Nanoquiz Week 11

The questions below are due on Thursday April 26, 2018; 09:50:00 AM.

Nanoquiz Instructions

Nanoquizzes are just like any other tutor exercise, except that they are timed, and that some questions allow a limited number of submissions. When the timer hits zero, you will be prevented from making any further submissions to the nanoquiz, and the answers will be displayed, so **please make sure you have submitted something before that occurs**.

Note that you are free to use any materials you want (electronic or otherwise, including notes, calculators, Python, and Wikipedia) during the nanoquiz, but you are **not** allowed to converse with other humans (including through text message, email, etc).

Nanoquiz

We will use an RNN to predict y_t , which we know is a decaying sum of the inputs x_t (which are numbers) with decay rate γ between 0 and 1:

$$y_t = \sum_{i=0}^t \gamma^{t-i} x_i$$

We will use an RNN of the following form:

$$egin{aligned} s_t &= f_1(W^{sx}x_t + W^{ss}s_{t-1}) \ y_t &= f_2(W^os_t) \end{aligned}$$

where f_1 and f_2 are two activation functions, and the x_t can be treated as 1x1 arrays. The output are numbers y_t .

Throughout this question, assume $x_t = 0$ for all t < 0.

1) Assuming $\gamma=0.9$, what are the values of $[y_0,y_1,y_2]$ given $[x_0,x_1,x_2]=[1,0,2]$.

Enter a list of three numbers:

Save

Submit

Clear Answer

As staff, you are always allowed to submit. If you were a student, you would see the following: *You have infinitely many submissions remaining.*

Solution: [1, 0.9, 2.81]

2) Conveniently, the definition of y_t can be rewritten in a recursive form, if we assume $y_t=0$ for t<0. Which of the following is correct?

Pick one:

- $\bigcirc \ y_t = \gamma y_{t-1} + x_t$
- $\square \ y_t = y_{t-1} + \sum_{i=1}^t x_i \gamma^{t-i}$

Save

Submit

Clear Answer

As staff, you are always allowed to submit. If you were a student, you would see the following: *You have infinitely many submissions remaining.*

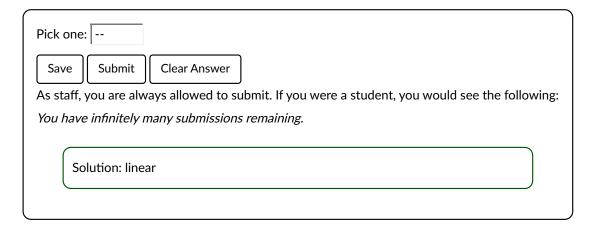
Solution:

$$\mathbf{x} y_t = \gamma y_{t-1} x_t$$

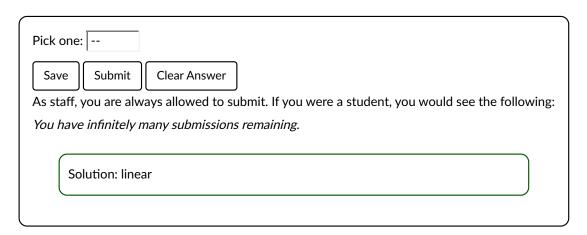
$$y_t = y_{t-1} + \gamma x_t$$

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3) What is the best choice for f_1 ?



4) What is the best choice for f_2 ?



5) What is the smallest dimensionality for the state s that will allow this function to be implemented exactly?

Enter a single number:
Save Submit Clear Answer
As staff, you are always allowed to submit. If you were a student, you would see the following:
You have infinitely many submissions remaining.
Solution: 1

6) Provide matrices $W^{s,x}$, $W^{s,s}$, W^o (in that order) that implement this model (assuming $\gamma=0.9$). Assume that the initial state is a column vector of 0's.

You will need to enter a list of three matrices, each matrix as a list of **rows**, each row is also a list. **If the answer were** three 2x2 matrices, you would enter something like this.

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[[[a, b], [c, d]], [[e, f], [g, h]], [[i, j], [k, l]]]

Enter a list of matrices:

Save Submit Clear Answer 100.00%

As staff, you are always allowed to submit. If you were a student, you would see the following: You have infinitely many submissions remaining.

Solution: [[[1]], [[0.9]], [[1]]]

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