Week of 10/23 Deliverables

Team cobalt

AWS grant has been awarded!

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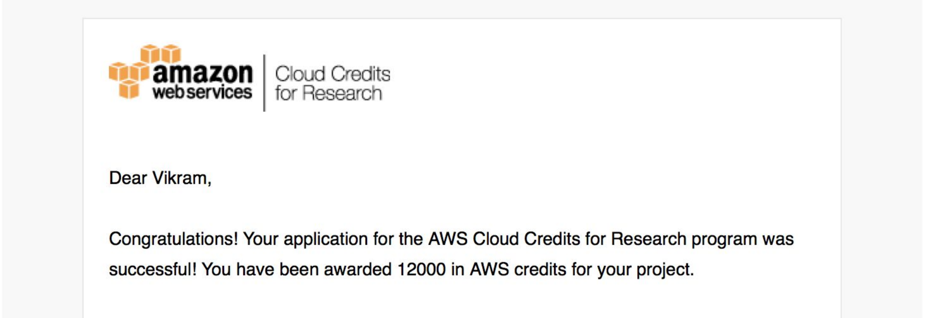


amazon web services | Cloud Credits for Research

Dear Vikram,

Congratulations! Your application for the AWS Cloud Credits for Research program was successful! You have been awarded 12000 in AWS credits for your project.

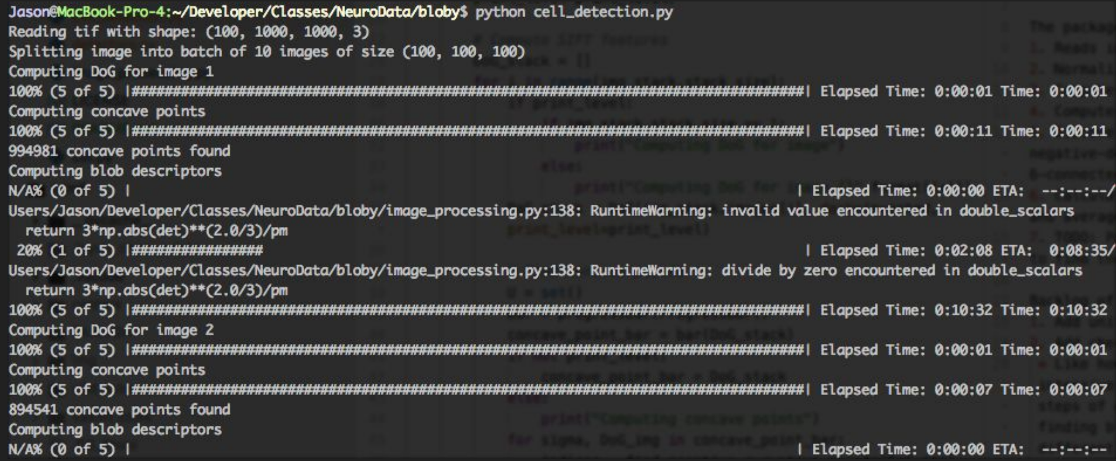
Last week’s goals

- Create alpha version of cell detection package.
- Extend blob-metrics package to support the following plots
  - Predictions per ground truth label
  - Ground truth labels per prediction
- Manually annotate s3617 cutout (2D centroids)
- Quantitatively evaluate Control9 registration with fiducials

100% complete >50% complete 0% complete

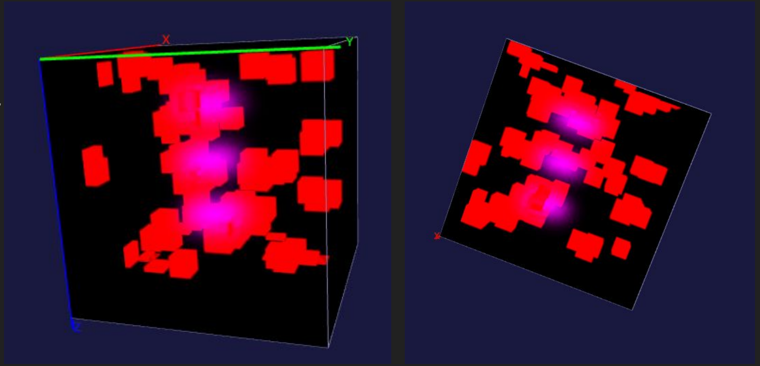
Alpha-implementation of HDoG Cell detection package completed

- Split work
  - Steps 1 to 3 - Jason
  - Step 4 - Srivathsa
- Prototype done
- Issues:
  - Known bugs
  - Very slow
  - Some nuances with the paper that we need to figure out… (dark or white blobs?)
- Step 1-3 notebook:
  - https://github.com/NeuroDataDesign/clarity-f17s18/blob/master/src/jupyter/jyim6/Cell%20detection.ipynb



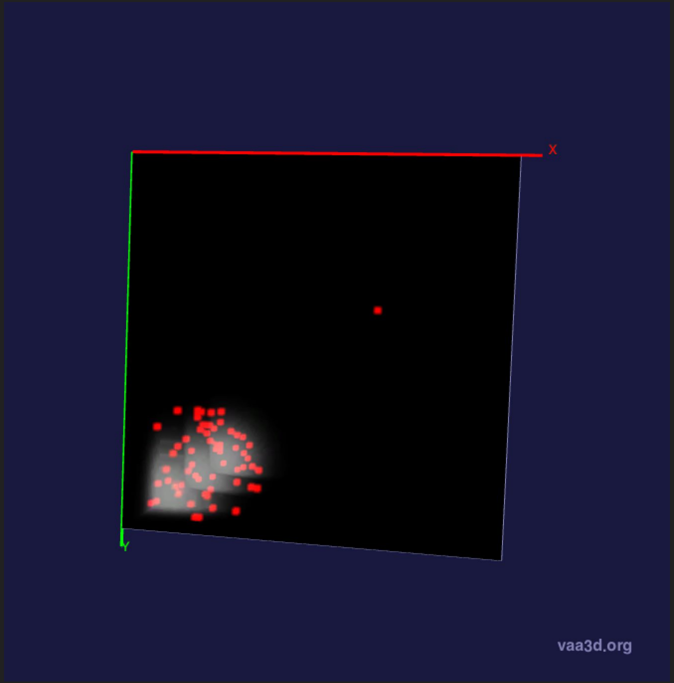
```
Jason@MacBook-Pro-4:~/Developer/Classes/NeuroData/bloby$ python cell_detection.py
Reading tif with shape: (100, 1000, 1000, 3)
Splitting image into batch of 10 images of size (100, 100, 100)
Computing DoG for image 1
100% (5 of 5) |##################################################################################| Elapsed Time: 0:00:01 Time: 0:00:01
Computing concave points
100% (5 of 5) |##################################################################################| Elapsed Time: 0:00:11 Time: 0:00:11
994981 concave points found
Computing blob descriptors
N/A% (0 of 5) |                                                                                  | Elapsed Time: 0:00:00 ETA:  --:--:--/
Users/Jason/Developer/Classes/NeuroData/bloby/image_processing.py:138: RuntimeWarning: invalid value encountered in double_scalars
  return 3*np.abs(det)**(2.0/3)/pm
 20% (1 of 5) |################                                                                  | Elapsed Time: 0:02:08 ETA:  0:08:35/
Users/Jason/Developer/Classes/NeuroData/bloby/image_processing.py:138: RuntimeWarning: divide by zero encountered in double_scalars
  return 3*np.abs(det)**(2.0/3)/pm
100% (5 of 5) |##################################################################################| Elapsed Time: 0:10:32 Time: 0:10:32
Computing DoG for image 2
100% (5 of 5) |##################################################################################| Elapsed Time: 0:00:01 Time: 0:00:01
Computing concave points
100% (5 of 5) |##################################################################################| Elapsed Time: 0:00:07 Time: 0:00:07
894541 concave points found
Computing blob descriptors
N/A% (0 of 5) |                                                                                  | Elapsed Time: 0:00:00 ETA:  --:--:--
```

Above: terminal Output of steps 1-3. Right: visualization of 1st stage blob candidates

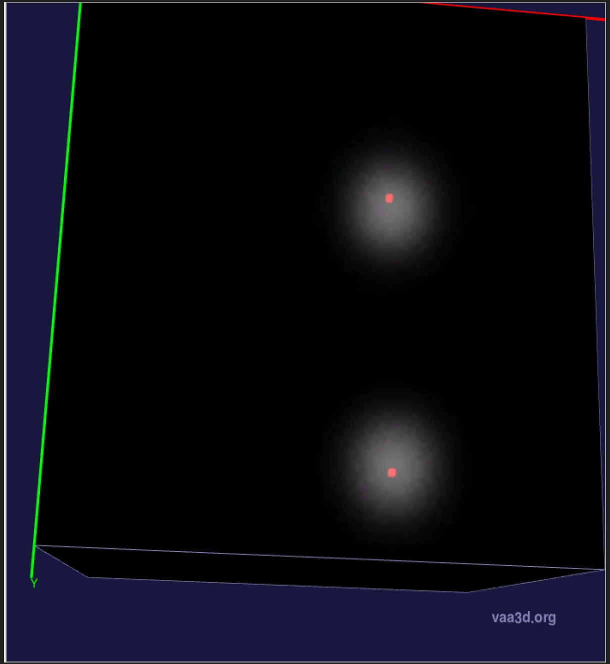


Alpha-implementation of HDoG Cell detection package completed

- Result of post-pruning using GMM is shown in the right
- Caveat: We have a bug in package

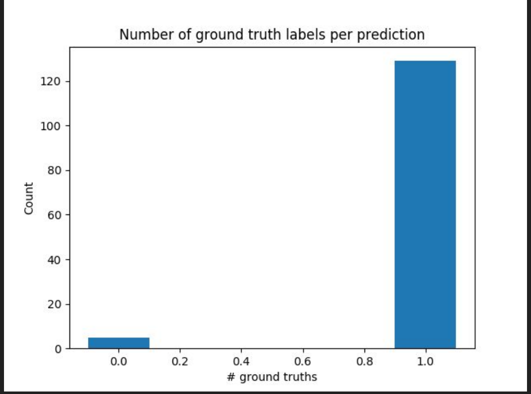


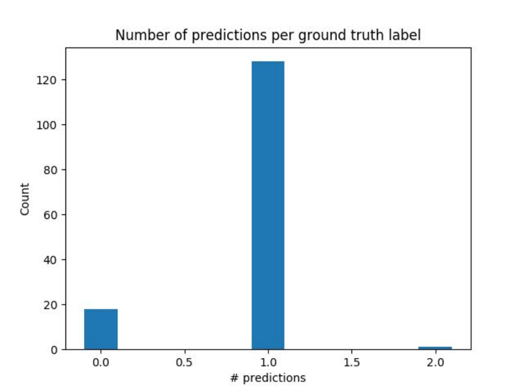
- Results from running our initial implementation



blob-metrics extended to support specificity plots

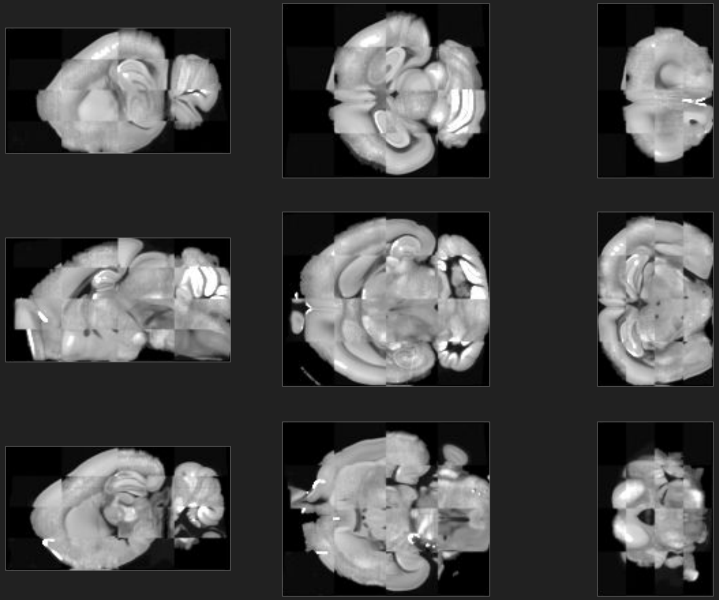
- Extended the *blob-metrics* package to support visualization of two important metrics
  - Number of ground truth labels per prediction
  - Number of predictions per ground truth label
- Notebook here





Initial registration evaluation indicates high quality

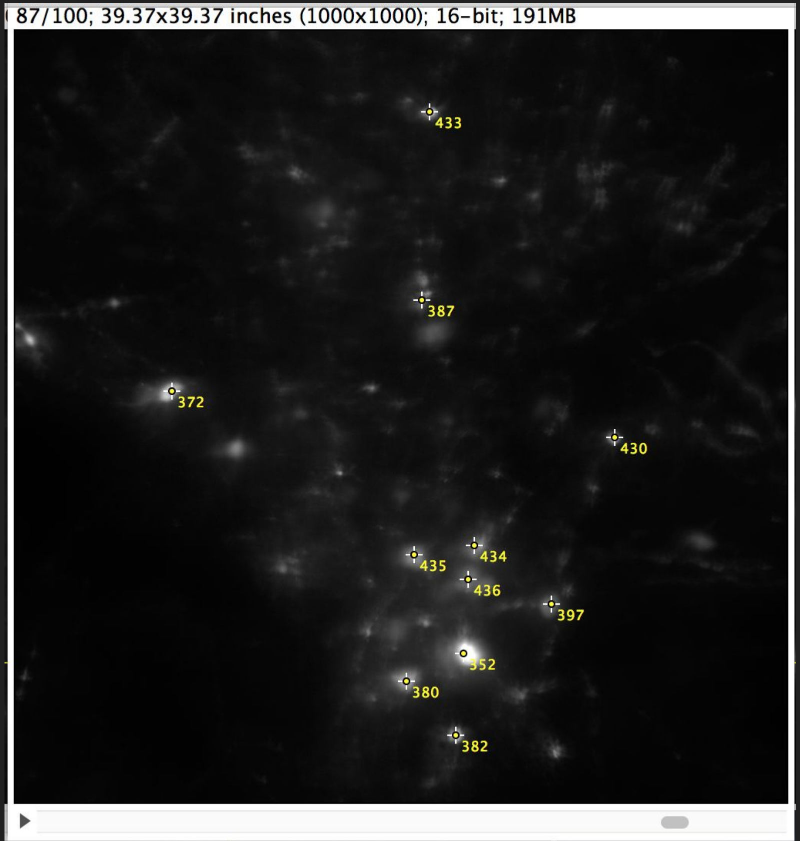
- Median MSE of 55 landmarks: ~4.22 mm
- Median MSE for clarity reg from lit: ~0.8-1.0 mm
- Seems a little high
- Need to verify that transformations are applied correctly
- notebook



Control 9/ARA checkerboard

s3617 cutout completely annotated with 2D centroids

- Used ImageJ to annotate the cell centers of the s3617 cutout:
  - x_range = [6900, 7900]
  - y_range = [6300, 7300]
  - z_range = [620, 720]
- Produced xls file with a list of the centroids and their coordinates
- Looked at orthogonal XZ and YZ slices to try and differentiate cell from noise (cells tend to be longer ins the XZ and YZ planes)
- Approx 200 cells in slices 51-100



Next week’s goals

- Refine *bloby* package.
    - Implement checkpoints (saving intermediates)
    - Debug/Unit tests
    - Make into a pip package
    - More user-friendly (informative outputs, csv, tif outputs)
    - Look more into VBGMM, mixture models in general
- Evaluate *bloby* package on annotated data
- Test ensemble methods on annotated data
- do more annotations
    - Combine 2D centroids into 3D centroids
- Finish registration
    - Registration + evaluation package on atlas and output from registration algorithm