Exercise RNN

Q: (i) h_1 ? (ii) y_1 ? (iii) y_2 ?

Solution $h_1 = \tanh(W_{hh} h_0 + W_{xh} x_1)$

$y_1 = W_{hy} h_1$

$$h_1 = \tanh\left(\begin{bmatrix} 0.1 & 0.2 \\ 0.3 & 0.4 \end{bmatrix}\begin{bmatrix} 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 0.5 & 0.2 \\ 0.2 & 0.1 \end{bmatrix}\begin{bmatrix} 3 \\ 4 \end{bmatrix}\right)$$

$$= \tanh\left(\begin{bmatrix} 2.3 \\ 1 \end{bmatrix}\right)$$

$$= \begin{bmatrix} 0.9801 \\ 0.7616 \end{bmatrix}$$

$1.5 + 0.8 = 2.3$

$0.6 + 0.4 = 1$

$$y_1 = \begin{bmatrix} 0.1 & 0.4 \end{bmatrix}\begin{bmatrix} 0.9801 \\ 0.7616 \end{bmatrix} = 0.40265$$

$$h_2 = \tanh\left(\begin{bmatrix} 0.1 & 0.2 \\ 0.3 & 0.4 \end{bmatrix}\begin{bmatrix} 0.9801 \\ 0.7616 \end{bmatrix} + \begin{bmatrix} 0.5 & 0.2 \\ 0.2 & 0.1 \end{bmatrix}\begin{bmatrix} 1 \\ 6 \end{bmatrix}\right)$$

$$= \tanh\left(\begin{bmatrix} 1.95033 \\ 1.39867 \end{bmatrix}\right) = \begin{bmatrix} 0.9603 \\ 0.8851 \end{bmatrix}$$

$$y_2 = \begin{bmatrix} 0.1 & 0.4 \end{bmatrix}\begin{bmatrix} 0.9603 \\ 0.8851 \end{bmatrix} = 0.4501$$