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Homework 2

Problem 1)

4. Since A is 100x100, here are some statistics of A without displaying the entire matrix:

- Mean: 5.6353 * 10 ^ -5
- Size: 100x100 elements

5. Angle Between G and G' : 1.000; Length of G' : 1.000

Problem 2)

3.

Cosine of the angle between f and f':

0.1512

Length of A * f':

0.1512

A*f' and cos of the angle between f and f' should be and are the same value. This is because of the transformation done by A onto f'.

Problem 3)

For this program, I made made 50 matrices from pairs vectors of random elements, and then built a connectivity matrix as the sum of the 50 matrices.

4. b) Here's a section of output comparing the length of g' to the angle between g' and g(i):

```
Length of g prime (output):
    0.0393

Angle between g prime and g(i):
    0.0017

Length of g prime (output):
    0.0445

Angle between g prime and g(i):
    0.0027

Length of g prime (output):
    0.1316

Angle between g prime and g(i):
   -0.0089

Length of g prime (output):
     1

Angle between g prime and g(i):
    1.0000
```

4. c) Here's a section of output for the length of g'

```
Length of g prime:
    0.2560

Length of g prime:
     1

Length of g prime:
    0.1644

Length of g prime:
    0.1352

Length of g prime:
    0.1221

Length of g prime:
    0.0650

Length of g prime:
    0.0583

Length of g prime:
    1.0000
```

4. d) Here's a section of output:

5. With only one pair per trial, the output (g') is of length 1 and is in the same direction as g. However, as number of pairs increases, the output length mean increases.

Problem 4)

I chose Option #2. I wasn't able to get numbers randomly replaced on higher dimension matrices in a time efficient manner, but even with matrices based on 10-dimensional vectors, by replacing half of the matrix with zeroes, the average length between a new vector and the connectivity matrix doubled.

With matrices based on 50-dimensional vectors and replacing half of the matrix with zeroes, the average length between a new vector and the connectivity matrix quadrupled.