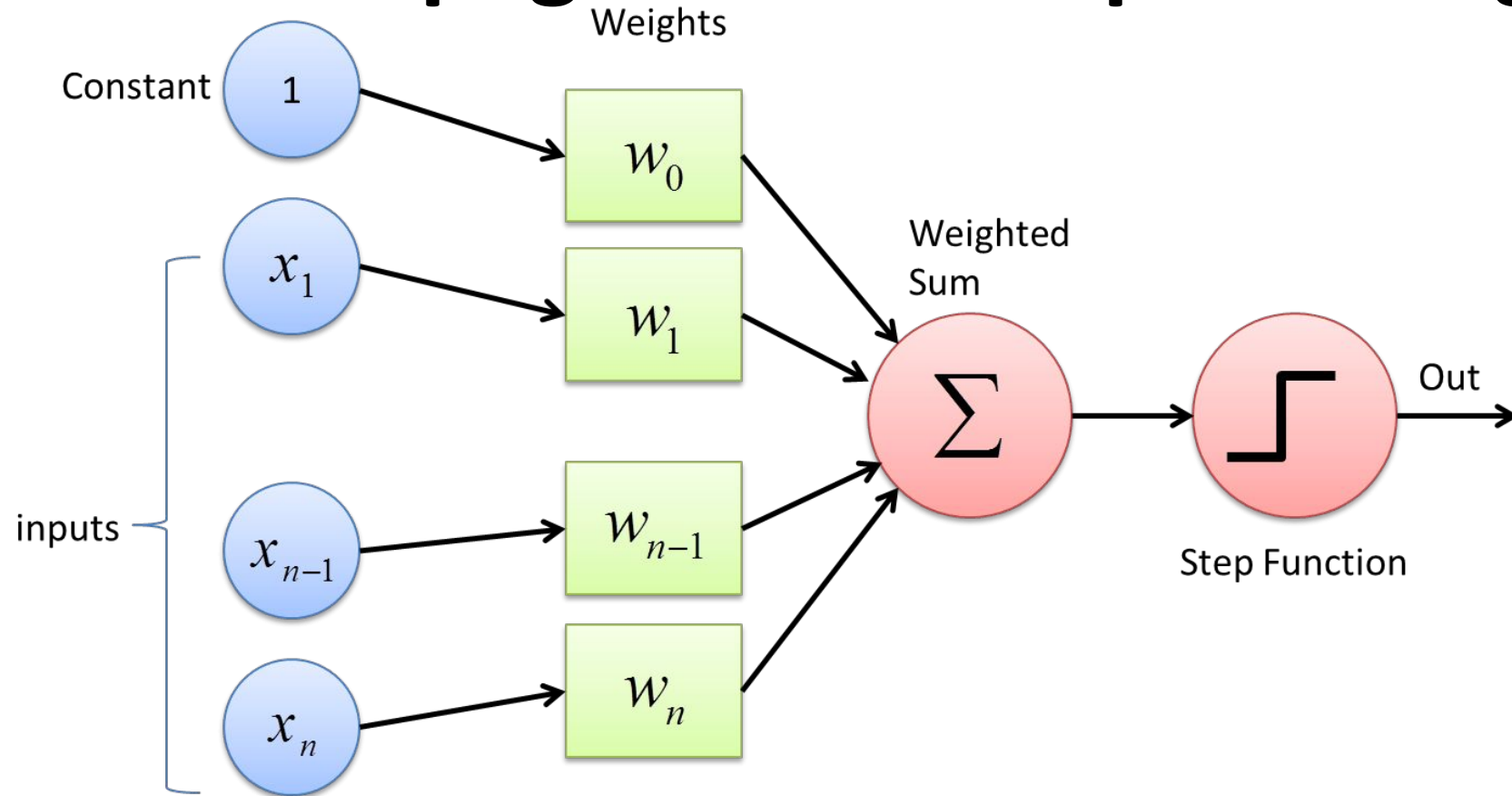# *Deep Learning from Scratch*

Theory + Practical

How Neural Network Work
and
Back Propagation in deep learning

How Neural Network Work with many neurons

Area (feet²) X_1

Bedrooms X_2

Distance to city (Miles) X_3

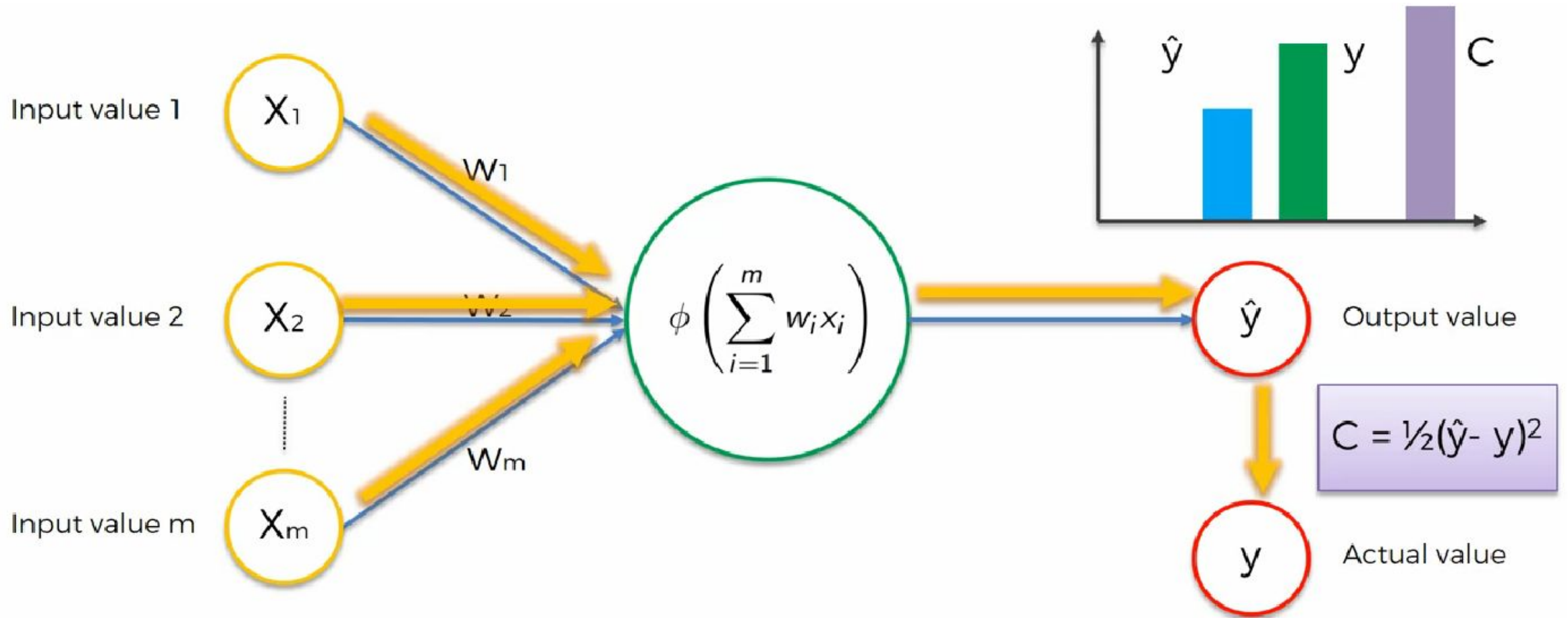Age X_4

y

Input Layer

Hidden Layer

Output Layer

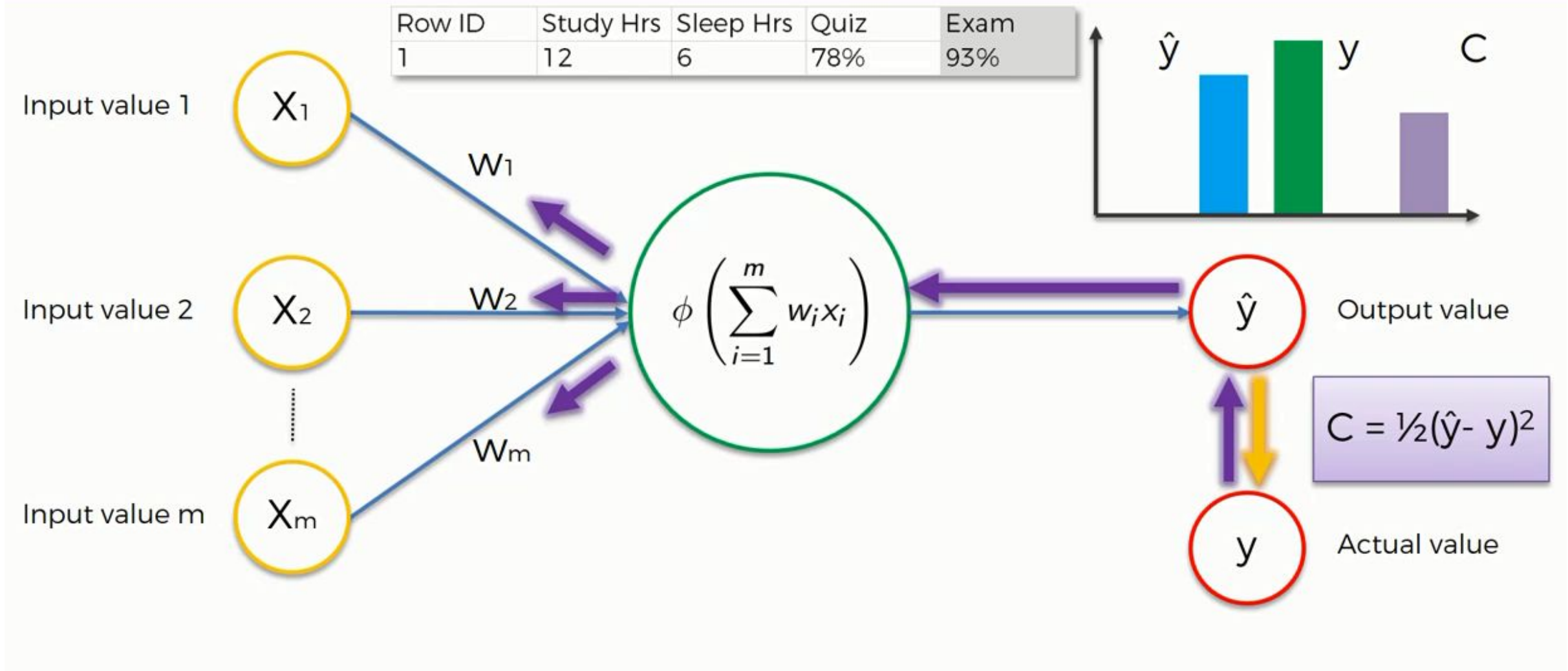# Back Propagation in deep learning

Back-propagation is the essence of neural net training. It is the method of fine-tuning the weights of a neural net based on the error rate obtained in the previous epoch (i.e., iteration). Proper tuning of the weights allows you to reduce error rates and to make the model reliable by increasing its generalization.

Backpropagation is a short form for "backward propagation of errors." It is a standard method of training artificial neural networks. This method helps to calculate the gradient of a loss function with respects to all the weights in the network.
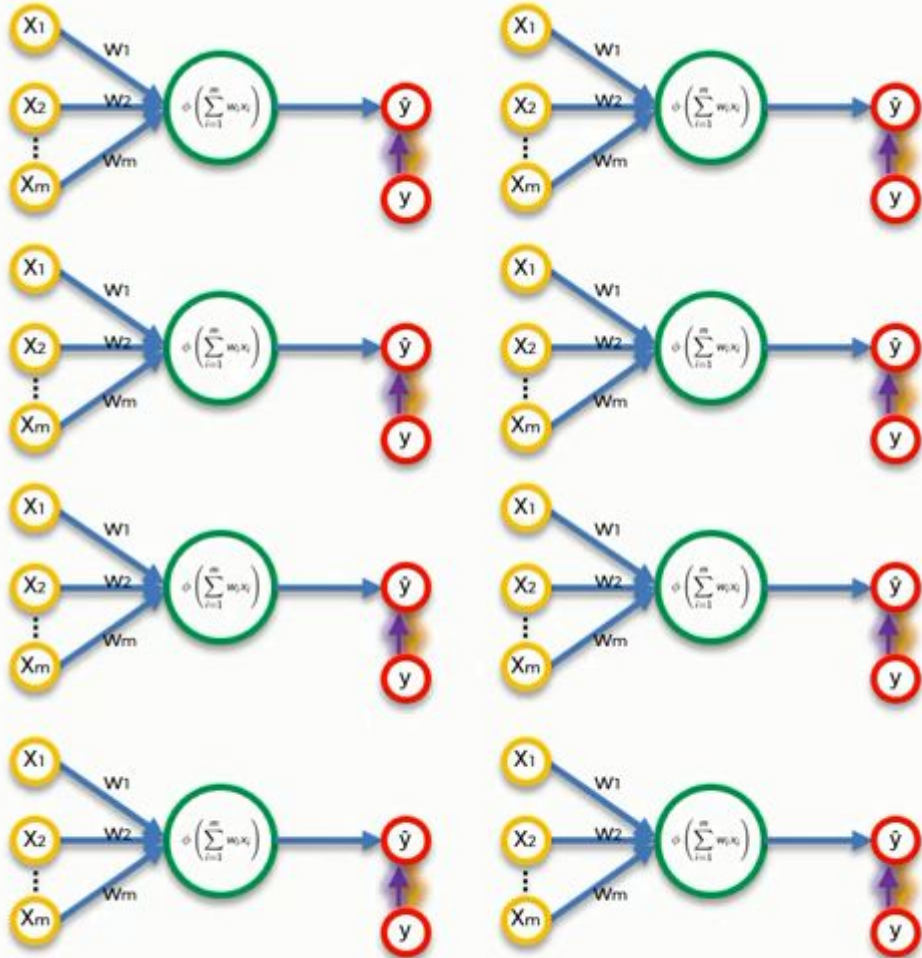
Back Propagation in deep learning

Input value 1 X_1

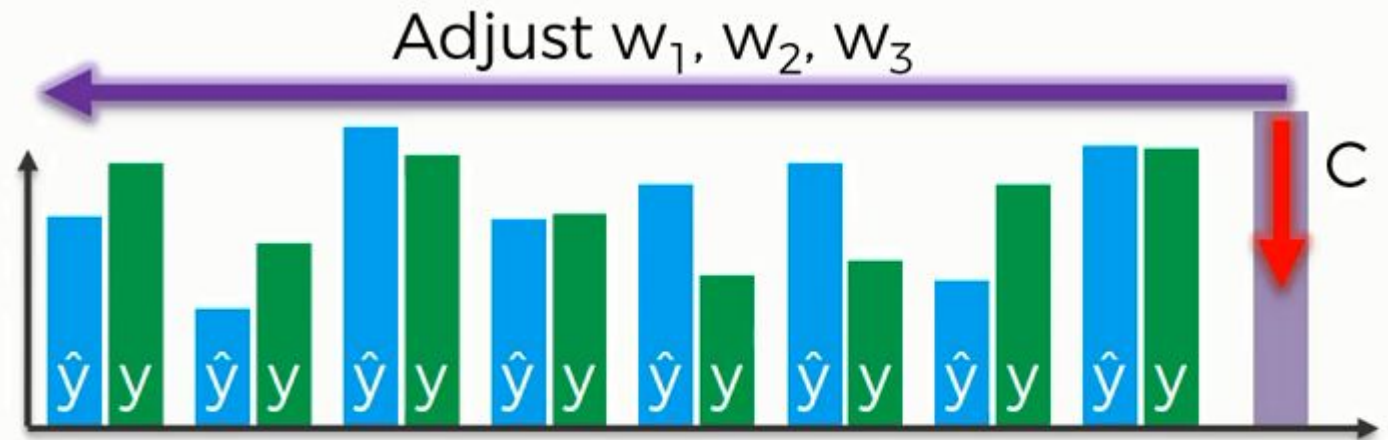Input value 2 X_2

Input value m X_m

W_1

W_2

W_m

$\phi \left(\sum_{i=1}^{m} w_i x_i \right)$

$\hat{y}$ Output value

y Actual value

$\hat{y}$ y C

$C = \frac{1}{2}(\hat{y} - y)^2$

Back Propagation in deep learning

Back Propagation in deep learning (epoch)

Row ID	Study Hrs	Sleep Hrs	Quiz	Exam
1	12	6	78%	93%
2	22	6.5	24%	68%
3	115	4	100%	95%
4	31	9	67%	75%
5	0	10	58%	51%
6	5	8	78%	60%
7	92	6	82%	89%
8	57	8	91%	97%

$$C = \sum \tfrac{1}{2}(\hat{y} - y)^2$$

Adjust w_1, w_2, w_3

C

For further assistance
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https://stats.stackexchange.com/questions/154879/a-list-of-cost-functions-used-in-neural-networks-alongside-applications