

1. ISO Map algorithm implementation

a) Provided is the output of adjacency matrix and the similarity matrix, you can also see the evident difference between the similarity graph and the adjacency graph, the similarity graph being much darker since it's including 100 nearest nodes for each node, while the similarity graph calculations the shortest distance with the dijakstra algorithm:

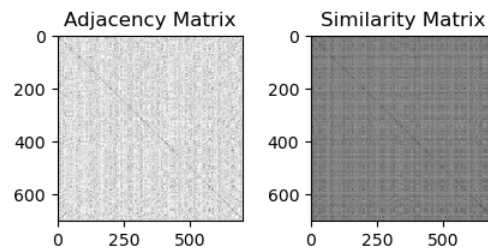


Figure 1: Adj matrix vs similarity matrix

Provided is the output of 3 random images from the pandas dataframe:



Figure 2: Image index 268



Figure 3: Image index 406



Figure 4: Image index 609

b) Compute euclidean distances across each image and use that to construct the H matrix, Centered Matrix C, then the Z matrix to retrieve the top two principal components for the faces dataframe. This will then allow us to see the particular groups for each of the nearest neighbor sections and look for patterns / orientation:

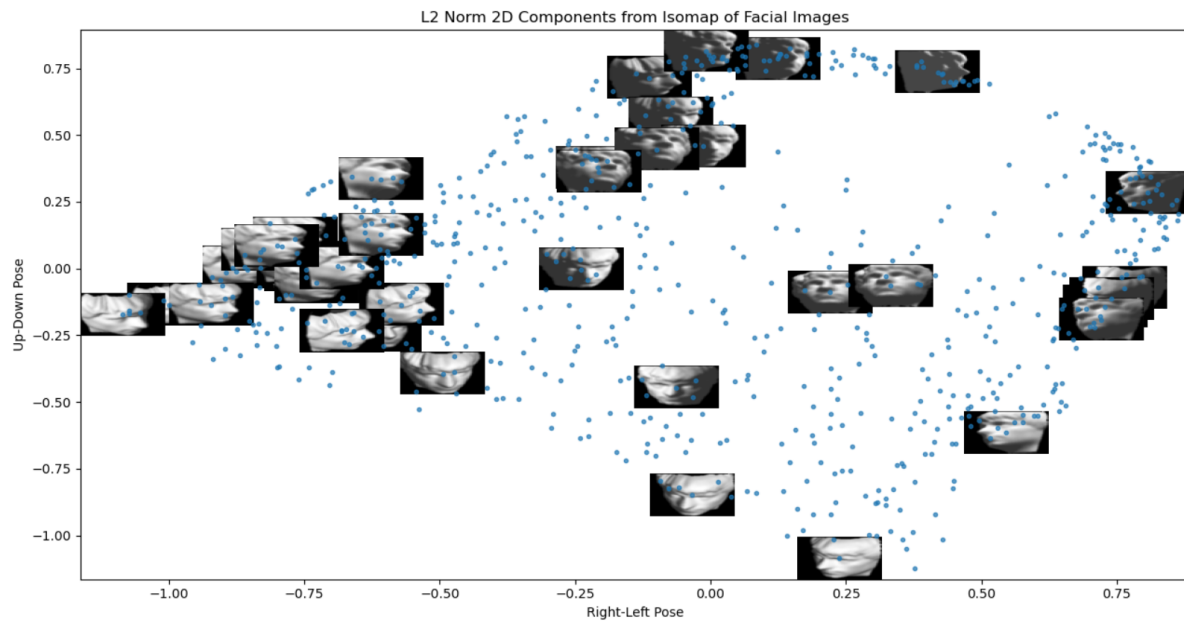


Figure 5: Isomap result using L2-Norm

c) Manhattan results

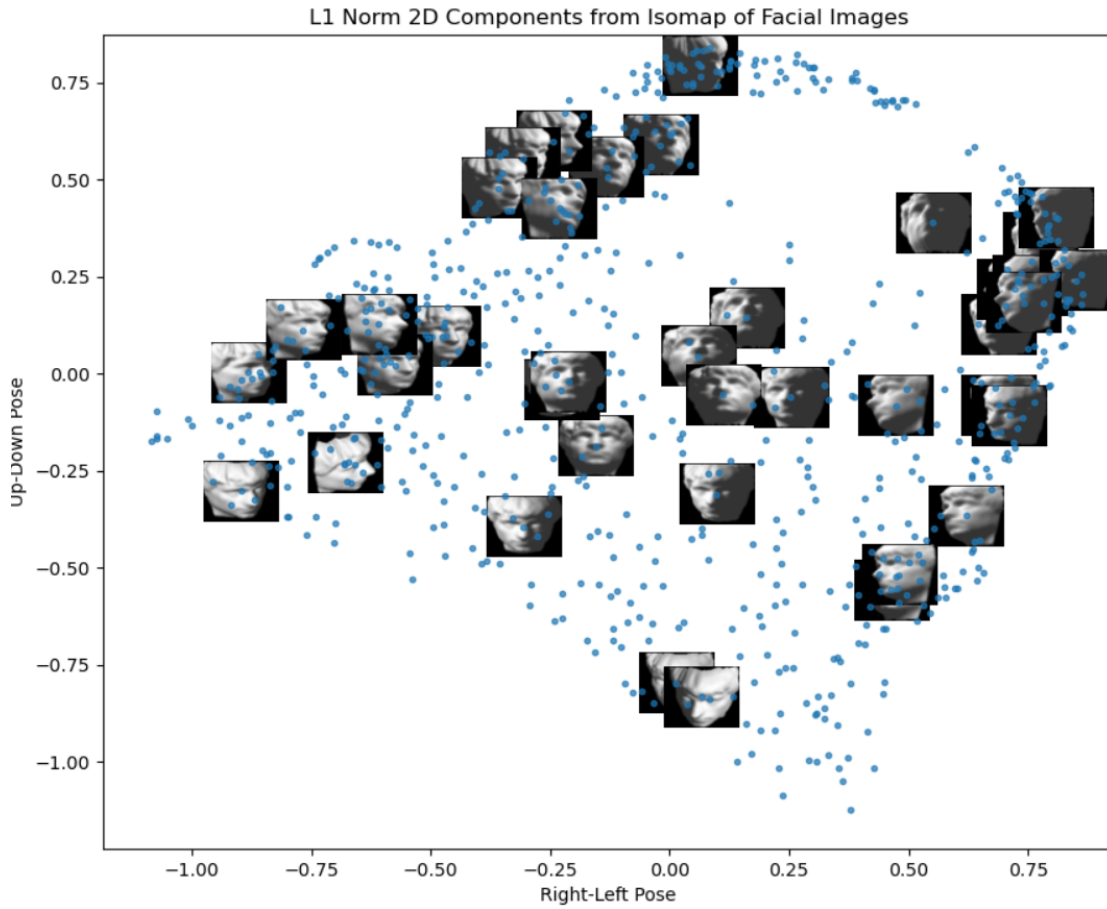


Figure 6: Isomap result using L1 norm

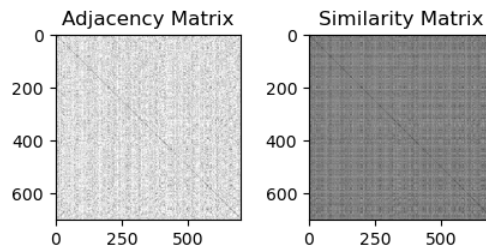


Figure 7: Adjacency matrix vs similarity matrix for L1 Norm

2. Density Estimation

a) Provided is the 2D histogram for Amygdala (X) by Acc (Y) for a different variations of the number of bins. We can see from the output we have higher frequency distributions for lower values of Acc and Amy, however we we're not able to see a clear distinction for the distribution of the data.

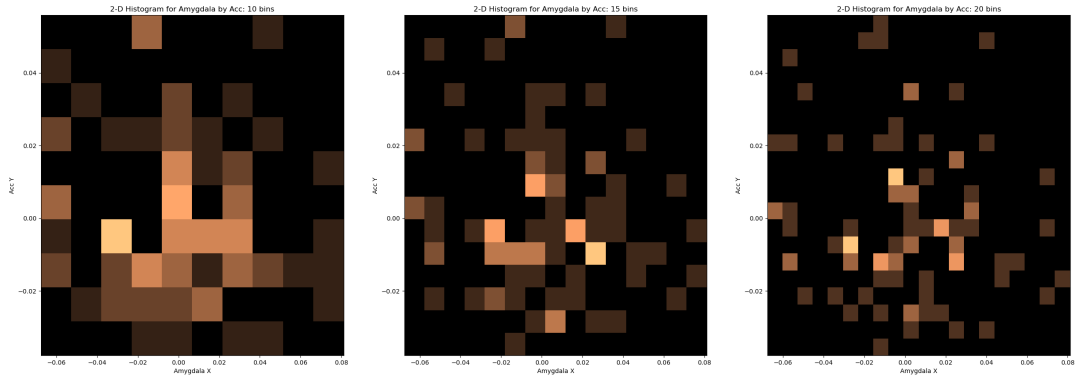


Figure 8: 2D Histogram Amygdala by ACC for 10, 15, 20 Bins

b)

Provided is the outputs of the contour plots for each distinct value of the orientation variable in the dataset:

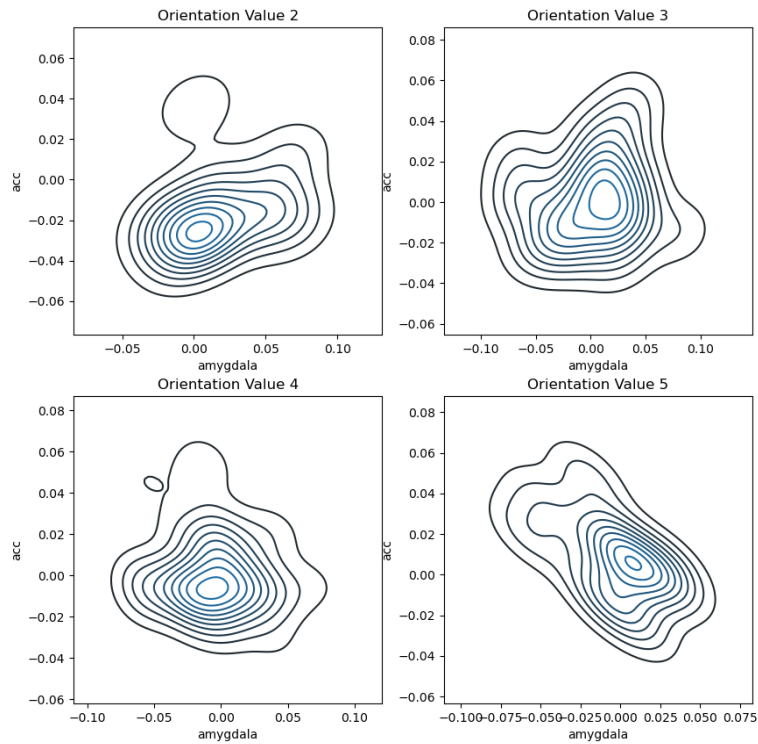


Figure 9: KDE Contour Plot for each unique Orientation Value

c) Provided is an output of the conditional probability for the political orientation for each variable: acc or amygdala:

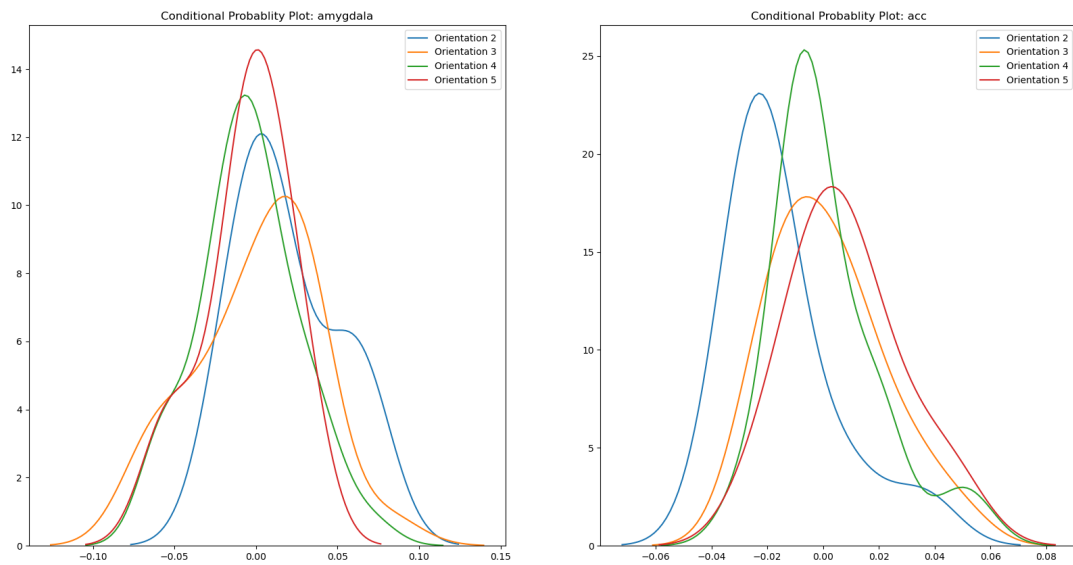


Figure 10: Conditional Probabilities for Amygdala vs Acc

3. GMM Model

a) Show the output of the digits 2 and 6 outputs:

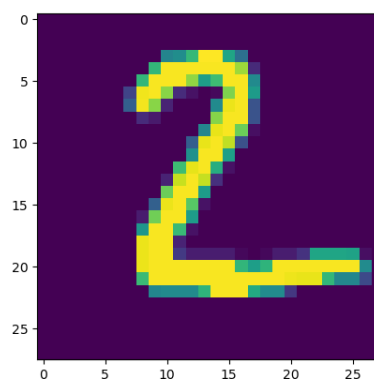


Figure 11: Same image with 2

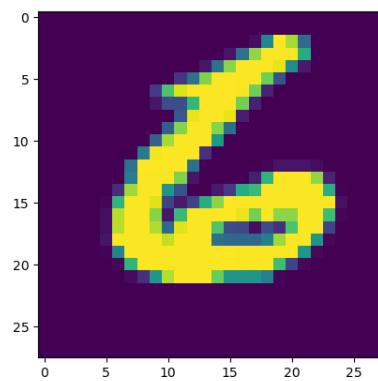


Figure 12: Sample image with 6

b) Not completed this part onwards