**Pre-processing steps:**

1. tifMotionCorrection.m: generate motion corrected video and max projection image.
   1. Inputs:
      1. Raw, Multipage Tif Videos/Images. Assumed to be uint16
   2. Outputs:
      1. Motion-Corrected Multipage Tifs -> m\_\*.tif
      2. Max projection image across videos -> ??
      3. Filtered, Motion-Corrected Multipage Tifs -> m\_f\_\*.tif
      4. Filtered, max projection image across videos -> ??
2. SemiSeg.m: Semi-automated code to select circular ROIs. (<https://github.com/kr-hansen/SemiSeg/>)
   1. Branch for Publication: mTBI\_Ca\_Hippocampus
   2. Inputs:
      1. Multipage Tifs (Typically motion corrected first)  
         OR
      2. Max projection image across multipage Tif
   3. Outputs:
      1. CellList structure, with saved pixel indexes for selected ROIs
3. batchExtractTraces.m: Extract traces using CellList structure & Motion-Corrected Tifs
   1. Requires:
      1. extract\_trace.m
      2. findNestedFiles.m
   2. Inputs:
      1. ROI CellList structure
      2. Motion-Corrected Multipage Tifs
   3. Outputs:
      1. Traces structure (called r\_out), with extracted traces for corresponding ROIs
4. traceProcessing.m: Load extracted traces from video to process and perform additional calculations on.
   1. Requires:
      1. findNestedFiles.m
   2. Inputs:
      1. Traces structure (called r\_out), with extracted traces for ROIs
   3. Outputs:
      1. Processed traces structure (also called r\_out, but saved differently) with additionally created/processed fields in the structure.
5. activityChanges.m: Combine data from all sessions into one structure and compare activity differences between periods.
   1. Requires:
      1. randomBinaryResample.m
      2. patchline.m
   2. Inputs:
      1. Edit Lines 5-30 to match higher parent directory, filenames, and indexes for corresponding blasting days for the proceesedTraces\*.mat after blasting sets.
      2. Edit Lines 156-181 to match directory, filenames, and indexes for corresponding blasting days for the proceesedTraces\*.mat before blasting sets.
   3. Outputs:
      1. Some Plots not necessarily used in the paper
      2. “activityResults\_MMDDYYYY\_DayX.mat” for each corresponding day. Needs to be uncommented on Line 252 for this to be output.

**Figure steps:**

Figure 2 B&C

1. traceHeatMaps.m: Plot trace Heat Maps using the “fnormtrace” field in the outputted structure.
   1. Requires nothing, but uses provided “redblue” for colormap, provided from stack exchange
   2. Inputs:
      1. Processed traces structure (r\_out from “traceProcessing.m”)
   3. Outputs:
      1. Plots like Figure 2 B&C in paper.

Figure 3 A&B

1. plotSpatialUpDownMap.m: Plot spatial map of whether cells were significantly increased or decreased.
   1. Inputs:
      1. Processed traces structure for 2 post-blast/sham sessions.
      2. “sigexamples\_MMDDYYYY.mat” generated by plotMeanValuesPopulation.m
   2. Outputs
      1. Plots like Figure 3 A&B (Left Images)
2. plotExampleDistributions.m: Plot traces and distributions of example cells
   1. Inputs:
      1. Processed traces structure for 2 post-blast/sham sessions.
   2. Outputs:
      1. Plots like Figure 3 A&B (Right Traces & Distributions)

Figure 3C

1. plotMeanValues.m: Compare mean values of all cells between two experimental conditions
   1. Requires:
      1. generateMeanValues.m
   2. Inputs:
      1. Processed traces structure for 2 post-blast/sham sessions.
   3. Outputs:
      1. Plot like Figure 3C

Figure 3D

1. plotMeanValuesPopulation.m: Combine data from all sessions into one structure and make some plots
   1. Requires:
      1. generateMeanValues.m
      2. patchline.m
   2. Inputs (Same as Pre-processing #5, but different lines):
      1. Edit Lines 5-30 to match higher parent directory, filenames, and indexes for corresponding blasting days for the proceesedTraces\*.mat after blasting sets.
      2. Edit Lines 175-200 to match directory, filenames, and indexes for corresponding blasting days for the proceesedTraces\*.mat before blasting sets.
   3. Outputs:
      1. Various Plots, including Figure 3D
      2. “sigexamples\_MMDDYYYY.mat” for selected example sessions. Used for figures 3 A&B
      3. “sigpopulation\_MMDDYYYY\_DayX.mat” for each corresponding day. Needs to be uncommented on Line 264 for this to be output.

Figure 3E

1. RearrangeForStats.m: Generate plots of statistical results
   1. Requires:
      1. errorbar\_groups.m
   2. Inputs:
      1. “sigpopulation\_MMDDYYYY\_DayX.mat” from Figure 3D script Output
   3. Outputs:
      1. Plots like Figure 3E in the paper (Figures 1&2 in this script).

Figure 4 A&B

1. traceHeatMaps.m: Same script as for figure 2 B&C, but use the field “dftrace” rather than the field “fnormtrace” and some scaling differences. Copied so differences can be seen.
   1. Requires nothing, but uses provided “redblue” for colormap, provided from stack exchange
   2. Inputs:
      1. Processed traces structure (r\_out from “traceProcessing.m”)
   3. Outputs:
      1. Plots like Figure 4 A&B in paper.

Figure 4C

1. SaveDataStructure.m: Script to re-arrange/organize data into a specific format
   1. Input:
      1. Edit Lines 7-54 to match higher parent directory, filenames, and indexes for corresponding blasting days for the proceesedTraces\*.mat files.
   2. Output:
      1. “allData.mat” which includes two structures used for subsequent plots.
2. PlotDifferences.m: Script to generate various plots for certain comparisons
   1. Requires:
      1. findPulses.m
      2. errorbar\_groups.m
   2. Input:
      1. “allData.mat” from “SaveDataStructure.m”
   3. Output:
      1. Several Plots, of which Figures 1&2 make up Figure 4C in the paper

Figure 4D

1. RearrangeForStats.m: Same script and instructions as Figure 3E, but output Figures 3&4 make up Figure 4D.

Figure 5

1. PlotDifferences.m: Same script and instructions as Figure 3C, but output Figures 9&10 make up Figure 5.
   1. Note, the usage of the function ‘scatter’ in this script works on Matlab R2016b. It does not work on Matlab 2013a. The function must have changed sometime between those Matlab versions.

**Additional Stats Steps in the Paper:**

1. compareEleSupIncDec.m: Statistically compare cells for mean baseline changes and activity changes.
   1. Input:
      1. “activityResults\_MMDDYYYY\_DayX.mat” from Pre-processing #5
      2. “sigpopulation\_MMDDYYYY\_DayX.mat” from Figure 3D script Output
   2. Output:
      1. Nothing saved, but stats in the workspace.

**File Exchange Functions**

1. redblue.m
   1. <https://www.mathworks.com/matlabcentral/fileexchange/25536-red-blue-colormap>
2. patchline.m
   1. <https://www.mathworks.com/matlabcentral/fileexchange/36953-patchline?focused=6794102&tab=function>
3. errorbar\_groups.m
   1. <https://www.mathworks.com/matlabcentral/fileexchange/47250-pierremegevand-errorbar-groups>