Recurrent Neural Networks
Quiz, 10 questions

✓ **Congratulations! You passed!**

Next Item

✓ 1 / 1 point

1.

Suppose your training examples are sentences (sequences of words). Which of the following refers to the jth word in the ith training example?

○ $x^{(i)<j>}$

▲

Correct
We index into the ith row first to get the ith training example (represented by parentheses), then the jth column to get the jth word (represented by the brackets).
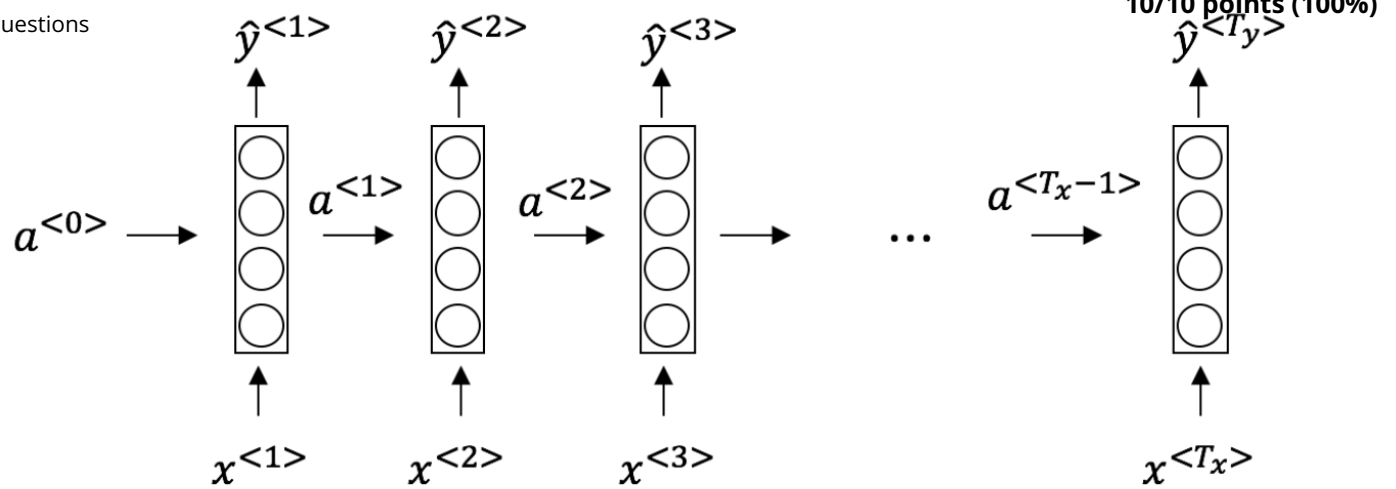
○ $x^{<i>(j)}$

○ $x^{(j)<i>}$

○ $x^{<j>(i)}$

✓ 1 / 1 point

2.

Consider this RNN:

Recurrent Neural Networks

Quiz, 10 questions

$\hat{y}^{<1>}$ $\hat{y}^{<2>}$ $\hat{y}^{<3>}$ $\hat{y}^{<T_y>}$

$a^{<0>}$ $a^{<1>}$ $a^{<2>}$ $a^{<T_x-1>}$

$x^{<1>}$ $x^{<2>}$ $x^{<3>}$ $x^{<T_x>}$

This specific type of architecture is appropriate when:

○ $T_x = T_y$

Correct
It is appropriate when every input should be matched to an output.

○ $T_x < T_y$

○ $T_x > T_y$
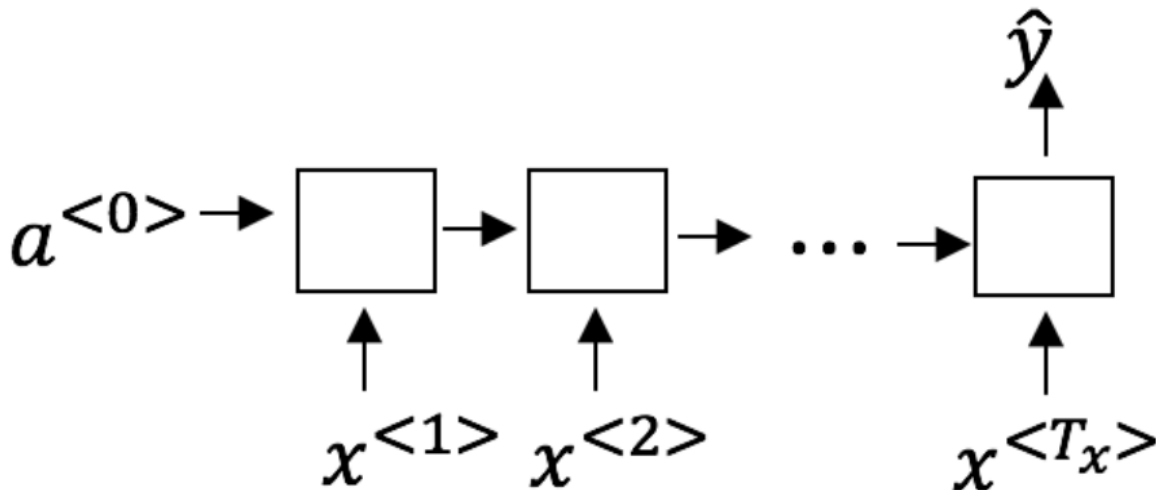
○ $T_x = 1$

✔   1 / 1
         point

3.

To which of these tasks would you apply a many-to-one RNN architecture? (Check all that apply).

Recurrent Neural Networks
Quiz, 10 questions

10/10 points (100%)

$$\hat{y}$$

$$a^{<0>} \rightarrow \boxed{} \rightarrow \boxed{} \rightarrow \cdots \rightarrow \boxed{}$$

$$x^{<1>} \quad x^{<2>} \qquad x^{<T_x>}$$

☐ Speech recognition (input an audio clip and output a transcript)

Un-selected is correct

☐ Sentiment classification (input a piece of text and output a 0/1 to denote positive or negative sentiment)

Correct
Correct!

☐ Image classification (input an image and output a label)

Un-selected is correct

☐ Gender recognition from speech (input an audio clip and output a label indicating the speaker's gender)
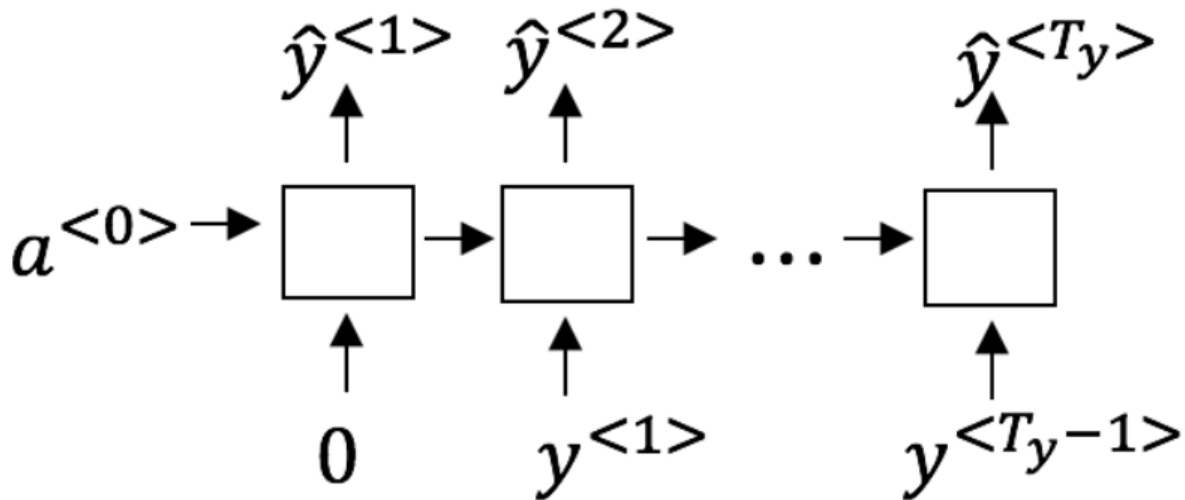
Correct
Correct!

1 / 1

✔

point
Recurrent Neural Networks
10/10 points (100%)

Quiz, 10 questions

You are training this RNN language model.

At the tth time step, what is the RNN doing? Choose the best answer.

○ Estimating $P(y^{<1>}, y^{<2>}, \ldots, y^{<t-1>})$

○ Estimating $P(y^{<t>})$

◉ Estimating $P(y^{<t>} \mid y^{<1>}, y^{<2>}, \ldots, y^{<t-1>})$

Correct
Yes, in a language model we try to predict the next step based on the knowledge of all prior steps.

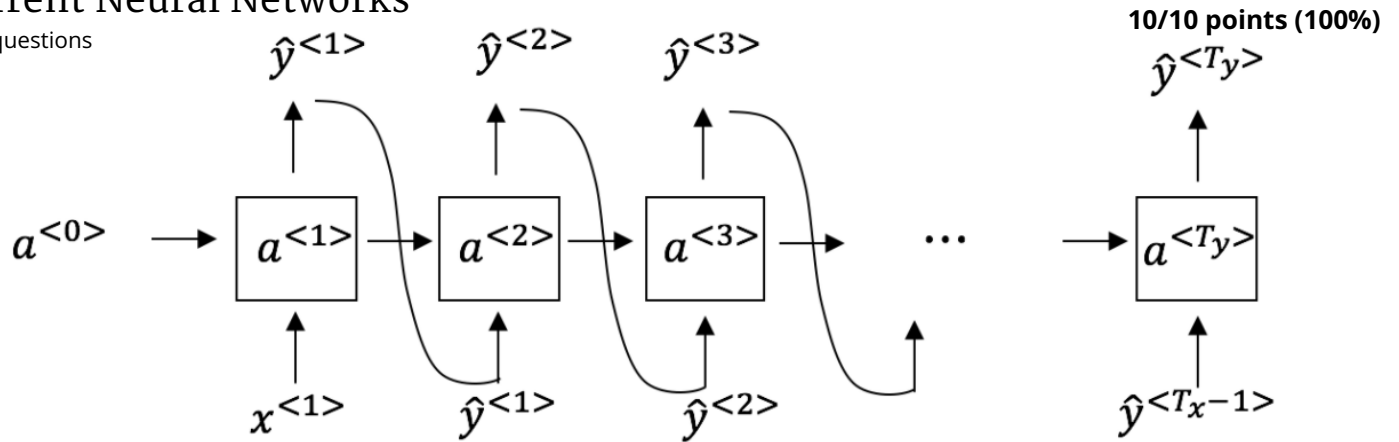○ Estimating $P(y^{<t>} \mid y^{<1>}, y^{<2>}, \ldots, y^{<t>})$

✔   1 / 1
point

5.

Recurrent Neural Networks

You have finished training a language model RNN and are using it to sample random sentences, as follows:

What are you doing at each time step t?

- ○ (i) Use the probabilities output by the RNN to pick the highest probability word for that time-step as $\hat{y}^{<t>}$. (ii) Then pass the ground-truth word from the training set to the next time-step.

- ○ (i) Use the probabilities output by the RNN to randomly sample a chosen word for that time-step as $\hat{y}^{<t>}$. (ii) Then pass the ground-truth word from the training set to the next time-step.

- ○ (i) Use the probabilities output by the RNN to pick the highest probability word for that time-step as $\hat{y}^{<t>}$. (ii) Then pass this selected word to the next time-step.

- ● (i) Use the probabilities output by the RNN to randomly sample a chosen word for that time-step as $\hat{y}^{<t>}$. (ii) Then pass this selected word to the next time-step.

Correct
Yes!

✔   1 / 1
      point

6.

You are training an RNN, and find that your weights and activations are all taking on the value of NaN ("Not a Number"). Which of these is the most likely cause of this problem?

- ○ Vanishing gradient problem.

- ● Exploding gradient problem.

Correct

○ ReLU activation function g(.) used to compute g(z), where z is too large.

Recurrent Neural Networks

○ Sigmoid activation function g(.) used to compute g(z), where z is too large.

10/10 points (100%)

✔ 1 / 1
point

7.

Suppose you are training a LSTM. You have a 10000 word vocabulary, and are using an LSTM with 100-dimensional activations $a^{<t>}$. What is the dimension of Γ_u at each time step?

○ 1

◉ 100

▲

Correct
Correct, Γ_u is a vector of dimension equal to the number of hidden units in the LSTM.

○ 300

○ 10000

✔ 1 / 1
point

8.

Here're the update equations for the GRU.

Recurrent Neural Networks

Quiz, 10 questions

10/10 points (100%)

GRU

$$\tilde{c}^{<t>} = \tanh(W_c[\Gamma_r * c^{<t-1>}, x^{<t>}] + b_c)$$

$$\Gamma_u = \sigma(W_u[c^{<t-1>}, x^{<t>}] + b_u)$$

$$\Gamma_r = \sigma(W_r[c^{<t-1>}, x^{<t>}] + b_r)$$

$$c^{<t>} = \Gamma_u * \tilde{c}^{<t>} + (1 - \Gamma_u) * c^{<t-1>}$$

$$a^{<t>} = c^{<t>}$$

Alice proposes to simplify the GRU by always removing the Γ_u. I.e., setting Γ_u = 1. Betty proposes to simplify the GRU by removing the Γ_r. I. e., setting Γ_r = 1 always. Which of these models is more likely to work without vanishing gradient problems even when trained on very long input sequences?

○   Alice's model (removing Γ_u), because if $\Gamma_r \approx 0$ for a timestep, the gradient can propagate back through that timestep without much decay.

○   Alice's model (removing Γ_u), because if $\Gamma_r \approx 1$ for a timestep, the gradient can propagate back through that timestep without much decay.

○   Betty's model (removing Γ_r), because if $\Gamma_u \approx 0$ for a timestep, the gradient can propagate back through that timestep without much decay.

Correct

Yes. For the signal to backpropagate without vanishing, we need $c^{<t>}$ to be highly dependant on $c^{<t-1>}$.

○   Betty's model (removing Γ_r), because if $\Gamma_u \approx 1$ for a timestep, the gradient can propagate back through that timestep without much decay.

✔   1 / 1 point

9.

Here are the equations for the GRU and the LSTM:

Recurrent Neural Networks

Quiz, 10 questions

10/10 points (100%)

GRU

$$\tilde{c}^{<t>} = \tanh(W_c[\Gamma_r * c^{<t-1>}, x^{<t>}] + b_c)$$

$$\Gamma_u = \sigma(W_u[c^{<t-1>}, x^{<t>}] + b_u)$$

$$\Gamma_r = \sigma(W_r[c^{<t-1>}, x^{<t>}] + b_r)$$

$$c^{<t>} = \Gamma_u * \tilde{c}^{<t>} + (1 - \Gamma_u) * c^{<t-1>}$$

$$a^{<t>} = c^{<t>}$$

LSTM

$$\tilde{c}^{<t>} = \tanh(W_c[a^{<t-1>}, x^{<t>}] + b_c)$$

$$\Gamma_u = \sigma(W_u[a^{<t-1>}, x^{<t>}] + b_u)$$

$$\Gamma_f = \sigma(W_f[a^{<t-1>}, x^{<t>}] + b_f)$$

$$\Gamma_o = \sigma(W_o[a^{<t-1>}, x^{<t>}] + b_o)$$

$$c^{<t>} = \Gamma_u * \tilde{c}^{<t>} + \Gamma_f * c^{<t-1>}$$

$$a^{<t>} = \Gamma_o * c^{<t>}$$

From these, we can see that the Update Gate and Forget Gate in the LSTM play a role similar to _____ and _____ in the GRU. What should go in the the blanks?

- ○ Γ_u and $1 - \Gamma_u$

  ▲

  Correct
  Yes, correct!

- ○ Γ_u and Γ_r

- ○ $1 - \Gamma_u$ and Γ_u

- ○ Γ_r and Γ_u

✔ 1 / 1
point

10.

You have a pet dog whose mood is heavily dependent on the current and past few days' weather. You've collected data for the past 365 days on the weather, which you represent as a sequence as $x^{<1>}, \ldots, x^{<365>}$. You've also collected data on your dog's mood, which you represent as $y^{<1>}, \ldots, y^{<365>}$. You'd like to build a model to map from $x \to y$. Should you use a Unidirectional RNN or Bidirectional RNN for this problem?

- ○ Bidirectional RNN, because this allows the prediction of mood on day t to take into account more information.

- ○ Bidirectional RNN, because this allows backpropagation to compute more accurate gradients.

○   Unidirectional RNN, because the value of $y^{<t>}$ depends only on $x^{<1>}, \ldots, x^{<t>}$, but not on $x^{<t+1>}, \ldots, x^{<T_x>}$

10/10 points (100%)

Correct

Yes!

○   Unidirectional RNN, because the value of $y^{<t>}$ depends only on $x^{<t>}$, and not other days' weather.

◡   ▽   ⌑

○   Unidirectional RNN, because the value of $y^{<t>}$ depends only on $x^{<1>}, \ldots, x^{<t>}$, but not on $x^{<t+1>}, \ldots, x^{<T_x>}$