

Week of 10/30 Deliverables

Team cobalt

Last week's goals

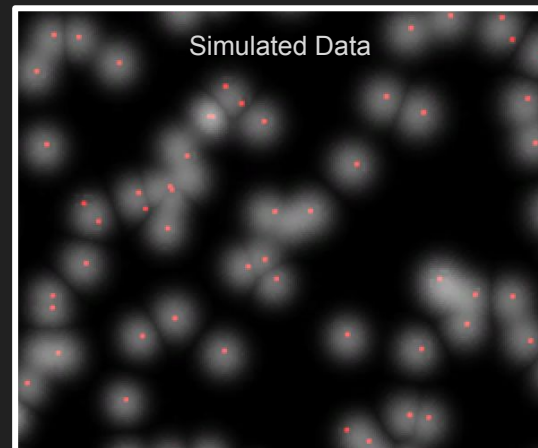
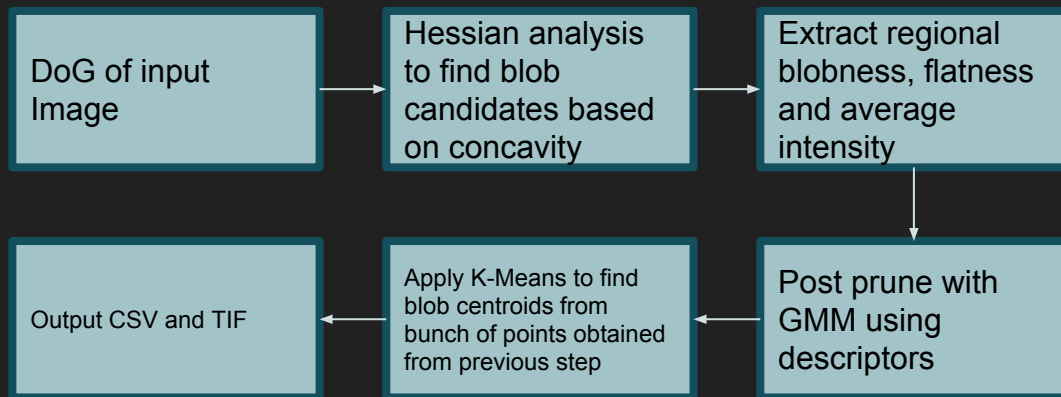
- Fix Package MVP
 - Fixed bugs
 - Now outputs TIF file with drawn centers and CSV file with center locations
- Run Package on annotated data and evaluate using *blob-metrics*
- Upload package outputs to BOSS
- Annotated 4 additional sub-volumes
 - Completed 8 out of 10 subvolumes targeted for this sprint
- Finish registration package
 - Registration + evaluation package on atlas and output from registration algorithm

100% complete >50% complete 0% complete

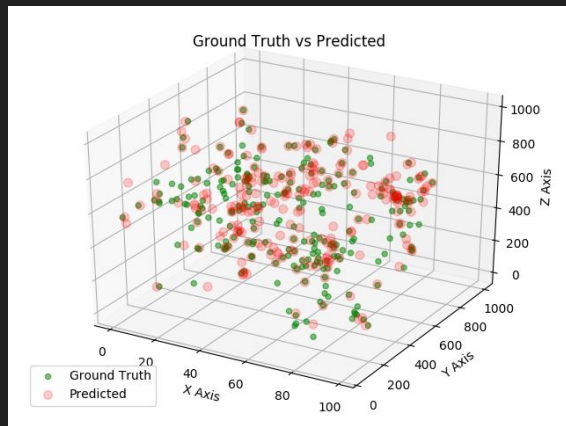
Completed MVP of cell detection package

- Cleaned up the package by fixing bugs. Sample outputs shown in the right
- Outputs results in CSV and TIF format
- Takes ~ 17 secs for a 100x100x100 slice. ~ 28 mins for 100x1000x1000
- Demo

Package pipeline flow diagram

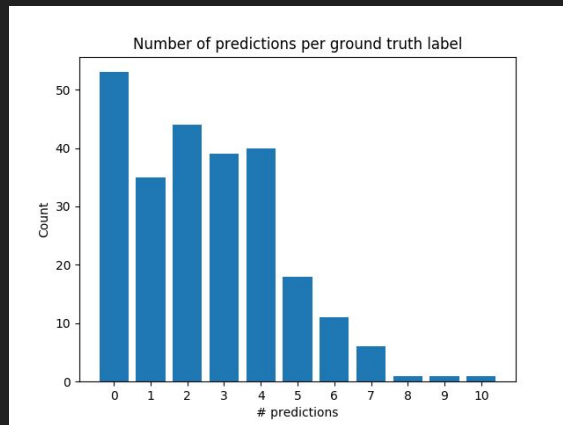
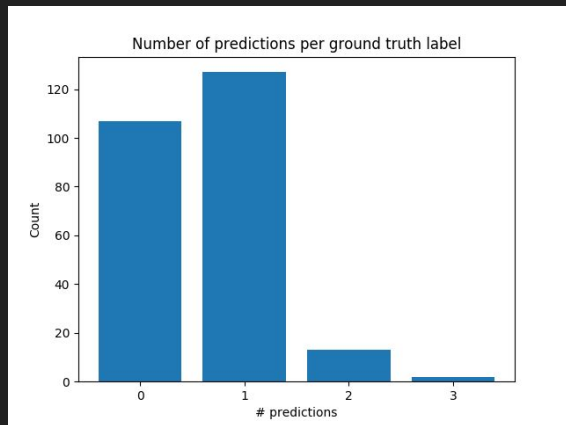
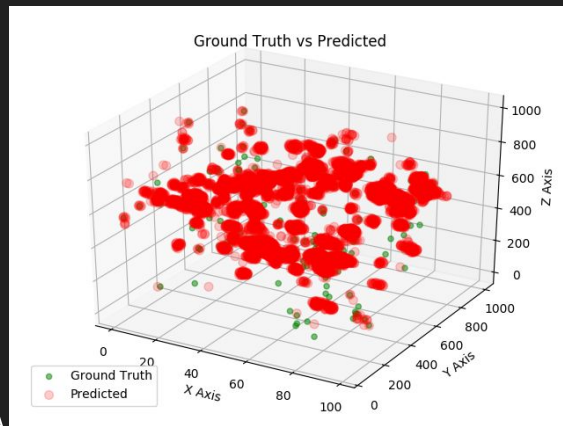


Package evaluated on ailey-dev/s3617 subvolume using *blob-metrics*



Using
K-Means
for finding
centroids

Skipping
the
K-Means
step



Better clustering algorithm will improve accuracy

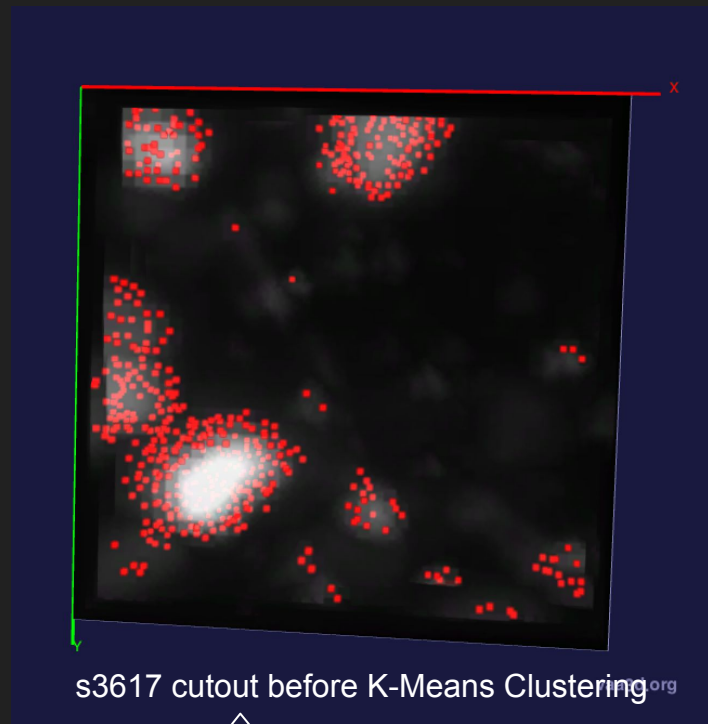
Evaluation Metrics for s3617 100x1000x1000 (Z,Y,X) subvolume

	With K-Means	Without K-Means
Accuracy	<u>50.6%</u>	<u>78.0%</u>
Precision	0.538	0.02
Recall	0.8936	0.02
F1 Score	0.672	0.02
Mean Square Error	32.868	66.12

Key Takeaway:

Metrics show that use of a better clustering algorithm (spectral clustering/ lambda-means) will improve accuracy

Other improvements: Do DoG with different scales and do fast hessian analysis for better performance. Work on denoising and binarization too



Pretty accurately finds voxels inside each blob

Annotations & package results visualized on BOSS

Steps Involved:

1. Created a new collection and a new experiment
2. Created a coordinate frame with range, voxel size etc.
3. Uploaded using this [script](#)
 - 3.1. Raw subvolume in a separate channel - “raw_image”
 - 3.2. Manual annotations as an annotation channel - “manual_annotations”
 - 3.3. Predictions as an annotation channel - “hdog_prediction”

[Boss Visualization](#)

Alpha Registration package on Docker Hub

- Code for package: <https://github.com/vikramc1/clareg>
- Docker image for registration package pushed to docker hub:
<https://hub.docker.com/r/vikramc/simple-elastix/>
- Sample jupyter notebook demo-ing it (run from within docker):
<https://github.com/vikramc1/clareg/blob/master/Registration%20package%20test.ipynb>

Manual annotations

- [List of annotation information](#)
- [Annotation CSVs on github](#)

File Name	Boss Collection	Boss Experiment	Boss Channel	Boss resolution	X range	Y range	Z range	Difficulty	Microscope
EXAMPLE_SYNTHETIC	N/A	N/A	N/A	N/A	[0, 1000]	[0, 1000]	[0, 1000]	Easy	Synthetic
cell_detection_0.tif	ailey-dev	s3617	Ch0	0	[6900, 7400]	[6300, 6800]	[620, 720]		COLM
cell_detection_1.tif	ailey-dev	s3617	Ch0	0	[6400, 7900]	[6300, 6800]	[620, 720]		COLM
cell_detection_2.tif	ailey-dev	s3617	Ch0	0	[6900, 7400]	[6800, 7300]	[620, 720]		COLM
cell_detection_0.tif	ailey-dev	s3617	Ch0	0	[6400, 7900]	[6800, 7300]	[620, 720]		COLM
cell_detection_4.tif	ailey-dev	170726_Insula-vCapture-Atenolol2_00-56-01	Ch0	0	[1560, 2160]	[677, 1177]	[622, 722]		COLM
cell_detection_5.tif	ailey-dev	170726_Insula-vCapture-Atenolol2_00-56-01	Ch0	0	[1560, 2160]	[677, 1177]	[722, 822]		COLM
cell_detection_6.tif	ailey-dev	170726_Insula-vCapture-Atenolol2_00-56-01	Ch0	0	[1560, 2160]	[677, 1177]	[822, 922]		COLM
cell_detection_7.tif	ailey-dev	170726_Insula-vCapture-Atenolol2_00-56-01	Ch0	0	[1560, 2160]	[677, 1177]	[922, 1022]	Easy	COLM

Next week's goals

- Annotate 2 more sub volumes to meet the sprint goal
- Quantitatively evaluate one more algorithm (FARSIGHT)
- Quantitatively evaluate registration on 4 control brains
- Work on better clustering for package

Sprint	Date Due	Requirements: Portion of manuscript (and package) corresponding to...
Sprint 1: Registration and Cell Detection	11/6	<ul style="list-style-type: none">• Obtain/Label up to 10 subvolumes of interest with manual annotations for cell detection• Tool for generating simulated validation data• Implement & quantitatively compare 2-3 unsupervised cell detection methods• Quantitative evaluation of 25 and 50 um registration on 4 control brains from ailey with manual fiducials