ECE/CS/ME 539 Introduction to Artificial Neural Networks

Homework #1

In this course, either Matlab or Python will be used. Examples used in lectures, in-class exercises, and homework, as well as the final exam and course project will use either of them.

1. Use either Matlab or Python (not both) to implement the M-P neuron model:

$$y = f\left(\sum_{i=1}^{N} w_i I_i - T\right) = \begin{cases} 0 & \sum_{i=1}^{N} w_i I_i < T \\ 1 & \sum_{i=1}^{N} w_i I_i \geq T \end{cases}$$

   (a) In Matlab, you should submit a m-file of a function y=mpneuron(N,I,W,T). Here, I and W are arrays of size N. Then, submit a live script hw01p01.mlx that computes y for N = 2, W = $[1 \;\; 1]^T$, $T = -1.5$, and I = $[0.6 \;\; 0.8]^T$ calling the function mpneuron.m.
   In Python, you should submit a Jupyter notebook or Google Colab script.

   (b) Assume N = 2. Suppose for four inputs $I = [0 \;\; 0]^T$, $[0 \;\; 1]^T$, $[1 \;\; 0]^T$, $[1 \;\; 1]^T$; the corresponding outputs y = 0, 0, 1, 0 respectively. Find a solution of W = $[w_1, w_2]^T$ and T such that the M-P neuron model will produce the desired output. Note that the solutions are NOT unique. You need to provide only one feasible solution.

2. In this open-end problem, you will be asked to formulate a problem.
   At URL: https://coronavirus.jhu.edu/map.html Coronavirus research center, you will find statistics related to covid-19 over the world. At another page
   https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus/coronavirus-frequently-asked-questions#understandingcovid19

   You will find a number of frequently asked questions about covid-19 virus.

   Find a question from this list and characterize what type of this question will be in terms of a classification problem or an estimation/prediction/regression/approximation problem, what would be the inputs and what would be the output, and what are the hypothesis. Also discuss if this question of your choice may be answered (at least partially) with available statistics (data) listed above. Briefly discuss your answer within a space no more than half a page.