Forward Pass: Layer-by-Layer Computation

Layer 0: Input

$x_1 = 0.5$

$x_2 = 0.8$

$x_3 = 0.2$

Layer 1: Hidden

Step 1: Weighted Sum

$$z^{(1)} = W^{(1)} \cdot x + b^{(1)}$$

$$z_1 = 0.3(0.5) + 0.5(0.8) + 0.2(0.2) + 0.1$$

$$z_1 = 0.69$$

Step 2: Activation

$$h^{(1)} = \sigma(z^{(1)})$$

$$h_1 = \sigma(0.69) = 0.67$$

Layer 2: Output

Step 3: Weighted Sum

$$z^{(2)} = W^{(2)} \cdot h^{(1)} + b^{(2)}$$

$$z_{out} = 0.8(0.67) + 0.6(0.72) - 0.2$$

$$z_{out} = 0.77$$

Step 4: Final Activation

$$\hat{y} = \sigma(z^{(2)})$$

$$\hat{y} = \sigma(0.77) = 0.68$$

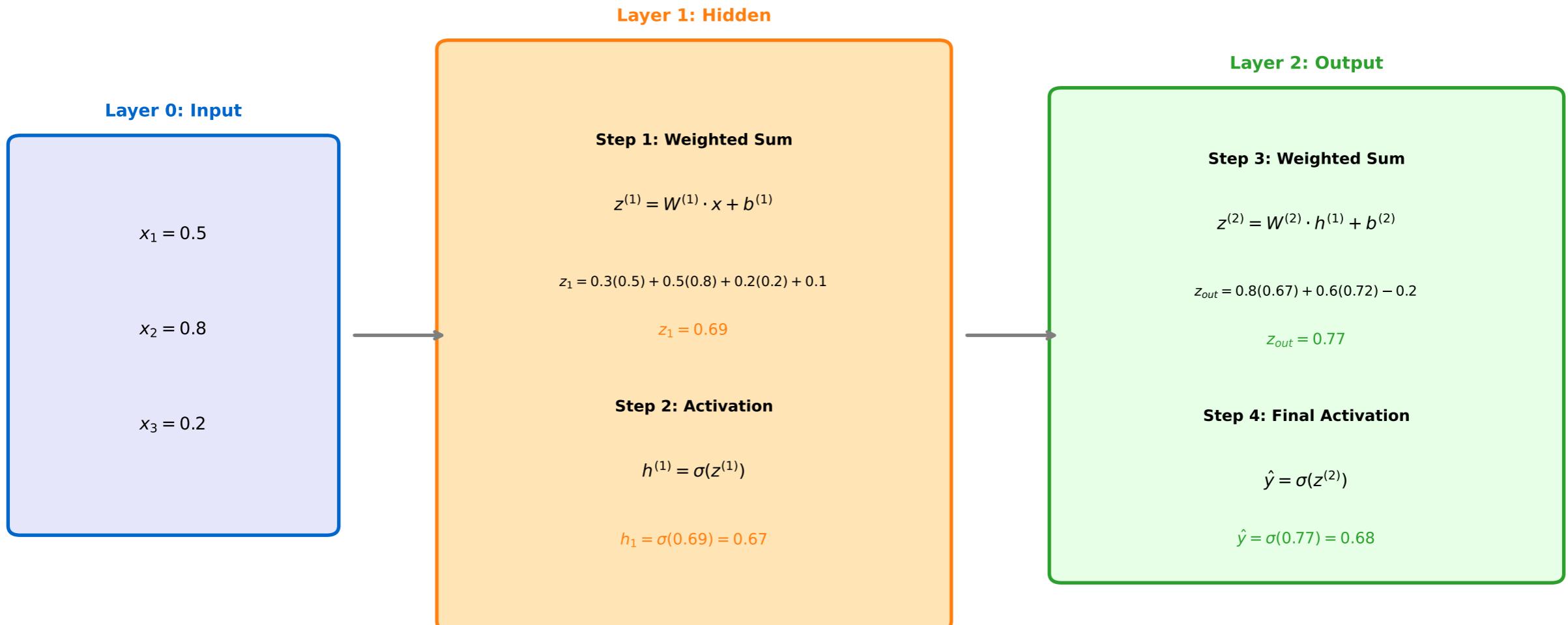
Forward Pass Summary:
Input → Linear Transform → Activation → Linear Transform → Activation → Output
Each layer: $h^{(l)} = \sigma(W^{(l)} \cdot h^{(l-1)} + b^{(l)})$