Detecting Invariance in Psychometric Models with the psychotree Package

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The **psychotree** package offers a statistical toolbox for detecting parameter differences in psychometric models, including different worth parameters in Bradley-Terry models (Strobl, Wickelmaier and Zeileis, 2011) and differential item functioning (DIF) in the Rasch model (Strobl, Kopf and Zeileis, 2010a,b). The method for detecting different worth parameters in Bradley-Terry models is implemented in the `bttree` function, the DIF detection method for the the Rasch model is implemented in the `raschtree` function. Both methods are based on a general model-based recursive partitioning framework employing generalized M-fuctuation tests for detecting differences in the model parameters between different groups of subjects (Zeileis and Hornik, 2007; Zeileis, Hothorn and Hornik, 2008). The main advantage of this approach is that it allows to detect groups of subjects exhibiting different model parameters, that are not pre-specifed, but are detected automatically from combinations of covariates. The talk outlines the statistical methodology behind **psychotree** as well as its practical application by means of illustrative examples.

References

Strobl, C., J. Kopf, and A. Zeileis. A New Method for Detecting Differential Item Functioning in the Rasch Model. Technical Report 92, Department of Statistics, Ludwig-Maximilians-Universität München, Germany, 2010. URL: http://epub.ub.uni-muenchen.de/11915/.

Strobl, C., J. Kopf, and A. Zeileis. "Wissen Frauen weniger oder nur das Falsche? – Ein statistisches Modell für unterschiedliche Aufgaben-Schwierigkeiten in Teilstichproben." *Allgemeinbildung in Deutschland – Erkenntnisse aus dem SPIEGEL Studentenpisa-Test*. Ed. S. Trepte and M. Verbeet Wiesbaden: VS Verlag, 2010, 255–272.

Strobl, C., F. Wickelmaier, and A. Zeileis. "Accounting for Individual Differences in Bradley-Terry Models by Means of Recursive Partitioning." (To appear.). *Journal of Educational and Behavioral Statistics* (2011).

Zeileis, A., T. Hothorn, and K. Hornik. "Model-Based Recursive Partitioning." *Journal of Computational and Graphical Statistics* 17 (2008): 492–514.

Zeileis, Achim and Kurt Hornik. "Generalized M-Fluctuation Tests for Parameter Instability." *Statistica Neerlandica* 61 (2007): 488–508.