Logistic Regression

Healthcare Data

↓

Patients features

(BP, BMI, Pregnant and many more)

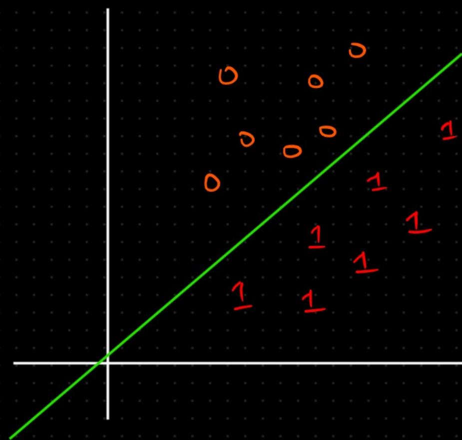
Diabetic — 0 (Not Diabetic)
— 1 (Diabetic)

(Binary Classification)

f_1	f_2	f_3	f_4 - - - -	target (Outcome)
				0
				1
				1
				0

Dataset

(0, 1, 2) ⟶ Multiclass Classification
(0, 1, 2, 3) ⟶

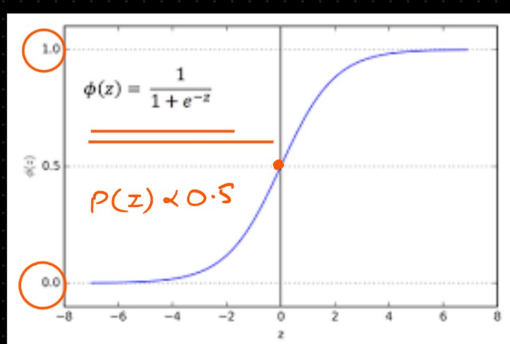


$P(\text{patient} = 0) \approx 0.45$

$P(\text{patient} = 1) \approx 0.55$

sigmoid function $\longrightarrow$ Probability

$\hat{y} = mx + c$



$$\sigma(\hat{y}) = \frac{1}{1+e^{-\hat{y}}}$$

$$\sigma(\hat{y}) = \frac{1}{1+e^{-(mx+c)}}$$

Binary classification

$$\sigma(\hat{y}) = \frac{1}{1+\frac{1}{e^{mx+c}}}$$

Probability of class 0

$$\sigma(\hat{y}) = \frac{e^{mx+c}}{1+e^{mx+c}} \quad \text{— (1)}$$

Probability of class 1 $\longleftarrow$

$$1 - \sigma(\hat{y}) = 1 - \frac{e^{mx+c}}{1+e^{mx+c}}$$

$$1-\sigma(\hat{y}) = \frac{1}{1+e^{mx+c}} \quad \text{--- (2)}$$

$$\frac{\sigma(\hat{y})}{1-\sigma(\hat{y})} = e^{mx+c}$$

$$\log_e\left(\frac{\sigma(\hat{y})}{1-\sigma(\hat{y})}\right) = mx+c \; \cancel{\log_e(e)}$$

$$\boxed{\log_e\left(\frac{\sigma(\hat{y})}{1-\sigma(\hat{y})}\right) = \underset{\hat{y}}{mx+c}}$$

$\sigma(\hat{y}) = 0.2$

$\sigma(\hat{y}) = \underline{0.8}$

$$\log_e\left(\frac{0.2}{0.8}\right) = \overset{\hat{y}}{\underline{\underline{mx+c}}}$$

$-ve$

$\hookrightarrow \underline{\underline{0}}$

$$\underline{\log_e\left(\frac{0.8}{0.2}\right) = \hat{y}}$$

$\underline{+ve}$

$\hookrightarrow \underline{\underline{1}}$