Logistic Regression 2

14 July 2024 11:51

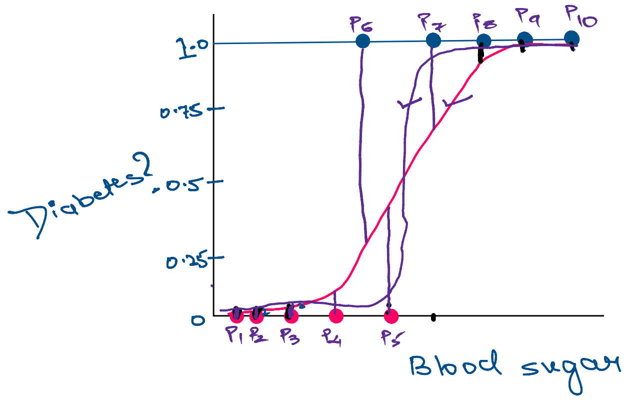
$$z = \hat{y} = \beta_0 + \beta_1 x$$

$$\downarrow$$

$$\frac{1}{1+e^{-z}}$$

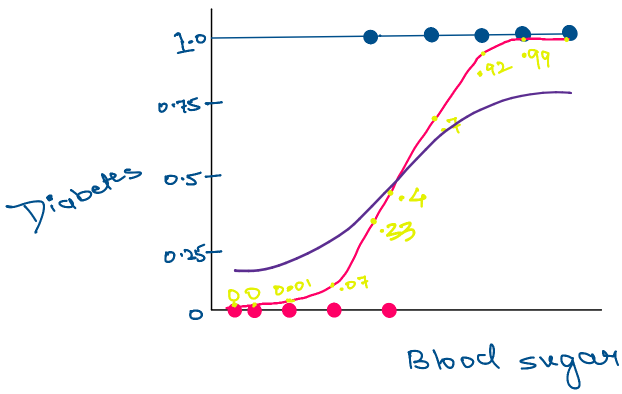
$$\downarrow$$

$$\boxed{\frac{1}{1+e^{-(\beta_0+\beta_1 x)}}}$$



$$y \text{ (Probability of Diabetes)} = \frac{1}{1+e^{-(\beta_0+\beta_1 x)}}$$

By changing the β_0 & β_1, the curve changes.

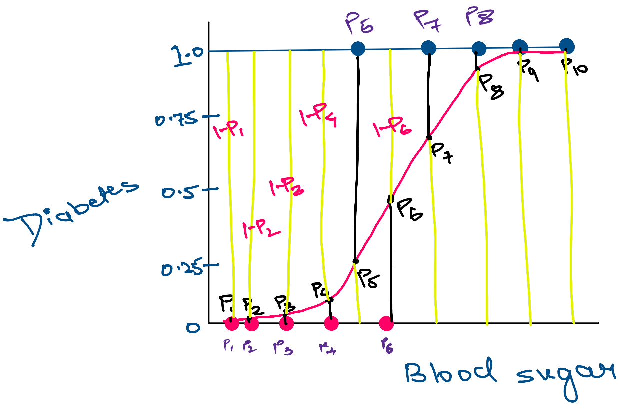


where suppose

$\beta_0 = -15$ and

$\beta_1 = 0.065$

Finding the best fit sigmoid curve →



maximizes $(P_5 * P_7 * P_8 * P_9 * P_{10})$

minimizes $(P_1 \; P_2 \; P_3 \; P_4 \; P_6)$

So the best fitting combination of β_0 & β_1 would be the one where we maximize the product :

$$(1-P_1)(1-P_2)(1-P_3)(1-P_4)(1-P_6)(P_5)(P_7)(P_8)(P_9)(P_{10})$$

product .

$(1-P_1)(1-P_2)(1-P_3)(1-P_4)(1-P_6)(P_5)(P_7)(P_8)(P_9)(P_{10})$

This product is called '<u>likelihood</u> <u>function</u>' .

It is the product of :

$\left[(1-P_i)(1-P_i)\ldots\ldots\right] * \left[(P_i)(P_i)\ldots\ldots\right]$

for all non-diabetics

for all diabetics

<u>MSE</u>

$P_1 = 0.3 \qquad 1-P_1 = 0.7$

$P_1 = 0.05 \qquad 1-P_1 = 0.95$

$$\left.\begin{array}{l} \text{maximizes}\left(P_5 * P_7 * P_8 * P_9 * P_{10}\right) \\ \text{minimizes}\left(P_1\ P_2\ P_3\ P_4\ P_6\right) \end{array}\right]$$

$\downarrow$

$$\text{maximizes}\left(1-P_1 \times 1-P_2 \times 1-P_3 \times 1-P_4 \times 1-P_6\ P_5\ P_7\ P_8\ P_9\ P_{10}\right)$$