

AI + ML Exam

12/02/21

4 a) The weights allow the neuron to learn from examples.

Excitatory connections have positive weights.

Inhibitory connections have negative weights.

Activity is calculated using a weighted summation of the input signals.

Learning is achieved through modifying the connection weights only (including Bias) with gradient descent.

4 b)

$$\begin{aligned} \text{i)} \quad y &= (0.9 \times 0.4) + (0.8 \times -0.2) + (-0.12 \times 0.12) \\ &\quad + 0.3 \\ &= 0.36 - 0.16 - 0.0144 + 0.3 \\ &= 0.4856 \end{aligned}$$

$$\phi(y) = \max\{0, 0.4856\} = \underline{0.4856}$$

ii)

$$\phi(0.4856) = \text{sigmoid}(0.4856)$$

$$= \frac{1}{1 + e^{-0.4856}}$$

$$= \underline{0.619}$$

4 c) The 'Dying ReLU' Problem occurs because the gradient is zero when $x < 0$.
As there is no gradient it can't learn using gradient descent.
This can be alleviated by using leaky ReLU which has a slight gradient when $x < 0$.