



# NLP: Recurrent Neural Network

**Video 1:** Understanding RNN

In Air



**Suggest the game based on review.**

“This game is bad.”



# Recurrent Neural Network

# Understanding RNN

RNN processes sequences one 'time step' at a time; each word is a step



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“ **This** game is bad.”



Time step 1

# Understanding RNN

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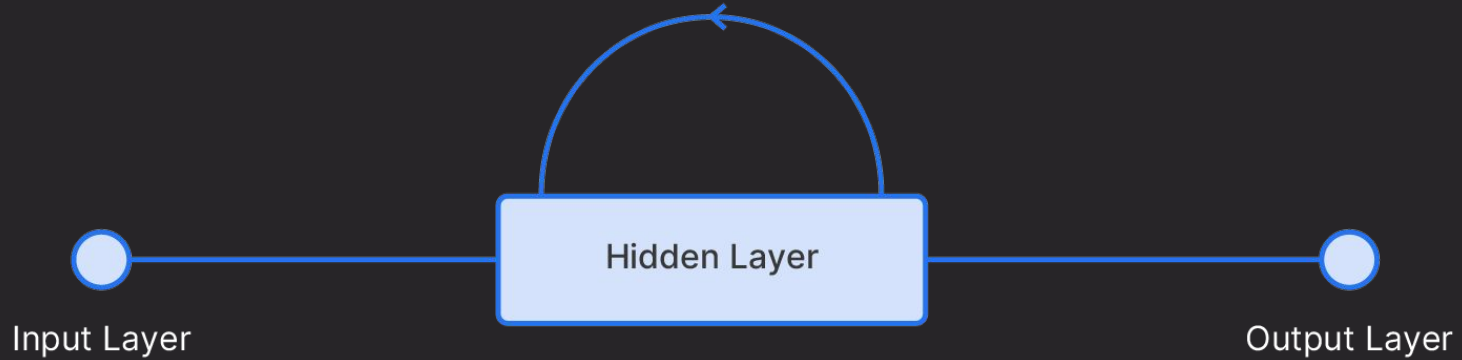
# Understanding RNN

RNN processes sequences one 'time step' at a time; each word is a step

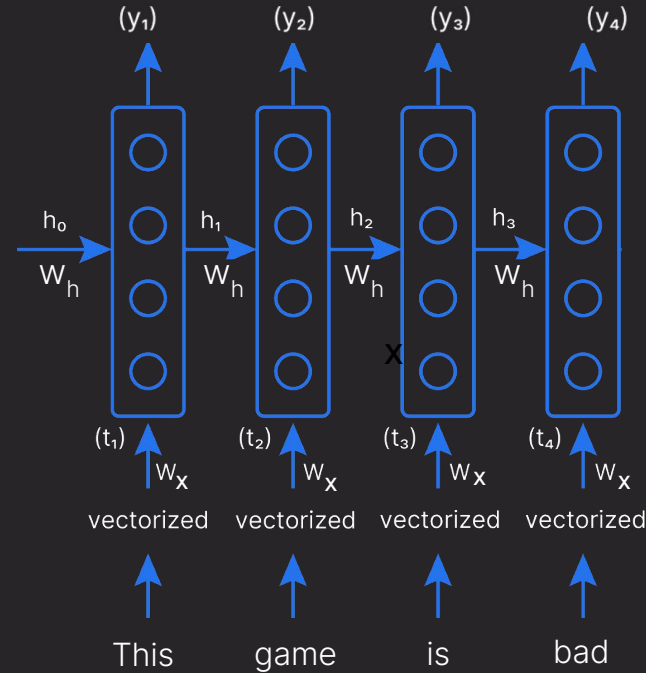
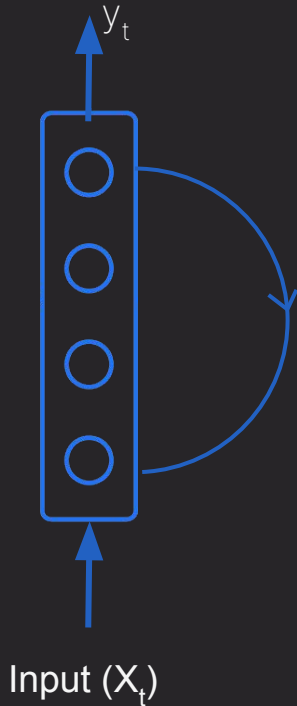




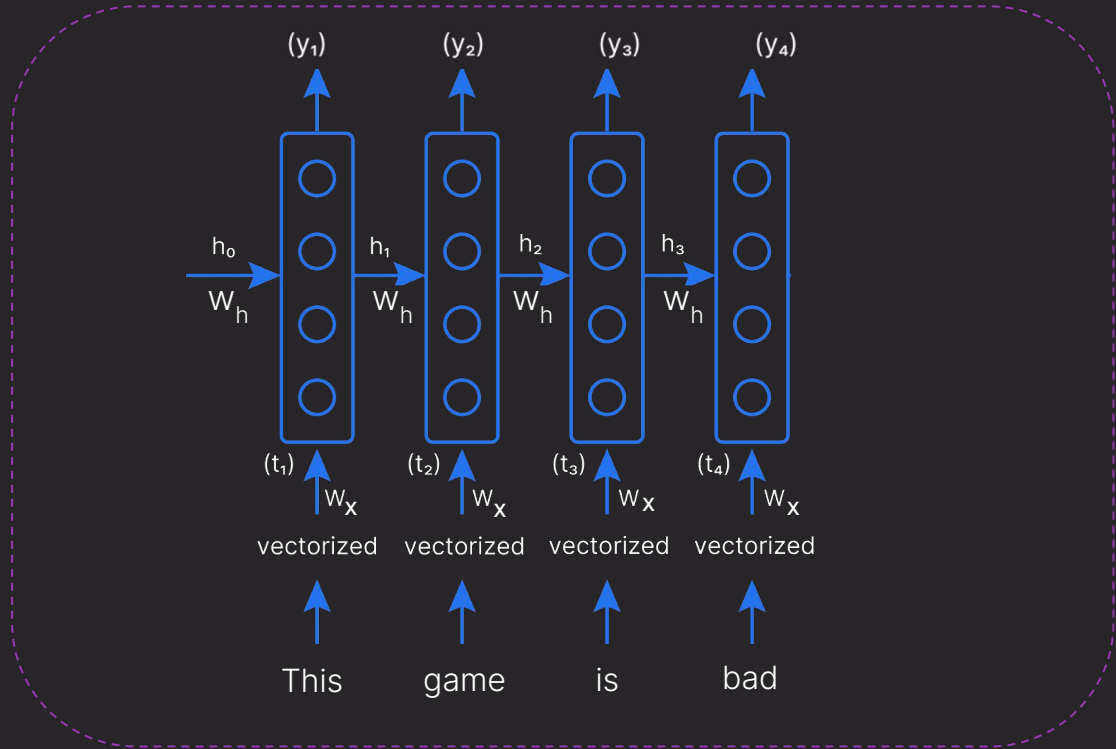
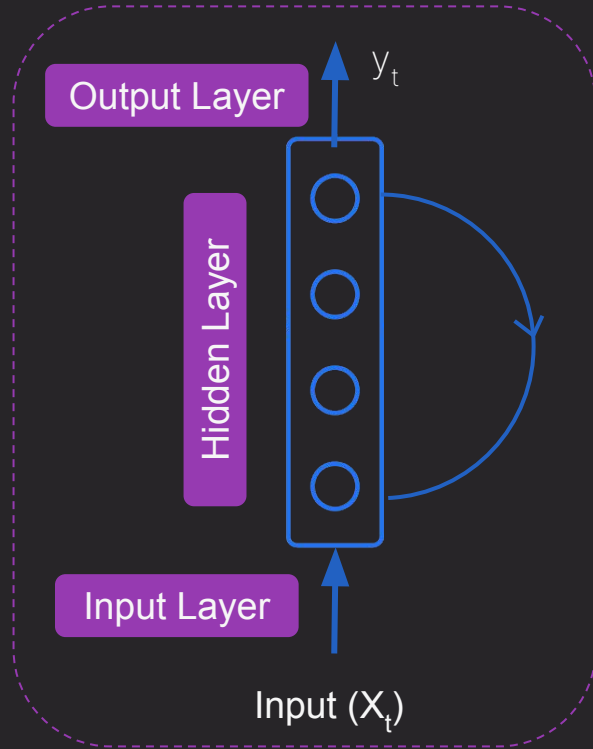
# RNN With One Hidden Layer



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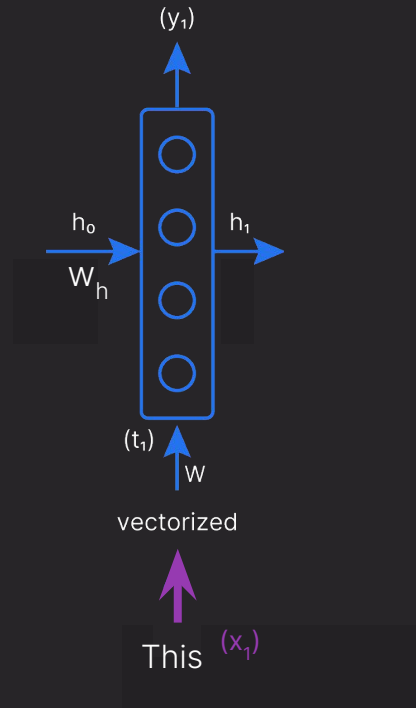


# RNN With One Hidden Layer



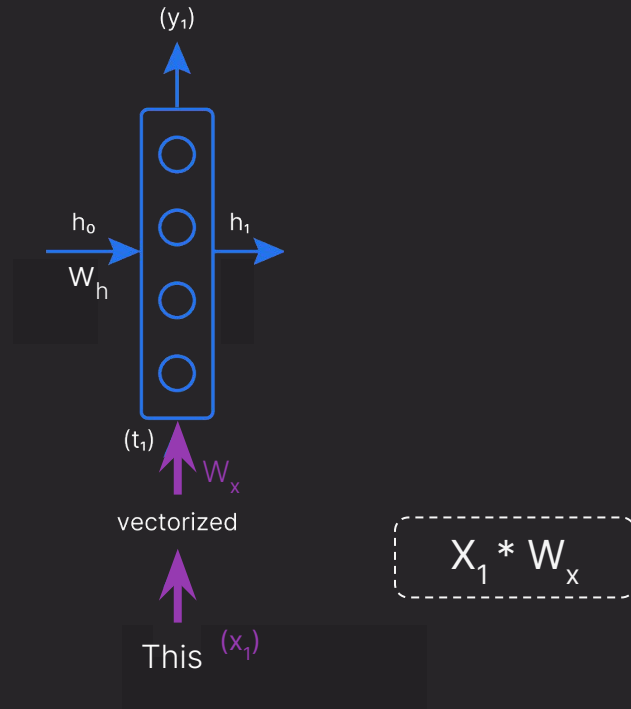
# RNN With One Hidden Layer

Time Step 1:



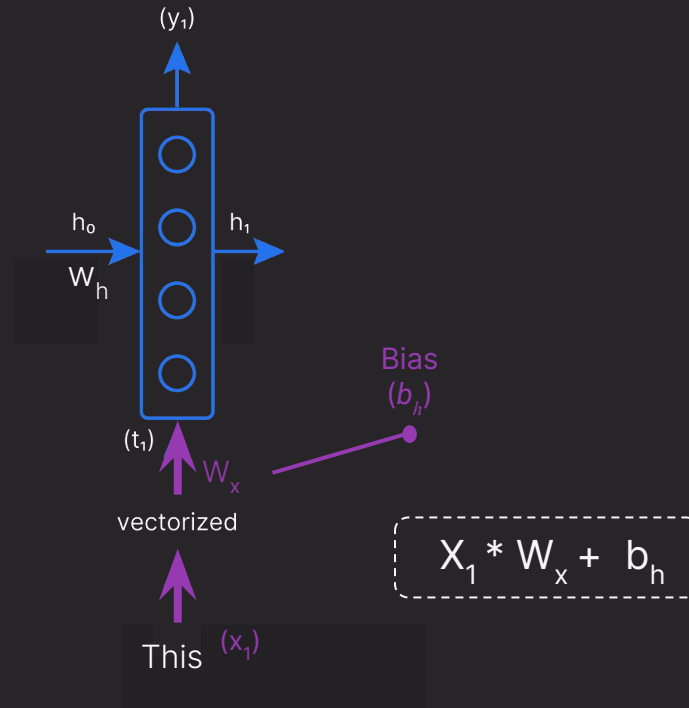
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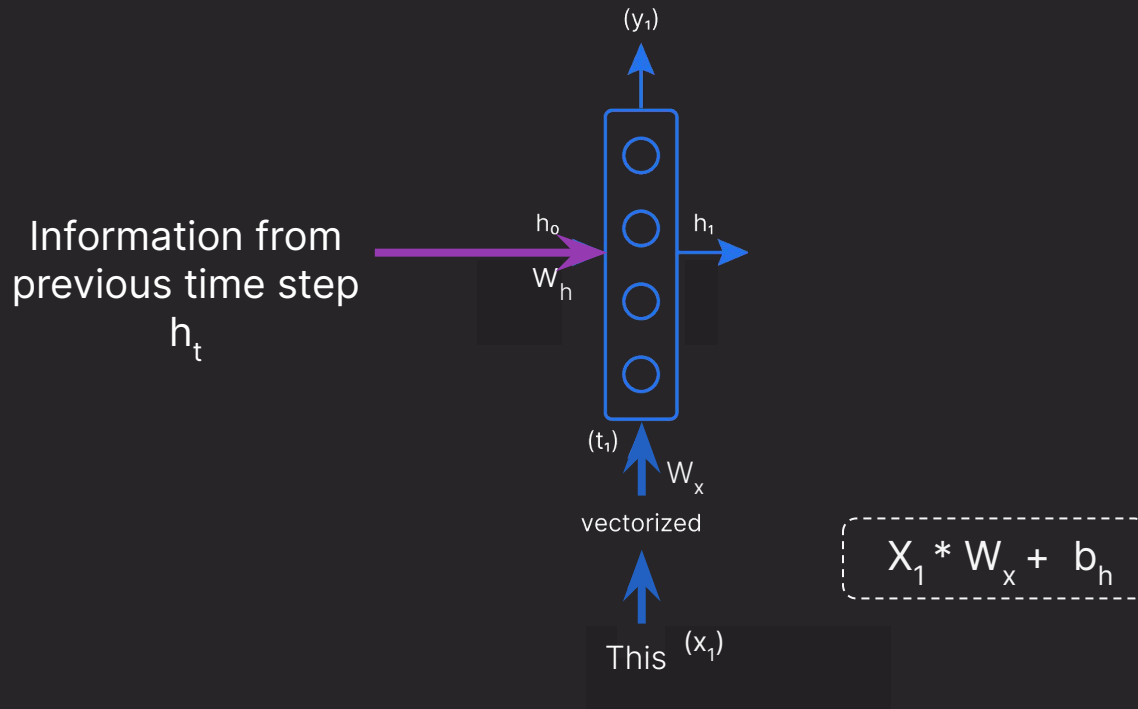
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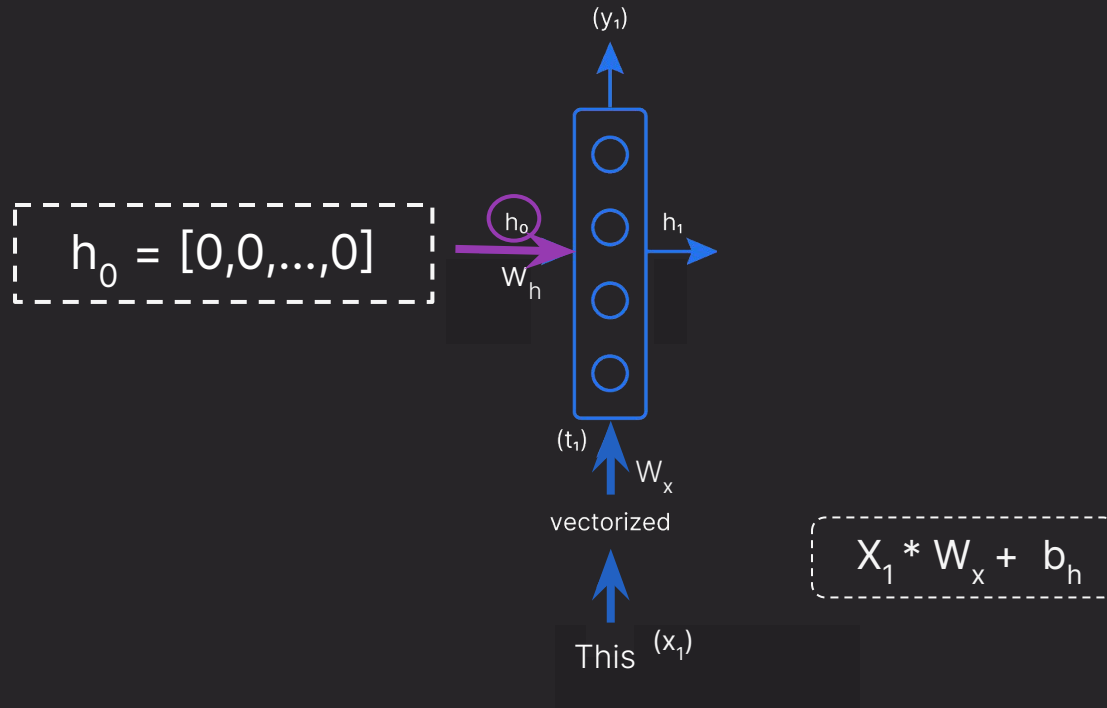
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Time Step 1:



# RNN With One Hidden Layer

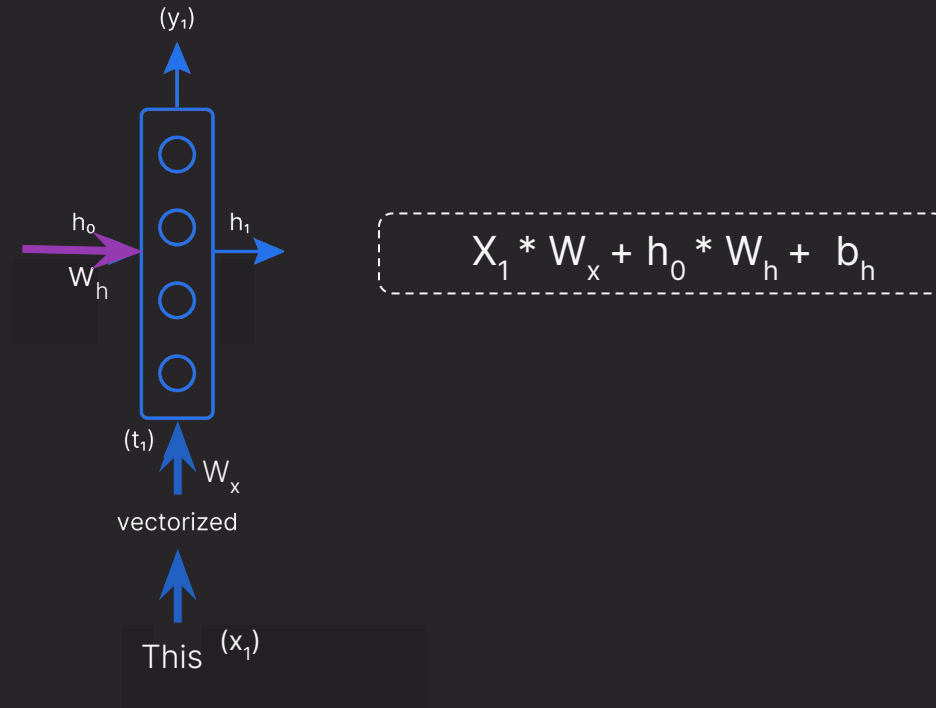
Time Step 1:





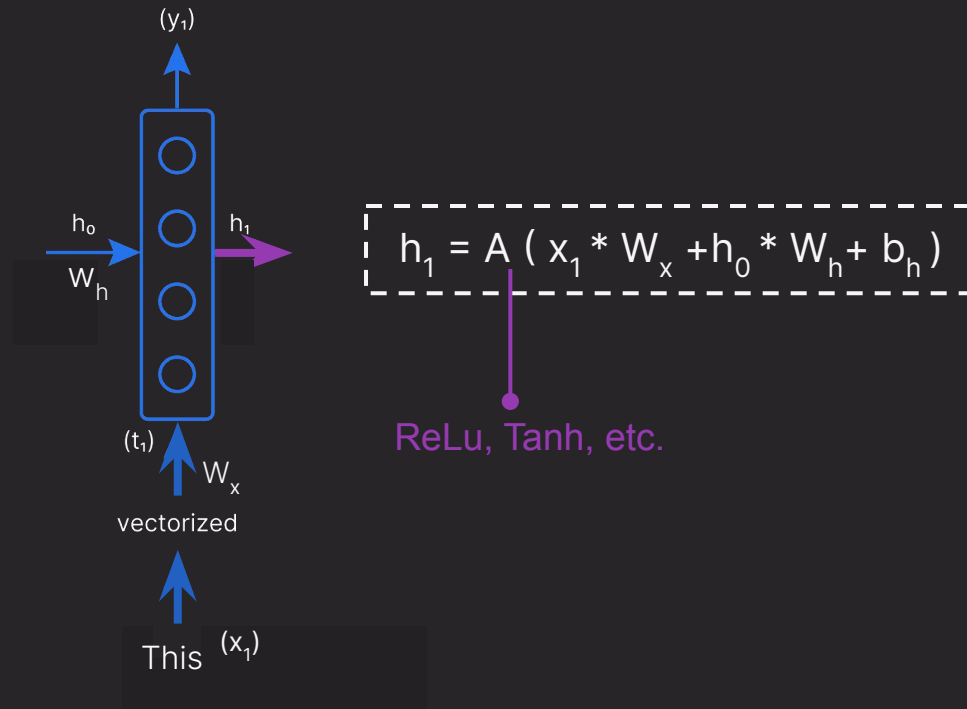
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Time Step 1:



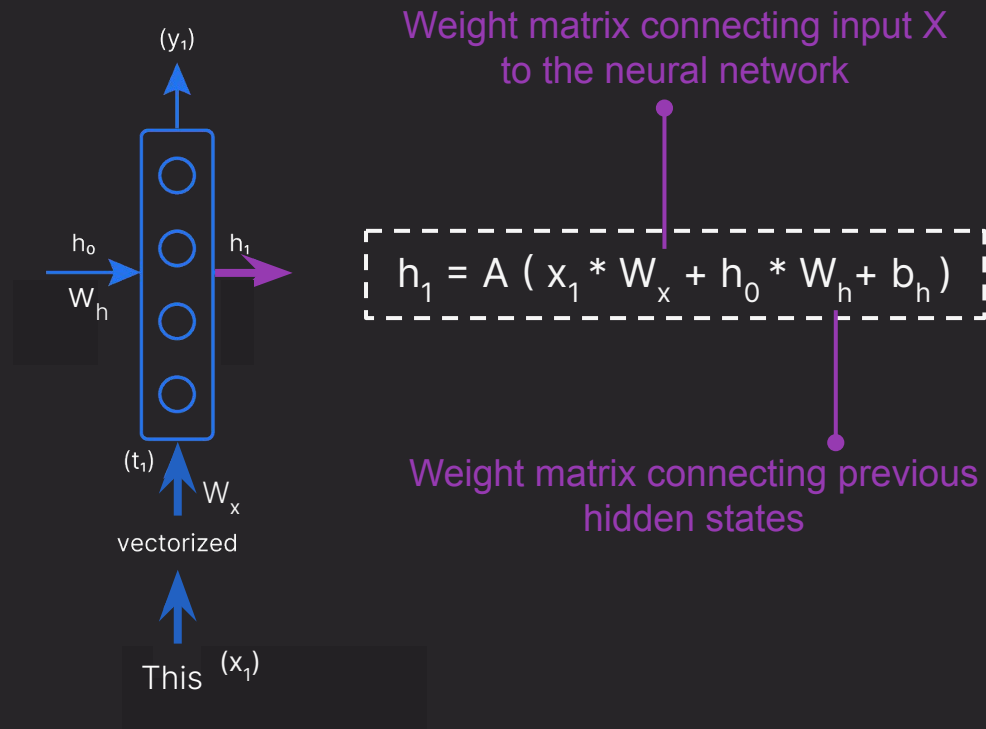
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Time Step 1:



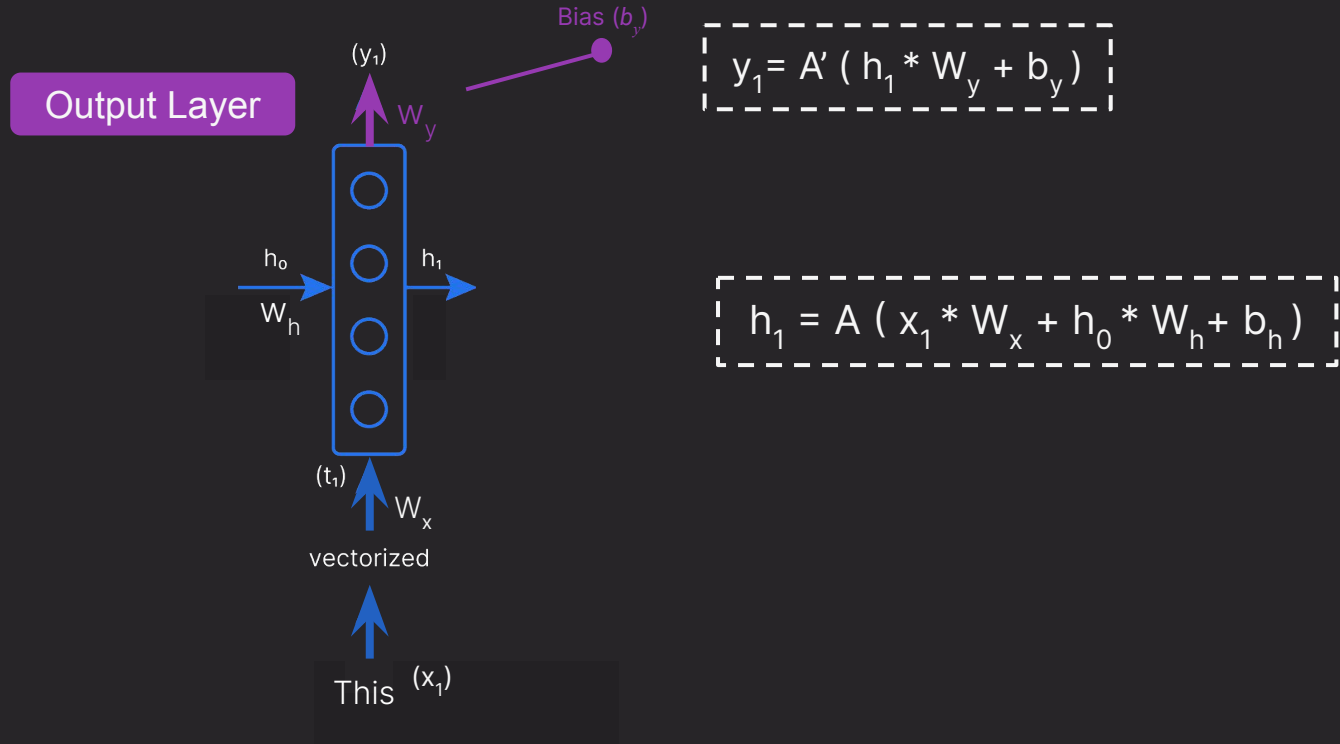
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Time Step 1:

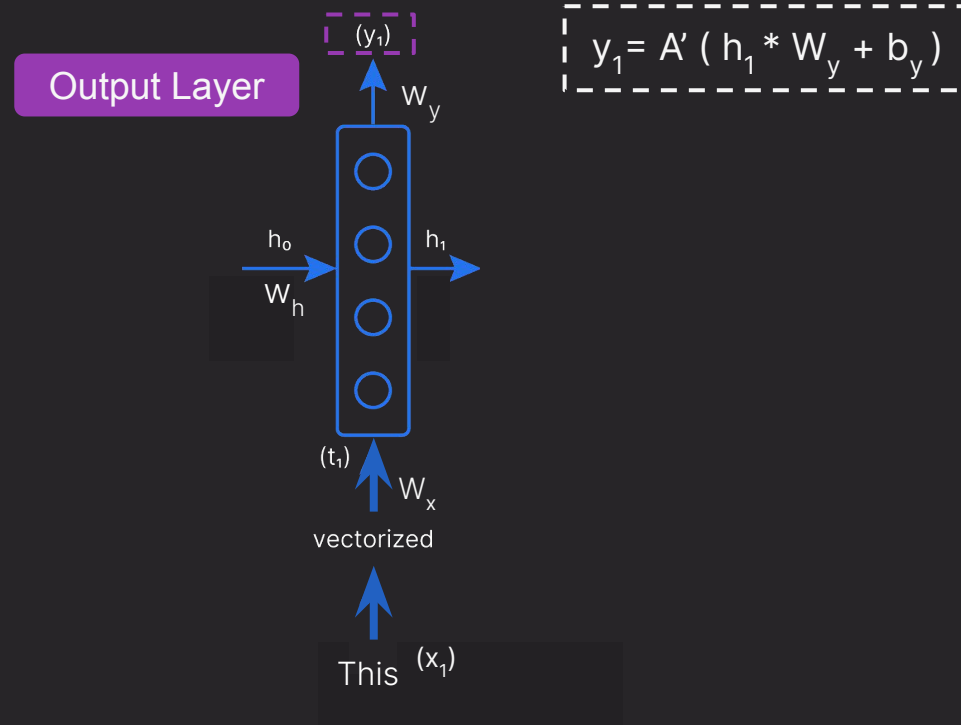


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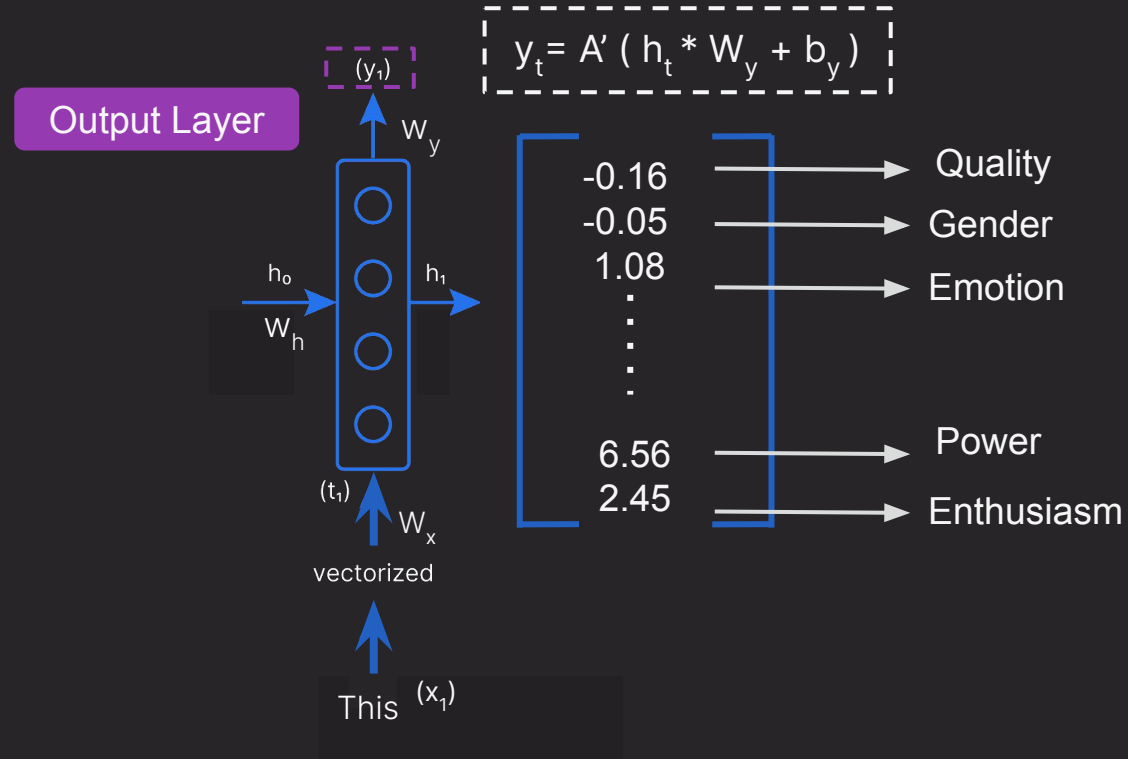
Time Step 1:



# RNN With One Hidden Layer

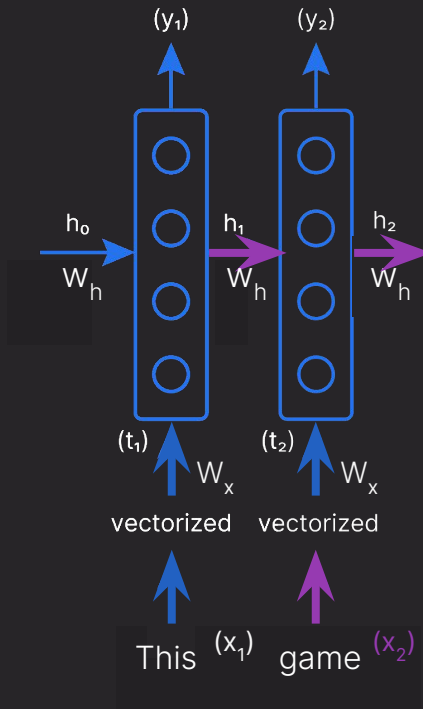


# RNN With One Hidden Layer



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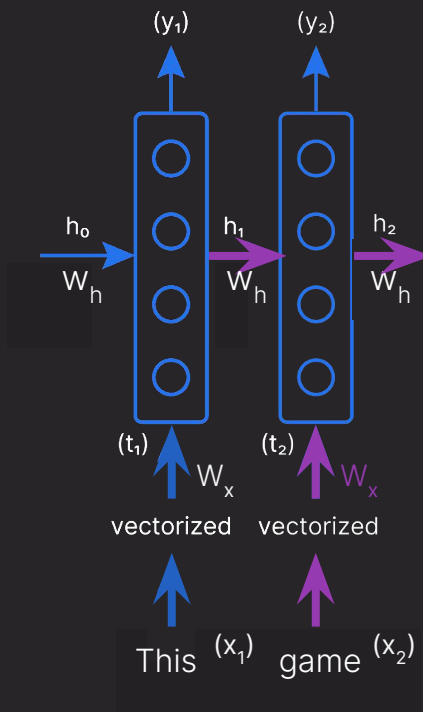
Time Step 2:



$h_2 =$

# RNN With One Hidden Layer

Time Step 2:



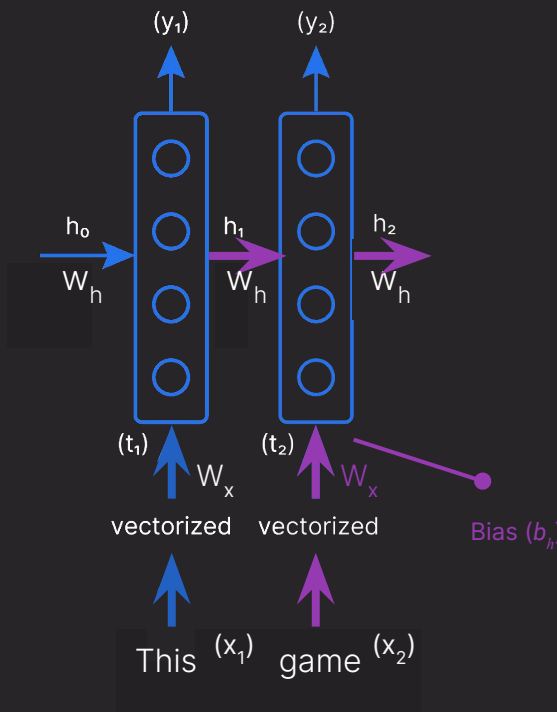
$$h_2 = X_2 * W_x$$

Weight matrix connecting input  $X$  to the neural network



# RNN With One Hidden Layer

Time Step 2:

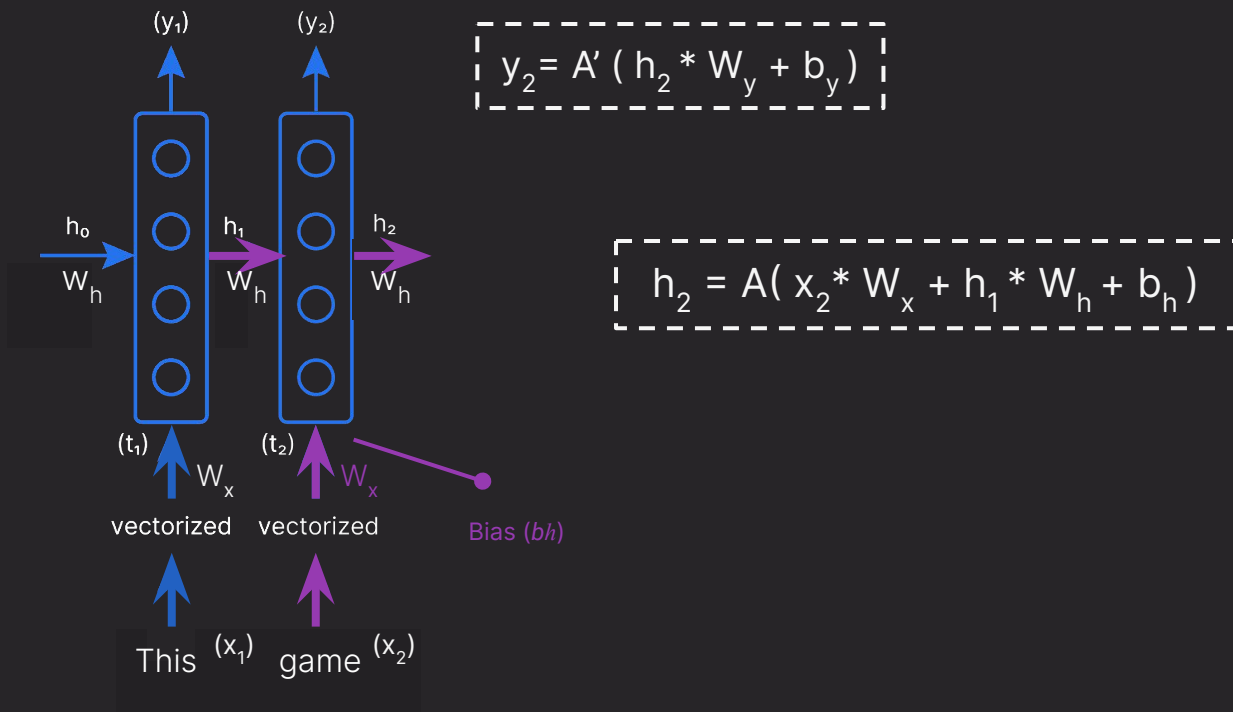


$$h_2 = A(x_2 * W_x + h_1 * W_h + b_h)$$

Weight matrix connecting previous hidden states

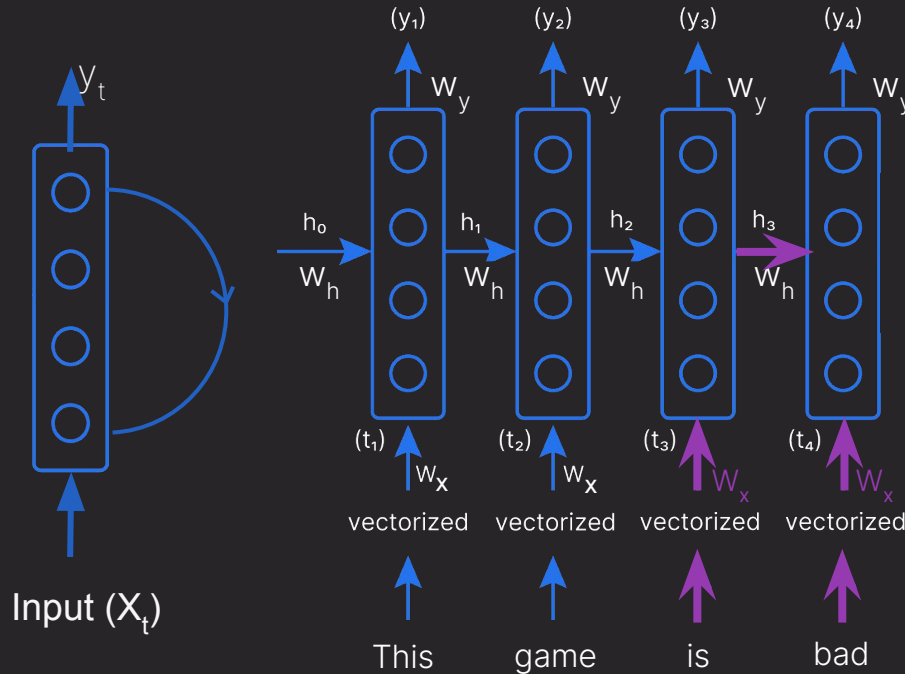
# RNN With One Hidden Layer

Time Step 2:



# RNN With One Hidden Layer

Time Step 3 & 4:



$$y_3 = A' (h_3 * W_y + b_y)$$

$$y_4 = A' (h_4 * W_y + b_y)$$

$$h_3 = A (x_3 * W_x + h_2 * W_h + b_h)$$

$$h_4 = A (x_4 * W_x + h_3 * W_h + b_h)$$

# RNN With One Hidden Layer

Formula :

Hidden state at time step t

$$h_t = A (X_t * W_x + h_{t-1} * W_h + b_h)$$

$$y_t = A' (h_t * W_y + b_y)$$

Output at time step t

# RNN With One Hidden Layer

