Recurrent Neural Networks

LATEST SUBMISSION GRADE

90%

1.

Question 1

Suppose your training examples are sentences (sequences of words). Which of the following refers to the j^{th} j^{th} word in the i^{th} i^{th} training example?

0 / 1 point

x^{(i)<j>} $x^{(i)<j>}$

x^{<i>(j)} $x^{<i>(j)}$

x^{<j>(i)} $x^{<j>(i)}$

x^{(j)<i>} $x^{(j)<i>}$

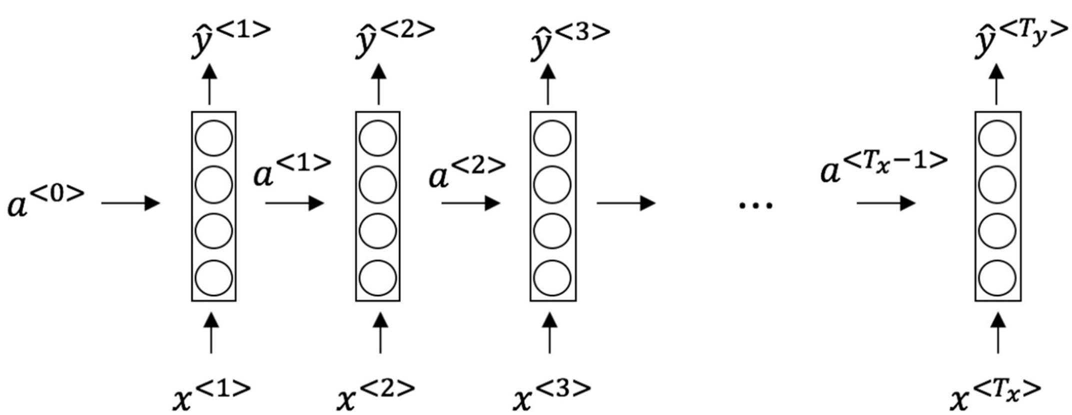
Incorrect

The parentheses represent the training example and the brackets represent the word. You should choose the training example and then the word.

2.

Question 2

Consider this RNN:



This specific type of architecture is appropriate when:

1 / 1 point

T_x=T_yT_x
</*strong*><*strong*>=</*strong*><*strong*>T_y

T_x>T_yT_x
</*strong*><*strong*>></*strong*><*strong*>T_y

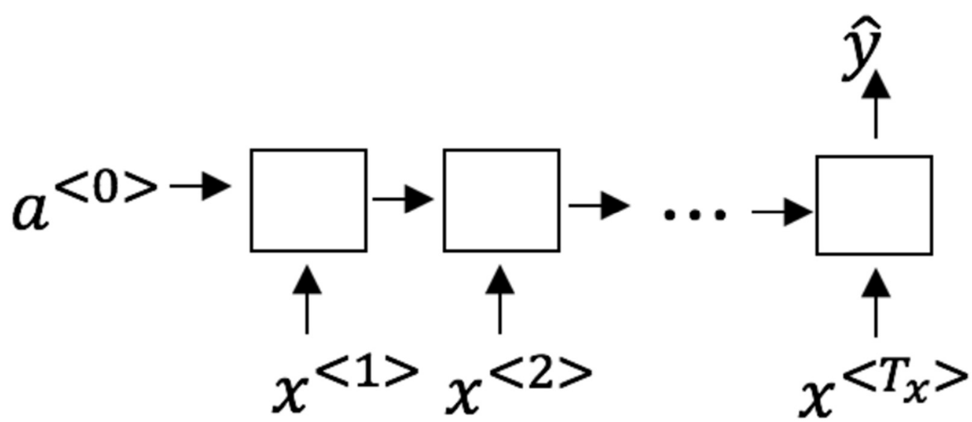
T_x= 1T_x</*strong*><*strong*>=1

T_x<<strong>T_yT_x
</*strong*><*strong*><</*strong*><*strong*>T_y

Correct

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

3.
Question 3
To which of these tasks would you apply a many-to-one RNN architecture? (Check all that apply).



1 / 1 point

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)

- [ ] Speech recognition (input an audio clip and output a transcript)

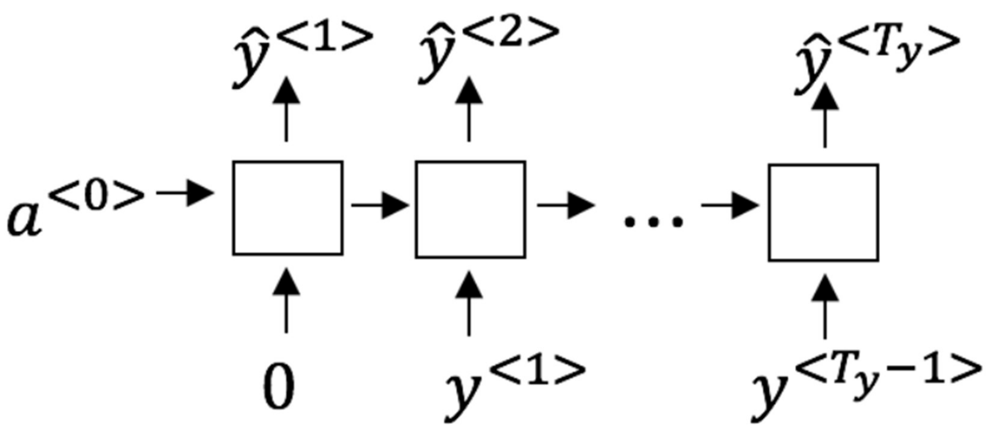
- [x] Gender recognition from speech (input an audio clip and output a label indicating the speaker's gender)

Correct

Correct!

4.
Question 4

You are training this RNN language model.



At the t^{th}t^{th} time step, what is the RNN doing? Choose the best answer.

1 / 1 point

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

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

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

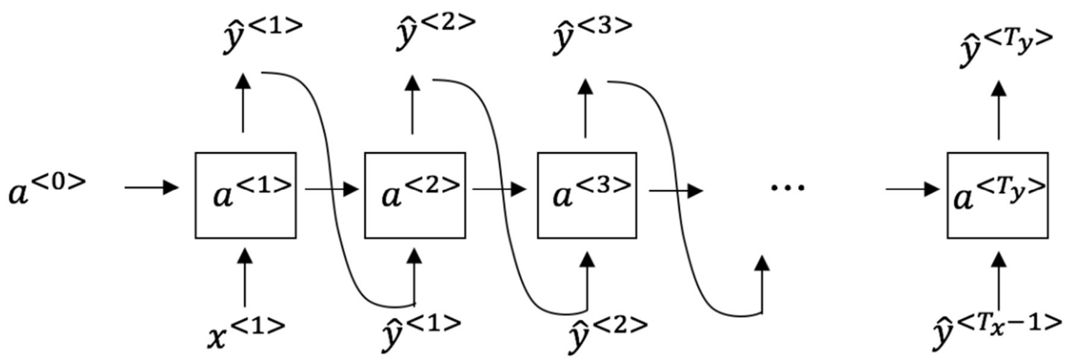
○ Estimating P(y^{<t>})$P(y^{<t>})$

Correct

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

5.
Question 5

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 tt?

1 / 1 point

○

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

Correct

6.
Question 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?

1 / 1 point

Vanishing gradient problem.

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

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

Exploding gradient problem.

Correct

7.

Question 7

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

1 / 1 point

10000

1

300

100

Correct

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

8.

Question 8

Here’re the update equations for the GRU.

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

1 / 1 point

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

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

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

( ) Betty's model (removing \Gamma_rΓ_r), because if \Gamma_u \approx 1$\Gamma_u \approx 1$ 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>}$c^{<t>}$ to be highly dependent on c^{<t-1>}$c^{<t-1>}$.

9.
Question 9
Here are the equations for the GRU and the LSTM:

GRU	LSTM
$\tilde{c}^{<t>} = \tanh(W_c[\Gamma_r * c^{<t-1>}, x^{<t>}] + b_c)$	$\tilde{c}^{<t>} = \tanh(W_c[a^{<t-1>}, x^{<t>}] + b_c)$
$\Gamma_u = \sigma(W_u[\, c^{<t-1>}, x^{<t>}] + b_u)$	$\Gamma_u = \sigma(W_u[\, a^{<t-1>}, x^{<t>}] + b_u)$
$\Gamma_r = \sigma(W_r[\, c^{<t-1>}, x^{<t>}] + b_r)$	$\Gamma_f = \sigma(W_f[\, a^{<t-1>}, x^{<t>}] + b_f)$
$c^{<t>} = \Gamma_u * \tilde{c}^{<t>} + (1 - \Gamma_u) * c^{<t-1>}$	$\Gamma_o = \sigma(W_o[\, a^{<t-1>}, x^{<t>}] + b_o)$
$a^{<t>} = c^{<t>}$	$c^{<t>} = \Gamma_u * \tilde{c}^{<t>} + \Gamma_f * c^{<t-1>}$
	$a^{<t>} = \Gamma_o * c^{<t>}$

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 blanks?

1 / 1 point

◉

\Gamma_uΓ_u and 1-\Gamma_u$1-\Gamma_u$

○

1-\Gamma_u$1-\Gamma_u$ and \Gamma_uΓ_u

○

\Gamma_rΓ_r and \Gamma_uΓ_u

○

\Gamma_uΓ_u and \Gamma_rΓ_r

Correct

Yes, correct!

10.
Question 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>}, …, x^{<365>}$x^{<1>},\dots,x^{<365>}$. You've also collected data on your dog's mood, which you represent as y^{<1>}, …, y^{<365>}$y^{<1>},\dots,y^{<365>}$. You'd like to build a model to map from x \rightarrow y$x \rightarrow y$. Should you use a Unidirectional RNN or Bidirectional RNN for this problem?

1 / 1 point

○

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

Unidirectional RNN, because the value of $y^{<t>}$ depends only on $x^{<1>}, \ldots, x^{<t>}$, but not on $x^{<t+1>}, \ldots, x^{<365>}$

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

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

Correct

Yes!