Defining the Logistic Regression Model

Complete Formulation:

$$P(y=1|x) = \sigma(w^T x + b)$$

$$= 1 / (1 + e^{-(w^T x + b)})$$

Step 1

$w^T x + b$

Linear combination

→

Step 2

$\sigma(...)$

Sigmoid function

→

Output

$P \in [0,1]$

Probability

Decision Rule:

Predict Class 1 if
P(y=1|x) ≥ 0.5

Threshold can be adjusted based on application needs

w

Weight Vector w

Model parameters to learn

b

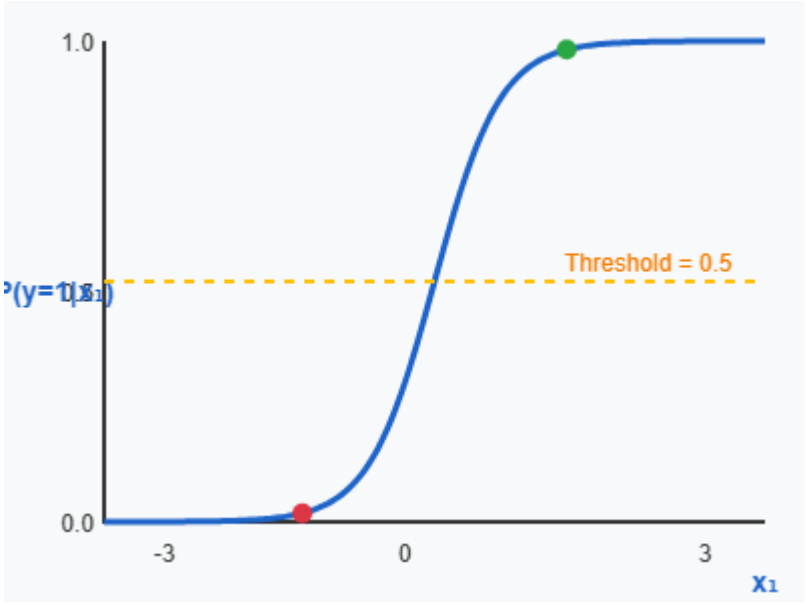
Bias b

Intercept term to learn

Training Goal: Find optimal w and b from data

Input-Output Visualization

2D: Single Feature (x_1)



Sigmoid curve: $P(y=1|x_1) = \sigma(w_1x_1 + b)$

3D: Two Features (x_1, x_2)

Decision surface: $P(y=1|x_1,x_2) = \sigma(w_1x_1 + w_2x_2 + b)$

Drag to rotate, scroll to zoom