Robust statistics by means of scaled Bregman distances

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1 Abstract

We present a method for the goal-oriented design of outlier- and inlier-robust statistical inference tools. In particular, this includes the tasks of parameter estimation, testing for goodness-of-fit resp. homogenity resp. independence, clustering, change-point detection, exploratory model search, and some Bayesian decision procedures.

In order to achieve this goal, we adapt the concept of *scaled Bregman distances between two distributions*, which was introduced in Stummer [2007], Stummer & Vajda [2012], and which generalizes the widely-used (partially non-robust) concepts of Kullback-Leibler information distance/relative entropy, Pearson's chisquare distance, Hellinger distance, Csiszar-Ali-Slivey divergences, etc. The classical (i.e., unscaled) Bregman distances – such as the L^2-distance and the more general density power divergences – are covered as well.

In order to visualize effectively and transparently the corresponding robustness properties, we present 3D-plots of associated *density-pair adjustment functions*. Numerous special cases will be illustrated. For the discrete case, some universally applicable results on the asymptotics of the underlying scaled-Bregman-distance test statistics are derived as well. Furthermore, we give some application to the robust estimation of the tail dependence coefficient of bivariate heavy-tailed distributions.

This talk is mainly based on several joint works with A.-L. Kißlinger (Erlangen-Nürnberg) respectively with B.H. Roensch (Erlangen-Nürnberg).

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