# Project work part II: Questions on Deep Learning

Prof. Dr.-Ing. Stache

## Fill out the following:

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I confirm that the work I handed in is my own work. All sources are cited.   
I know that my work will be checked for plagiarism, and I accept that any occurrence of plagiarism and/or non-cited sources will lead to a grade of 5.0 for this part. The due date for this work and the upload-link are present in ILIAS, uploads after the due are not accepted.

## Questions:

Please answer the questions briefly but very precisely. You will not receive the point if the answer is not precise and clear. Nor do you get the point(s) if your answer itself is correct but contains additional statements that are wrong.

1. Topic “Architecture & Training”
   1. Why could it be reasonable to use only a linear activation function in the output layer instead of a sigmoid? (1 P)
   2. For what kind of data do we typically use “cross entropy loss” as loss function? (1 P)
   3. What is meant by the principle of weight sharing in the context of convolutional neural networks? (1 P)
2. Topic: “Language processing”
   1. How is an embedding determined? (1 P)
   2. What does the parameter “size” of an embedding mean and to which parameter does it correspond in a neural network? (1 P)
   3. What is the main difference between CBOW and Skip-gram? (1 P)
3. Topic: “Reinforcement Learning”
   1. What’s the issue with training an agent to maximize the expected immediate reward? (1 P)
   2. Is the value loss function for Deep Q-Learning usually monotonically decreasing? Explain why / why not. (1 P)
   3. What are the differences and similarities between (tabular) Q-Learning and Dynamic   
      Programming? (2 P)
4. Topic: “Transformers”
   1. How does the transformer get information of the order of words and how is this implemented? (2 P)
   2. How is an attention filter created in the transformer and how is cosine similarity taken into account? (2 P)
   3. Why does the decoder structure of the transformer use a masking in the attention Mechanism? (1 P)

Answers:

* 1. Why could it be reasonable to use only a linear activation function in the output layer instead of a sigmoid?

Using only a linear activation function in the output layer instead of a sigmoid can be a reasonable choice for several reasons. Firstly, in the sigmoid activation function the neurons never truly reach the output values of 1 to 0 that’s because of saturation. When using a linear activation function instead, it helps to reduce the saturation.

The next reason is, that its very efficient to implement, that’s because of the threshold matrix is 0.

The third reason is to reduce vanishing gradient issues which enables deep network structures.

The last reason is that the sigmoid function is learning slow when there are large weights, and the gradients are small. This is not the case for linear activation functions.

(Stache, 5. Deep Neural Networks, pp. 15-16)

1.2 For what kind of data do we typically use “cross entropy loss” as loss function?

# Literaturverzeichnis

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