Deep Learning: Exercise Sheet 8 (SoSe2018)

13th of June (due 20th of June at 14:00)

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Question 14: CNN Back-propagtion Part 2- Backward Pass (10 Points)

Consider the forward pass from question 13. Using the logistic loss and label $y = 0$, backpropagate the error and compute the gradient for θ, and for the top left parameters on every K (as bold-faced below).

$$K^{(1)}_{1,1} = \begin{pmatrix} \mathbf{2} & -3 \\ -3 & 2 \end{pmatrix} \qquad K^{(1)}_{1,2} = \begin{pmatrix} \mathbf{1} & -1 \\ -1 & 1 \end{pmatrix}$$

And,

$$K^{(2)}_{1,1} = \begin{pmatrix} \mathbf{1} & -2 \\ -4 & 3 \end{pmatrix} \qquad K^{(2)}_{2,1} = \begin{pmatrix} \mathbf{2} & 1 \\ 1 & 2 \end{pmatrix}$$

$$\boldsymbol{\theta} = \mathbf{-2}$$

Do not use padding, do not use strides, and don't be confused, there is no pooling layer involved here.

Question 15: Recurrent Neural Networks - Introduction (10 Points)

Worried about their future, students from deep learning have developed a Recurrent neural network that takes into consideration the novelty of the topics from the last lectures and the difficulty of the same and output the chances of having a Backpropagation question in the next exercise. Consider the following data-set:

$Time(t)$	$Novelty(x_1)$	$Difficulty(x_2)$
1	0.1	0.1
2	0.7	0.4
3	0.5	0.2
4	0.1	0.1
5	0.8	0.8

Consider that we have a sigmoid layer at the very end and that:

$$U = \begin{pmatrix} 0.5 & 0.1 \\ 0.4 & 0.01 \end{pmatrix} \qquad W = \begin{pmatrix} 0.1 & 0.3 \\ 0.3 & 0.1 \end{pmatrix} \qquad b = (0, 0)$$

$$V^{(t)} = \begin{pmatrix} 2 & 3 \end{pmatrix} \quad c = 1 \qquad h^{(t)} = ReLU(a^{(t)}) \quad h^{(0)} = (0, 0)$$

Draw a graph of the output for each time-step and interpret the results.

How to submit?

DO NOT FORGET TO WRITE YOUR NAME ON YOUR SHEET! Nameless files will NOT be graded!

The new submission method is via LearnWeb. https://www.uni-hildesheim.de/learnweb2018/course/search.php?search=3108

Warning!

If we detect **Plagiarism** on your solution, you will receive no points for it. If a second plagiarism attempt is detected, you might fail the class or be expelled from your program. You are allowed to discuss solutions, but if you work on a group, you must indicate on your sheet with whom are you working with. Group submissions earn 0 points, but counts as participation.