Artificial Intelligence in Automotive Technology

Recurrent Neural Networks

Exercise 1 (SS19)

The gradient of the parameters of a recurrent neural network with regards to your loss function turns out to be large and the loss seems to not decrease. Which action can you take in order to further train the same neural network? Name the technical term and shortly describe the precise effect of the measure in text or using a formula!

Exercise 2 (SS19)

On the right, you see the formula for a recurrent neural network. Which type of re-current neural network is presented? Name a task that this type of neural network would be suited for!

$$h_t = \tanh(A_1 x_t + B_1 h_{t-1} + c_1)$$
$$k_t = \tanh(A_2 x_t + B_2 k_{t+1} + c_2)$$
$$y_t = h_t + k_t$$

Exercise 3 (SS19)

Using the formula below of a simple recurrent neural network, calculate L over two points in time for the given input data and two different parameter sets (1) and (2)! Should you initialize your parameters in order of magnitude similar to (1) or (2)? Explain shortly based on your calculations! Round to 2 decimal places!

Formula:

$$h_t = \tanh(a x_t + b h_{t-1} + c)$$
$$y_t = h_t$$
$$L = \sum_t y_t^2$$

Parameter sets:

$$(1)\colon\ h_0 = 0,\ a = 20,\ b = 1,\ c = 1$$
$$(2)\colon\ h_0 = 0,\ a = 1,\ b = 1,\ c = 0$$

Input data:

$$x_1 = 0.5;\ x_2 = -1$$

Exercise 4 (WS18)

Before training your recurrent neural network, you decide to split long sequences into multiple shorter ones. Name one disadvantage and one advantage of your decision.

Exercise 5 (optional)

This exercise is explained in the provided Jupyter notebook.