

ACTIVATION FUNCTION

- PROCESSING BASED ON INPUTS
- CRUCIAL COMPONENT OF NN
- NON-LINEARITY
- IT COMES IN HIDDEN AND IT TAKES INPUT (X'S AND W'S)
- INPUT -> HIDDEN LAYER (ACTIVATION FUNCTION)-> PROCESSING -> PREDICTION

TYPES OF ACTIVATION FUNCTION

1. SIGMOID FUNCTION

- $X = 1 / (1 + e^{-x})$
- RANGE : (0,1)
- CHARACTERISTICS : S-SHAPE CURVED, SMOOTH, CONTINUOUS, MAPS TO THE INPUT AND GIVE US PREDICTION

2. TAN-H (HYPERBOLIC TANGENT FUNCTION)

- $\text{TANh}(X) = \frac{e^x - e^{-x}}{e^x + e^{-x}}$
- RANGE : (-1,1)
- Characteristics : Similar to sigmoid but centered at 0, symmetric around the origin

3. RELU (RECTIFIED LINEAR UNIT)

- $\text{RELU}(X) = \max(0, x)$
- RANGE : [0, +INFINITY)
- Characteristics : simple, computational efficiency is good, on priority function of DL

CATEGORIZATION OF RELU

LEAKY RELU , ELU (EXPONENTIAL LINEAR UNIT)

1. LEAKY RELU

- $\text{LRELU}(X) = X \text{ IF } X > 0, \text{ AX OTHERWISE}$

- **RANGE** : (-INFINITY, +INFINITY)
- **CHARACTERISTICS** : similar to relu but it allows small values too, non-zero gradient when the input is negative. Prevent “dying neurons”

**DYING NEURONS // NEURONS - INACTIVE
GIVES OUTPUT 0**

**SCENARIO-1 (SOME NEURONS INACTIVE) - IT LEADS THE
PROBLEM OF DYING NEURONS**

SCENARIO 2 (THERE IS NO NEURON INACTIVE) - LEAKY RELU, ELU

2.EXPONENTIAL LINEAR UNIT (ELU)

- $ELU(X) = X$ IF $X > 0$, $A(E^X - 1)$ OTHERWISE
- **RANGE** : (-A, +INFINITY)
- **CHARACTERISTICS** :