UNIVERSITÄT ZU LÜBECK
INSTITUTE FOR ROBOTICS
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Artificial Intelligence II
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Exercise sheet 2

Submission deadline: November 20, 2020 at 10:00 a.m.

Task 1: Perceptron learning in MATLAB (20 points)

Download the given MATLAB code snippets from the Moodle course.

- `perceptronOutput.m`

  `function [ f ] = perceptronOutput( x, w )`

  This function returns the output characteristic f for a given data point **x** and a weight vector **w**. Implement the needed functionality.

- `perceptronPBPL.m`

  `function [ w, iter, exitflag ] = perceptronPBPL( X, w, eta, maxIter )`

  This function returns the final weight vector **w** for a given data point matrix **X**, an initial weight vector **w** and a given step size η using the perceptron pattern-by-pattern learning. Also, there is an additional exit condition for the maximum number of iterations. The function also returns the needed number of iterations and an exit flag (see additional comments in the snippet). Implement the needed functionality.

- `perceptronBL.m`

  `function [ w, iter, exitflag ] = perceptronBL( X, w, eta, maxIter )`

  The same as before, just for the perceptron batch learning. Implement the needed functionality.

- `perceptronTest.m`

  This script tests your implementations. There are two perceptron test instances. The script generates four figures and some text output which will automatically be saved as PDF and TXT files. **Do not edit this script**.

Pay attention to the comments provided in the snippets. The data point matrix **X** already contains the class labels s_i in the last column. Furthermore, the weight vector **w** is already initialized in the test script. All other parameters are also set up there.

a) Implement the missing functionality in `perceptronOutput.m`. (5 points)

b) Implement the missing functionality in `perceptronPBPL.m`. (5 points)

c) Implement the missing functionality in `perceptronBL.m`. (5 points)

d) Zip your implementations from a) – c) and the generated PDF and TXT files from the `perceptronTest.m` script and upload your archive to the Moodle course. (2 points)

e) What is the main difference between pattern-by-pattern-learning and batch learning? Give one advantage of each of both methods. (3 points)

Do not forget to comment your code!
Upload only one zip archive!
Do not forget to comment your code!
Do not print anything, just upload your solutions to the Moodle course!
Do not forget to comment your code!