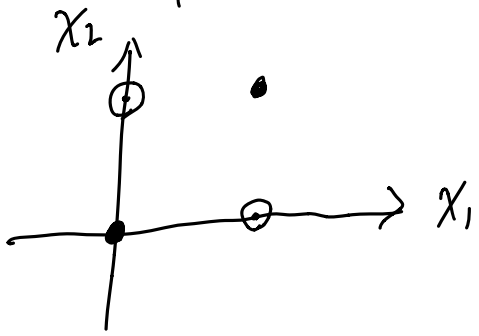
1. 证：异或问题.



实心圆表示 $y=0$

空心圆表示 $y=1$

感知器，即单层神经网络. $o=sgn(W^TX-T)$

$$X=\begin{pmatrix}x_1\\x_2\end{pmatrix},\quad W=\begin{pmatrix}w_1\\w_2\end{pmatrix}$$

$$y=sgn(w_1x_1+w_2x_2-T)$$

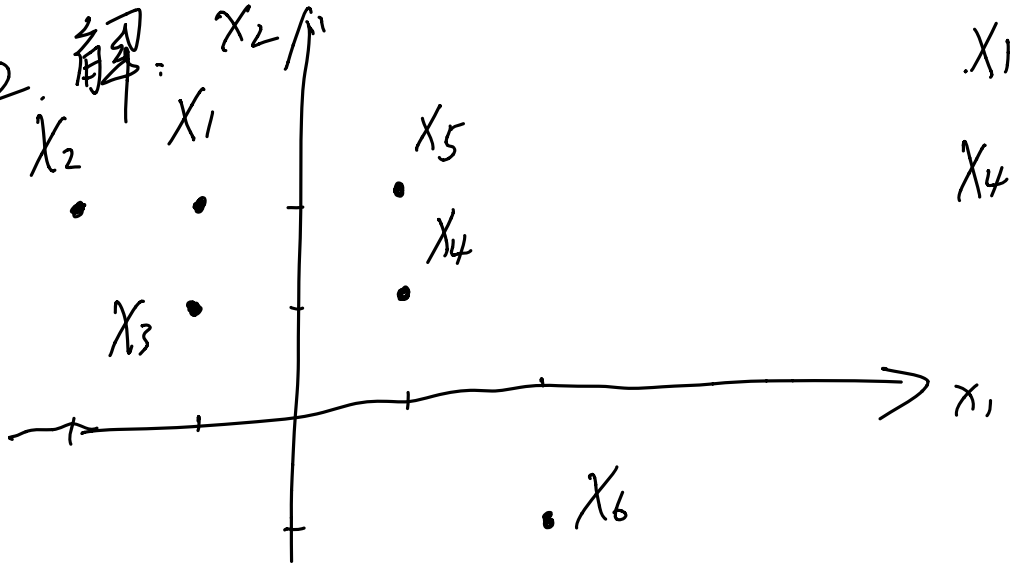
代入4个值（假设若能分类）.

$$\begin{cases}0=sign(-T)\\1=sign(w_2-T)\\1=sign(w_1-T)\\0=sign(w_1+w_2-T)\end{cases}\Rightarrow\begin{cases}T\geq 0\\w_2-T>0 \quad T<w_2 \ ①\\w_1-T>0 \quad T<w_1 \ ②\\w_1+w_2-T\leq 0,\ T\geq w_1+w_2\end{cases}$$

①+② $2T<w_1+w_2\leq T \Rightarrow T<0$ 与 $T\geq 0$ 矛盾.

故单层感知器不能解决"异或"问题。

2. 解：



x_1, x_2, x_3 $y=1$

x_4, x_5, x_6 $y=0$.

(1) 感知器方程 $o = sgn(W^T X - T)$，$sgn(x) = \begin{cases} 1 & x>0 \\ 0 & x \le 0 \end{cases}$

$o = sgn(w_1 x_1 + w_2 x_2 - T)$ 参数 $W = \begin{pmatrix} w_1 \\ w_2 \end{pmatrix}$，$T$

随便设计一个，令 $w_1 = -1$，$w_2 = 0$，$T = 0$

即 $o = -sgn(-x_1)$

(2). 输入验证即可.

(3). $X^7 = \begin{pmatrix} -2 \\ -2 \end{pmatrix} \Rightarrow d^7 = 1$

$X^8 = \begin{pmatrix} 2 \\ 0 \end{pmatrix} \Rightarrow d^8 = 0$

3. 解：$W = \begin{pmatrix} w_1 \\ w_2 \\ w_3 \end{pmatrix}$，$o = sgn(w_1 x_1 + w_2 x_2 + w_3 x_3)$