Machine Learning
Exercise Sheet 4

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Exercise 8: Gradient Descent (5 Points)

Apply gradient descent on the function $f(x) = \frac{1}{4}x^4 + \frac{1}{3}x^3 - \frac{1}{2}x^2$ with following configurations:

a)

Use step length $\alpha = 0.3$ and starting point $x_0 = -1$ and show the first four iterations. What is your minimum?

b)

Use step length $\alpha = 2$ and starting point $x_0 = -1$ and show the first four iterations. What has happened and why?

c)

Use step length $\alpha = 0.3$ and starting point $x_0 = 0$ and show the first two iterations. What has happened and why?
Do the same again with $\alpha = 0.8$ and starting point $x_0 = 0.5$ and show the first four iterations. Where is your minimum now?
What would be a possible solution to overcome the problem just identified?

Exercise 9: Statistic models in R (3 Points)

Read chapter 11 of „An Introduction to R".

a)

Using which formula can you express linear regression without intercept? Give a formula for a non-trivial polynomial regression.

b)

How do you predict with the model estimated by `lm()`?

Exercise 10: Linear and Logistic Regression in Weka (2 Points)

Apply on a regression and classification data set of your choice with Weka linear respectively logistic regression.

a)

Which of the shown error metrics makes sense to evaluate a regression respectively a classification model? Choose one metric and explain briefly.

b)

Try in both cases different `ridge` parameters and test whether they lead to better results.