

09/17/24

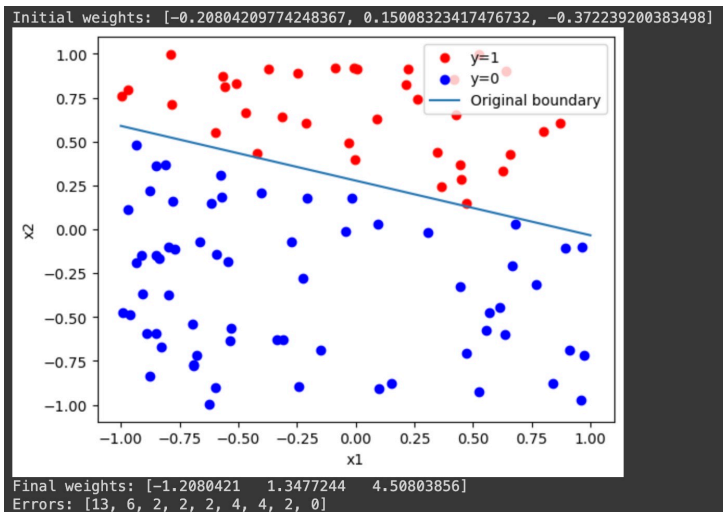
Neural Network - HW3

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1) a) The code has been submitted Separately.

weight
Vector = $[-0.20804, 0.150083, -0.37223]$

b) Code has been submitted. The below is the output.



c) Given and verified that $\begin{bmatrix} w_1^* \\ w_2^* \end{bmatrix}$ is normal to the line $w^* x$.

To prove: distance between origin and $w^* x$

$$= \frac{|w_0^*|}{\sqrt{w_1^{*2} + w_2^{*2}}}$$

Inference: Shortest distance between a point and a line

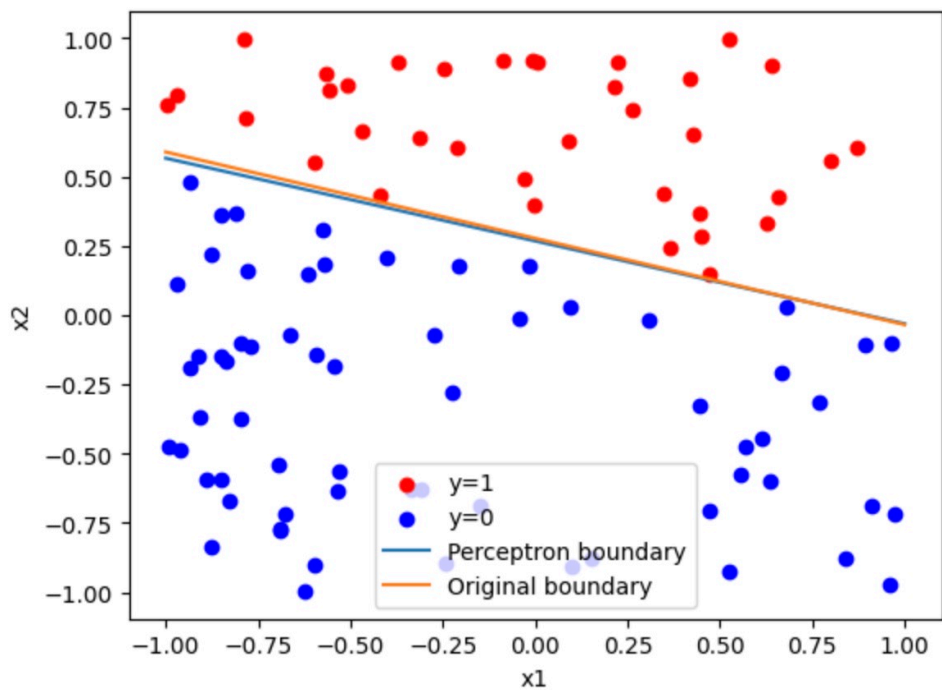
$$= \frac{|w_0 + w_1 x_1 + w_2 x_2|}{\sqrt{w_1^2 + w_2^2}}$$

Since $x_1 = 0, x_2 = 0$ for origin.

$$= \frac{|w_0^*|}{\sqrt{w_1^{*2} + w_2^{*2}}}$$

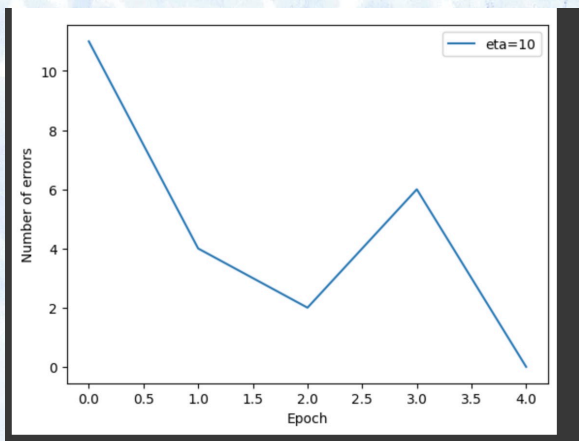
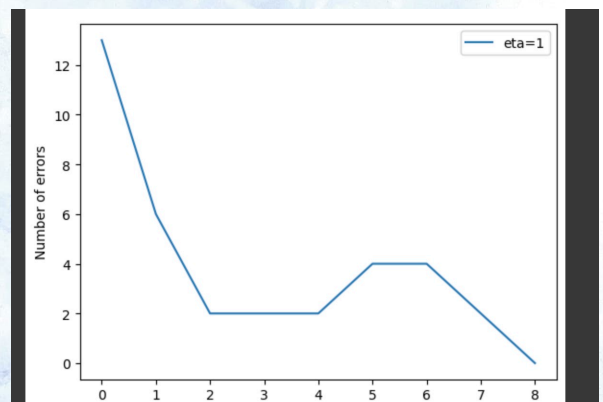
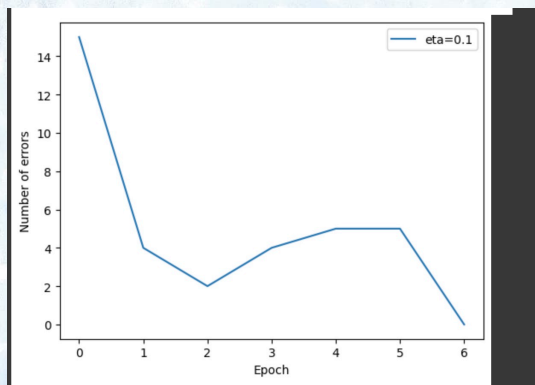
Thus proved.

2) a)



Due to randomness, the weights may not be the same.

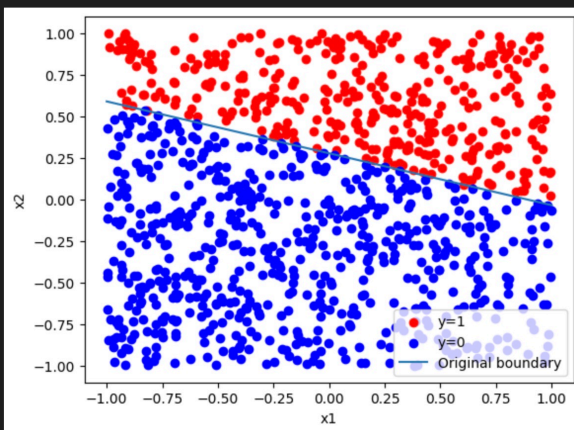
b)



Smaller eta had more control over parameter than the larger as the steps are bigger.

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Initial weights: [-0.20804209774248367, 0.15008323417476732, -0.372239200383498]



Final weights: [-7.2080421 8.05960245 25.83207236]

Errors: [61, 27, 34, 36, 25, 8, 10, 12, 32, 26, 24, 21, 18, 6, 6, 2, 10, 18, 24, 22, 24, 20,

