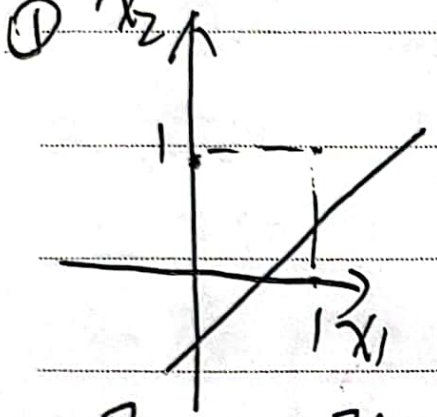
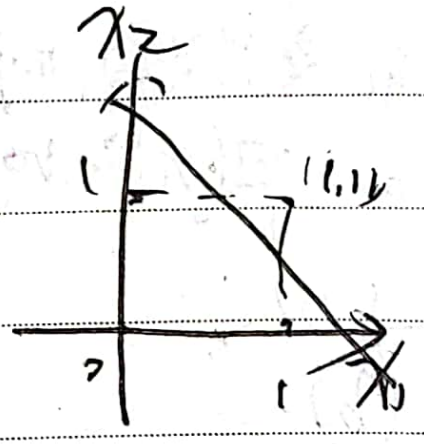
date. page.

1. 解：

a): 由于分界线为一直线，故最小error为25%

① 

② 

由上图 w_0, w_1, w_2 应满足：

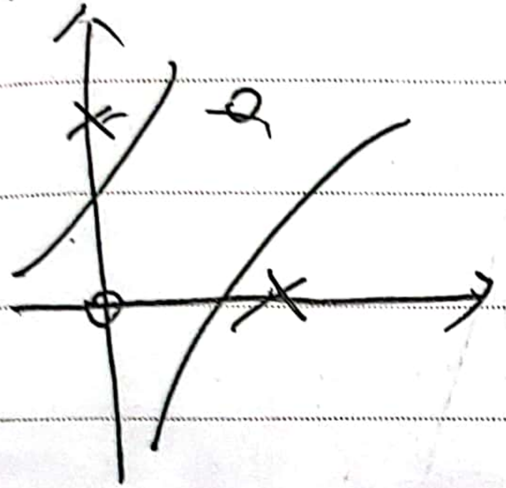
①: $\begin{cases} w_0 + w_2 > 0 \\ w_0 + w_1 + w_2 > 0 \\ w_0 > 0 \\ w_0 + w_1 < 0 \end{cases}$

可取 $(w_0, w_1, w_2) = (1, -2, 2)$

②: $\begin{cases} w_0 < 0 \\ w_0 + w_2 < 0 \\ w_0 + w_1 + w_2 > 0 \\ w_0 + w_1 < 0 \end{cases}$

可取 $(w_0, w_1, w_2) = (-2, 1, 2)$

b. 例：最小 error 为 0、



应有：$\begin{cases} w_0 \geq 0 \\ w_0 + w_2 < 0 \\ w_0 + w_1 < 0 \\ w_0 + w_1 + w_2 + w_3 \geq 0 \end{cases}$ → 可取：$\begin{cases} w_0 = 1 \\ w_1 = -2 \\ w_2 = -2 \\ w_3 = 4 \end{cases}$

2. Loss Function $= \sum_{i=1} \left(-\pi^{(i)} \log y^{(i)} - (1-\pi^{(i)}) \log(1-y^{(i)}) \right)$.

3. 选 (b)

不选 (b)

$\because$ 神经元 $\frac{\partial f}{\partial w_2} = \sigma'(\sigma(x_1 w_1) w_2 + x_2)\,\sigma(x_1 w_1)$

$\because f(x_1, x_2, w_1, w_2) = \frac{1}{2}$ $\quad \sigma(x_1 w_1) = \frac{1}{2}$

$\therefore \frac{\partial f}{\partial w_2} = \frac{1}{2}(1-\frac{1}{2}) \times \frac{1}{2} = \frac{1}{8}$

$\because$ ~~$L(f, y) = \frac{1}{2}(f-y)^2$~~ $\quad L = \frac{1}{N}\sum_{i=1}^{N}(f-y)^2$

$\frac{\partial L}{\partial w_2} = \frac{\partial L}{\partial f}\frac{\partial f}{\partial w_2} = \frac{\partial L}{\partial f}\frac{\partial f}{\partial a}\frac{\partial a}{\partial w_2}$

$= (f-y)\cdot\frac{1}{8} = (\frac{1}{2}-\frac{1}{2})\times\frac{1}{8} = \frac{9}{16}$

$\therefore w_2' = w_2 + \eta\cdot\frac{\partial L}{\partial w_2} = \frac{9}{32}$