ML Problem Solving

Binary Perceptron Learning Algorithm

1. Consider the following dataset, where each row is one input image and the measured output is the last column.

D = [[255, 128, 128, 0, 0], [55, 128, 128, 128, 0], [192, 128, 128, 0, 0],

[100, 128, 128, 100, 1], [30, 64, 128, 30, 1], [20, 64, 128, 0, 1]]

Assuming the sequence of $b_{row,column}$ bytes are $[b_{0,0}, b_{0,1}, b_{1,0}, b_{1,1}]$, draw the images.

2. Normalize the input features to the [0,1] range.

Perceptron Learning Algorithm:

a. Set b and all w's to 0.

b. for N iterations (or until the weights do not change):

- for each sample x^k with answer a^k:
  - if $a^k - f(x^k) \neq 0$:
  $\Delta w_i = (a^k - f(x^k))x_i$

3. Calculate the weight and bias updates for each sample in D in a single iteration (full pass of the training dataset), according to the perceptron learning algorithm. Follow the sequence of samples provided in the dataset. Calculate the updates for all samples.

4. For each update from previous question, report the accuracy of the updated model on the whole dataset.