



## **Hypothesis testing in structured models using Kronecker products for variance components with constrains**

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When testing hypothesis for variance components in random and mixed models, built with Kronecker products of their associated Jordan algebras, using likelihood ratio tests, the positivity of these parameters is often overlooked. Using the results obtained in [1], hypothesis tests with positivity constrains based on approximate distributions and permutation procedures for random models with 2 and 3 variance components has been proposed. The performance of these procedures is investigated through simulation studies. References: [1] Self S. G., and Liang K.-Y. (1987). Asymptotic properties of maximum likelihood estimators and likelihood ratio tests under nonstandard conditions. *Journal of the American Statistical Association*, 82:605-610.