

Dead ReLU Problem

DEFINITION

Neurons that always output zero for all inputs (permanently inactive)

CAUSE

Large negative gradients push weights into negative region



CONSEQUENCE

Neuron stops learning, effectively removed



IMPACT

Reduced capacity, wasted parameters

⚠ Symptoms & Detection

Significant portion of neurons inactive (**sometimes >40%**) · Monitor percentage of always-zero activations during training

✓ Solutions



Leaky ReLU / PReLU



Lower Learning Rate



Better Initialization



Gradient Clipping