

Power Analysis for Multivariate Generalised Linear Models

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Sample size determination is an important and continuously developing part of statistics. New designs, new approaches are continuously emerging and broadening of computational opportunities are also increase the set of available techniques.

Most of our work is based on the considerations of Daniel F. Heitjan [1] who developed a S-Plus package for power and sample size analysis of a special group of Generalised Linear Models (GLMs), the Multivariate Generalised Linear Models.

Multivariate Generalised Linear Models can be mathematically described by the model

$$\mathbf{Y}_{N \times p} = \mathbf{X}_{N \times q} \mathbf{B}_{q \times p} + \mathbf{E}_{N \times p}$$

where

\mathbf{Y} is the vector of response, \mathbf{X} is the design matrix, \mathbf{B} is the vector of effect coefficients, and \mathbf{E} is the vector of errors assuming that $\mathbf{E} \sim N_{n \times p}(\mathbf{0}, \mathbf{I}_N \otimes \mathbf{\Sigma})$. Here $\mathbf{\Sigma}$ represents the covariance matrix of the \mathbf{Y} columns (varying over "within" factor levels) and often referred as repeated measures.

Sample size determination for these models is also supported by SAS (among others with a SAS-macro developed by Keyes and Muller [2] in 2005, but we could not find any trace of having such a tool in R. This was our motivation to implement Heitjan's methods in R.

What we exactly did and would like to present to R-community is:

1. Implementation of Heitjan's methods in R.
2. Our experiences on application the procedures (in R) on the examples of Muller, LaVange, Ramey and Ramey [3].
3. Extension of Heitjan's original work with plotting procedures which was completely missing from his published procedures.

References

- [1] Heitjan, D.F. (2009). Powerex package for S-Plus, <http://www.cceb.upenn.edu/pages/heitjan/power/>.
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