CSE404 Hw 10

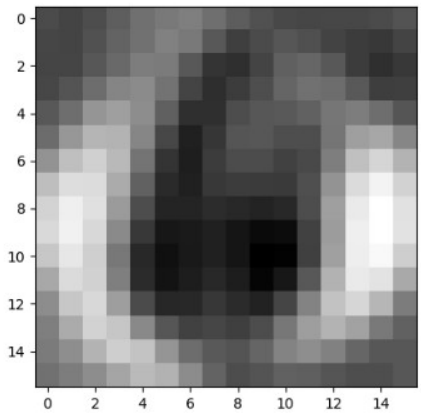
Team Evaluation:

- Richard Huang
  - Created the PCA Algorithms function so that Brendan and Eden can work on their part.
- Brendan Rizzo
  - Using what Richard created, came up with a method to calculate the reconstruction error for each d value.
- **Eden Seo**
  - Using Richard's function, created a function to reconstruct an image for each d value
- Jiashang Cao
  - Same as last time. Where is this person? I have no clue.

1. Implement PCA
   a. When d = 10
      i.

```
D: 10
[[-11.49397831  -0.76503537   4.66415787 ...  -4.48710133  -3.02767387
   -1.16492766]
 [ -1.53129785  -2.04459231  -6.19241548 ...  -0.79632732   2.37339467
    2.58889737]
 [ -9.61921718  -0.59962753  -0.64485563 ...  -2.41342146   3.9633603
   -1.6885922 ]
 ...
 [  5.08328682   2.96683852   0.59989369 ...  -1.93218914  -1.18883761
    0.6044995 ]
 [  2.79456842   8.34313587  -2.27659989 ...   1.13957674   1.88945772
   -3.36906137]
 [  3.50133095   5.73473832  -3.34161407 ...  -0.52519837   2.91467798
   -2.13044567]]
Reconstruction Error when d = 10 : 3.6870478780472973
```

      ii.

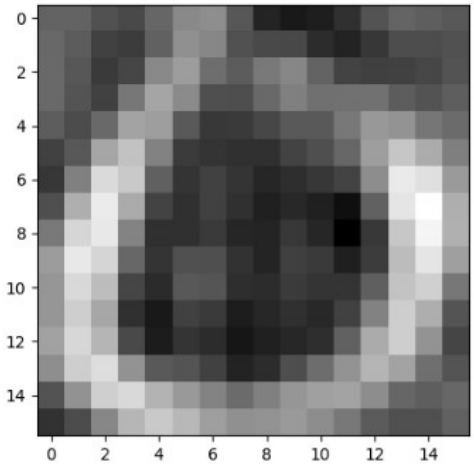


b. When d = 50

i.

```
D: 50
[[-11.49397831  -0.76503537   4.66415787 ...  -1.29622585  -1.31218994
   -0.63675497]
 [ -1.53129785  -2.04459231  -6.19241548 ...   1.17635941   0.4869963
   -0.92427629]
 [ -9.61921718  -0.59962753  -0.64485563 ...   0.54105674  -1.2411548
    1.2210892 ]
 ...
 [  5.08328682   2.96683852   0.59989369 ...   0.52006429  -0.68303575
    0.47628452]
 [  2.79456842   8.34313587  -2.27659989 ...  -0.46226482   0.95191093
    0.96298822]
 [  3.50133095   5.73473832  -3.34161407 ...  -0.10488739  -0.02796455
    0.88629292]]
Reconstruction Error when d = 50 : 2.2711646404520405
```

ii.

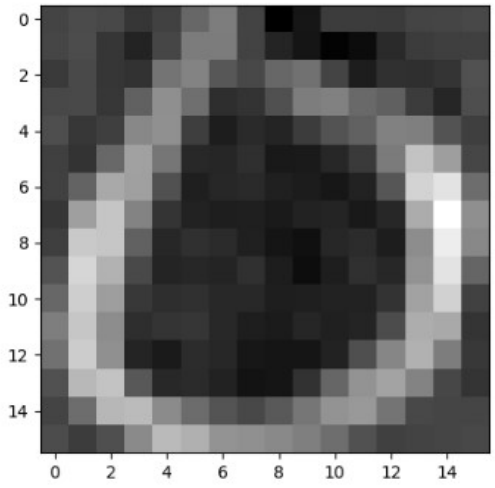


c. When d = 100

i.

```
D: 100
[[-1.14939783e+01 -7.65035372e-01  4.66415787e+00 ... -1.95677654e-01
   6.83920573e-01  3.29079031e-01]
 [-1.53129785e+00 -2.04459231e+00 -6.19241548e+00 ...  4.94602843e-01
  -4.74102735e-01 -1.72161925e-01]
 [-9.61921718e+00 -5.99627531e-01 -6.44855630e-01 ...  4.06669112e-01
   2.53139408e-01  5.06619552e-02]
 ...
 [ 5.08328682e+00  2.96683852e+00  5.99893692e-01 ...  4.00305205e-03
  -3.41933943e-01 -1.66000053e-01]
 [ 2.79456842e+00  8.34313587e+00 -2.27659989e+00 ...  1.56284609e-01
   1.08816900e-02  3.30536651e-01]
 [ 3.50133095e+00  5.73473832e+00 -3.34161407e+00 ...  1.82832560e-01
   7.29347368e-01  3.96834044e-02]]
Reconstruction Error when d = 100 : 1.799639831449212
```

ii.

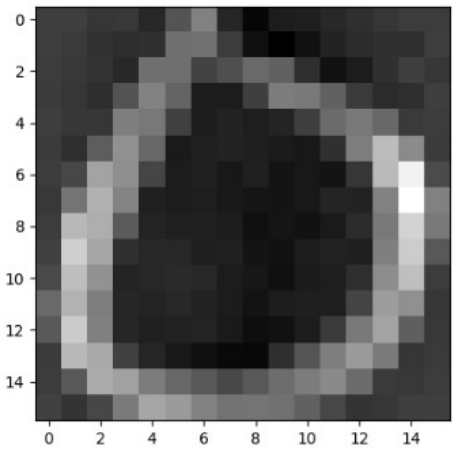


d. When d = 200

i.

```
D: 200
[[-11.49397831  -0.76503537   4.66415787 ...  -0.15993997   0.55761662
   -0.0181675 ]
 [ -1.53129785  -2.04459231  -6.19241548 ...   0.02756484  -0.07883645
   -0.05389376]
 [ -9.61921718  -0.59962753  -0.64485563 ...  -0.16500193   0.20178288
   -0.18597649]
 ...
 [  5.08328682   2.96683852   0.59989369 ...  -0.13447642  -0.18458959
    0.14267427]
 [  2.79456842   8.34313587  -2.27659989 ...   0.13600308   0.10659176
    0.07512477]
 [  3.50133095   5.73473832  -3.34161407 ...  -0.01884492  -0.1112545
    0.04650978]]
Reconstruction Error when d = 200 : 1.4545922901456851
```

ii.



CSE404 Hw 10

Side-by-side Comparison

d = 10 d = 50 d = 100 d = 200