**Use of the score test to detect outliers under the alternative outlier model**

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The alternative outlier model (AOM) was introduced by Cook et al. (1982) to model a single outlier in the normal linear model as an observation with unknown inflated variance. Thompson (1985) considered the same model and used REML for variance parameter estimation. The appeal of the AOM is the downweighting of an observation (or group of observations) rather deleting it as in case-deletion methods. The weighting is determined automatically as part of the estimation procedure via the use of a variance parameter. In this paper we review the AOM of Thompson (1985). We set up the AOM as a linear mixed model and then use the score test statistic as an objective measure for determining whether the weighting is required, i.e. whether the observation is an outlier. The advantage of the score test is that it involves the score vector and information matrix under the null hypothesis, hence it requires fitting the null model only, unlike the likelihood ratio test. We examine the dependence of the score test statistic on the second derivatives of the REML log-likelihood, i.e. observed, expected and average information matrices. We also investigate distributional properties of the proposed score tests and consider the problem of multiple testing. We illustrate the proposed methodology using simulated and real data sets.

## References

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THOMPSON, R. (1985): A note on restricted maximum likelihood estimation with an alternative outlier model. *Journal of the Royal Statistical Society, Series B, 47, 53-55.*