Exercise: Perceptron and Multi-Layer Perceptron

Due: Optional

Problem 1 (Sigmoid function)

Let $\sigma(x) = \frac{1}{1+\exp(-x)}$. Show that

$$\sigma'(x) = \sigma(x)\big(1 - \sigma(x)\big).$$

Problem 2 (Multi-Layer Perceptron)

Consider a fully-connected MLP with 5 layers: 1 input layer, 1 output layer and 3 hidden layers. Assume the input layer has 6 nodes, the three hidden layers have 6, 8, 10 nodes respectively, and the output layer has 3 nodes. Compute the number of trainable parameters.

Problem 3 (Forward Propagation)

Consider the following MLP with three layers. Let the input vector be $\mathbf{x} = (2, -1)^\top$. Apply the forward propagation to compute the final output.