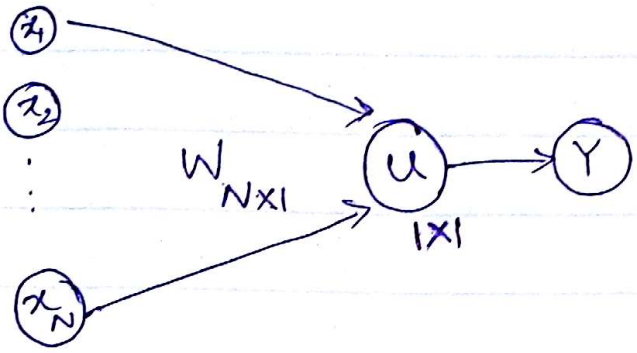
Single Unit Neural network



$$u = X_{V\times N}\, W_{N\times 1}$$

$$Y_{V\times 1} = \text{sigmoid}(u)$$

$$\text{Error, } E = \frac{1}{2}(Y-T)^2 \quad \text{[Mean squared error]}$$

where T is the actual output vector of size $V\times 1$

Now, lets find the update equation for W.

$$W^{new} = W^{old} - \eta \frac{\partial E}{\partial W}$$

or

$$W_{n+1} = W_n - \eta \frac{\partial E}{\partial W}$$ (η is step size and is a small value)

$$\frac{\partial E}{\partial W} = \frac{\partial E}{\partial Y}\frac{\partial Y}{\partial u}\frac{\partial u}{\partial W}$$

$$\frac{\partial E}{\partial W} = (Y-T)\,Y(1-Y)\,X$$

$$\boxed{W_{n+1} = W_n - \eta\left[(Y-T)(1-Y)Y\right]X}$$