

CSCI 550
Homework 00
Due Fri 2020-09-04

For this assignment, you must collaborate with at least two other learners using some collection of remote collaboration tools. That is, you have to work together while being in different geographic locations! Experiment with tools and please, share what works on the discussion board.

The reason for the somewhat non-standard requirement is that due to COVID, you may find yourself in quarantine in the middle of the semester. You DO NOT want to find yourself mid-semester trying figure out how collaborate remotely! (Trust me, I had to unexpectedly quarantine over the summer. There were many problems that I needed to solve. The last thing I wanted to figure out was how to keep my projects going.)

Problem 1 (adapted from DM 1.1)

Let D be a data matrix in which all entries are continuing real values. Show that the mean of the centered data matrix \bar{D} is zero.

Problem 2 (adapted from M4D 1.4)

Let X be a continuous random variable with a *uniform distribution* over $[0, 2]$; its pdf is described

$$f(X = x) = \begin{cases} 1/2 & \text{if } x \in [0, 2] \\ 0 & \text{if } x \notin [0, 2] \end{cases}$$

- What is the probability $f(X = 1)$?
- What is the probability $f(X \in [.5, 1.5])$?

Problem 3 (adapted from M4D 1.2)

Review the definition of *expected value* (e.g. DM 2.1.1).

An “adventurous” athlete has the following running routine every morning: She takes a bus to a random stop, then hitches a ride, and then runs all the way home. The bus, described by a random variable B , has four stops where the stops are at a distance of 1, 3, 4, and 7 miles from her house – she chooses each with probability $1/4$. Then the random hitchhiking takes her further from his house with a uniform distribution between -1 and 4 miles; that is, it is represented as a random variable H with pdf described

$$f(H = x) = \begin{cases} 1/5 & \text{if } x \in [-1, 4] \\ 0 & \text{if } x \notin [-1, 4] \end{cases}$$

What is the expected distance she runs each morning (all the way home)?

Problem 4 (adapted from FoDS 2.2)

Write a small program to generate 30 points inside the cube $[-1, 1]^{100}$ and plot the L_1 -, L_2 -, and L_∞ -distances and cos similarity between all pairs of points.

Problem 5

- List your remote collaborators.
- List the technologies that you used to enable the collaboration.
- For each technology, write what worked and what did not work. Provide a sentence or two explaining why.
- What will you do next time to improve the remote collaborations?