

# POISSON GENERALIZED LINEAR MODEL FOR COUNT DATA

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## Description

A generalized linear model for count data.

## Implementation

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

## Model statement

Let  $z_i$ , for  $i = 1, \dots, n$ , be observed count data (i.e.,  $z_i$  are integers greater than or equal to 0). 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.

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

## Full conditional distributions

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

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

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