

Data Science Assignment 4

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1 PCA, SVD

1. We search for matrices U, Σ, V with $X = U\Sigma V^T$ so that the columns of U and V are eigenvectors of XX^T and $X^T X$ respectively.

We'll begin by computing U :

$$\begin{aligned} XX^T &= \begin{bmatrix} 4 & 2 \\ \sqrt{2} & 2\sqrt{2} \\ -\sqrt{2} & -2\sqrt{2} \end{bmatrix} \times \begin{bmatrix} 4 & \sqrt{2} & -\sqrt{2} \\ 2 & 2\sqrt{2} & -2\sqrt{2} \end{bmatrix} \\ &= \begin{bmatrix} 20 & 8\sqrt{2} & -8\sqrt{2} \\ 8\sqrt{2} & 10 & -10 \\ -8\sqrt{2} & -10 & 10 \end{bmatrix} \end{aligned}$$

2.