

## Common Activation Functions and Their Formulas

Here are the formulas for commonly used activation functions in neural networks:

### 1. Sigmoid Function

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

Output range: (0,1)

- Used in LSTMs for gates.

### 2. Tanh (Hyperbolic Tangent) Function

$$\tanh(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}}$$

Output range: (-1,1)

- Used in LSTMs for candidate cell state.

### 3. ReLU (Rectified Linear Unit)

$$ReLU(x) = \max(0, x)$$

- Output range: (0,∞)
- Used in deep networks to prevent vanishing gradients.

### 4. Softmax Function (for multi-class classification)

$$S(x_i) = \frac{e^{x_i}}{\sum_j e^{x_j}}$$

- Converts logits into probability distributions.