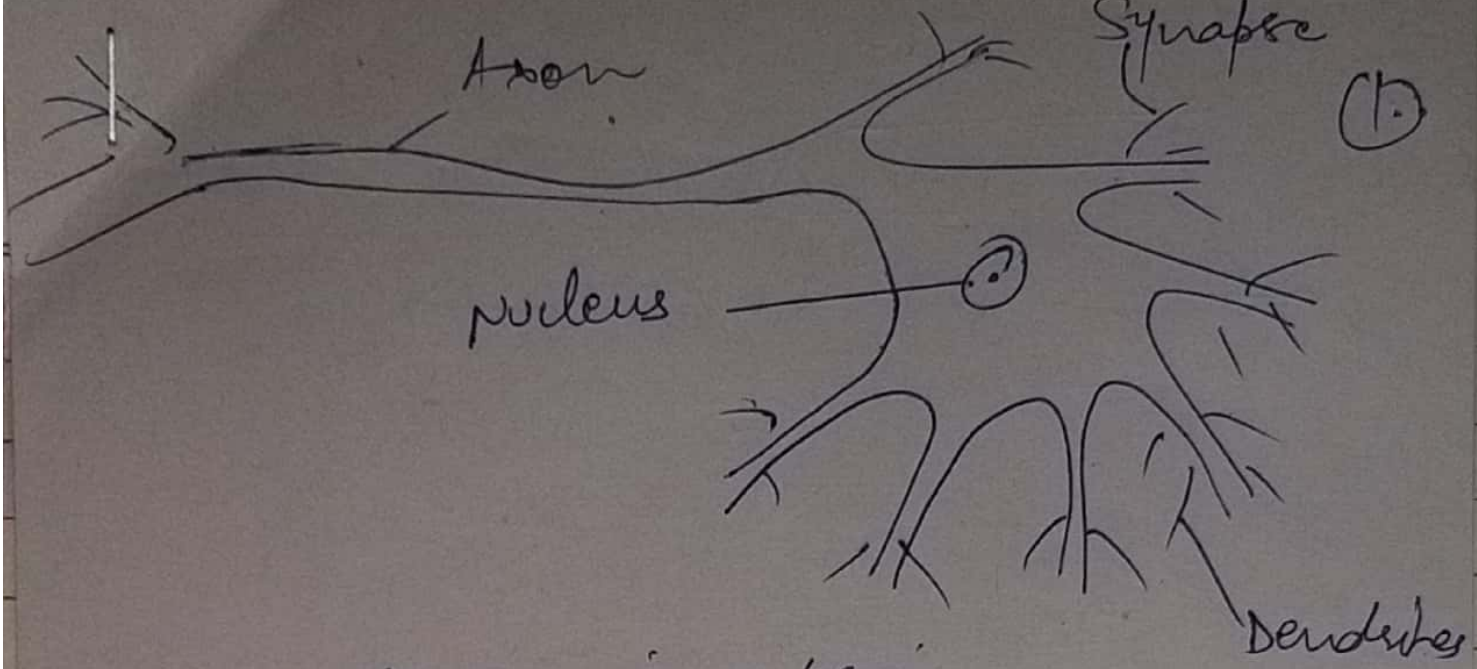
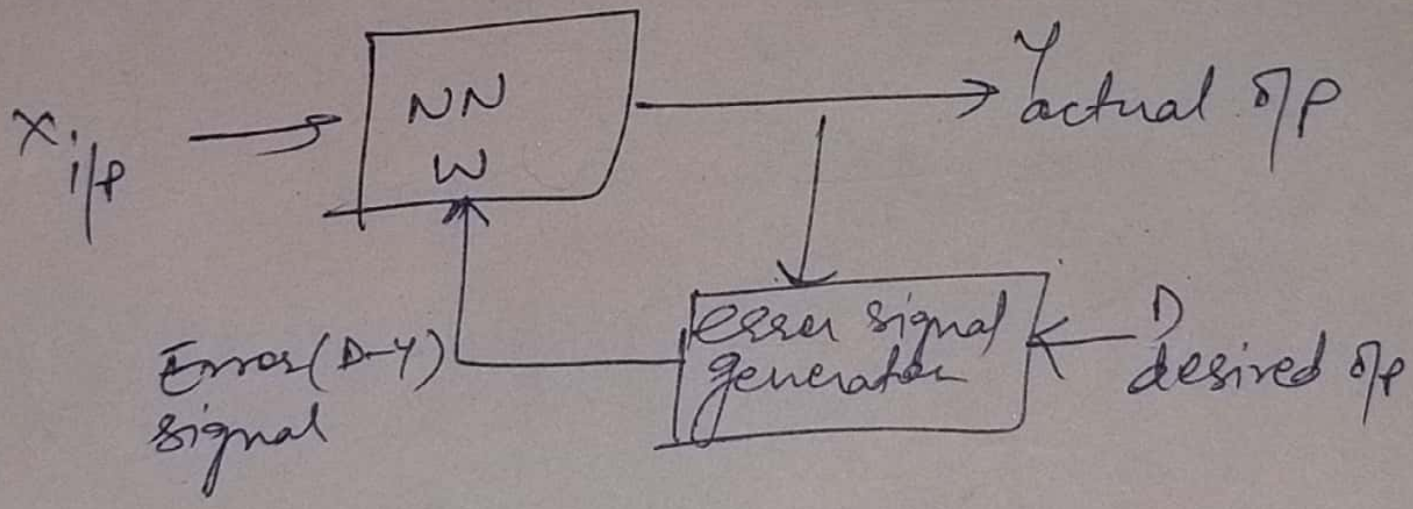


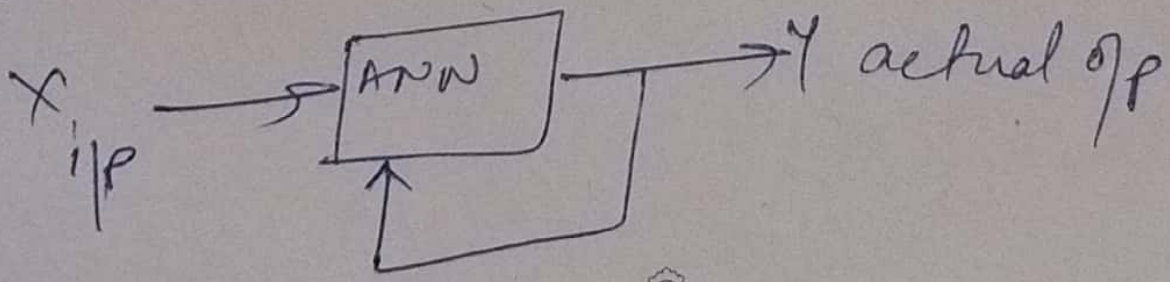

Neuron in a brain

## Learning

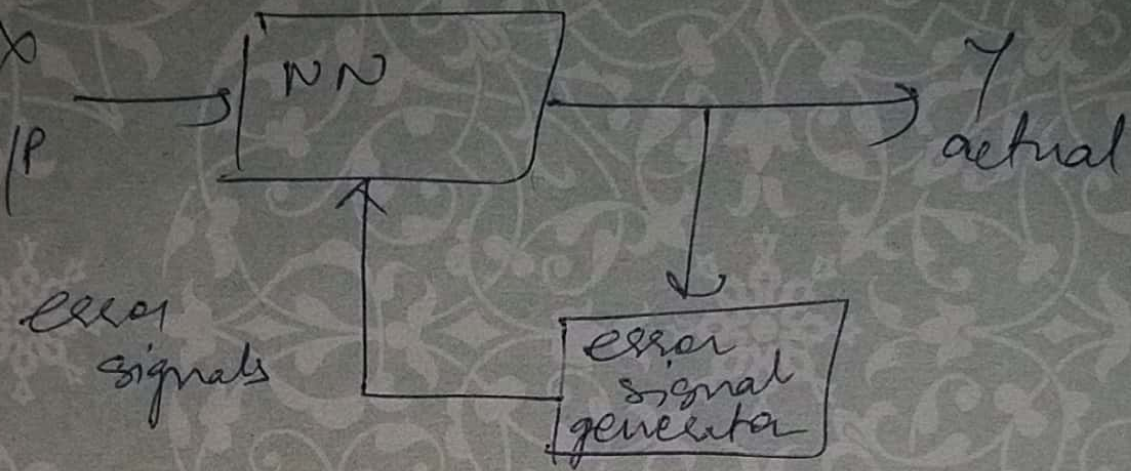
### (1.) Supervised




### (2.) Unsupervised



(3) Reinforcement




Activation functions

(1) Identity fnc'n $f(x) = x$ for all $x$

(2) Binary step fnc'n $f(x) = \begin{cases} 1 & \text{if } x \geq \theta \\ 0 & x < \theta \end{cases}$

(3) Bipolar step fnc'n $f(x) = \begin{cases} 1 & \text{if } x \geq \theta \\ -1 & x < \theta \end{cases}$

(4) Sigmoidal fnc

↳ Binary / Unipolar $f(x) = \frac{1}{1+e^{-\lambda x}}$

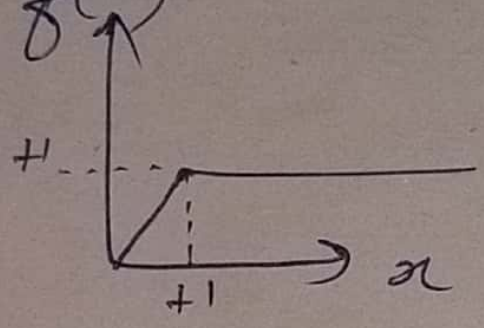
$\lambda$ is steepness fnc'n.

$f'(x) = \lambda f(x)[1 - f(x)]$

4. Bipolar $f(x) = \frac{2}{1+e^{-\lambda x}} - 1$

$$f'(x) = \frac{1}{2}[1+f(x)][1-f(x)]$$

5. Ramp fun'n $f(x) = \begin{cases} 1 & x > 1 \\ x & 0 \le x \le 1 \\ 0 & x < 0 \end{cases}$




Bias : $b_0 / w_0$

$$y = b_0 + \sum x_i w_i$$

Learning Rate : $\alpha$ : control weight adjustment. Range from 0 to 1.