$$\nabla J = \frac{\partial J}{\partial w} \triangleq \frac{\partial L}{\partial w} \qquad \frac{\partial L}{\partial b} \qquad y = \frac{1}{1+e^{-z}}$$

$$\frac{d\, f(x(t))}{dt} = \frac{df}{dx} \cdot \frac{dx}{dt}$$

$$\frac{dL}{dy}^{\bar{y}} = 2 \times \frac{1}{2} \times (y-t) = y-t. \qquad \frac{dL}{dz}^{\bar{z}} = \frac{dL}{dy}^{\bar{y}} \cdot \frac{dy}{dz} = (y-t) \cdot \sigma'(z).$$

$$\frac{\partial L}{\partial w}^{\bar{w}} = \frac{\partial L}{\partial z}^{\bar{z}} \cdot \frac{\partial z}{\partial w} = (y-t) \cdot \sigma'(z) \cdot x,$$

$$\frac{\partial L}{\partial b}^{\bar{b}} = \frac{\partial L}{\partial z}^{\bar{z}} \cdot \frac{\partial z}{\partial b} = (y-t) \cdot \sigma'(z) \cdot 1$$

$$\frac{df}{dt} = \frac{d}{dt} f(x(t), y(t)) = \frac{\partial f}{\partial x} \cdot \frac{\partial x}{\partial t} + \frac{\partial f}{\partial y} \cdot \frac{\partial y}{\partial t}$$

$$f(x,y) = y + e^{xy}, \quad x(t) = \cos t \quad y(t) = t^2$$

w/ respect to x

$$\frac{df}{dt}^{\bar{t}} = \underbrace{y \cdot e^{xy}}_{\frac{df}{dx}^{\bar{x}}} \cdot \underbrace{(-\sin t)}_{\frac{\partial x}{\partial t}} + \underbrace{(1 + x \cdot e^{xy})}_{\frac{\partial f}{\partial y}^{\bar{y}}} \cdot \underbrace{2t}_{\frac{\partial y}{\partial t}}.$$

$$\overline{\mathcal{L}_{reg}} = \frac{\partial \mathcal{L}_{reg}}{\partial \mathcal{L}_{reg}} = 1$$

$$\overline{R} = \overline{\mathcal{L}_{reg}} \cdot \frac{d \mathcal{L}_{reg}}{d R} = \overline{\mathcal{L}_{reg}} \cdot \lambda \qquad \overline{y} = \overline{\mathcal{L}_{reg}} \cdot \frac{\partial \mathcal{L}_{reg}}{\partial y} = \overline{\mathcal{L}_{reg}} \cdot (y-t)$$

$$\overline{\mathcal{L}} = \overline{\mathcal{L}_{reg}} \cdot \frac{d \mathcal{L}_{reg}}{d \mathcal{L}} = \overline{\mathcal{L}_{reg}} \cdot 1$$

$$\overline{b} = \overline{z} \cdot \frac{\partial z}{\partial b} = \overline{z} \cdot 1$$

$$\overline{z} = \overline{y} \cdot \frac{dy}{dz} = \overline{y} \cdot \sigma'(z)$$

$$\overline{w} = \overline{z} \cdot \frac{\partial z}{\partial w} + \overline{R} \cdot \frac{\partial R}{\partial w} = \overline{z} \cdot x + \overline{R} w.$$

$$\overline{\mathcal{L}} = \frac{\partial \mathcal{L}}{\partial \mathcal{L}} = 1. \qquad \overline{y_k} = \overline{\mathcal{L}} \cdot (y_k - t_k)$$

$$\overline{w_{ki}^{(2)}} = \overline{y_k} \cdot \frac{\partial y_k}{\partial w_{ki}^{(2)}} = \overline{y_k} \cdot h_i \qquad \overline{b_k^{(2)}} = \overline{y_k} \cdot \frac{\partial y_k}{\partial b_k^{(2)}} = \overline{y_k} \cdot 1$$

$$\overline{h_i} = \overline{y_1} \cdot \frac{\partial y_1}{\partial h_i} + \overline{y_2} \cdot \frac{\partial y_2}{\partial h_i} = \overline{y_1} \cdot w_{ki}^{(2)} + \overline{y_2} \cdot w_{ki}^{(2)}$$

$$\overline{z_i} = \overline{h_i} \cdot \frac{\partial h_i}{\partial z_i} = \overline{h_i} \cdot \sigma'(z_i)$$

$$\overline{w_{ij}^{(1)}} = \overline{z_i} \cdot \frac{\partial z_i}{\partial w_{ij}^{(1)}} = \overline{z_i} \cdot x_j \qquad \overline{b_i^{(1)}} = \overline{z_i} \cdot 1 = \overline{z_i}$$