Foreword

In recent years data-analytic methods originating from the area of machine learning have gained also strong momentum in Statistics. Statisticians have contributed to the methodological foundations of these algorithmic methods and substantially extended them, and thus these methods have become part of statistical methodology. A particularly popular example are recursive partitioning methods, including so-called classification and regression trees. Their basic rationale is to analyse multivariate data by successively splitting the sample and thus partitioning it into sub-groups that are homogeneous with respect to an outcome variable of interest. Originally, these methods, which are typically very powerful in prediction problems, have been understood as model-free, providing a fundamental alternative to regression modelling, contrasting the explanation-oriented regression modelling culture with the prediction-oriented algorithmic culture.

This seemingly fundamental antagonism is overcome by the model-based recursive partitioning ("MOB") approach of Zeileis, Hothorn & Hornik (2008; Journal of Computational and Graphical Statistics), where, in simplified terms, regression models are spilt: First a regression model relating the core covariates to the response variable is estimated on the whole sample, and then it is investigated for parameter instability, i.e. whether the individual score contributions suggest a substantial structural change in the parameter values over the ordered values of some additional variable. If so, the sample is split, and separate regression models are estimated for the sub-groups, which then are taken as new samples for an iterative repetition of the procedures until a stopping criterion is fulfilled. In the end, the procedure gives the user a partition whose members are homogeneous with respect to the core regression model, and thus parsimonious regression models of high explanatory power are obtained - if (!) no measurement error occurs.

However, substantial measurement error is quite a common problem, for instance, in econometrics and biometrics. Therefore, the development of powerful measurement correction methods has been an intensively studied area in traditional regression models. Birke is the first who transferred some of these methods to the model-based

recursive partitioning context. Her basic technical insight is that for the MOB methodology it is sufficient to consider arbitrary unbiased estimation functions, instead of the commonly used likelihood-based score-function. Birke therefore relies on measurement error corrected score functions in terms of Nakamura, and she is indeed able to extend the whole MOB framework to the situation of classical additive covariate measurement error. This includes a sophisticated implementation for the Weibull and the Cox model that makes this computationally quite demanding procedure still practically applicable. A well designed simulation study corroborates the high power of the developed methodology.
By incorporating measurement error correction methods in a very elegant and efficient way, Birke's work boosts the practical application and relevance of the model-based recursive partitioning methodology.

Munich, November 2014 *Prof. Dr. Thomas Augustin*

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