DETECTION OF AXONAL SYNAPSES IN 3D TWO-PHOTON IMAGES

1 INSTALLATION

1.1 SYSTEM AND SOFTWARE REQUIREMENTS:

This code was only thoroughly tested on a Windows 10 machine (64bit), with Matlab2014b and up.

If using a different system, certain feature descriptors might not work ('HOG', 'SIFT'). These are not necessary to run the default parameters, but if you want to run them, install "mRMR Feature Selection (using mutual information computation)" by Hanchuan Peng:

https://uk.mathworks.com/matlabcentral/fileexchange/14608-mrmr-feature-selection--using-mutual-information-computation-

Follow the instructions in this link (you might be required to compile the code for your system).

1.2 RUNNING THE CODE

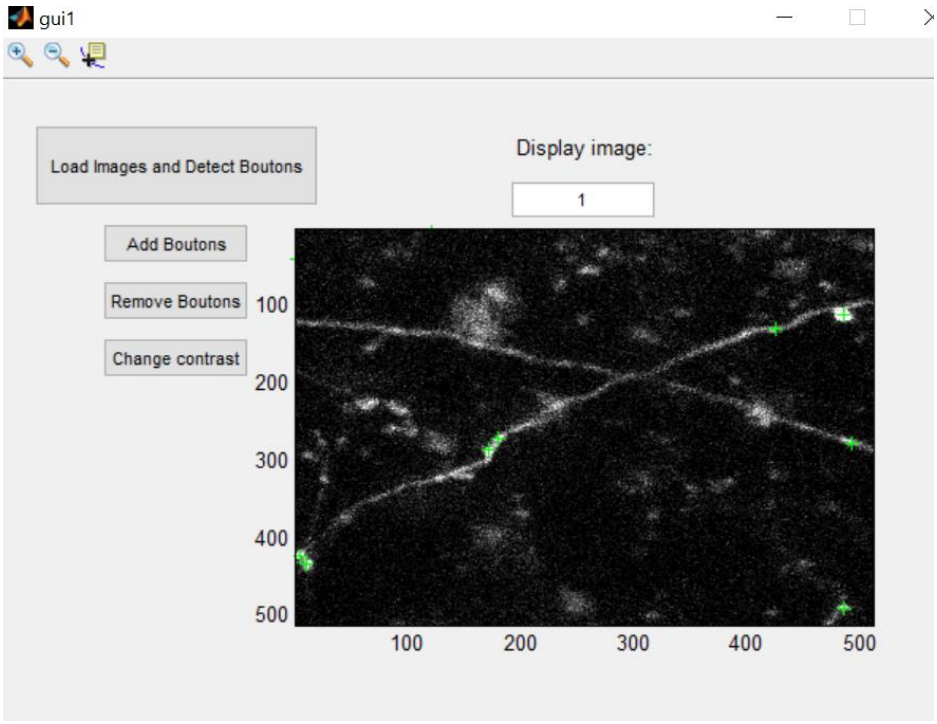
In order to run the code, place all the code into one folder, making sure all folders are in path.

To start the gui, run "runGUI.m" or type "runGUI" into the command window.

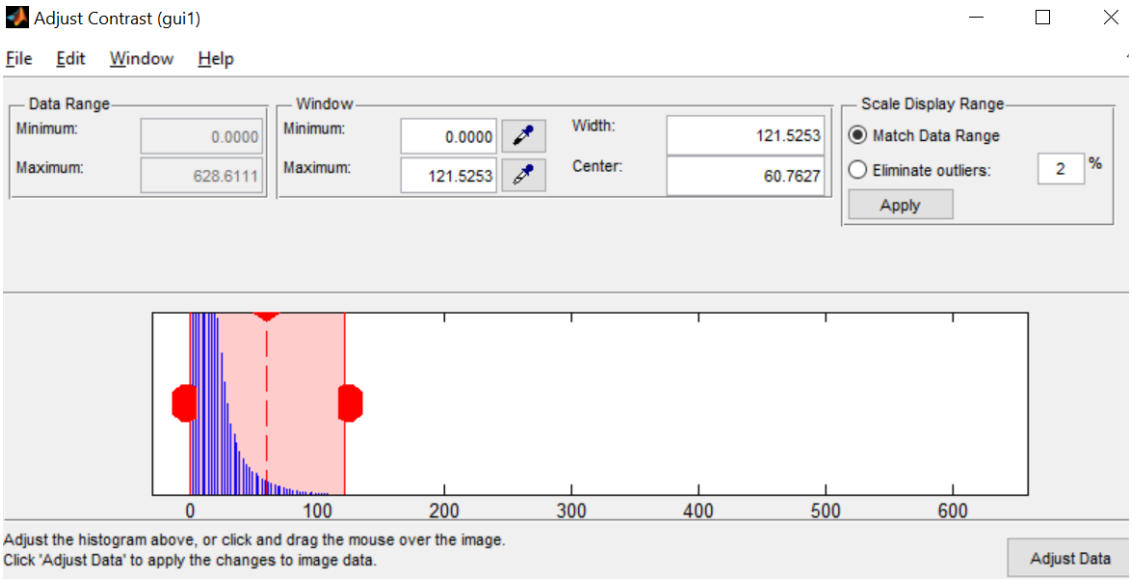
2 INSTRUCTIONS FOR USE

2.1 USING THE GUI

Upon starting the GUI, you will see the following:



- To start detection, click on the “Load Image and Detect Bouton”. You can load multiple TIFF files.
- In the command line, you will see the algorithm running. Once “done” is displayed, you can start editing.
- In the toolbar, the zoom tools are available to zoom in particular regions.
- To add/ remove boutons, click the respective buttons, and click on all boutons to add/ remove. Press “Enter” when done, to finish.
- To change between images, enter the image number required into the textbox above the image. Changes that have already been made, are saved.
- If it is necessary to change the pixel contrast in the images, click the “Change contrast” button. Drag the red line in the GUI to change contrast in the image. **Once done, close this gui by clicking “X” button at the top.** Don’t click “Adjust Data”.



2.2 SAVING

All data is saved to a file called “Data.m” in the same folder, which contains a *struct* called ‘finalBoutons’, with the following fields:

- Image: the image name
- Locations: a matrix all the detection bouton locations (x,y,z) after editing. Z location is available if `find3D = 1;` in runBoutonDetection.m file.
- Intensities: the intensity at the corresponding location
- removedBoutons: the locations of boutons selected to remove. These can be sent back to us so that we can improve the algorithm with further training.

Copy this file to required folder/ document before analysing any other data, so that the analysis is not over-written.

2.3 CHANGING PARAMETERS

Certain parameters can be changed in “runBoutonDetection.m” file. Open file to change the following:

```
Parameters.descriptor = 'Gabor';            %Options='Gabor','SIFT','HOG'
Parameters.interestPointDetector = 'SURF';  %Options='SURF','SIFT','harris'

find3D = 0;              %0= don't find 3D points, 1= find 3D points
Plot = 0;                %0= don't plot figures, 1=plot figures
Plot3D = 0;              %0= don't plot, 1=plot 3D image stacks
Save = 1;                %0= don't save, 1=save bouton locations
```

For example, if you change “`Parameters.descriptor = 'HOG'`”, the algorithm will be using HOG features instead of Gabor.