Lab 5̄

1. Calculate the Kronecker product of the matrices *C* and *D*:

$$C = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 1 & 2 \\ 2 & 3 & 1 \end{bmatrix} \quad \text{and} \quad D = \begin{bmatrix} 5 & 0 & 4 \\ 4 & 5 & 0 \\ 0 & 4 & 5 \end{bmatrix}$$

2. Calculate the Kronecker Product of the matrices *U* and *W*:

$$U = \begin{bmatrix} 5 & 2 \\ 3 & 9 \end{bmatrix} \quad \text{and} \quad W = \begin{bmatrix} 5 & 0 & 4 & 9 \\ 4 & 5 & 0 & 9 \\ 0 & 4 & 5 & 0 \\ 1 & 2 & 3 & 4 \end{bmatrix}$$

3. Write a Python function `kron_add(A, B)` that takes as input two 2-D NumPy array, `A` and `B`, and calculates their Kronecker sum. Use this function to calculate the Kronecker sum of the matrices *C* and *D* from question 1.

4. Find the distance matrix for the 3 points in the datamatrix

$$X = \begin{bmatrix} 0 & 0 \\ 1 & 1 \\ 2 & 2 \end{bmatrix}$$

5. Use spectral decomposition to find one datamatrix X that is compatible with the distance matrix

$$D = \begin{bmatrix} 0 & 2 & 8 \\ 2 & 0 & 2 \\ 8 & 2 & 0 \end{bmatrix}$$