

# Machine Learning

## Exercise Sheet 2

Prof. Dr. Dr. Lars Schmidt-Thieme, Martin Wistuba  
Information Systems and Machine Learning Lab  
University of Hildesheim

November 3rd, 2015  
Submission until November 10th, 13.00 to wistuba@ismll.de

### Exercise 3: R-Tutorial 2 (4 Points)

- a) Read Chapter 2 and 3 of „An Introduction to R“. In R there are different possibilities to create vectors. Give an example for three of them. Tell in three sentences something about objects and classes in R.
- b) Create a linear regression model for the in R integrated data set `cars`. We want to find a predictor for the variable `cars$dist` given `cars$speed`. Get the coefficients, plot the data and add a regression line. Add the used R code to your solution.  
Hint: The needed commands can be found in Appendix A.

### Exercise 4: Logistic Regression (6 Points)

Given is following data:

y	x	y	x
0	9.5	1	11.1
0	9.6	1	11.1
0	9.7	1	11.1
0	9.8	1	11.5
0	9.9	1	11.8
0	10.5	1	11.9
0	11.0	1	12.1
0	11.2	1	12.2
0	11.5	1	12.5
0	11.7	1	12.6
0	12.1	1	12.6

- a) Apply linear regression for the target  $y$  using the method of R (see Exercise 3). Estimate the mean squared error of the model for the given data. Submit results and the code.
- b) Optimize a logistic regression model with the Newton algorithm for the target  $y$ . Use  $\alpha = 1$  and  $\beta = 0$  for this and do it manually (for solving equation systems you can use a tool e.g. R). Stop after two iterations and estimate the mean squared error of the model on the given data. Compare the parameters after the first and second iteration with the final parameters  $\hat{\beta}_0 = -23.35$ ,  $\hat{\beta}_1 = 2.064$
- c) Plot the data and the predictor functions of (a) and (b). Discuss the results.