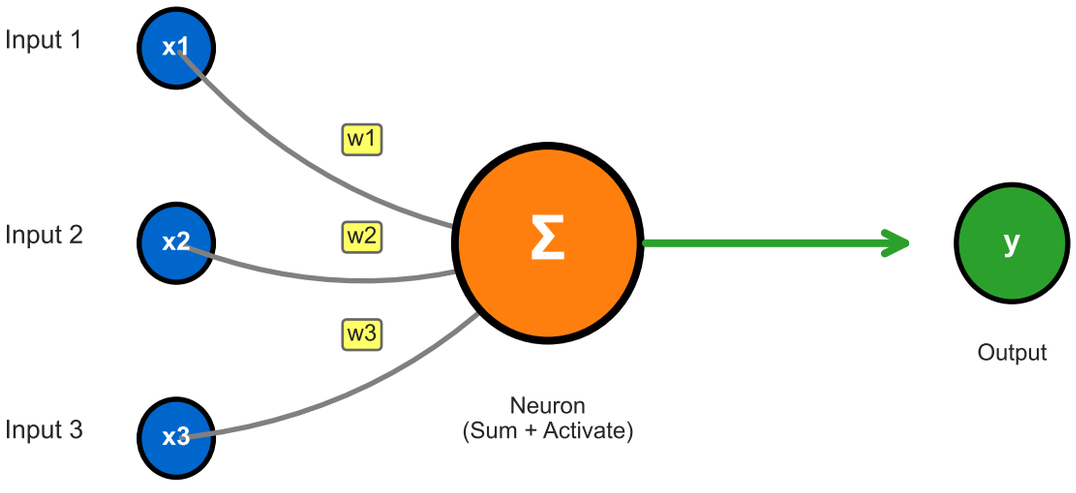
Understanding a Single Neuron

Anatomy of a Single Neuron



What Happens Inside a Neuron

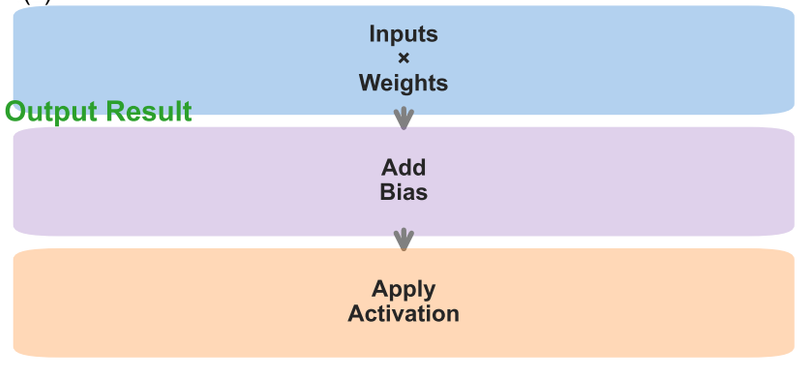
1. Weighted Sum

$z = \Sigma(w_i \times x_i) + bias$

2. Apply Activation

$y = f(z)$

3. Output Result



Concrete Example

Example: Is this fruit ripe?

Inputs:

$x_1 = 2$ (color: red=high)
$x_2 = 3$ (softness: high)
$x_3 = 1$ (smell: low)

Learned Weights:

$w_1 = 0.5$ (color matters)
$w_2 = -0.3$ (softness negative)
$w_3 = 0.8$ (smell important)
$bias = 0.1$

Calculation:

$z = (2 \times 0.5) + (3 \times -0.3) + (1 \times 0.8) + 0.1$
$z = 1.0 + -0.9 + 0.8 + 0.1$
$z = 1.0$

Activation (sigmoid):
$y = 1/(1 + e^{(-z)}) = 0.76$

Decision: 76% confident it's ripe!

Common Activation Functions