gnm: a Package for Generalized Nonlinear Models

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This talk will introduce the *gnm* package which provides functions for the specification, estimation and evaluation of generalized nonlinear models. The class of generalized non-linear models extends that of generalized linear models by allowing non-linear terms in the predictor. Examples include models with multiplicative interaction terms such as the row-column association models from sociology and the GAMMI models from crop science; stereotype models for an ordered categorical response, and diagonal reference models for dependence on a square two-way classification.

The main functions in *gnm* have been patterned on the *base* function `glm` and its methods (for generalized linear models), so the package integrates well into R and useRs should find it straight-forward to pick up. The package includes some functions that may be used in the context of (generalized) linear models, in particular functions for setting up structured linear interactions between factors. However the major contribution of the package is to provide facilities for the specification and estimation of nonlinear terms. From a user's perspective, this is achieved through two functions: `Mult` for the common case of multiplicative terms and `Nonlin` for any other differentiable non-linear term.

The generality of *gnm* is made possible by two features of the package. First `Nonlin` can be used to specify any differentiable nonlinear term through the use of "plug-in" functions, a number of which are provided by the package and which may also be user-defined. Second an over-parameterized representation of models is used throughout, so that rules for applying constraints do not need to be defined. A set of tools is provided by *gnm* so that estimable parameter combinations and their standard errors can be obtained after a generalized nonlinear model has been fitted.

Although the number of user-level functions in *gnm* is small, the functionality of the package is large and this talk will only provide a snapshot of its capabilities. A more detailed overview is provided by the vignette which is available on the *gnm* webpage (http://www.warwick.ac.uk/go/heatherturner/gnm) or as part of the package itself, which may be downloaded from CRAN (http://cran.r-project.org).