· 예측모델

$u = w_0 + w_1 x_1 + w_2 x_2 \rightarrow u = w \cdot x$

→ 입력데이터에 의해 산출된 u값을 시그모이드 함수에 대입된다.

$$f(u) = \frac{1}{1+\exp(-u)}$$

$f(u)$ 값은 해당 점이 class-1에 속하는 확률로 간주 (즉, yp(예상값)이다)

• 손실함수

$$P(yt, yp) = \begin{cases} yp & (yt=1)\text{인경우} \\ 1-yp & (yt=0)\text{인경우} \end{cases}$$

최대가능도 추정을 이용해 손실함수 정의

m	$yt^{(m)}$	$u^{(m)}$	$yp^{(m)}$	$p^{(m)}$
1	1	$x^{(1)} \cdot w$	$f(u^{(1)})$	$yp^{(1)}$
2	0	$x^{(2)} \cdot w$	$f(u^{(2)})$	$1-yp^{(2)}$
3	0	$x^{(3)} \cdot w$	$f(u^{(3)})$	$1-yp^{(3)}$
4	1	$x^{(4)} \cdot w$	$f(u^{(4)})$	$yp^{(4)}$
5	0	$x^{(5)} \cdot w$	$f(u^{(5)})$	$1-yp^{(5)}$

$$Lk = p^{(1)} \cdot p^{(2)} \cdot p^{(3)} \cdot p^{(4)} \cdot p^{(5)}$$

$$\log(Lk) = \log(p^{(1)} \cdot p^{(2)} \cdots p^{(5)})$$

$$= \log(p^{(1)}) + \cdots \log(p^{(5)}) \rightarrow \sum_{m=1}^{5} (yt^{(m)} \log(yp^{(m)}) + (1-yt^{(m)}) \log(1-yp^{(m)}))$$

$$\log(p^{(m)}) = yt^{(m)} \log(yp^{(m)}) + (1-yt^{(m)}) \log(1-yp^{(m)})$$

$$L(w_0, w_1, w_2) = -\frac{1}{M} \sum_{m=0}^{M-1} (yt^{(m)} \cdot \log(yp^{(m)}) + (1-yt^{(m)}) \log(1-yp^{(m)}))$$

CamScanner로 스캔하기

• 손실함수 미분계산

$$\frac{\partial L}{\partial w_1} = \boxed{\frac{\partial u}{\partial w_1}} \cdot \boxed{\frac{dL}{du}} = \boxed{\frac{dL}{d(yp)}} \cdot \frac{d(yp)}{du}$$

$$x_1 \cdot \underbrace{yp-yt}_{yd} \qquad \frac{yp-yt}{\cancel{yp(1-yp)}} \cdot \cancel{yp(1-yp)}$$

$$\therefore \frac{\partial L}{\partial w_1} = x_1 \cdot yd$$

$$= \frac{1}{m}\sum_{m=0}^{m-1} x_1^{(m)} \cdot yd^{(m)}$$

$$\frac{\partial L}{\partial w_i} = \frac{1}{m}\sum_{m=0}^{m-1} x_i^{(m)} \cdot yd^{(m)} \quad (i = 0, 1, 2)$$

• 경사하강법 적용

$$w^{(k+1)} = w^{(k)} - \frac{\alpha}{m}\sum_{m=0}^{m-1} x^{(m)} \cdot yd^{(k)(m)}$$