DSCI 369
Lab 8

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Goals: Visualize inner product and cosine similarity. Examine how inner product and its variants (e.g., convolution, cosine similarity, correlation) can be used to compare data and extract information.

Non-MATLAB/Python in-lab portion

Go to `https://www.geogebra.org/m/hfsc8dwg`. This computes the inner product and cosine similarity of $\vec{u}$ and $\vec{v}$. Set

$$\vec{u} = \begin{pmatrix} -2 \\ 2 \end{pmatrix}$$

- Make $\vec{v}$ shorter/longer but pointing in the exact same direction. What happens to the inner product and cosine similarity?
- Make $\vec{v}$ shorter/longer but pointing in the exact opposite direction. What happens to the inner product and cosine similarity?
- Slowly rotate $\vec{v}$ around in a circle. What happens to the cosine similarity?

Exercises

1. Go to `DSCI_369_Module_7_Lab_Python` or `DSCI_369_Module_7_Lab_Matlab`.
2. Go to `DSCI_369_Module_7_Lab_Python` or `DSCI_369_Module_7_Lab_Matlab`.
3. Go to `https://www.geogebra.org/m/hfsc8dwg`. Move around both $\vec{u}$ and $\vec{v}$ to see how the inner product and cosine similarity change.
   (a) Slide around the vectors until the cosine similarity is (approximately) 0.5. Is the angle between the vectors acute, obtuse, or right?
   (b) Slide around the vectors until the cosine similarity is (approximately) 0.5. Is the angle between the vectors acute, obtuse, or right? Slide around the vectors until the cosine similarity is (approximately) 0. Is the angle between the vectors acute, obtuse, or right?