* Assignment 05 *

Q.1.] Solution:

No. of RNN units = 2

$W_x = [3, -4]$; $b_h = 0$

$W_h = \begin{bmatrix} 4 & -5 \\ -3 & 2 \end{bmatrix}$; $b_y = 10$

$h_0 = [0, 0]$

$W_y = \begin{bmatrix} -4 \\ 2 \end{bmatrix}$; $x_1 = 1, x_2 = 2, x_3 = 3$

$h_t = \tanh(W_x \cdot x_t + W_h \cdot h_{t-1} + b_h)$

$h_1 = \tanh(1 \times [3 \quad -4] + 0 + 0)$

$= [0.99505 \quad -0.99932]$

$h_2 = \tanh(2 \times [3 \quad -4] + [0.99505 \quad -0.99932] \cdot \begin{bmatrix} 4 & -5 \\ -3 & 2 \end{bmatrix} + 0)$

$= [0.99999 \quad -1]$

$h_3 = \tanh(3 \times [3 \quad -4] + [0.99999 \quad -1] \begin{bmatrix} 4 & -5 \\ -3 & 2 \end{bmatrix} + 0)$

$$= \begin{bmatrix} 1 & -1 \end{bmatrix}$$

$$\hat{y}_t = W_y \cdot h_t + b_y$$

$$\hat{y}_t = W_y \cdot h_3 + b_y$$

$$= \begin{bmatrix} 1 & -1 \end{bmatrix} \begin{bmatrix} -4 \\ 2 \end{bmatrix} + 10$$

$$= -6 + 10$$

$$\boxed{\hat{y}_t = 4}$$

Q.2.] Solution :

(I) Embedding ⟶ 72120

12020 × 6

{ input dim = vocab len } { req. output dim }

(II) Simple RNN (1) ⟶ 4544

(64 × 64) + (64 × 6) + 64

{ Recurrent weights } { No. of units × No. of feat from embed } { backprop }

(III) Simple RNN (2) ⟶ 3104

(32 × 32) + (32 × 64) + 32

{ Recurrent weights } { input weights } { backprop }

(IV) Simple RNN (3) ⟶ 784

(16 × 16) + (16 × 32) + 16

{recurrent weights} {input weights} {backprop}

(V) Dense ⟶ 408

(24 × 16) + 24

{No. of units × No. of prev. RNN layer} {backprop}

(VI) Dense (output layer) ⟶ 150

(6 × 24) + 6

{No. of o/p units × No. of prev hidden layer} {backprop}