Mini assignment 1: Perceptron Learning

The goal of this assignment is to implement the Perceptron Learning algorithm as explained in the book of Ertel. This implementation should also be able to classify a list of points (queries) according to the result of this algorithm.
This assignment has to be done in Java. A template Netbeans project for this can be found on Canvas.

Template

In this template you will find three classes: *PerceptronLearner*, *PVector* and *PerceptronLearnerTest*.

In the class *PerceptronLearner* you will implement Perceptron Learning in the method *execute*. This method has 5 parameters:

- *positive*: A list with the positive training patterns.
- *negative*: A list with the negative training patterns.
- *bias*: Whether you need a bias for this training set or not.
- *maxIterations*: The maximum number of iterations your implementation may take.
- *queries*: A list of points whose classifications form the output.

The method should return a string of the format "d q" where d is the amount of iterations the algorithm needed, either to converge or to stop; and q is the result of the queries. A result of a query can either be '+' if it is positively classified and '−' if it is negatively classified. Example: "23 $--+$+$-$" (without quotes). This result tells you that 23 iterations where needed and that of the five queries 3 where negatively classified and 2 positively.
If the algorithm has reached the maximum allowed iterations, it should return a string of the format "d". Example: "1000" (without quotes). This result tells you that after 1000 iterations the algorithm still did not converge.

The class *PVector* defines a vector and is used to represent the data points. This class contains all methods needed to manipulate data points, both patterns and queries.

In the class *PerceptronLearnerTest* you will be able to test your implementation using JUnit. There is an example test given to show how such a test is constructed.To execute the tests, select the Test menu item of the project.

Submission

The file *PerceptronLearner.java* with your implementation has to be handed in on Momotor. Before you hand it in, please make sure that

- the file does not contain a package statement and
- there are no print statements in the file.

After submission Momotor will test your implementation and either determine a grade in $[0, 100]$ or output an error.