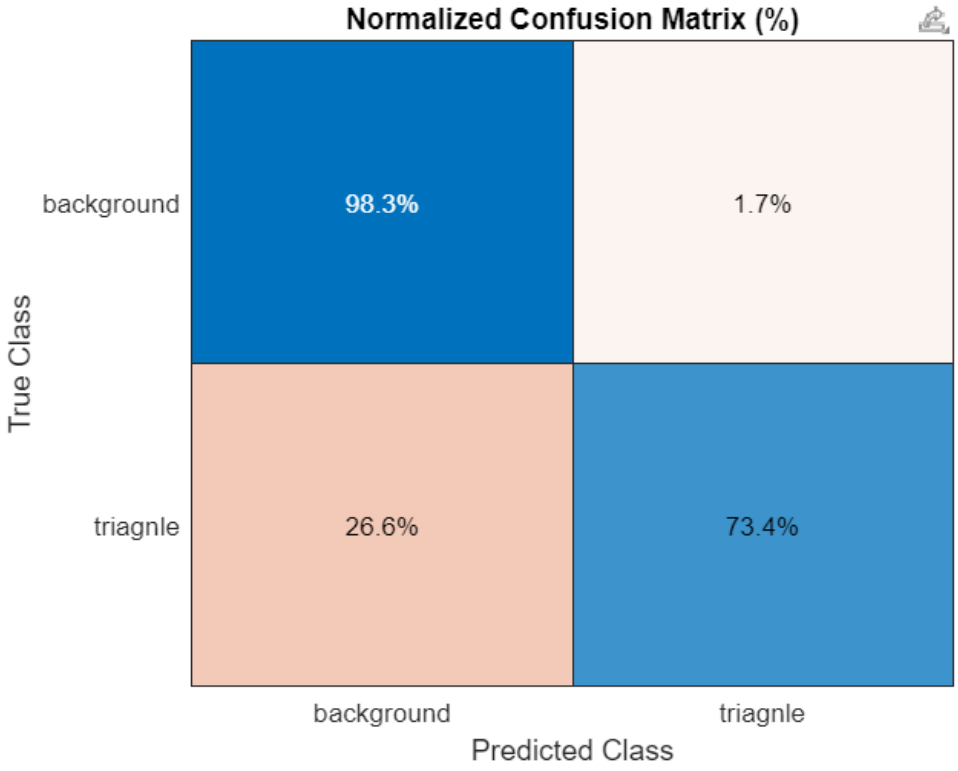
The learning rate affects directly on the accuracy of the first iteration if the learning rate is higher the accuracy will also be higher.

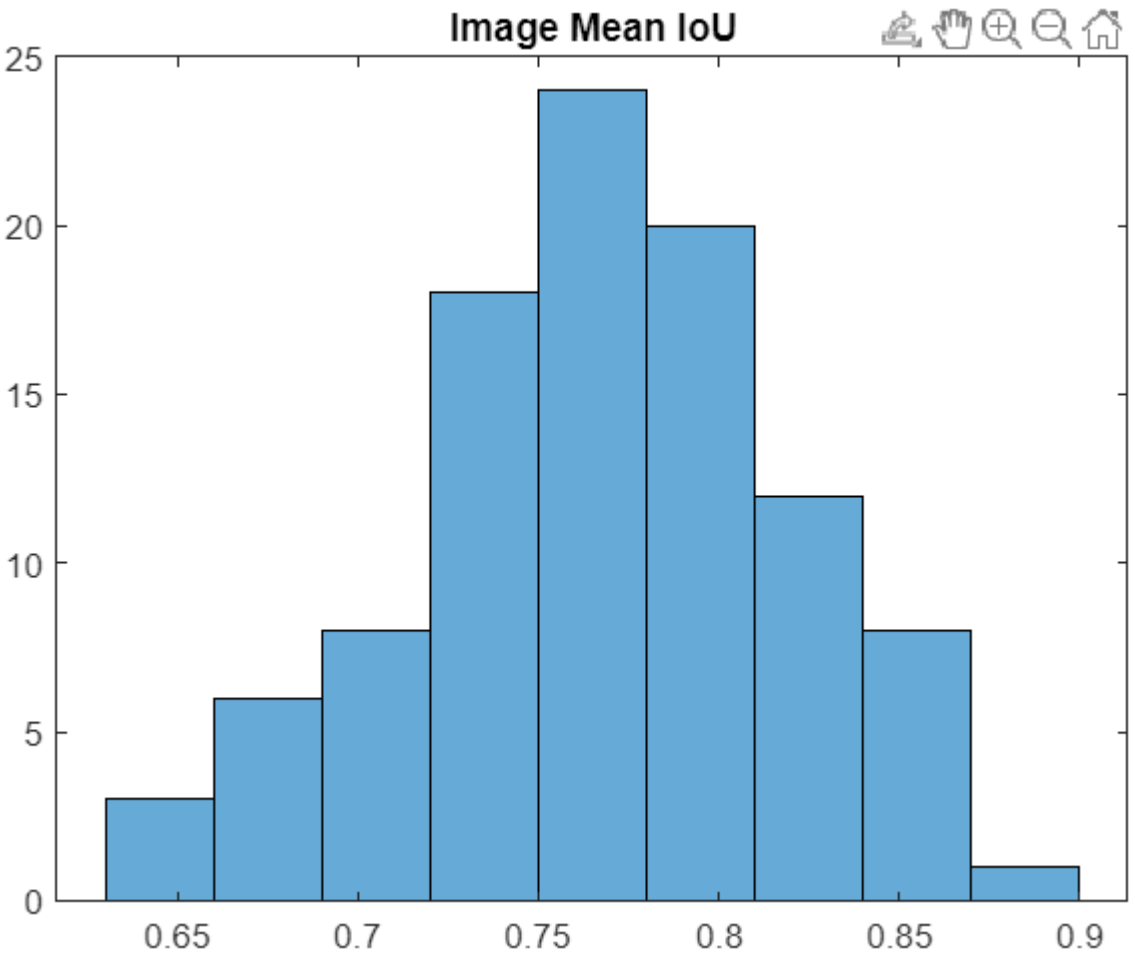
Segmentation U-Net parte 2

```
Training on single CPU.
Initializing input data normalization.
|=========================================================================================|
|  Epoch  |  Iteration  |  Time Elapsed  |  Mini-batch  |  Mini-batch  |  Base Learning  |
|         |             |   (hh:mm:ss)   |   Accuracy   |     Loss     |      Rate       |
|=========================================================================================|
|       1 |           1 |       00:00:04 |       49.72% |       4.7173 |          0.0010 |
|      10 |          10 |       00:00:40 |       95.78% |       0.4422 |          0.0010 |
|      20 |          20 |       00:01:22 |       96.15% |       0.2552 |          0.0010 |
|=========================================================================================|
Training finished: Max epochs completed.
Running semantic segmentation network
---------------------------------------
* Processed 1 images.
* Processed 100 images.

Evaluating semantic segmentation results
----------------------------------------
* Selected metrics: global accuracy, class accuracy, IoU, weighted IoU, BF score.
* Processed 3 images.
* Processed 21 images.
* Processed 35 images.
* Processed 51 images.
* Processed 74 images.
* Processed 88 images.
* Processed 100 images.

* Finalizing...
```

* Data set metrics:

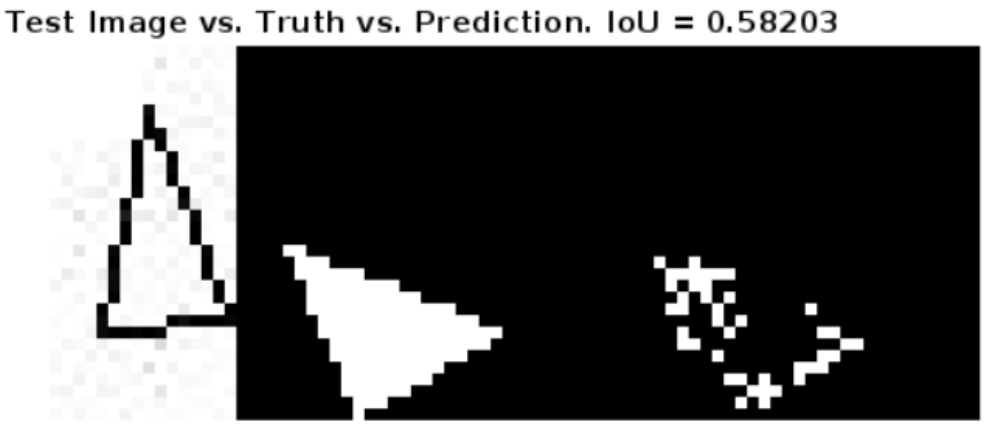
GlobalAccuracy	MeanAccuracy	MeanIoU	WeightedIoU	MeanBFScore
0.97162	0.85878	0.75757	0.95094	0.69874



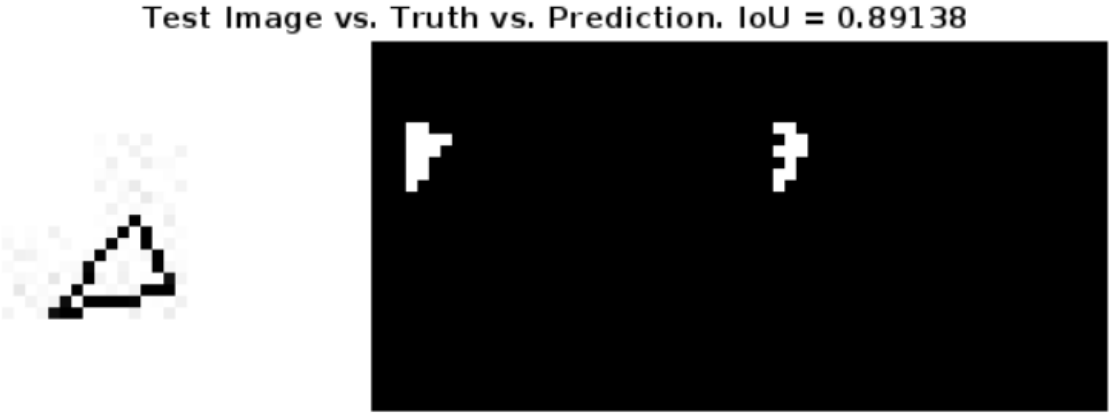


The most common mean IoU on the images is 0.75, according to the histogram above.

Worst mean IoU



Best mean IoU


Test Image vs. Truth vs. Prediction. IoU = 0.89138