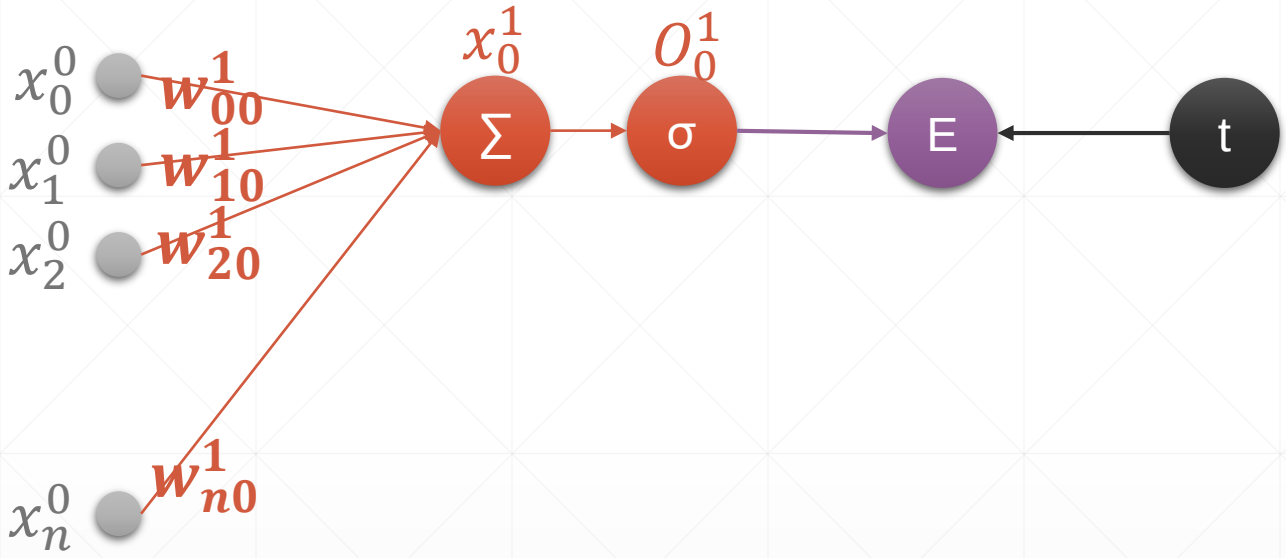
PyTorch

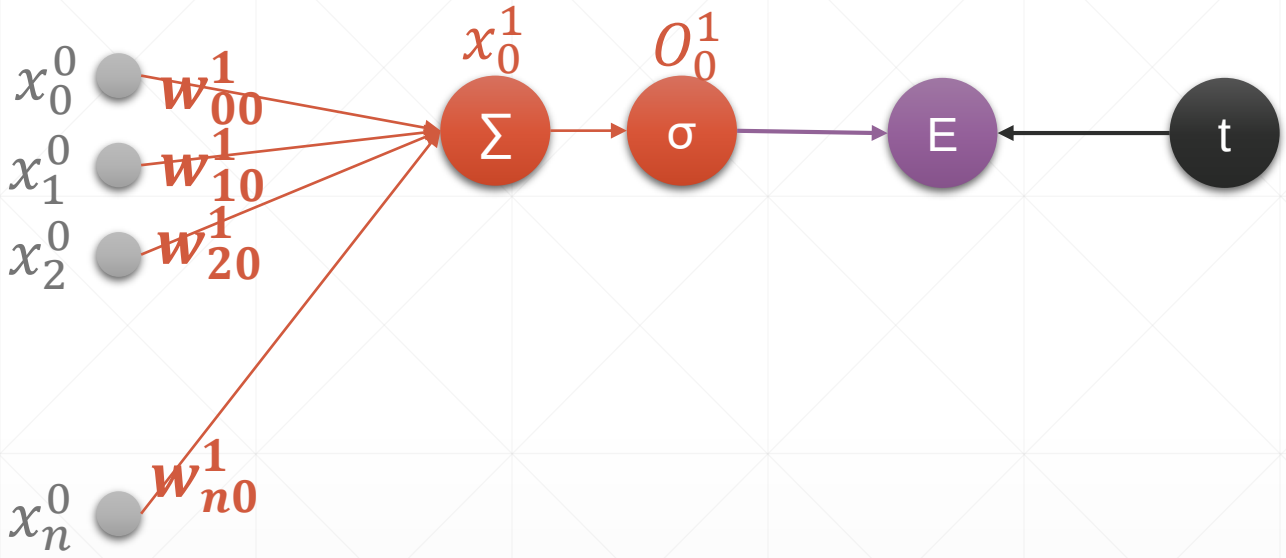
感知机-2

主讲人：龙良曲

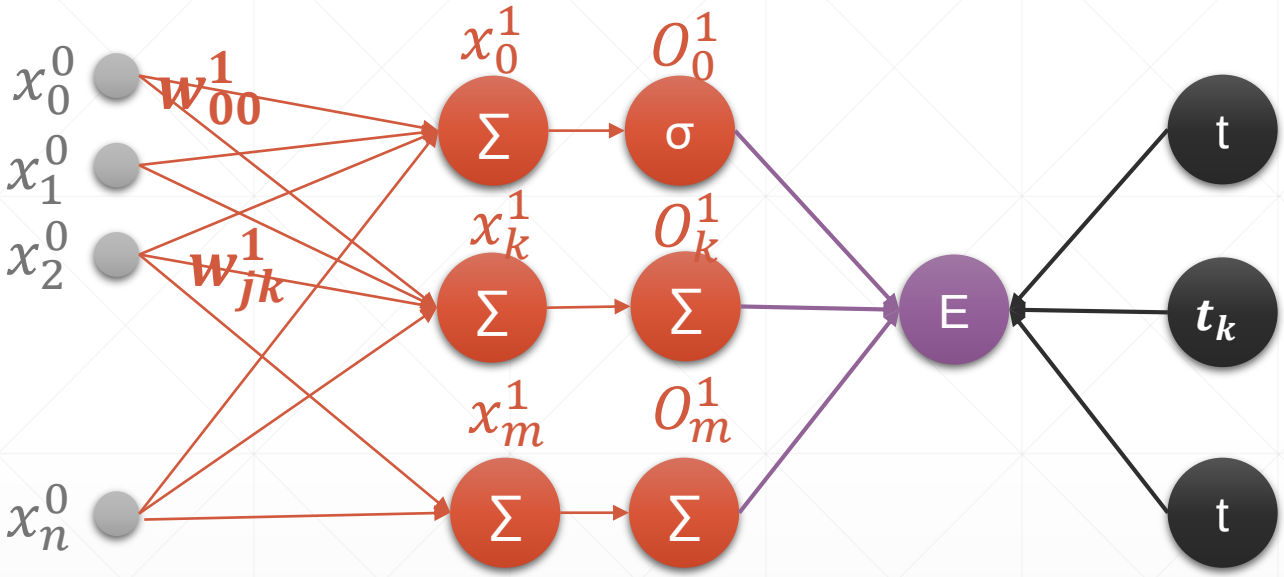
Perceptron



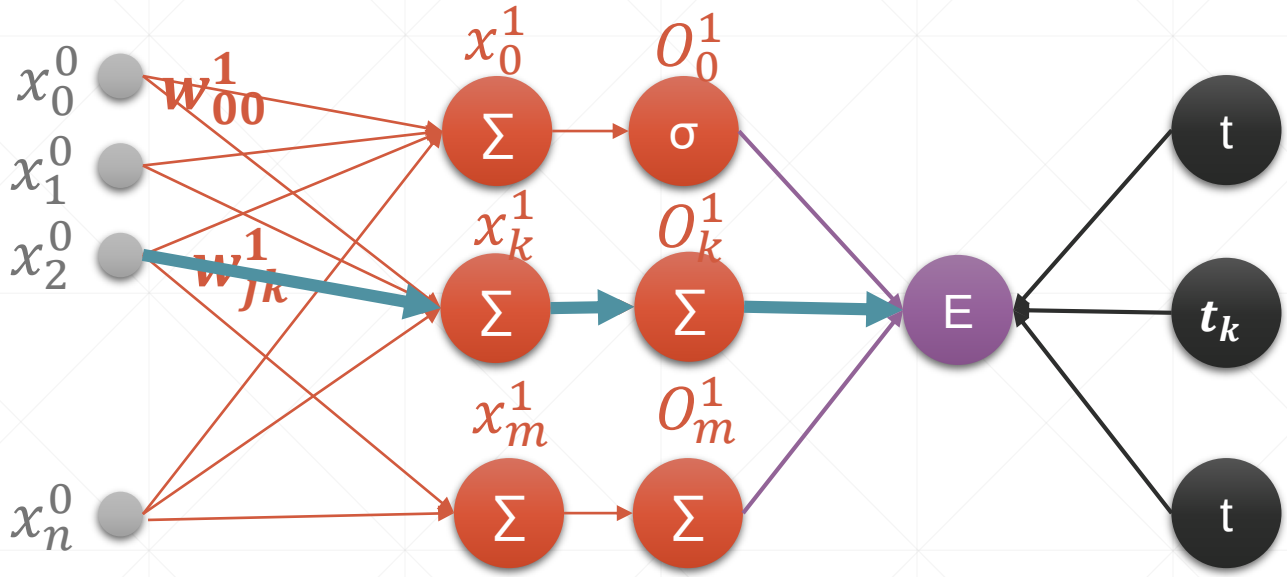
$$\frac{\partial E}{\partial w_{j0}} = (O_0 - t) O_0 (1 - O_0) x_j^0$$


x_0^0
x_1^0
x_2^0
x_n^0
w_{00}^1
w_{10}^1
w_{20}^1
w_{n0}^1
x_0^1
Σ
O_0^1
σ
E
t

Multi-output Perceptron



Derivative



$$E = \frac{1}{2}\sum (O_i^1 - t_i)^2$$

$$\frac{\partial E}{\partial w_{jk}} = (O_k - t_k)\frac{\partial O_k}{\partial w_{jk}}$$

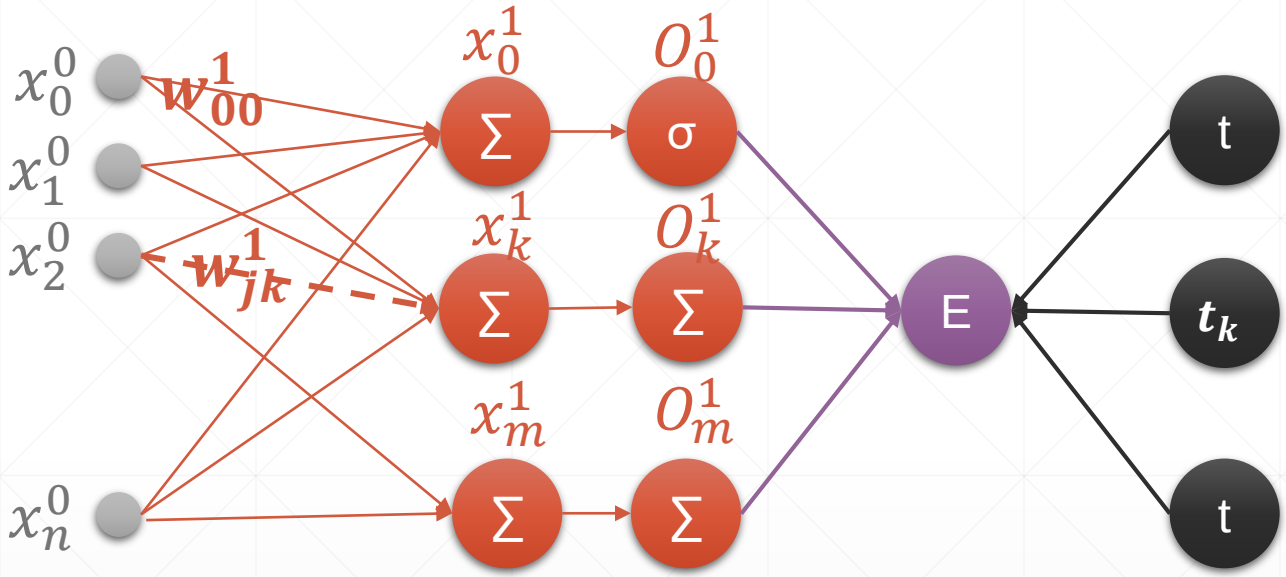
$$\frac{\partial E}{\partial w_{jk}} = (O_{\mathrm{k}} - t_k)\frac{\partial \sigma(x_k)}{\partial w_{jk}}$$

$$\frac{\partial E}{\partial w_{jk}} = (O_k - t_k)\,\sigma(x_k)(1 - \sigma(x_k))\frac{\partial x_k^1}{\partial w_{jk}}$$

$$\frac{\partial E}{\partial w_{jk}} = (O_k - t_k)\mathrm{O_k}\,(1 - O_k)\frac{\partial x_k^1}{\partial w_{jk}}$$

$$\frac{\partial E}{\partial w_{jk}} = (O_k - t_k)\mathrm{O_k}\,(1 - O_k)\,x_j^0$$

Multi-output Perceptron



$$\frac{\partial E}{\partial w_{jk}} = (O_k - t_k) O_k (1 - O_k) x_j^0$$

```
In [55]: x=torch.randn(1,10)
In [56]: w=torch.randn(2,10,requires_grad=True)

In [57]: o=torch.sigmoid(x@w.t())
In [58]: o.shape
Out[58]: torch.Size([1, 2])

In [59]: loss=F.mse_loss(torch.ones(1,1),o)
In [60]: loss
Out[60]: tensor(0.2443, grad_fn=<MeanBackward1>)

In [61]: loss.backward()

In [62]: w.grad
Out[62]:
tensor([[-0.0040,  0.0004,  0.0041, -0.0088,  0.0017, -0.0103,  0.0067, -0.0005,
         -0.0035, -0.0043],
        [-0.1182,  0.0114,  0.1221, -0.2628,  0.0495, -0.3060,  0.2002, -0.0149,
         -0.1027, -0.1266]])
```

下一课时

链式法则

Thank You.