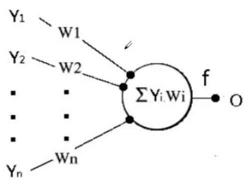
神经网络的实现

神经元基本计算公式



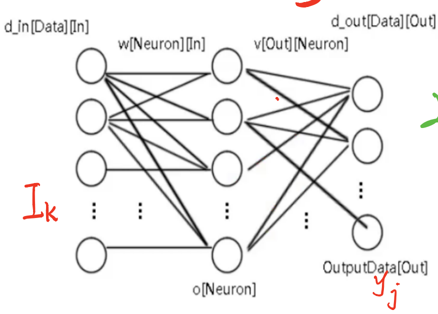
$$\left\{\begin{array}{l} x_j = \sum_i Y_i w_{ji} \\ y_j = \dfrac{1}{1+e^{-x_j}} \end{array}\right. \quad f$$

① $E=1/2\times\Sigma(y_j-d_j)^2$ 均方误差

(因为输出层的值与真实的值会存在误差，我们可以用均方误差来衡量预测值和真实值之间的误差)

神经网络的实现

输出层和隐藏层权值的调整方法



② $y_j = \sum_i o_i v_{ji} \Rightarrow \dfrac{\partial y_j}{\partial v_{ji}} = o_i, \dfrac{\partial y_j}{\partial o_i} = v_{ji}$

③ $\boxed{\dfrac{\partial E}{\partial y_j} = y_j - d}$

$\therefore \dfrac{\partial E}{\partial v_{ji}} = \dfrac{\partial E}{\partial y_j}\dfrac{\partial y_j}{\partial v_{ji}} = (y_j - d)o_i$ ✓

2° $\dfrac{\partial E}{\partial o_i} = \sum_j \dfrac{\partial E}{\partial y_j}\dfrac{\partial y_j}{\partial o_i} = \sum_j (y_j - d)v_{ji}$

$x_i = \sum_k I_k w_{ki}$

$o_i = \dfrac{1}{1+e^{-x_i}}$ (激活函数)

1° $\dfrac{\partial E}{\partial w_{ki}} = \dfrac{\partial E}{\partial o_i}\dfrac{\partial o_i}{\partial w_{ki}}$

3° $\dfrac{\partial o_i}{\partial w_{ki}} = \dfrac{\partial o_i}{\partial x_i}\dfrac{\partial x_i}{\partial w_{ki}} = o_i(1-o_i)I_k$

$\therefore \dfrac{\partial E}{\partial w_{ki}} = o_i(1-o_i)I_k\sum(y_j - d)v_{ji}$ ✓

梯度下降法

(求偏导) (W, V)

调整权值

W、V：权重由二维数组表示.