Bootstrap method

The bootstrap method is used for error estimation of the freely varying parameters of a fit. It is an error estimation model of the 'Monte Carlo' type, which means it works basically by generating simulated data sets on the basis of the experimental data and repeating the fit for these simulated data sets. The spread of all the best fit paramter sets generated by these fits serves as a measure for the parameter errors.

Specifically, the bootstrap analysis takes a subset of N randomly chosen points out of the experimental data set, which itself consists of N data points. Since the points are chosen randomly, some of the points will be selected more than once; others will not be selected at all. Thus the 'simulated' data set is not identical to the original one, while the statistical properties of the original data set are maintained (since the number of data points remains the same).

Advantages and disadvantages

Since at least 1000 data sets have to be simulated and fitted, the bootstrap method seems to be rather time consuming. On the other hand all parameter errors are calculated “in one go”; also the simulation process is not very time consuming. The bootstrap method makes far less assumptions than the support plane analysis and thus can be applied even to MLE fitting.

Implementation

The implementation of the bootstrap method is straightforward: The original data set is used for all fits while introducing an additional (integer) weighting factor according to how many times a point was picked in the 'simulation' process.

References

- Press WH, Teukolsky SA, Vertterling WT, Flannery BP (1992) *Numerical Recipes in* C, 2nd edn. Cambridge University Press, New York (available in room C202)

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