Slides 16

diff. j' v. j

$$\frac{\partial y}{\partial w_j} = \frac{\partial}{\partial \boxed{w_j}}\left(\sum_{j'=0}^{D} w_{j'}x_{j'} + b\right) = \frac{\partial}{\partial w_j}\Big(\cancel{w_0 x_0} + \cancel{b} + \cancel{w_1 x_1} + \cancel{b} + \dots + \boxed{w_j}x_j + \cancel{b} + \dots + \cancel{w_D x_D} + \cancel{b}\Big) = x_j.$$

$$\frac{\partial y}{\partial b} = \frac{\partial}{\partial b}\left(\sum_{j'=0}^{D} w_{j'}x_{j'} + b\right) \quad \boxed{Db}$$

$$= 1.$$

Loss derivatives

$$\frac{\partial L}{\partial w_j} = \frac{d L}{d y}\,\frac{\partial y}{\partial w_j} = \frac{d L}{d y}\,x_j$$

$$= \frac{d}{dy}\left(\boxed{\tfrac{1}{2}(y-t)^2}\right)x_j = (y-t)x_j.$$

$$\left(\tfrac{1}{2}(y-t)^2\right)' = 2\times\tfrac{1}{2}(y-t) = y-t$$

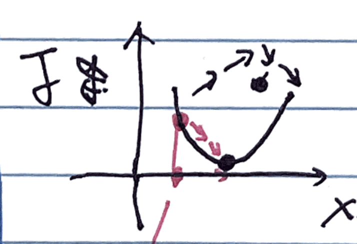
$$\frac{\partial L}{\partial b} = \frac{\partial L}{\partial y}\,\boxed{\overset{1}{\frac{\partial y}{\partial b}}} = (y-t)$$

cost f: $\mathcal{J} \to \boxed{\frac{1}{N}\sum L}$ linearity

$$\frac{\partial \mathcal{J}}{\partial w_j} = \boxed{\frac{1}{N}\sum^{N}(y_{i} - t_{i})\,x_j.}$$

$$\frac{\partial \mathcal{J}}{\partial b} = \frac{1}{N}\sum^{N}(y_i - t_i).$$

slide 29



resulted from the initializat

Slides 18~24.

$x \in \mathbb{R}^1 \rightarrow$ not linear ; $\phi(x) \in \mathbb{R}^2$, $\rightarrow$ ~~y~~ f(x) could be linear

$$y = w_0 x^0 + w_1 x^1 + w_2 x^2 + \cdots\cdots + w_M x^M$$

$$x \rightarrow [1, x, x^2, x^3, \cdots, x^M]^T$$

$y = \underline{\phi(x)}^T$ is still linear given the weight matrix $w_0 \ldots w_M$

slide 27

$W = [\underline{[2,6]}, \underline{[7,5]}] = \frac{1}{2} \|W\|_2^2$

$$\underset{\text{weight matrix}}{R(\underline{\underline{w}})} = \frac{1}{2} \|w\|_2^2 = \frac{1}{2} \sum_j w_j^2$$

$$J_{regularized} = \underline{\underline{J}} + \lambda \underline{\underline{R(w)}} = J(w) + \frac{1}{2} \sum_j^D w_j^2$$

like M, λ is tunable

slides 30~31

$\frac{\partial J}{\partial w_j}$ >0, $w_j \uparrow$, $J \uparrow$; <0, $w_j \uparrow$, $J \downarrow$.

a is always positive.

$$w_j \xleftarrow{\text{update}} w_j - \underset{+}{\underset{=}{a}} \boxed{\frac{\partial J}{\partial w_j}}$$

>0.

<0.