# **Retinal Vessel Binary Segmentation**

Data preprocessing.

Data split 80%-10%-10% (training, testing, validation) mix of Veronica annotated data and DRIVE public dataset.

Crop images in small tiles and used rotation as data augmentation technique (90, 180, 270 degrees).

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| --- | --- | --- | --- | --- | --- |
| **Image Size** | **Total** | **Augmentation** | **Training** | **Validation** | **Test** |
| 128x128 | 9476 | 37904 | 30324 | 3790 | 3790 |
| 64x64 | 48456 | 193824 | 155060 | 19382 | 19382 |

Unet model with resnet34 and vgg16 backbones, IoU as main metric for evaluating results.

Epochs = 100

Batch size = 500

Loss functions – Jaccard Loss (1-IoU) and Binary Cross Entropy

DRIVE dataset – 20 images 565x584

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model/Backbone/Loss** | **Image Processing** | **IoU**  **Val vs Test** | **IoU in STARE Full Size** | **IoU in Veronica Full Size** |
| Unet – resnet34 - **JaccardLoss** | 128x128 – Gray Scale | 0.6610 vs 0.6675 | 0.5504 | 0.6338 |
| Unet – vgg16 -**JaccardLoss** | 128x128 – Gray Scale | 0.6672 vs 0.6796 | 0.5758 | 0.6574 |
| Unet – vgg16 -  **Binary Cross Entropy** | 128x128 – Gray Scale | 0.5122 vs 0.5395 | 0.48 | 0.53 |
| Unet – resnet34 – **Binary Cross Entropy** | 128x128 – Gray Scale | 0.6403 vs 0.6804 | 0.5776 | 0.6577 |
| Unet – vgg16 -**JaccardLoss** | 128x128 – Original | 0.6640 vs 0.6935 | 0.4732 | 0.6707 |
| Unet – resnet34 -**JaccardLoss** | 128x128 – Original | 0.6786 vs 0.6792 | 0.4720 | 0.6604 |

STARE dataset – 20 images 700x605

DRIVE and STARE public datasets are wide used for retinal vessel segmentation studies, intents to replicate the results in published papers was impossible, and images have poor quality compared to our annotated images, couldn’t find the originals without resizing.

See below results for a set of our images not used for the training. Background pattern

Description automatically generatedBackground pattern

Description automatically generated with medium confidence

Background pattern

Description automatically generated