Machine Learning Homework 11

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1 Problem 1

A small σ results in localized neighborhoods where only close neighbors have high similarity. This creates an adjacency matrix with strong connections to nearest neighbors but weak to distant points.

A larger σ leads to a smoother and more connected graph, where even distant points have moderate similarity, making the adjacency matrix appear more blurred.

For $\sigma = 2$, the adjacency matrix that best corresponds is option (c). For $\sigma = 5$, the best match is either option (g) or (h).

2 Problem 2

- Zero reconstruction error is impossible for $K < D$ because information is lost unless the data inherently lies in a K-dimensional subspace. The reconstruction process cannot recover lost dimensions, leading to a nonzero reconstruction error.
- It is possible only if the data lies within a K-dimensional subspace of R^D, meaning the dataset has an intrinsic dimensionality of at most K.

3 Problem 3