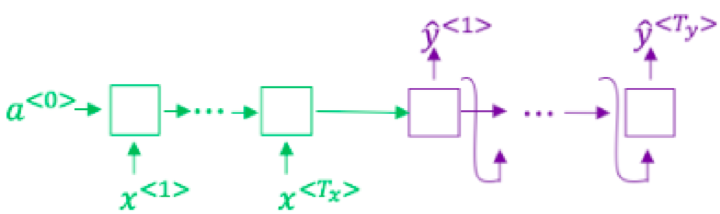
Sequence models & Attention mechanism

TOTAL POINTS 10

1. Consider using this encoder-decoder model for machine translation.

1 point



This model is a “conditional language model” in the sense that the encoder portion (shown in green) is modeling the probability of the input sentence x.

- ○ True
- ◉ False

2. In beam search, if you increase the beam width B, which of the following would you expect to be true? Check all that apply.

1 point

- [x] Beam search will run more slowly.
- [x] Beam search will use up more memory.
- [x] Beam search will generally find better solutions (i.e. do a better job maximizing $P(y \mid x)$)
- [ ] Beam search will converge after fewer steps.

3. In machine translation, if we carry out beam search without using sentence normalization, the algorithm will tend to output overly short translations.

1 point

- ◉ True
- ○ False

4. Suppose you are building a speech recognition system, which uses an RNN model to map from audio clip x to a text transcript y. Your algorithm uses beam search to try to find the

1 point

value of y that maximizes $P(y \mid x)$.

On a dev set example, given an input audio clip, your algorithm outputs the transcript $\hat{y} =$ "I'm building an A Eye system in Silly con Valley.", whereas a human gives a much superior transcript $y^* =$ "I'm building an AI system in Silicon Valley."

According to your model,

$P(\hat{y} \mid x) = 1.09 * 10^-7$

$P(y^* \mid x) = 7.21 * 10^-8$

Would you expect increasing the beam width B to help correct this example?

- [x] No, because $P(y^* \mid x) \leq P(\hat{y} \mid x)$ indicates the error should be attributed to the RNN rather than to the search algorithm.
- [ ] No, because $P(y^* \mid x) \leq P(\hat{y} \mid x)$ indicates the error should be attributed to the search algorithm rather than to the RNN.
- [ ] Yes, because $P(y^* \mid x) \leq P(\hat{y} \mid x)$ indicates the error should be attributed to the RNN rather than to the search algorithm.
- [ ] Yes, because $P(y^* \mid x) \leq P(\hat{y} \mid x)$ indicates the error should be attributed to the search algorithm rather than to the RNN.

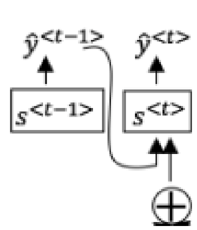
5. Continuing the example from Q4, suppose you work on your algorithm for a few more weeks, and now find that for the vast majority of examples on which your algorithm makes a mistake, $P(y^* \mid x) > P(\hat{y} \mid x)$. This suggest you should focus your attention on improving the search algorithm.

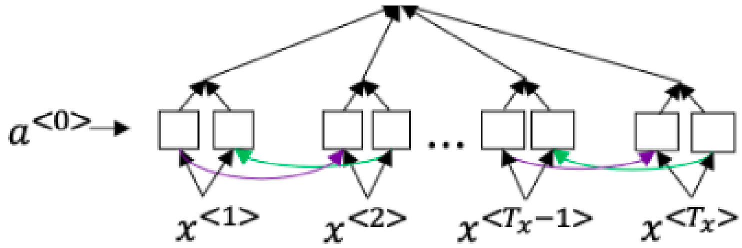
1 point

- [x] True.
- [ ] False.

6. Consider the attention model for machine translation.

1 point





Further, here is the formula for $\alpha^{<t,t'>}$.

$$\alpha^{<t,t'>} = \frac{\exp(e^{<t,t'>})}{\sum_{t'=1}^{T_x} \exp(e^{<t,t'>})}$$

Which of the following statements about $\alpha^{<t,t'>}$ are true? Check all that apply.

- [x] We expect $\alpha^{<t,t'>}$ to be generally larger for values of $a^{<t'>}$ that are highly relevant to the value the network should output for $y^{<t>}$. (Note the indices in the superscripts.)
- [ ] We expect $\alpha^{<t,t'>}$ to be generally larger for values of $a^{<t>}$ that are highly relevant to the value the network should output for $y^{<t'>}$. (Note the indices in the superscripts.)
- [ ] $\sum_t \alpha^{<t,t'>} = 1$ (Note the summation is over t.)
- [x] $\sum_{t'} \alpha^{<t,t'>} = 1$ (Note the summation is over t'.)

7. The network learns where to "pay attention" by learning the values $e^{<t,t'>}$, which are computed using a small neural network:

1 point

We can't replace $s^{<t-1>}$ with $s^{<t>}$ as an input to this neural network. This is because $s^{<t>}$ depends on $\alpha^{<t,t'>}$ which in turn depends on $e^{<t,t'>}$; so at the time we need to evalute this network, we haven't computed $s^{<t>}$ yet.

- (●) True
- ( ) False

8. Compared to the encoder-decoder model shown in Question 1 of this quiz (which does not use an attention mechanism), we expect the attention model to have the greatest advantage when:

1 point

- (●) The input sequence length T_x is large.

○ The input sequence length T_x is small.

9. Under the CTC model, identical repeated characters not separated by the “blank” character (_) are collapsed. Under the CTC model, what does the following string collapse to?

1 point

__c_oo_o_kk___b_ooooo__oo__kkk

○ cokbok

◉ cookbook

○ cook book

○ cooookkbooooooookkk

10. In trigger word detection, $x^{<t>}$ is:

1 point

◉ Features of the audio (such as spectrogram features) at time t.

○ The t-th input word, represented as either a one-hot vector or a word embedding.

○ Whether the trigger word is being said at time t.

○ Whether someone has just finished saying the trigger word at time t.