利用随机梯度下降法得到新的$\vec{w}$

$$\vec{w}^{(t+1)} = \vec{w}^{(t)} - \eta \frac{\partial E_{in}\left(\vec{w}^{(t)}\right)}{\partial \vec{w}^{(t)}} = \vec{w}^{(t)} + \eta [\![1 - y_n(\vec{w}^T \vec{x_n} + b) \geq 0]\!] y_n \vec{x_n}$$

其中，$[\![\cdot]\!] = \begin{cases} 1, \ if\ condition\ is\ satisfied \\ 0, \ otherwise \end{cases}$

（2） 初始增广权向量$\vec{w}^{(0)} = (0,0,0)^T$

$\vec{x_1} = (1,1,1)^T, \vec{x_2} = (1,2,2)^T, \vec{x_3} = (1,2,0)^T,$

$\vec{x_4} = (1,0,0)^T, \vec{x_5} = (1,1,0)^T, \vec{x_6} = (1,0,1)^T$

$y_1 = 1, y_2 = 1, y_3 = 1, y_4 = -1, y_5 = -1, y_6 = -1$

取学习率$\eta = 1$

第一轮迭代

$$\max\left(0,1 - y_1\left(\vec{w}^{(0)^T} \vec{x_1}\right)\right) = \max(0,1) = 1$$

$$\frac{\partial E_{in}(\vec{w}^{(0)})}{\partial \vec{w}^{(0)}} = -y_1 \vec{x_1} = (-1,-1,-1)^T$$

$$\vec{w}^{(1)} = \vec{w}^{(0)} - \eta \frac{\partial E_{in}\left(\vec{w}^{(1)}\right)}{\partial \vec{w}^{(1)}} = \vec{w}^{(0)} + y_1 \vec{x_1} = (1,1,1)^T$$

第二轮迭代

$$\max\left(0,1 - y_2\left(\vec{w}^{(1)^T} \vec{x_2}\right)\right) = \max(0,-4) = 0$$

$$\vec{w}^{(2)} = \vec{w}^{(1)} = (1,1,1)^T$$

第三轮迭代

$$\max\left(0,1 - y_3\left(\vec{w}^{(2)^T} \vec{x_3}\right)\right) = \max(0,-2) = 0$$

$$\vec{w}^{(3)} = \vec{w}^{(2)} = (1,1,1)^T$$

第四轮迭代