**RLRsim: Testing for Random Effects or Nonparametric Regression Functions in Additive Mixed Models**

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**Abstract.** Testing for a zero random effects variance is an important and common testing problem. Special cases include testing for a random intercept, and testing for polynomial regression versus a general smooth alternative based on penalized splines. The problem is non-regular, however, due to the tested parameter on the boundary of the parameter space. Our package RLRsim uses the approximate null distribution for the Restricted Likelihood Ratio Test proposed in Greven et al. (2008) to provide a rapid, powerful and reliable test for this problem. This method extends the exact distribution derived for models with one random effect (Crainiceanu & Ruppert, 2004) to obtain a good approximation for models with several random effects. The test performed better than a number of competitors in an extensive simulation study covering a variety of typical settings (Scheipl et al., 2008). RLRsim also proved to be an equivalent and fast alternative to computationally intensive parametric bootstrap procedures. Our package can be used in a variety of settings, providing convenient wrapper functions to test terms in models fitted using nlme::lme, lme4::lmer, mgcv::gamm or SemiPar::spm.

**References**


**Keywords**

Linear Mixed Model; Non-regular Problem; Penalized Splines; Restricted Likelihood Ratio Test; Variance Component