Lecture2 作业

1，假设训练样本集为$\mathrm{D}=\{(\mathbf{x}_1,y_1)=((3,3)^T,1),(\mathbf{x}_2,y_2)=((4,3)^T,1),(\mathbf{x}_3,y_3)=((1,1)^T,-1)\}$,使用感知器算法设计分类面，并判断测试样本$\mathbf{x}=(0,1)^T$属于哪个类别。

解：

样本增广后为：$\vec{x}_1=(1,3,3)^T$，$y_1=1$，$\vec{x}_2=(1,4,3)^T$，$y_2=1$，$\vec{x}_3=(1,1,1)^T$，$y_3=-1$

初始化权重：$\vec{w}^{(0)}=(0,0,0)^T$

$sign\left(\vec{w}^{(0)T}\vec{x}_1\right)=0\neq y_1$，$\therefore\ \vec{w}^{(1)}=\vec{w}^{(0)}+y_1\vec{x}_1=(1,3,3)^T$，

$sign\left(\vec{w}^{(1)T}\vec{x}_2\right)=1=y_2$，$\therefore\ \vec{w}^{(2)}=\vec{w}^{(1)}=(1,3,3)^T$

$sign\left(\vec{w}^{(2)T}\vec{x}_3\right)=1\neq y_3$，$\therefore\ \vec{w}^{(3)}=\vec{w}^{(2)}+y_3\vec{x}_3=(0,2,2)^T$

$sign\left(\vec{w}^{(3)T}\vec{x}_1\right)=1=y_1$，$\therefore\ \vec{w}^{(4)}=\vec{w}^{(3)}=(0,2,2)^T$

$sign\left(\vec{w}^{(4)T}\vec{x}_2\right)=1=y_2$，$\therefore\ \vec{w}^{(5)}=\vec{w}^{(4)}=(0,2,2)^T$

$sign\left(\vec{w}^{(5)T}\vec{x}_3\right)=1\neq y_3$，$\therefore\ \vec{w}^{(6)}=\vec{w}^{(5)}+y_3\vec{x}_3=(-1,1,1)^T$

$sign\left(\vec{w}^{(6)T}\vec{x}_1\right)=1=y_1$，$\therefore\ \vec{w}^{(7)}=\vec{w}^{(6)}=(-1,1,1)^T$

$sign\left(\vec{w}^{(7)T}\vec{x}_2\right)=1=y_2$，$\therefore\ \vec{w}^{(8)}=\vec{w}^{(7)}=(-1,1,1)^T$

$sign\left(\vec{w}^{(8)T}\vec{x}_3\right)=1\neq y_3$，$\therefore\ \vec{w}^{(9)}=\vec{w}^{(8)}+y_3\vec{x}_3=(-2,0,0)^T$

$sign\left(\vec{w}^{(9)T}\vec{x}_1\right)=-1\neq y_1$，$\therefore\ \vec{w}^{(10)}=\vec{w}^{(9)}+y_1\vec{x}_1=(-1,3,3)^T$

$sign\left(\vec{w}^{(10)T}\vec{x}_2\right)=1=y_2$，$\therefore\ \vec{w}^{(11)}=\vec{w}^{(10)}=(-1,3,3)^T$

$sign\left(\vec{w}^{(11)T}\vec{x}_3\right)=1\neq y_3$，$\therefore\ \vec{w}^{(12)}=\vec{w}^{(11)}+y_3\vec{x}_3=(-2,2,2)^T$