

EEVAL

Project 2

Implement a binary classifier in \mathbb{R}^2 with learning algorithm.

1. The training data set $D = \{(\bar{x}_1, y_1), (\bar{x}_2, y_2), \dots, (\bar{x}_l, y_l)\}$ for $l = 20$, $\bar{x}_i \in \mathbb{R}^2$ and $y_i \in \{+1, -1\}$ have to be generated with [Script 1](#).
2. The classifier should be implemented in MATLAB, however C++ and Python are also allowed.
3. Implement a training algorithm from book „Knowledge discovery with support vector machines” L. Hamel (Chapter 5.1). The book is available on-line via the website of WUT Main Library.
4. The PDF report must include:
 - a. Result for 3 different learning rates (for the same initial setting of the classifier).
 - b. Results for the same learning rate, but 4 different initial setting of the classifier. Each of the 4 classifiers must resemble a line passing through the origin of coordinate system, but with different orientation:
 - i. Initial classifier 1: a horizontal line;
 - ii. Initial classifier 2: a vertical line;
 - iii. Initial classifier 3: a line passing through I and III quadrants;
 - iv. Initial classifier 4: a line passing through II and IV quadrants.
 - c. Charts showing:
 - i. change of the classifier parameters during the learning process;
 - ii. error of evaluation, i.e. classification after each learning iteration (not the learning error)
 - d. Parameters of the final classifier.
 - e. Optionally: prepare animated visualizations of the learning which can be embedded into the PDF or submitted as supplemental files.
5. In addition to the PDF report and optional animations, please upload the source code of your implementation.
6. All files must be submitted to the STUDIA server by the **January 10, 2021**.

The project is led by: **dr inż. Grzegorz Bogdan**

Office hours:

- Tuesdays, 14:15-15:00
- Thursdays, 16:15-17:00

Script 1 (MATLAB)

```
rng(index_number);
N=20;
A=[randn(N/2,1) rand(N/2,1)+0.5;randn(N/2,1) -rand(N/2,1)-0.5];
angle=randn(1);
x(:,1)=A(:,1)*cos(angle)-A(:,2)*sin(angle);
x(:,2)=A(:,1)*sin(angle)+A(:,2)*cos(angle);
x=x+randn(1,2);
y=sign(A(:,2));
```