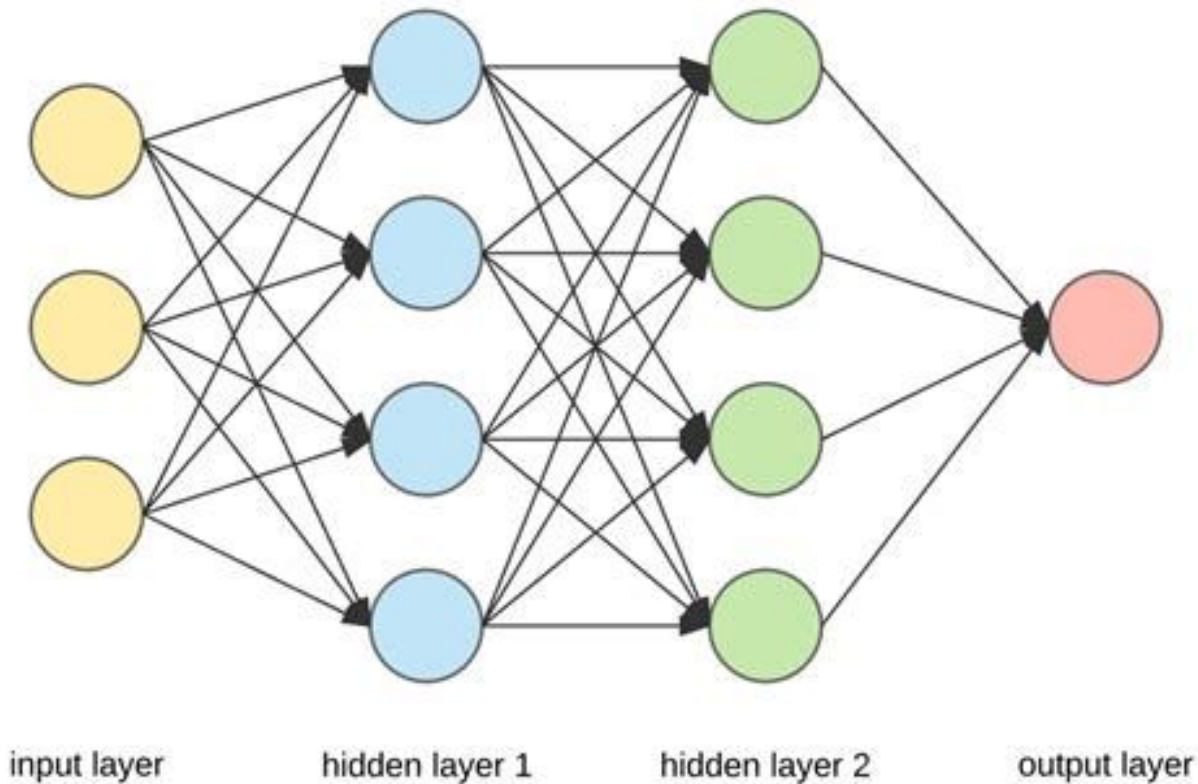
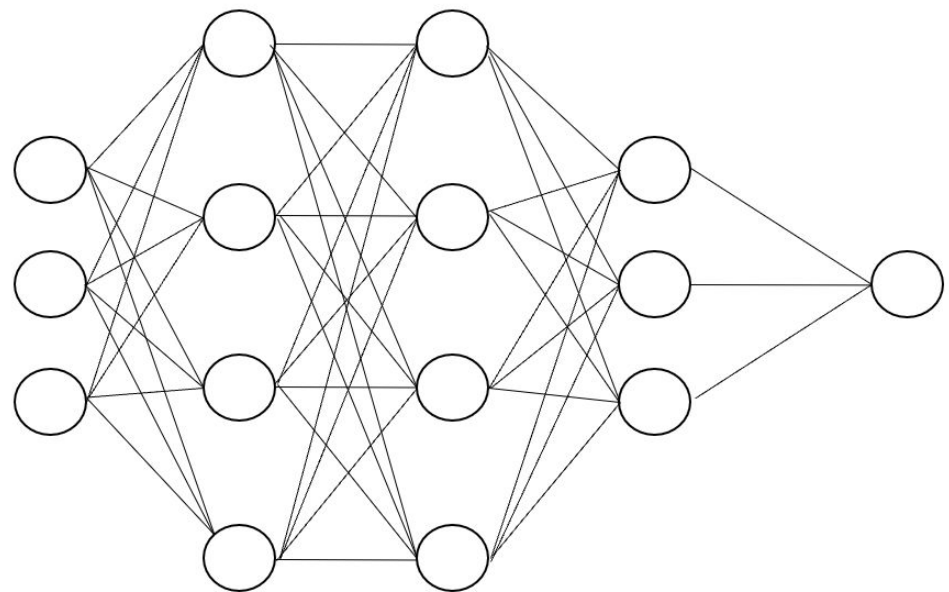


PULL IT ALL TOGETHER

**Dr. Ernesto Lee**

# NEURAL NETWORKS





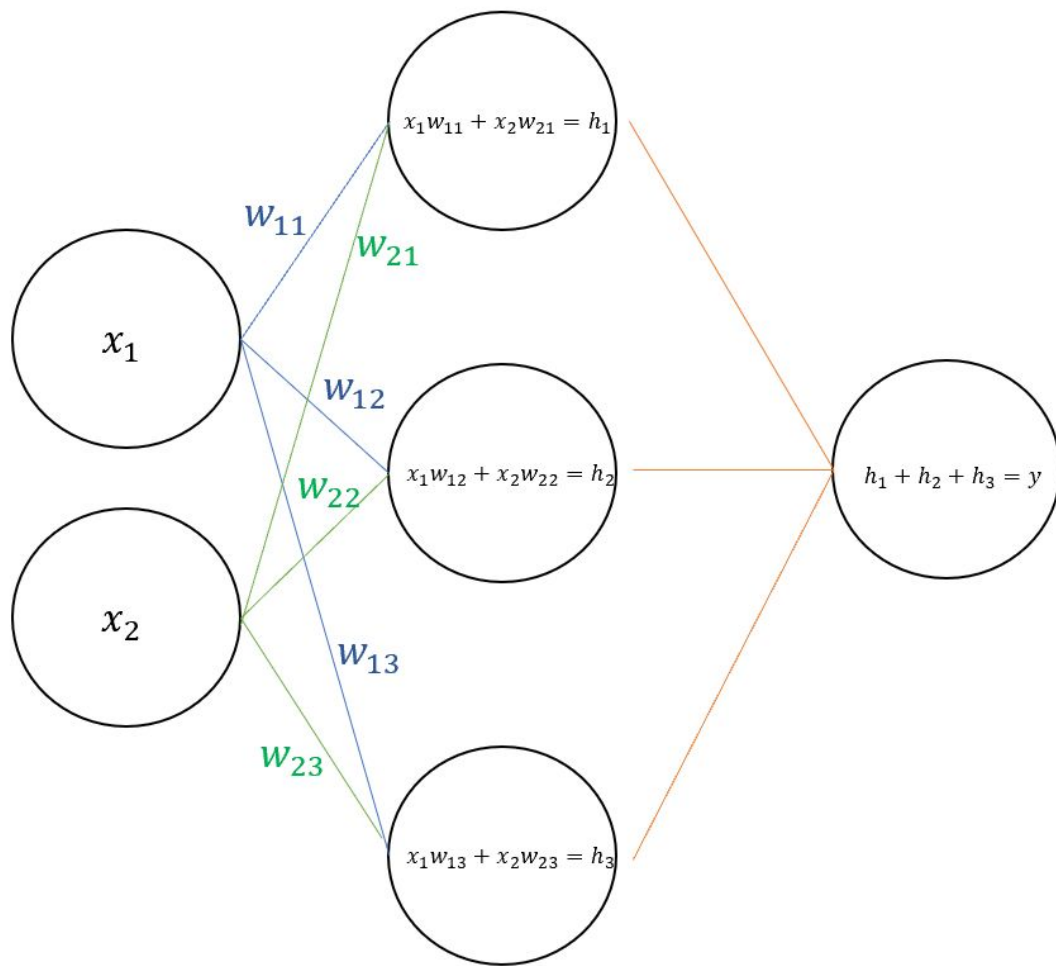
Input  
Layer

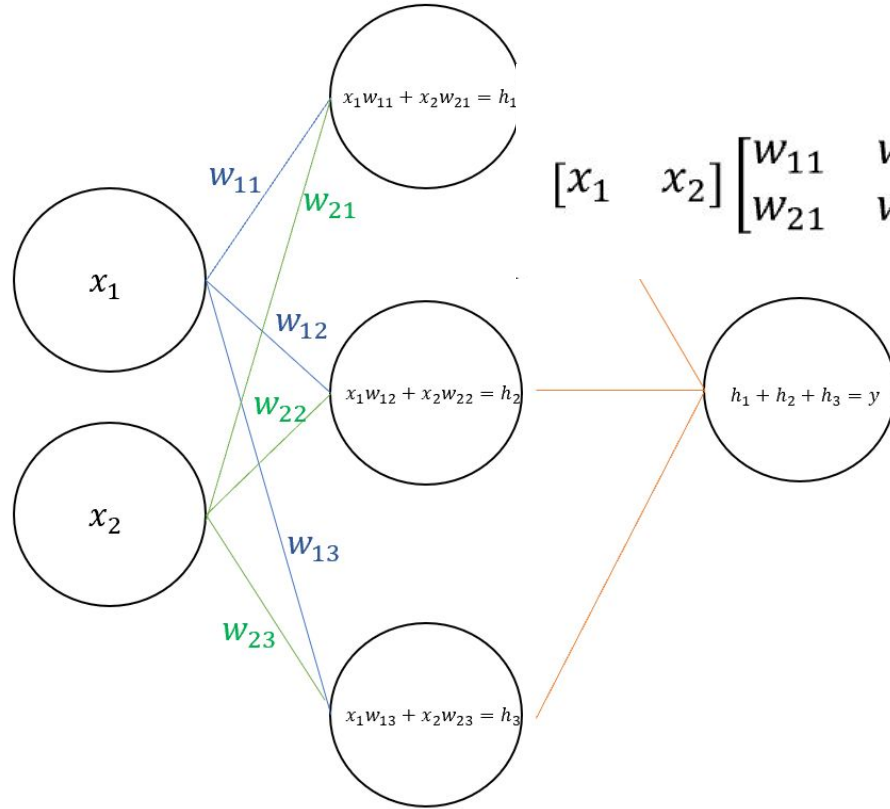


Hidden Layers

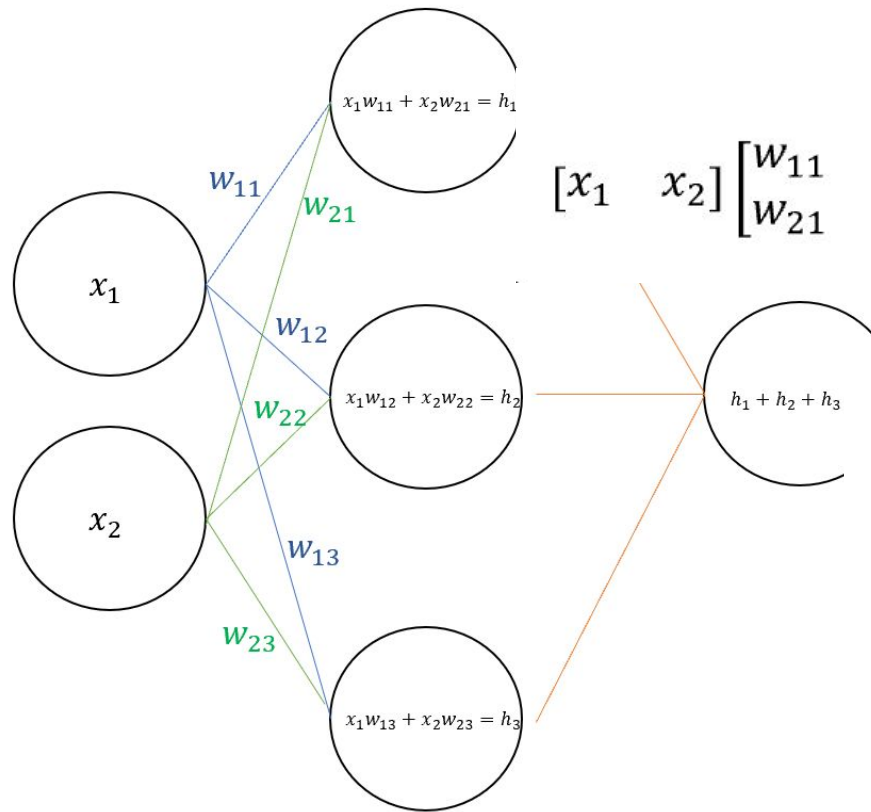


Output  
Layer





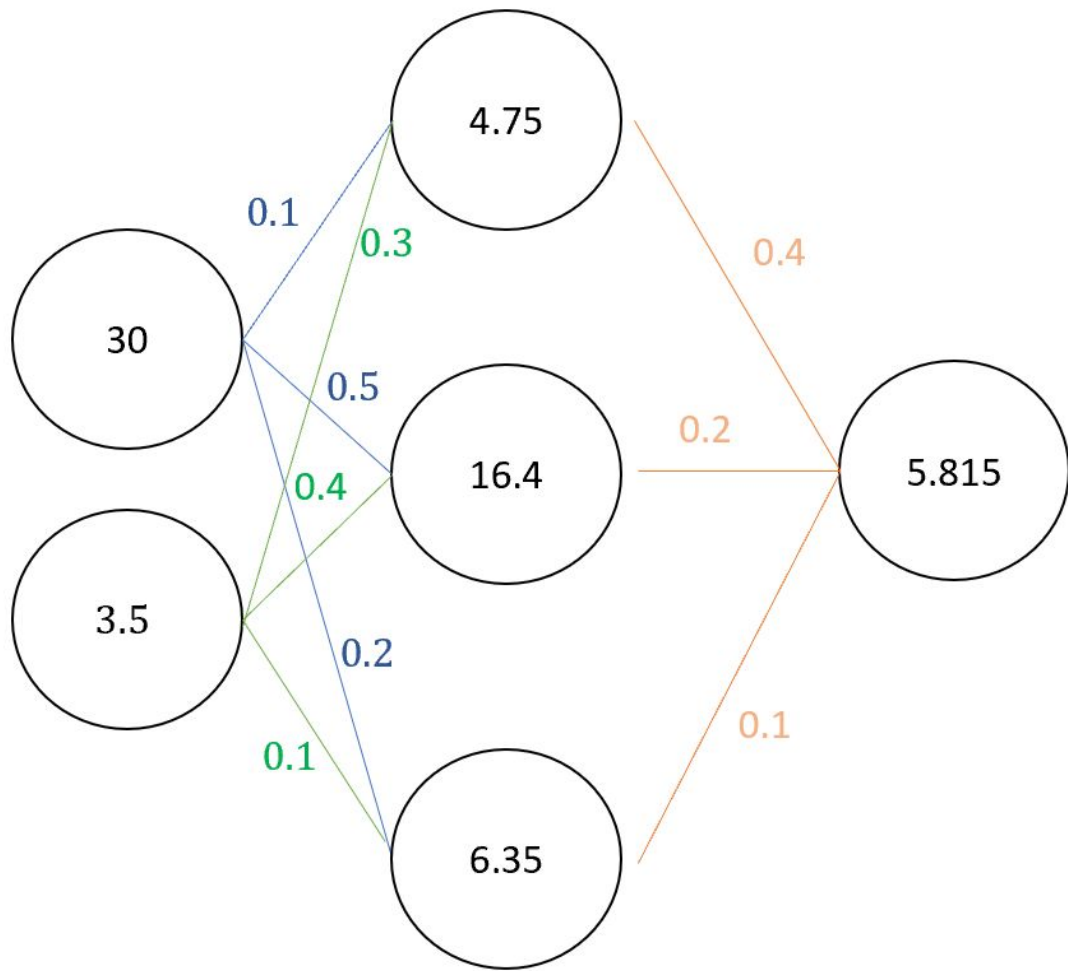
$$\begin{bmatrix} x_1 & x_2 \end{bmatrix} \begin{bmatrix} w_{11} & w_{12} & w_{13} \\ w_{21} & w_{22} & w_{23} \end{bmatrix} = \begin{bmatrix} x_1 w_{11} + x_2 w_{21} \\ x_1 w_{12} + x_2 w_{22} \\ x_1 w_{13} + x_2 w_{23} \end{bmatrix}' = \begin{bmatrix} h_1 \\ h_2 \\ h_3 \end{bmatrix}'$$



$$\begin{bmatrix} x_1 & x_2 \end{bmatrix} \begin{bmatrix} w_{11} & w_{12} & w_{13} \\ w_{21} & w_{22} & w_{23} \end{bmatrix} = \begin{bmatrix} x_1 w_{11} + x_2 w_{21} \\ x_1 w_{12} + x_2 w_{22} \\ x_1 w_{13} + x_2 w_{23} \end{bmatrix}' = \begin{bmatrix} h_1 \\ h_2 \\ h_3 \end{bmatrix}'$$

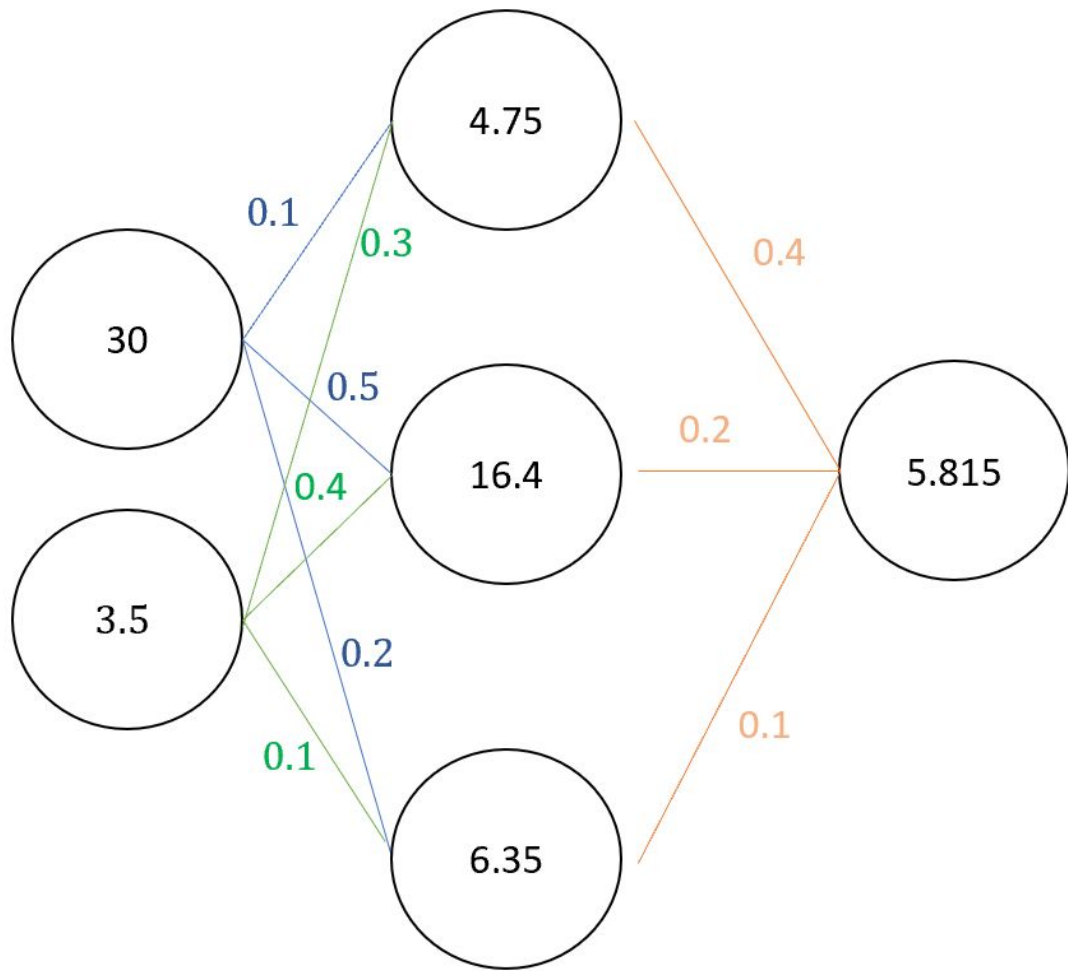
$$\begin{bmatrix} h_1 \\ h_2 \\ h_3 \end{bmatrix}' \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = h_1 + h_2 + h_3 = y$$

Hours of study	GPA	Exam result
30	3.5	'pass'
12	2	'fail'
10	2.2	'fail'
34	4	'pass'

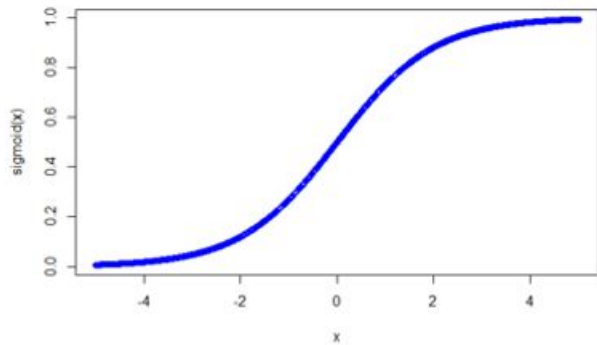


Hours of study	GPA	Exam result
30	3.5	'pass'
12	2	'fail'
10	2.2	'fail'
34	4	'pass'

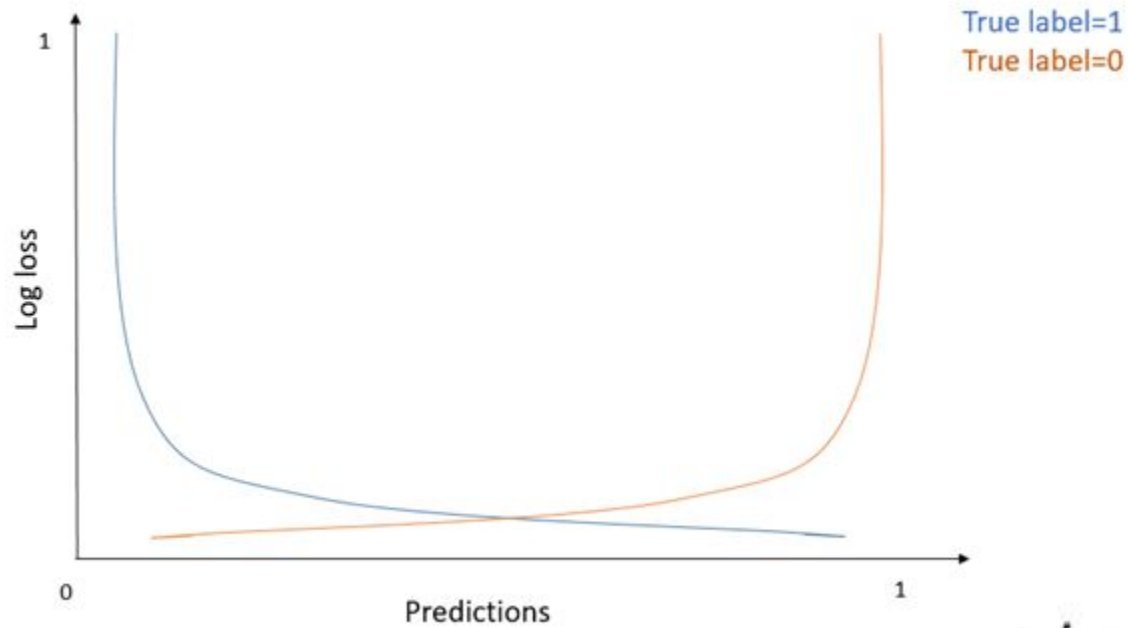




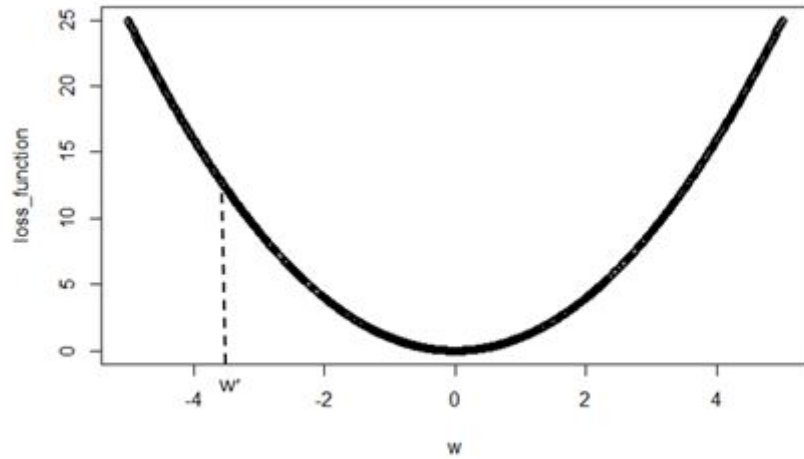
Hours of study	GPA	Exam result
30	3.5	'pass'
12	2	'fail'
10	2.2	'fail'
34	4	'pass'



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



$$w'_i = w_i - \frac{\delta L}{\delta w_i}$$



$$w'_i = w_i - \frac{\delta L}{\delta w_i}$$

