Assignment 3: Regression Classifier

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In the lecture classification using logistic regression was presented.

- $P(y = y_i|x) = \frac{e^{f_i(x)}}{\sum_j e^{f_j(x)}}$
- $L = -\sum_{i=1}^{m} \log(P(y_i|x_i)) = -\sum_{i=1}^{m} \log(\frac{e^{f_{y_i}(x_i)}}{\sum_j e^{f_j(x_i)}})$

The task is now to implement a classifier using logistic regression

- $f_j(x) = w_j^T x = w_{j1}x_1 + \ldots + w_{jn}x_n$
- $\frac{\partial}{\partial w_j} L = -\sum_{i=1}^{m} (c(y_i == j) - P(y_j|x_i))x_i$
  with $c()$ indicator function (proof in tutorial)
- Use gradient descent: $w_i = w_i - \eta \cdot \frac{\partial}{\partial w_i} L$
- First coefficient of x is always 1 (to code the intercept), i.e. the dimension of the input space increases by 1

The classifier should be tested on the Fisher Iris data set (available on the course home page[1])

- Sequence of patterns; 4 features and 1 class label $\in \{1, 2, 3\}$ ($\rightarrow$ 5 dimensional input space)
- Please note that the optimal gain rate η may be very small

The solution of the assignment should include

- Listing of the program (all not exotic prog. lang allowed)
- Output including value of L after each iteration and the final error rate on the whole set

Extra task

- Implement k-NN classifier and compare results

[1] http://sml.nicta.com.au/Education/Teaching/OverviewCourse/view