All of the Scripts Associated with Metrics and Including Metrics MAP

*Updated: 2/7/2024*

1. Metrics MAP (Coordinate\_Mosaic\_Metrics\_MAP.m)
   1. The input is the original ROI TIF and the cone coords for each subject.
   2. You will also need an LUT for running the script. Save as a .csv.
      1. Column A will be a common identifier of the ROI and the coords such as JC\_XXXXX\_YYYYMMDD\_OX
      2. Column B will be the axial length of each subject at the visit date.
      3. Column C will be the ppd scale of the AO montage.
   3. To change the window size, change the “upper bound” in line 96.
      1. If it gives you an error right after you start running it, change the {} to () on line 153.
   4. Make an input folder within the main folder containing the script. Place the ROIs and their coords in this folder.
   5. Copy/paste the LUT file into the main folder containing the script.
   6. When you run this script, you can specify microns, degrees, or arcminutes
   7. The purpose of this script is to output density topography of an ROI, min and max density and their coordinates
   8. Results will populate in a folder within the Input folder.
      1. For this script, the results are:
         1. Bound density matrix .csv
         2. Bound density matrix matfile
         3. Bound density map figure with min/max and location (.png)
         4. Bound density figure marked with PCD (.tif)
         5. Bound density map (.tif)
         6. Window results matfile
2. PCD & CDC Analysis (PCD\_CDC\_Analysis.m) (MAP Analysis PCD CDC)
   1. Input is the bound density matrix .csv files from the metrics output. You will also need to input the same LUT table from metrics for this script.
      1. Do not make an Input folder. Just place the bound density matrices in the main folder containing the script.
      2. You will need to make a folder named “LUT.” Place the LUT file here.
   2. When you run this script, you can specify the isodensity contour that you want to report. Do 80% unless you have a reason not to.
   3. The purpose of this script is to report the PCD, CDC, their locations, and 80% isodensity contour area for each ROI in your dataset
   4. The results will include individual files for each subject, an analysis summary, and a file containing all of the PCD points.
      1. The analysis summary and the file of the PCD points will populate in the LUT folder. The remaining PCD and CDC maps from the script will populate in the main subject folder.
   5. Results:
      1. A .csv with the coordinates of whatever isodensity contour you chose when you ran the script.
      2. A figure with the PCD and CDC marked
      3. A figure with the 80% contour only
      4. A figure with the contour, best fit ellipse, PCD, and CDC
3. Ellipse Contour (Plot\_Isodensity\_Contour\_Overlay.m) (MAP Analysis > Isodensity Contours)
   1. Input is the bound density matrix .csv files from the metrics output. You will also need to input the same LUT table from metrics.
      1. Same as above, make a “LUT” folder and place the LUT file in here. Put the bound density matrices in the main subject folder.
   2. I only ran this code for the subjects I needed for figures. You can choose which contour percentage you want to run.
   3. If you only want an 80% isodensity contour, you can run the Plot\_Isodensity\_Contour\_Overlay\_80th\_Percentile\_Only.m found in the same folder
   4. These two scripts give you a .tif that you can use for figures
   5. Results will populate within the main script folder
   6. Results are:
      1. Combined contours .tif
      2. Combined contours .csv
      3. A .csv with the center coordinates for each ellipse
4. Compare Windows (PCD\_CDC\_Location\_Comparison\_95\_CI.m) (MAP Analysis > PCD CDC)
   1. Input files are a PCD and CDC excel docs. Place them in the main folder containing the script. Within my input folder there are instructions for making the input files as well as instructions for running the script. You do not need an LUT for running this script.
   2. The purpose of running this script is to see the 95% confidence ellipse when you are comparing multiple methods for one metric
      1. Niamh used this for comparing all five graders’ PCD and CDC metrics
      2. Emma used this for comparing all 10 window sizes and their PCD and CDC metrics
   3. Results:
      1. A matlab figure and a tif of the following
         1. Combined PCD and CDC 95% confidence ellipses with each individual point marked
         2. PCD only ellipse
         3. CDC only ellipse
5. Cells within radius from PCD (cells\_within\_radius\_from\_PCD.m) (MAP Analysis PCD CDC)
   1. Input: bound density matrix .csv, coords .csv, and the LUT file used for metrics
      1. Place all of these inputs into the same folder to run the script
   2. When you run the script, you type the radius in microns from the PCD where you want to know the cell count
   3. The purpose to see how many cells are within a chosen radius of the PCD
   4. Results
      1. .csv that tells you how many cells are within a certain radius of the PCD
6. Density at a distance from the PCD (Density\_at\_Distance\_from\_PCD.m) (MAP Analysis PCD CDC)
   1. Input: density matrix .csv and LUT
      1. The density matrix .csv needs to be in the same folder the script is running from
      2. The LUT needs to be in its own LUT folder
   2. The user enters the x and y distance in um from the PCD
      1. Negative distances are to the left and up
   3. The purpose of this script is to find density at a specific distance from the PCD in a density matrix
   4. Results: a .csv containing the density at the distance you specified from the PCD
7. Density Matrix Subtraction (Density\_Matrix\_Subraction.m) (MAP Analysis > Matrix Operations)
   1. Before running this script, you need to scale all of the ROIs and their coords to the same scale
   2. Input: two density matrix .csv, analysis summary output from PCD & CDC analysis script
      1. You need to run the PCD & CDC analysis script once with ONLY the two subjects you want to use the density matrix subtraction, so only two subject output on the analysis summary
   3. When you run the script, the first matrix you select needs to be the first one listed in the analysis summary
      1. If you have different sized ROIs, ideally the first matrix you select is the smaller of the two ROIs
   4. The purpose of this script is to compare density maps from different time points
   5. Results:
      1. .csv with the results of the subtraction in matrix form
      2. Svg of the plotted result
         1. Can input into illustrator and use it like a .tif
         2. The svg is flipped across the y-axis which you know because it still has the axis on it when it saves
         3. So you need to flip it in illustrator to have the correct orientation
      3. .tif of the plotted result – the color scale sucks on this one; it looks very binary and is hard to tell what’s going on (this is why the svg was made)
8. New Maps (New\_Maps.m) (MAP Analysis folder)
   1. Input: the windows results matfile from metrics map
   2. You can select what kind of map you want to output
      1. Bound area
      2. Unbound area
      3. Bound number of cells
      4. Unbound number of cells
      5. Bound density in degrees
      6. Bound density in microns
   3. To change the clims its on line 97
   4. The purpose of this script is to make new maps from your existing data that you got from metrics map so you don’t have to rerun metrics just to get a new map
      1. This can be useful if you need to change the clims of the map but don’t want to rerun metrics just to get new maps
   5. Results:
      1. The new map
      2. \*If you say you want to do the bound density degrees map, it will save the results that you’re supposed to get from metrics map but this avoids having to rerun metrics in degrees and that takes too long
9. Standard Deviation Maps (Stdev\_Maps.m) (MAP Analysis folder)
   1. Input: bound density matrix matfile (with MATFILE listed in all caps in the file name)
      1. You can separate the matfiles by creating a new folder for each window size within the input folder
      2. Or you can put all the matfiles from all the window sizes into the input folder
   2. The script identifies by subject ID so it will do the standard deviation for all matfiles from that ID
   3. To adjust the clims its line 43
   4. The purpose of this script is to create a standard deviation of density from previously made density maps
      1. If you want to add the CDC location on the standard deviation map, you have to average all of the x CDC locations and then average all of the y CDC locations and your result is the weighted average CDC location point
   5. Results: a tif of the new map
10. Window Analysis
    1. Input: the window results matfile from metrics
       1. You don’t need a LUT
       2. Put the matfiles into an Input folder
    2. Select the input folder when prompted to select the directory for the window results matfiles
    3. You can choose which outputs you want
       1. Bound area (um2 units)
       2. Unbound area (um2 units)
       3. Bound number of cones
       4. Unbound number of cones
    4. The purpose is to determine how many actual coords are included in each sampling window. This is more of a sanity check script because we know that metrics now has the exact number of cells you want it to have in each window
    5. Results: whatever you selected to output shows up on a .csv