[1] $\mathbb{P}(C=1 \mid X=x) = \dfrac{e^{-\eta(x)}}{1+e^{-\eta(x)}}$ ↙ logit function

where the linear predictor η takes the form: $\eta(x) = \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_p x_p$.

$x \in \mathbb{R}^{n^2}$, $n \approx 100$

[2] * Bayes' Thm: $\mathbb{P}(A \mid B) = \dfrac{\mathbb{P}(B \text{ and } A)}{\mathbb{P}(B)}$

$$= \frac{\mathbb{P}(A) \cdot \mathbb{P}(B \mid A)}{\mathbb{P}(B)}$$

* Law of total probability:

$$\mathbb{P}(A) = \mathbb{P}(A \cap B) + \mathbb{P}(A \cap B^c)$$
$$= \mathbb{P}(B) \cdot \mathbb{P}(A \mid B) + \mathbb{P}(B^c) \cdot \mathbb{P}(A \mid B^c)$$

[3] $P(i \mid x) = \mathbb{P}(C=i \mid X=x)$ for $i = 1 \ldots K$

$$\mathbb{P}(X \in [x, x+dx]) = \sum_{i=1}^{K} \pi_i \cdot \int_x^{x+dx} f_i(x)\,dx$$

let $dx \to 0$; $\lim_{dx \to 0} \mathbb{P}(X \in [x, x+dx])/dx$

$$= \pi_1 \cdot f_1(x) + \pi_2 \cdot f_2(x) + \cdots + \pi_K f_K(x)$$

$\therefore P(i \mid x) = \dfrac{\pi_i \cdot f_i(x)}{[\text{fill this space}]}$