Optimization for Machine Learning (Spring 2026): Homework 1

- LO4ML stands for the textbook *Linear Algebra and Optimization for Machine Learning*.

- You **must email your submission** as a **PDF file** to kbala@wsu.edu. You are welcome to write answers by hand and scan the pages. Put all the images on a PDF file, though.

- Your file name should identify you in the following manner. If you are Leopold Stotch, you should **name your submission LeopoldStotch_Hw1.pdf**. If you want to add more bits to the title, e.g., Math565, you could name it LeopoldStotch_Math565_Hw1.pdf, for instance. But you should **start the file name with LeopoldStotch. And please avoid white spaces in the file name**.

- **Begin the SUBJECT of your email submission with the same `FirstnameLastname`, expression, e.g., "LeopoldStotch Hw1 submission".**

- **This homework is due by 10:00 PM on Tuesday, February 3**.

0. (20)   Meet with me briefly (in person or on Zoom). Check-in hours (for this class or Math 529) work best, but contact me if you want to meet at another time. You do **not** have to contact me if you plan to show up during one of the scheduled check-in hours.

1. (15)   We introduced the L_2-SVM loss function in Lecture 2 (called $J_{L_2\text{-SVM}}$; it is also presented in LO4ML Page 184). Write a quadratic optimization problem (or formulation) for minimizing $J_{L_2\text{-SVM}}$, i.e., where the objective function has quadratic terms *without* the max term along with any required constraints.

2. (25)   LO4ML Problem 8 from Page 200. You can also assume that A is symmetric.

3. (30)   Prove Statements 3 and 5 in Lemma 4.3.2 in LO4ML Pages 155–156.

4. (20)   LO4ML Problem 10 from Page 200.