

Math 420, Spring 2023
Random Graphs: Third Team Homework

I. Implement the three community discovery algorithms (partition algorithms) based on spectral method, and run them on your project data set. Specifically, implement:

1. Spectral methods using W
2. Spectral methods using Δ
3. Spectral methods using $\tilde{\Delta}$

Then run the algorithms on the data set assigned to your project.

II. Implement the Laplacian Eigenmap and the Local Linear Embedding (LLE) algorithms, and run them on your project data set.

Specifically, implement and run:

1. Laplacian Eigenmap data embedding for target dimension $d = 2$;
2. LLE dimension reduction after Laplacian Eigenmap data embedding:
 - (a) First run the Laplacian Eigenmap data embedding algorithm to create a geometric graph $\{x_1, \dots, x_n\} \subset \mathbb{R}^N$ with $N = 10$;
 - (b) Then implement and run the dimension reduction LLE algorithm with non-negativity constraints on the this geometric graph to reduce dimension to $d = 2$; use $K = 2d = 4$.

Plot both embeddings in two different figures, and then on the same figure using different colors.