

GENERALIZED LINEAR MODEL FOR BINOMIAL DATA USING THE LOGIT LINK

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Description

A generalized linear model for binomially distributed data using the logit link.

Implementation

The file `binomial.logit.glm.sim.R` simulates data according to the model statement presented below, and `binomial.logit.glm.mcmc.R` contains the MCMC algorithm for model fitting.

Model statement

Let z_i be the number of “successes” (i.e., z_i are integers greater than or equal to 0) out of N_i “trials” during event i , for $i = 1, \dots, n$. Also let \mathbf{x}_i be a vector of covariates associated with z_i for which inference is desired, and the vector $\boldsymbol{\beta}$ be the corresponding coefficients.

$$\begin{aligned} z_i &\sim \text{Binom}(N_i, p_i) \\ \text{logit}(p_i) &= \mathbf{x}_i' \boldsymbol{\beta} \\ \boldsymbol{\beta} &\sim \mathcal{N}(\mathbf{0}, \sigma_{\boldsymbol{\beta}}^2 \mathbf{I}) \end{aligned}$$

Full conditional distributions

Regression coefficients ($\boldsymbol{\beta}$):

$$\begin{aligned} [\boldsymbol{\beta} | \cdot] &\propto \prod_{i=1}^n [p_i | \boldsymbol{\beta}] [\boldsymbol{\beta}] \\ &\propto \prod_{i=1}^n \text{Binom}(z_i | \mathbf{x}_i' \boldsymbol{\beta}) \mathcal{N}(\boldsymbol{\beta} | \mathbf{0}, \sigma_{\boldsymbol{\beta}}^2 \mathbf{I}). \end{aligned}$$

The update for $\boldsymbol{\beta}$ proceeds using Metropolis-Hastings.