# Linear Data Chapter 8

Written by: Emily J. King

1. Assume $\vec{x}, \vec{y} \in \mathbb{R}^{1001}$ and you know the following:

$$\|\vec{x}\| = 4, \quad \vec{y} = 0.5\vec{x}.$$

   For each of the following, explicitly compute the value.

   (a) Explicitly compute $\|\vec{y}\|$. Explain your answer.

   (b) Explicitly compute the cosine similarity of $\vec{x}$ and $\vec{y}$. Explain your answer.

   (c) Explicitly compute $\langle \vec{x}, \vec{y} \rangle$. Explain your answer.

2. The following plot is the autocorrelation of a vector $\vec{z} \in \mathbb{R}^{150}$.
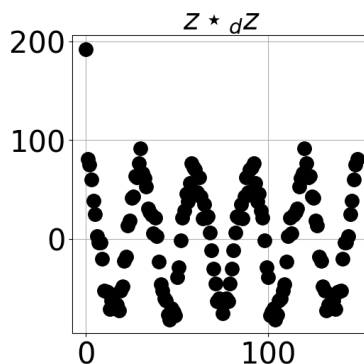
   Given that information, write in complete sentences as many properties of $\vec{z}$ as you can.

3. Explain the different goals of cross-correlation/convolution of an image with a Gaussian kernel versus a Sobel filter.

4. Consider the pattern vector $\vec{p}$ and signal vector $\vec{s}$ pictured below

Pattern $\vec{p}$

Signal $\vec{s}$
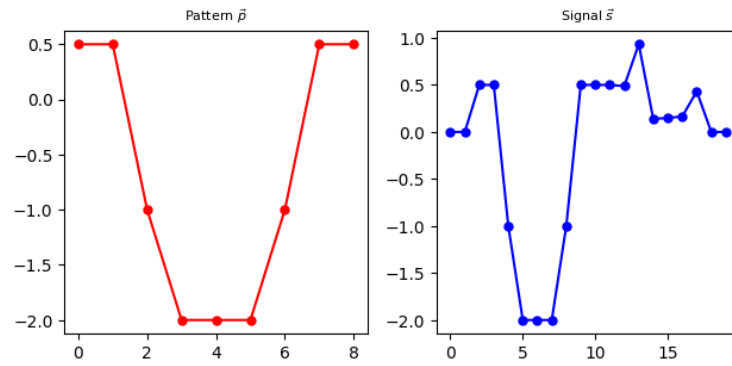
What is most likely the cross-correlation $\vec{p} \star \vec{s}$? You MUST justify your answer to receive ANY points.

I

II

III