

Machine Learning

Exercise Sheet 12

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Exercise 27: Perceptron (5 Points)

a)

x_1	x_2	x_3	class
4	3	6	negative
2	-2	3	positive
1	0	-3	positive
4	2	3	negative

Apply the perceptron learning algorithm until convergence on the given data. Use a step length $\alpha = 1$ and start with $\beta = 0$, $\beta_0 = 1$. Use the algorithm with a small difference: choose the training instances sequentially instead randomly (line 6).

b)

x_1	x_2	class
1	1	positive
1	0	negative
0	0	positive
0	1	negative

Show that the problem given in the table above cannot be solved with a single perceptron.

Exercise 28: Nearest-Neighbor and Kernel Regression (5 Points)

Given is following data set:

x	y	x	y
1	2	6	12
2	4	7	14
3	6	8	16
4	8	9	18
5	10	10	20

a) Predict the target for 0, 2.5 and 5.75 using

1. 2-nearest-neighbor regression
2. Nadaraya-Watson kernel weighted average with a Epanechnikov kernel with bandwidth $\lambda = 2$.

b) Plot the data and the models of part a).