

# Artificial Intelligence 2 – SS 2020

## Assignment 12: Decision Lists and Neural Networks

– Given July 3., Due July 12. –

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**Hint:** Exercises need to be handed in via StudOn at 23:59 on the day they are due or earlier. Please use only the exercise group of your tutor to hand in your work.

If any concepts here seem unfamiliar to you or you have no idea how to proceed, consult the lecture materials, ask a fellow student, your tutor, or on the Forum.

If a problem asks for code, comment it or make it otherwise self-explanatory. You do not need to write a lot, but it should be enough to convince your tutor that you understand what the code does. We may deduct up to 30% for uncommented and unclear code, but would prefer not to.

Problems with no points (0pt) will not be graded, but might appear on the exam in a similar form. For these, we will provide a reference solution after the submission deadline. If you find the reference solution unclear, ask about it on the forum or in a tutorial.

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### Problem 12.1 (Decision List)

This is exercise 18.12 from Russel and Norvig. Construct a decision list to classify the data below. The tests should be as small as possible (in terms of attributes), breaking ties among tests with the same number of attributes by selecting the one that classifies the greatest number of examples correctly. If multiple tests have the same number of attributes and classify the same number of examples, then break the tie using attributes with lower index numbers (e.g., select  $A_1$  over  $A_2$ ). 0pt

Example	$A_1$	$A_2$	$A_3$	$A_4$	$y$
$x_1$	1	0	0	0	1
$x_2$	1	0	1	1	1
$x_3$	0	1	0	0	1
$x_4$	0	1	1	0	0
$x_5$	1	1	0	1	1
$x_6$	0	1	0	1	0
$x_7$	0	0	1	1	1
$x_8$	0	0	1	0	0

### Problem 12.2 (XOR Neural Network)

Construct by hand a neural network that will compute the XOR of two inputs. What kind of an activation function should you use (the step-function or logistic function)? 20pt