Practice Problem 7

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Problem 1 — Show the forward pass, in matrix form, of the following record. How would this neural network classify the record (Class A or Class B)?

Feature1	Feature2	Class
5	10	?

Answer

The forward pass of the neural network is as follows:

$$\begin{bmatrix} A1 & A2 & 1 \end{bmatrix} \times \begin{bmatrix} 0.8 & -0.5 \\ 0.3 & 0.2 \\ 0.3 & -0.8 \end{bmatrix} = \begin{bmatrix} net_{B1} & net_{B2} \end{bmatrix}$$

$$\phi_{sign}(\begin{bmatrix} net_{B1} & net_{B2} \end{bmatrix}) \rightarrow \begin{bmatrix} B1 & B2 \end{bmatrix}$$

$$\begin{bmatrix} B1 & B2 & 1 \end{bmatrix} \times \begin{bmatrix} -0.4 & 0.7 \\ 0.4 & 0.2 \\ 0.1 & 0.7 \end{bmatrix} = \begin{bmatrix} net_{C1} & net_{C2} \end{bmatrix}$$

$$\phi_{step}(\begin{bmatrix} net_{C1} & net_{C2} \end{bmatrix}) \rightarrow \begin{bmatrix} C1 & C2 \end{bmatrix}$$

Plugging in 5 for A1 and 10 for A2, we get the following forward pass:

$$\begin{bmatrix} 5 & 10 & 1 \end{bmatrix} \times \begin{bmatrix} 0.8 & -0.5 \\ 0.3 & 0.2 \\ 0.3 & -0.8 \end{bmatrix} = \begin{bmatrix} 7.3 & -1.3 \end{bmatrix}$$

$$\phi_{sign}(\begin{bmatrix} 7.3 & -1.3 \end{bmatrix}) \rightarrow \begin{bmatrix} 1 & -1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & -1 & 1 \end{bmatrix} \times \begin{bmatrix} -0.4 & 0.7 \\ 0.4 & 0.2 \\ 0.1 & 0.7 \end{bmatrix} = \begin{bmatrix} -0.7 & 1.2 \end{bmatrix}$$

$$\phi_{step}(\begin{bmatrix} -0.7 & 1.2 \end{bmatrix}) \rightarrow \begin{bmatrix} 0 & 1 \end{bmatrix}$$

The record would be classified as Class B