

SBE II: Homework 9

Experiment-2:

- a) Analytically, we can see the following:

$$X^\dagger X = (X^T X)^{-1} X^T X = \frac{X^T X}{X^T X} = I$$

Computationally, as can be seen in the attached code, I verify that the multiplication of the pseudoinverse of X multiplied with X indeed is the identity matrix. Also, this satisfies the equation given in the initial statement, as each image is given a direct matching to itself.

- b) Since the matrix has 10 linearly independent images, the rank of the matrix is 10.
- c) The weight matrix is required to map a vector of pixel intensities to an image class; therefore it must be a square matrix of size 72690 x 72690.
- d) The images visualized all look correct, to my eye. The relative error, as computed by the equation given, is 1.5150e-15 (little more than numerical error of MATLABs processing).
- e) When using only a portion of the voxels we can still see a mostly recovered image, but there is obvious distortion. Two images (original left, partial right) can be seen below to show this. The error in this case was 0.51826

