Logistic Regression w/ 2 categories in the Response.

We can represent one category by 0,
and the other by 1.

$$\mathbb{P}[Y=1 \mid X=x] = p(x)$$

$$\ln\left(\frac{p(x)}{1-p(x)}\right) = \beta_0 + \beta X$$

$$\Updownarrow$$

$$p(x) = \frac{e^{\beta_0+\beta X}}{1+e^{\beta_0+\beta X}}$$

$$\mathbb{P}[Y=1 \mid X=x] = \frac{e^{\beta_0+\beta_1 x_1 + \cdots + \beta_p x_p}}{1+e^{\beta_0+\beta_1 x_1 + \cdots + \beta_p x_p}}$$

$$\mathbb{P}[Y=0 \mid X=x] = \frac{1}{1+e^{\beta_0+\beta_1 x_1 + \cdots + \beta_p x_p}}$$