Single Layer

$$\hat{y} = f(x, b) = b_0 + \sum_{j=1}^{m} b_j F(b_0^j + b_1^j x)$$

- single numeric output y
- single numeric input x

$m = 2$

$$f(x, \Theta) = b_0 + b_1 F(b_0^1 + b_1^1 x) + b_2 F(b_0^2 + b_1^2 x)$$

$$\Theta = (b_0, b_1, b_2, b_0^1, b_1^1, b_0^2, b_1^2)$$

$$L(x, y, b) = (y - \hat{y})^2 = (y - f(x, \Theta))^2$$

$$\frac{\partial L}{\partial \Theta_j} = 2(y - f(x, \Theta)) \left[- \frac{\partial f}{\partial \Theta_j} \right]$$

chain rule!!

$$f(g(x))' = f'(g(x)) g'(x)$$

$$f(x,\Theta) = b_0 + b_1 F(b_0' + b_1' x) + b_2 F(b_0^2 + b_1^2 x)$$

$$\frac{\partial f}{\partial b_0} = 1$$

$$\frac{\partial f}{\partial b_1} = F(b_0' + b_1' x)$$

$$\frac{\partial f}{\partial b_0'} = b_1 F'(b_0' + b_1' x)$$

$$\frac{\partial f}{\partial b_1'} = b_2 F'(b_0' + b_1' x)[x]$$