1, 0

$y_i \qquad\qquad \underline{x_i}$

$y_i = \underline{\beta' x_i} + \underline{\varepsilon_i}$

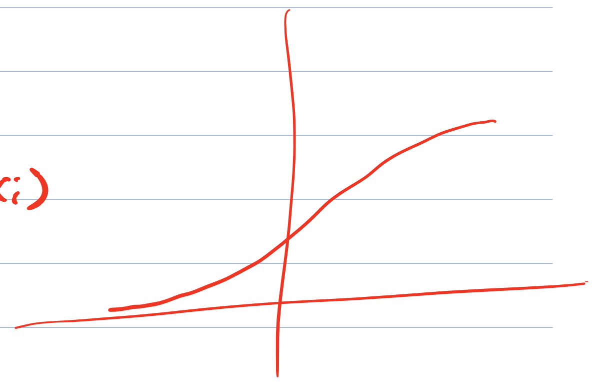
$\underbrace{E[y_i \mid x_i]} = \beta' x_i = \beta_1 x_{1i} + \beta_2 x_{2i}$

$= 1 \cdot Pr(y_i = 1 \mid x_i) + 0 \cdot Pr(y_i = 0 \mid x_i)$

$= \underline{Pr(y_i = 1 \mid x_i)} = \beta' x_i$

$= F(x_i)$

$Pr(y_i = 0 \mid x_i) = 1 - F(x_i)$



$$\ln \frac{P(y=1 \mid x)}{P(y=0 \mid x)} = \theta' x = \theta_1 x_1 + \theta_2 x_2 + \cdots$$

$$\frac{P(y=1 \mid x)}{P(y=0 \mid x)} = e^{\theta' x}$$

$$\frac{P(y=1 \mid x)}{1 - P(y=1 \mid x)} = e^{\theta' x}$$

$$P(y=1|x) = (1 - P(y=1|x))\, e^{\theta' x}$$

$$(1 + e^{\theta' x})\, P(y=1|x) = e^{\theta' x}$$

$$P(y=1|x) = \frac{e^{\theta' x}}{1 + e^{\theta' x}}$$

$(x_1, \overset{0}{\cancel{y_1}})$

$(x_2, \overset{1}{\cancel{y_2}})$

$\vdots$

(x_N, y_N)

$$P(y_i=1|x_i) = \frac{e^{\theta' x_i}}{1 + e^{\theta' x_i}}$$

$$P(y_i=0|x_i) = 1 - P(y_i=1|x_i)$$

$$(1 - P(y_1=1|x_1))\, P(y_2=1|x_2)$$

$$\Updownarrow$$

$$\boxed{F^{y_i}(1-F)^{1-y_i}} \quad \begin{cases} F & \text{if } y_i = 1 \\ 1-F & \text{if } y_i = 0 \end{cases}$$

$$P(y_1|x_1)\, P(y_2|x_2) \cdots P(y_N|x_N)$$

$$\text{Overall error rate} = \frac{FP + FN}{N + P}$$

$$= \frac{FP}{N+P} + \frac{FN}{N+P}$$

$$= \frac{N}{N+P}\,\frac{FP}{N} + \frac{P}{N+P}\,\frac{FN}{P}$$

$$= \frac{N}{N+P}\,\text{Type I} + \frac{P}{N+P}\cdot\text{Type II}$$

$$\text{Type I error rate} = \frac{23}{9667}$$

$$\text{Type II} \text{ ——— } = \frac{252}{333}$$

$$\text{Overall} \text{ ——— } = \frac{23+252}{10{,}000}$$