SC4000 Machine Learning Tutorial
Artificial Neural Networks

Question 1: On Slide 64 of Lecture 7, we have shown how to use backpropagation to update the parameters of ANN with one initialization setting for $\mathbf{w}$. Suppose now we initialize $\mathbf{w}$ with another set of values: $w_{13} = -1$, $w_{14} = -1$, $w_{23} = -1$, $w_{24} = -1$, $w_{35} = -1$, and $w_{45} = -1$. Run one epoch (i.e., run through the whole training dataset once), to show how the parameters are updated at each iteration.

Question 2: Consider a 2-dimensional dataset for three-class classification by ANN, as shown in Figure 1. Which ANN model as shown in Figure 2 is proper to solve the classification problem? Why?

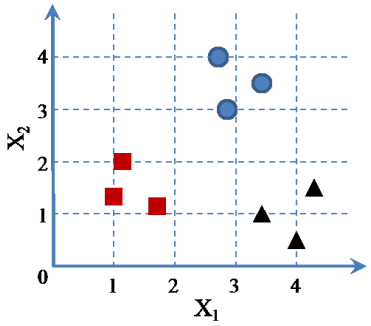
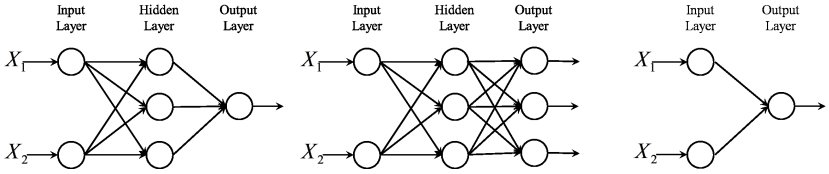


Figure 1: Dataset for Question 2.



(a) ANN model A. (b) ANN model B. (c) ANN model C.

Figure 2: Different ANN structures for Question 2.

Question 3: Compute the derivative of the sigmoid function $f(z) = \frac{1}{1+e^{-z}}$ w.r.t. z.