Project 3: Neuron Segmentation

Team Johnson

Workflow + Algorithms

NMF

CNMF

UNET

Spectral Clustering - (no results.)

Preprocessing

For Unet:

Combined all inputs.

Created a common mask.

So for 00.00.train:

Training images = 12 (to check this number)

[we tried the other way too, train using all images with the same mask. Accuracy was not so good.]

Preprocessing

NMF:

We tried to add mean/median filter with morphology. (In particular, Morphology.square in skimage.)

(Mean and median filters do not make a big difference?)

We referred to a good intro here:
https://github.com/eds-uga/cbio4835-sp17/blob/master/lectures/Lecture23.ipynb

Results before combinating from each test set (after combination: total 3.1315)

Test Results

Module	arguments	Total Score	Avg Precision	Avg Recall	Avg Inclusion	Avg Exclusion
ThunderNMF	percentile=99, max_iter=50, overlap=0.1, chunk=32	2.94815	0.78606	0.84156	0.56725	0.75328
ThunderNMF	percentile=99, max_iter=50, overlap=0.1, chunk=128, padding=15	2.852	0.663	0.93048	0.67249	0.58641
Unet (only running on 00 sets)	train_iter=120, epoch=500, layer=4, features=64	2.93394	1.0	0.9446	0.41857	0.57077
CNMF	k=1000, g=5, merge=0.8	2.60321	0.860	0.645	0.790	0.309

Total precision: 0.94378; Total recall: 0.96134 (thanks to Unet!)
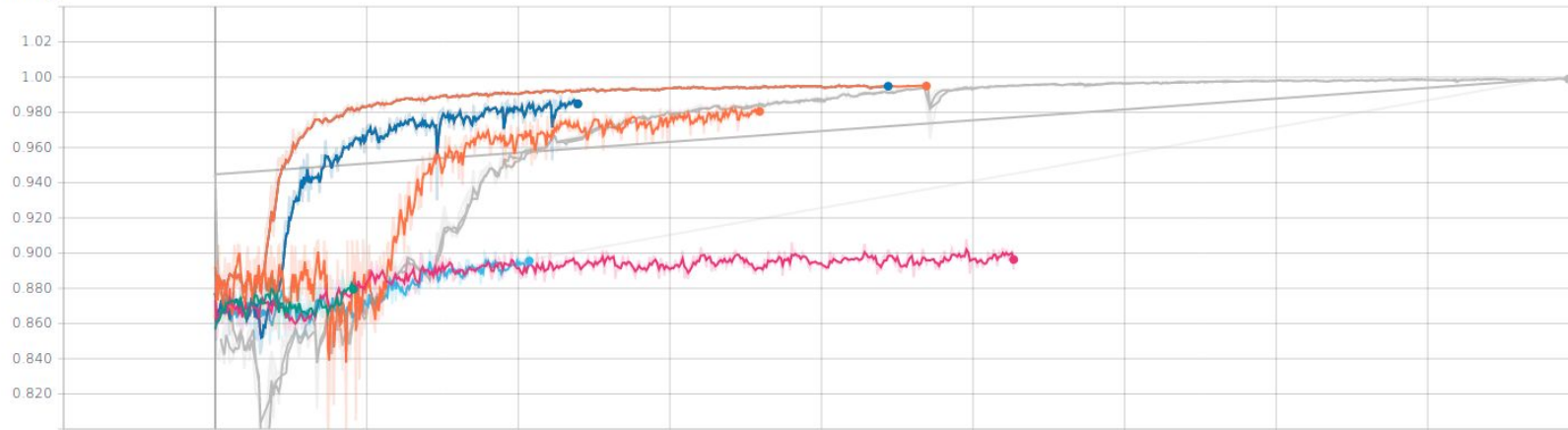
In tuning the parameters, we referred to some teams last year, mainly teams Provectus and Minions.

Results

- Results from UNet on 00.00.test and 00.01.test (note the skewed scale.)

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Problems

- Settling on a Unet implementation - Tensorflow implementation was limited in its documentation.
- The resulting image was smaller than the input size. (Could have tried image registration techniques to get to the original size.)
- Problem of NaNs in the resulting image - no clue why. (Underflow?)
- We were getting a good accuracy on the UNet - (wow images) - but a big problem was to transfer the obtained segments into the required format, also the image size didn't help.
- Sometimes UNet won't converge (as shown in tensorboard results).
- Low scores for CNMF - we thought semi-supervised learning should be nicer than NMF, but not exactly at the end
- Too late by the time we thought of spectral clustering, we managed to scratch out the code but could not get it to test on any images.

Thank you!

Questions?