< Gradient Descent for Logistic Regression cost Function >

$$J(\vec{w}, b) = -\frac{1}{m}\sum_{i=1}^{m}\left[y^{(i)} \log\left(f_{\vec{w},b}(\vec{x}^{(i)})\right) + (1-y^{(i)}) \log\left(1-f_{\vec{w},b}(\vec{x}^{(i)})\right)\right]$$

⇓

objective : $\underset{\vec{w}, b}{\text{minimize}}\ J(\vec{w}, b)$

* $J(\vec{w}, b)$는 convex이므로 gradient descent를 통해 최적의 parameter $\vec{w}, b$를 찾을 수 있음

repeat {

$$w_j := w_j - \alpha \frac{\partial}{\partial w_j} J(\vec{w}, b) \quad \rightarrow \quad \frac{\partial}{\partial w_j} J(\vec{w}, b) = \frac{1}{m}\sum_{i=1}^{m}\left(f_{\vec{w},b}(\vec{x}^{(i)}) - y^{(i)}\right) x_j^{(i)}$$

$$b := b - \alpha \frac{\partial}{\partial b} J(\vec{w}, b) \quad \rightarrow \quad \frac{\partial}{\partial b} J(\vec{w}, b) = \frac{1}{m}\sum_{i=1}^{m}\left(f_{\vec{w},b}(\vec{x}^{(i)}) - y^{(i)}\right)$$

} simultaneous updates

⇓

위 수식만 보면 linear regression의 gradient descent와 동일

하지만 hypothesis function이 다름

- linear regression $f_{\vec{w},b}(\vec{x}^{(i)}) = \vec{w} \cdot \vec{x} + b$
- logistic regression $f_{\vec{w},b}(\vec{x}^{(i)}) = \dfrac{1}{1 + e^{-(\vec{w} \cdot \vec{x} + b)}}$