Neuronalyzer - User Manual

0. **Downloading and running**

0.1. Download the latest version from the git repository
https://github.com/Omer1Yuval1/Neuronalizer

0.2. Open the file 'Tracer_UI.m' in MATLAB and run it.

1. **Tracing**

Follow these steps to trace one or more images. Steps marked in gray are optional.

1.1. Under the "Project" tab, click the "Start A New Project" button and choose a grayscale image of a neuron.

- A sample image named "Sample_Image.tif" can be found in "Neuronalizer\Inputs\".

1.2. Once the image is loaded, a form will show up. Fill in the neuron's properties and press "Continue".

- The chosen image will show up in the main panel with the cell-body detected.

1.3. Select the "Pre-Processing" tab and click the "Load A Trained Neural Network" button. Choose a .mat file containing a pre-trained denoising neural network.

- The .mat file must contain a neural network variable named "My_CNN".
- Sample pre-trained denoising neural networks can be found in "Neuronalizer\Inputs\".
- Once done, the denoised image will be binarized and displayed.

1.4. The binarization pixel value threshold and the minimum object size can be adjusted using the slide-bars in the same tab. After setting these parameters, the binary image can be manually edited. Left-click adds neuron pixels, while right-click removes them. The marker size can be selected in the same tab.

- Once done, click "Update" to confirm the changes and save the result to the workspace.
- An alternative view of the binary image as RGB is available from the "Reconstructions" menu.

1.5. Finally, go to the "Tracing" tab and click "Start Tracing".

1.6. Once complete, click OK to continue and save the project from the "Project" tab.

2. **Loading a project and working with multiple dataset**
   - To load an existing project, click the "Load an Existing Project" button in the "Project" tab, and choose a previously saved project .mat file.
   - To trace multiple images from different datasets (different biological background, different scaling etc.), first trace each dataset separately and save into a project .mat file. Then, use the "Create Multiple Neuron DB" button in the Project tab to combine the different datasets into a single database, and save the result in a separate file. This file can later be loaded as explained before.

3. **Visualization and validation**

   The software provides various options to visualize and validate traced images and extracted morphological features. These are available from the "Reconstructions". The "Image" menu can be used to switch between images.

4. **Analysis**

   The software provides various interactive plots via the "Analysis Plots" menu. These can be used to quantify morphological features in traced images, and compare them across datasets.

   Interactive options include normalization, statistics, group filtering, histogram bin size and more.