Package 'asp23hmc'

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Type Package

Title Hamiltonian Monte Carlo

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Description Statistical inference using Hamiltonian MCMC with flat priors for location-scale regression. The package is inspireed by the lmls package.

Depends lmls, gamlss.data, cli

License No current license

URL https://gitlab.gwdg.de/paul.jarschke/hamiltonian-mcmc.git

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R topics documented:

`coef.hmc` *Extract Coefficients from an HMC Model This function extracts coefficients from an HMC model object.*

Description

Extract Coefficients from an HMC Model This function extracts coefficients from an HMC model object.

Usage

```
## S3 method for class 'hmc'
coef(object, predictor = c("location", "scale"), ...)
```

Arguments

object	An HMC model object.
predictor	A character vector specifying the predictor(s) for which coefficients are extracted. Options include "location" and "scale." Default is c("location", "scale"), which returns both location and scale coefficients.
...	Additional arguments (not used).

Value

A list of coefficients corresponding to the specified predictor(s).

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hmc *Hamiltonian Markov Chain Monte Carlo (HMC) Sampling*

Description

This function performs HMC sampling for a given location-scale regression model.

Usage

```
hmc(
  location = y ~ x,
  scale = ~1,
  data = environment(location),
  light = FALSE,
  num_samples = 1000,
  verbose = TRUE,
  threshold = 1/10000,
  include_warmup = FALSE,
 dual_average = list(DELTA = 0.65, LAMBDA = 5, KAPPA = 0.75, GAMMA = 0.05, t0 = 10),
  num_adapt = 500,
  num_warmup = 500,
  max_L = 250
)
```

Arguments

location	A formula specifying the model's location component (e.g., y ~ x).
scale	A formula specifying the model's scale component (e.g., ~ 1).
data	The dataset containing the model's variables.
light	A logical indicating whether to use the "light" version of the model (default is FALSE).
num_samples	The number of MCMC samples to generate (default is 1000).
verbose	A logical indicating whether to display progress messages (default is TRUE).

threshold	The convergence threshold for adaptive step size tuning (default is 1/10000).
include_warmup	A logical indicating whether to include warm-up samples in the final results (default is FALSE).
dual_average	A list of parameters for dual averaging step size adaptation.
num_adapt	The maximum number of adaptation iterations (default is 500).
num_warmup	The number of warm-up iterations (default is 500).
max_L	The maximum number of leapfrog steps for HMC (default is 250).

Value

An HMC model object containing MCMC samples and results.

Examples

```
library(gamlss.data)
data(abdom, package = "gamlss.data")
output <- hmc(y ~ x, ~x, data = abdom)
```

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logLik.hmc *Extract Log-Likelihood from an HMC Model This function extracts the log-likelihood from an HMC model object.*

Description

Extract Log-Likelihood from an HMC Model This function extracts the log-likelihood from an HMC model object.

Usage

```
## S3 method for class 'hmc'
logLik(object, ...)
```

Arguments

object	An HMC model object.
...	Additional arguments (not used).

plot.hmc *Plot Method for an HMC Model*

Description

This function generates various types of plots for an HMC model object.

Usage

```
## S3 method for class 'hmc'
plot(
  x,
  predictor = c("location", "scale"),
  type = c("trace", "hist", "density", "acf", "roll_avg"),
  exclude_warmup = TRUE,
  ...
)
```

Arguments

x	An HMC model object.
predictor	A character vector specifying the predictor for which plots are generated. Options include "location" and "scale." Default is c("location", "scale"), which generates plots for both location and scale predictors.
type	A character vector specifying the type of plots to generate. Options include "trace," "hist," "density," "acf," and "roll_avg."
exclude_warmup	A logical value indicating whether to exclude warm-up iterations when generating plots. Default is TRUE.
...	Additional arguments (not used).

print.hmc *Print Method for an HMC Model*

Description

This function provides a customized print method for an HMC model object.

Usage

```
## S3 method for class 'hmc'
print(x, digits = max(3, getOption("digits") - 3), ...)
```

Arguments

x	An HMC model object.
digits	The number of digits to be used for printing numeric values. Default is max(3, getOption("digits") - 3).
...	Additional arguments (not used).

summary.hmc *Summary Method for an HMC Model*

Description

This function provides a summary of an HMC model object.

Usage

```
## S3 method for class 'hmc'
summary(object, type = "hmc", digits = max(3, getOption("digits") - 3), ...)
```

Arguments

object	An HMC model object.
type	A character string specifying the type of summary to generate. Default is 'hmc'.
digits	The number of digits to be used for printing numeric values. Default is max(3, getOption("digits") - 3).
...	Additional arguments (not used).

Value

A summary of the HMC model object.

Index