Homework #1 (SAMPLE)
RELEASE DATE: 09/13/2023

RED CORRECTION: 09/17/2023 17:00

DUE DATE: 09/27/2023, BEFORE 13:00 on GRADESCOPE

QUESTIONS ARE WELCOMED ON DISCORD (INFORMALLY) OR NTU COOL (FORMALLY).

You will use Gradescope to upload your scanned/printed solutions. For problems marked with (*), please follow the guidelines on the course website and upload your source code to Gradescope as well. Any programming language/platform is allowed.

Any form of cheating, lying, or plagiarism will not be tolerated. Students can get zero scores and/or fail the class and/or be kicked out of school and/or receive other punishments for those kinds of misconducts.

Discussions on course materials and homework solutions are encouraged. But you should write the final solutions alone and understand them fully. Books, notes, and Internet resources can be consulted, but not copied from.

Since everyone needs to write the final solutions alone, there is absolutely no need to lend your homework solutions and/or source codes to your classmates at any time. In order to maximize the level of fairness in this class, lending and borrowing homework solutions are both regarded as dishonest behaviors and will be punished according to the honesty policy.

You should write your solutions in English or Chinese with the common math notations introduced in class or in the problems. We do not accept solutions written in any other languages.

This homework set comes with 240 points and 20 bonus points. In general, every homework set would come with a full credit of 240 points, with some possible bonus points.

Learning Problems

1. (20 points) Describe an application of self-supervised learning with 10-20 English or Chinese sentences.

2.

3.

Perceptron Learning Algorithm

4. (20 points) For the PLA algorithm introduced in class (page 8/22 of Lecture 2), assume that T_+ mistakes happened during $y_{n(t)} = 1$, and T_- mistakes happened during $y_{n(t)} = -1$. Express w_0, the zero-th component of the PLA solution, in terms of T_+ and T_-, and prove the result.