Warm Up Assignment

This won't be graded!

You are given a dataset that represents a binary classifier, f:

$$f: X \rightarrow y \quad \text{where } X \in \mathbb{R}^2, y \in \{0,1\}$$

Construct the simple neural network given in Fig.1 to perform function f.

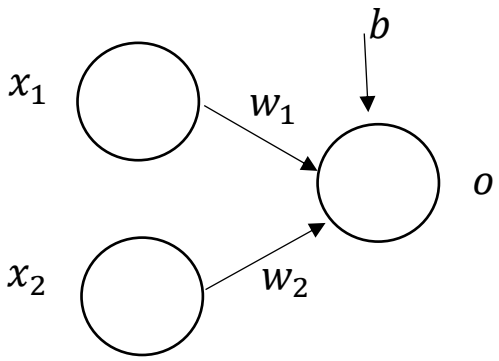

Figure 1: Binary classifier

Use **ReLU** as the activation function and **mean squared error** given bellow as the error function.

$$E(X, \theta) = \frac{1}{2N}\sum_{i=1}^{N}(f(X) - y)^2$$

, where θ represents parameters and N is number of samples.

Implement the back-propagation algorithm and use gradient descent to train the network.

You are given 2 csv files, x_train, and y_train. In the x_train file, each line is a data point of 2 dimensions. The y_train file contains respective labels. The n^{th} entry in the y_train file is the corresponding label of the n^{th} entry in the x_train file.

Note:

- You can use the read_data() function in util.py to read data.
- 0.001 would be a good choice for the learning rate.

How can you check if you are correct?

Suppose that you are given the data point, $X = [x_1, x_2] = [-2,2] \quad and \quad y = 0$

Also assume that weights and the bias of the network are, $w_1 = 0.08 \;\; w_2 = 1.2 \;\; b = 0.3$

Using given information calculate gradients of loss w.r.t. w_1, w_2 and b. Results should be as follows:

$$\frac{dL}{dw_1} = -5.08 \quad \frac{dL}{dw_2} = 5.08 \quad \frac{dL}{db} = 2.54$$