**Foveal Cone Deviation Mapping Instructions:**

1. ROI images and coordinates MUST be scaled to a common scale before creating metrics maps if you would like to align and average maps or compare maps at any point.
   1. This includes all normative data contributing to the normative averaged maps as well as any comparison/pathological data.
   2. For Jenna G’s Deviation mapping for foveal cone mosaic topography project/poster the scale used was 0.242 mpp (1240x1240 for 300um or 2066x2066 for 500um image size).
      1. **Coordinate\_Scaling.m and Image\_Scaling.m** located in the main Metricks folder were used to automatically scale the data to the common scale.
         1. Note: If you have ROIs that are not 300 or 500um, the script will need a modification to scale them correctly.
         2. Note: These scripts are currently hard coded for 0.242 mpp scaling
         3. Note: The data must be in either of these formats at this time:
            1. JC\_XXXXX\_date\_OD/S\_XpXXXXmpp\_XXXpXXXppd\_XXXum\_date\_jc\_coords.csv/tif
            2. XXXXX\_date\_OD/S\_XpXXXXmpp\_XXXpXXXppd\_XXXum\_date\_jc\_coords.csv/tif
2. Create metrics maps with scaled data.
   1. **Coordinate\_Mosaic\_Metricks\_MAP.m** is used to create the maps.
   2. *Inputs*:
      1. Tif images (optional, however density values will not be as accurate).
      2. Coordinate .csv files of the same name as the images with \_coords appended at the end of the file name.
      3. A LUT file. There are three columns needed:
         1. The file name.
         2. The axial length.
         3. The pixels per degree (ppd).
   3. Line 477 controls the type of metric for the map
      1. By default, it is set for bound density (5). To see the entire list of metrics that can be used see lines 415-419.
      2. Note: if the metric is changed the map clims will most likely need to be changed to better suit the range of the metric selected (line 511).
   4. *Outputs* for each image:
      1. Metric matrix .csv with raw data.
      2. 3 images
         1. Matlab figure.
         2. Image marked with peak density value.
         3. Raw Image.
3. Run PCD\_CDC Analysis.
   1. Once metrics maps have been created, the CDC must be found for all of them.
   2. **PCD\_CDC\_Analysis.m** in the MAP\_Analysis>PCD\_CDC folder is the script to run.
      1. The 80th percentile is the typical parameter chosen for the isodensity contour.
   3. *Inputs*:
      1. Metric matrices (.csv files).
      2. LUT file used previously for coordinate\_mosaic\_metrics\_MAP.m
   4. *Outputs*:
      1. Individual contours and contours with markings (images and .csv)
      2. Analysis summary .csv
      3. All max coords .csv
4. Create normative Averaged map/averaged map that you’d like to compare other maps to.
   1. **Density\_Matrix\_Averaging.m** located in the MAP\_Analysis folder is used.
      1. This script takes multiple metrics maps (e.g. density maps) and aligns then accordingly to the map CDC points to then create average and standard deviation maps for the data. This script creates different variations of the average and standard deviation maps. Including all possible data even in spots where no overlapping occurs, data that has at least N (50) maps overlapping, and data that has all matrices overlapping.
      2. Note: N can be changed on line 36.
         1. It is important that at minimum you have more than N input maps.
   2. *Inputs*:
      1. Metric matrices (.csv files)
      2. LUT file. There are three columns needed:
         1. The names of the matrices.
         2. The X CDC coordinates (or other point to align to).
         3. The Y CDC coordinates (or other point to align to).
   3. *Outputs*:
      1. 3 versions of the average and standard deviation matrices (saved as figures, raw images, .csv files).
         1. All possible data even where no overlapping occurs (ALL).
         2. Data that has at least N maps overlapping.
         3. Data that have all matrices overlapping.
      2. Image and .csv of the amount of overlapping datapoints.
      3. CDC .csv of the master CDC for each of the resulting types of map (or master point that they were aligned to).
5. Run deviation map script**, Deviation\_Mapping.m** located in the MAP\_Analysis folder.
   1. This script compares metrics maps (e.g. density maps) to a normative averaged map to output a deviation map of the inputted maps for comparison (within 1 SD, within 2 SD, >2 SD).
      1. Note: All maps including normative average & standard deviation maps must be the same scale.
   2. *Inputs*:
      1. A folder containing:
         1. A LUT file with CDC coordinates for normative maps (3 columns)
            1. File name.
            2. X coords.
            3. Y coords.
         2. Average normative map (.csv) (output from Density\_Matrix\_Averaging.m)
         3. Standard deviation normative map (.csv) (output from Density\_Matrix\_Averaging.m)
      2. Another folder containing:
         1. Comparison metric maps (.csv)
         2. LUT file with CDC coordinates (3 columns)
            1. File name.
            2. X coords.
            3. Y coords.
   3. Note: The code will ask you for things in this order:
      1. The normative averaged map
      2. The directory of comparison maps
      3. CDC LUT file for normative averaged map
      4. CDC LUT file for comparison maps
      5. Normative standard deviation map
   4. *Outputs*:
      1. Raw data deviation map .csv for each comparison metric map.
      2. Deviation map image and .svg for each comparison metric map.
      3. Deviation percentage analysis summary .csv file.