

Neural Network exercise solution

$$\text{input } x = [1 \ 1]$$

first hidden layer :

$$[1 \ 1] \times \begin{bmatrix} -0.5 & 0.4 & 0.3 & 0.5 \\ 0.1 & -0.4 & 0.1 & -0.1 \end{bmatrix}$$

$$= [-0.4 \quad 0 \quad 0.4 \quad 0.4]$$

add the bias vector : $+ [0 \ -0.1 \ 0.1 \ 0]$

$$= [-0.4 \ -0.1 \ 0.5 \ 0.4]$$

apply ReLU
 \rightarrow

$$[0 \quad 0 \quad 0.5 \quad 0.4]$$

This is the output of the first hidden layer.

Second hidden layer:

$$[0 \quad 0 \quad 0.5 \quad 0.4] \times \begin{bmatrix} 1 & 0 & 1 \\ 0 & -1 & 1 \\ 0 & -1 & 0 \\ 1 & 0 & -1 \end{bmatrix}$$

$$= [0.4 \quad -0.5 \quad -0.4]$$

$$\text{add bias} + [0 \quad -1 \quad 1] = [0.4 \quad -1.5 \quad 0.6]$$

$$\xrightarrow{\text{apply ReLU}} = [0.4 \quad 0 \quad 0.6]$$

This is the output of the second hidden layer.

Output layer:

$$[0.4 \quad 0 \quad 0.6] \times \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix} = [1] \quad \begin{matrix} \text{add bias} \\ + [1] \end{matrix} = [2]$$

The output layer does not have an activation function. So the output of the NN is equal to 2.