Institute for Computer Science VI, Autonomous Intelligent Systems, University of Bonn

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http://www.ais.uni-bonn.de/WS1920/4204_L_NN.html

Exercises for module Technical Neural Networks (MA-INF 4204), WS1920

Exercises sheet 1, due: Monday 14.10.2019

7.10.2019

Group	Name	1	2	3	4	5	6	7	$\sum$ Sheet 1

Rules:

To be admitted to the exam you need: **50 percent** of the possible 260 points for the exercise assignments: paper and pencil assignments, and programming assignments
and **two times a presentation** of your results in the exercise group in front of a small audiences.

The assignments shall be worked out in 2 person groups.

Active participation in the exercise groups is mandatory to practice presentation and discussion of the respective lecture dependent contents from the assignments.

Assignment 1 (2 Points)

Name and describe (briefly) the 4 important basic principles of a technical neuron that have been taken from biology.

Assignment 2 (1 Point)

Name a neural network paradigm that has NOT been mentioned within the lecture on Monday 7th Oct, 2019 that you would like to learn more about.
Please give the references where you have found this paradigm.

Assignment 3 (2 Points)

Name and characterize (in one sentence each) the **five** historical phases of neural network research.

Assignment 4 (3 Points)

Construct the Boolean functions AND, NAND, NOR with one McCulloch Pitts type neuron per Boolean function. Draw them, and give the values for weights and thresholds
(it is favorable to have weights and thresholds with real valued numbers).

Assignment 5 (2 Points)

Please explain in your own words the function and the task of the so called BIAS, and the BIAS-weights for a technical neuron.
Use formulas and a sketch/diagram **of your own** to support your explanation.

Assignment 6 (2 Points)

Describe all essential parts of a technical neuron (including BIAS).
Draw a fully labled diagram and write down the essential formulas.

Assignment 7 (3 Points)

A simple Perzeptron with two inputs x_1, x_2, BIAS, and transferfunction $y = f(z) = sgn(z)$, separates the two dimensional input space into two parts with help of a line g.

Calculate for this Perzeptron the weights w_1, w_2, w_b in such a way, that the line g separates the given $P = 8$ patterns (${}^p x_1$, ${}^p x_2$; ${}^p \hat{y}$) into two classes.
Depict the given patterns and the resulting line g.

${}^1X = (0, 0; +1)$, ${}^2X = (2, 3; -1)$,
${}^3X = (-1 - \varepsilon, 3 - \varepsilon; +1)$, ${}^4X = (-1 + \varepsilon, 3 + \varepsilon; -1)$,
${}^5X = (-1, 2; +1)$, ${}^6X = (3, 1; -1), ;$
${}^7X = (5, -2 + \varepsilon; -1)$, ${}^8X = (5 - \varepsilon, -2; +1)$
Remark: $0 < \varepsilon \ll 1$.