

מ'ס' חירקה

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$$a) \quad p(y=y | x=x) = \frac{e^{w_i x_t + b_i}}{\sum_j^K e^{w_j x_t + b_j}}$$

$$b) \quad \underset{\text{argmin}}{\sum} -\log \left(\frac{e^{w_i x_t + b_i}}{\sum_j^K e^{w_j x_t + b_j}} \right)$$

$$-\log \frac{e^{w_y \cdot x + b}}{\sum_{j=1}^K e^{w_j x + b}}$$

$$= -\left[\log(e^{w_y \cdot x + b}) - \log\left(\sum_{j=1}^K e^{w_j x + b}\right) \right]$$

$$\stackrel{(*)}{=} -\left[\frac{d}{dw_y} [w_y x + b] - \frac{e^{w_y x + b}}{\sum_{j=1}^K e^{w_j x + b}} \cdot x \right]$$

$$= -\left[x - \frac{e^{w_y x + b}}{\sum_{j=1}^K e^{w_j x + b}} x \right]$$

$$= -x + \frac{e^{w_y x + b}}{\sum_{j=1}^K e^{w_j x + b}} x$$

$$\stackrel{(*)}{=} -\left[\frac{d}{dw_y} [w_y x + b] - \frac{e^{w_y x + b}}{\sum_{j=1}^K e^{w_j x + b}} x \right]$$

$$= \frac{e^{w_y x + b}}{\sum_{j=1}^K e^{w_j x + b}}$$

$$w^+ \leftarrow w^{+-1} \cdot \eta \left(\frac{dl}{dw^{+-1}} \right)$$

$$-\left[\log(e^{w_j x + b}) - \log\left(\sum_{j=1}^K e^{w_j x + b}\right) \right]$$

$$= \left[1 - \frac{e^{w_i x + b}}{\sum_{j=1}^K e^{w_j x + b}} \right] \quad b \text{ is the bias}$$

$$= 1 + \frac{e^{w_i x + b}}{\sum_{j=1}^K e^{w_j x + b}}$$

$$b^+ \leftarrow b^+ + -1 + \frac{e^{w_i x + b}}{\sum_{j=1}^K e^{w_j x + b}}$$

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