Intelligent Data Analysis — Summer 2012

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**Exercise Sheet 6**

**Additional Exercise** Error Measures

Given the following data set and the sets of coefficients $P_i$ for interpolating polynomials $f_i = p_0 x^0 + \ldots + p_{|P_i|} x^{|P_i|}$ calculate the squared error (SE), mean squared error (MSE) and root mean squared error (RMSE). For each polynomial calculate the Bayes Information Criterion (BIC) and Akaike Information Criterion (AIC). Consider that the y values are distorted by gaussian noise. This simplifies the formulas to

$$BIC_{Gauss} = k \ln(n) + n \cdot \frac{MSE}{\sigma^2}$$
$$AIC_{Gauss} = 2k + n \ln(MSE),$$

where $\sigma^2$ is the (estimated) variance.

What can you deduce from your results?

People claim that the AIC is more suitable than the BIC. Imagine a case where this does not hold!

| $x$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| $y$ | 0 | 2 | 3 | 3 | 3 | 3.5 | 4 | 5 | 7 | 10 |

1. $P_1 = [0.25, 0.80]$
2. $P_2 = [1.30, 0.05, 0.10]$
3. $P_3 = [0.13, 2.23, -0.55, 0.05]$
4. $P_4 = [0.03, 2.65, -0.79, 0.09, -0.0023]$
5. $P_5 = [-0.02, 3.12, -1.22, 0.2251, -0.02, 0.0008]$

**Additional Exercise** Model Fitting

In the lecture slides you can find the solution for determining the coefficients for $P_1$. Starting from that derive a formula to calculate $P_0$! What do you see?

**Additional Exercise** No Free Lunch Theorem

During the lecture you heard about the *No-Free-Lunch-Theorom*. Explain this theorem and why it is important for data analysis! (Further information can be found at http://www.no-free-lunch.org/ )