

Package: hpolcc (via r-universe)

July 17, 2026

Type Package

Title Hierarchical Air Pollution Model

Version 0.5.2

Description Fits hierarchical functional case-crossover models for air pollution health effects, with hierarchical structures and case-crossover designs built on the adlplace Laplace approximation framework.

SystemRequirements OpenMP

License MPL-2.0

Depends R ($\geq 4.1.0$), adlplace ($\geq 0.5.0$)

LinkingTo Rcpp, adlplace, RcppEigen, trustOptim, RCppAD

Imports Rcpp, Matrix, data.table, methods, timeDate, stats, adlplaceHgp, RCppAD

Suggests GET, WoodburyMatrix, testthat ($\geq 3.0.0$), rmarkdown, knitr, trustOptim

Enhances extraDistr

VignetteBuilder knitr

Config/testthat/edition 3

Encoding UTF-8

Roxygen list(markdown = TRUE)

Collate '000.R' 'RcppExports.R' 'case_crossover.R' 'dirichlet_multinom.R' 'hnlm-methods.R' 'hnlm.R' 'remove_holidays.R' 'zzz.R'

NeedsCompilation yes

Config/roxygen2/version 8.0.0

Repository <https://eborgnine.r-universe.dev>

Date/Publication 2026-07-17 22:33:33 UTC

RemoteUrl <https://github.com/eborgnine/adlplace>

RemoteRef main

RemoteSha 96d35f802cd1c076c717dc2284fafebab64dad52

RemoteSubdir hpolcc

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dirichlet_multinom	<i>Dirichlet-multinomial case-crossover response term</i>
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Description

Dirichlet-multinomial case-crossover response term

Usage

```
dirichlet_multinom(x, by, init = 0.001, lower = 0, upper = Inf, parscale = 1)
```

Arguments

- x Outcome variable name.
- by Character vector of stratification variables (e.g. c("year", "month", "dow")).
- init Initial value for overdispersion sd.
- lower Lower bound for sd.
- upper Upper bound for sd.
- parscale Parameter scale for optimization.

Value

A dirichlet_multinom object.

dirichlet_multinom-class

Dirichlet-multinomial response term

Description

Model term for the case-crossover Dirichlet-multinomial log density registered as `dirichlet_multinomial`.

Usage

```
## S4 method for signature 'dirichlet_multinom'
elgm_matrix(term, data)
```

```
## S4 method for signature 'dirichlet_multinom'
design(term, data)
```

```
## S4 method for signature 'dirichlet_multinom'
precision(term, data)
```

```
## S4 method for signature 'dirichlet_multinom'
theta_info(term)
```

```
## S4 method for signature 'dirichlet_multinom'
beta_info(term, data)
```

```
## S4 method for signature 'dirichlet_multinom'
random_info(term, data)
```

Arguments

<code>term</code>	A <code>dirichlet_multinom</code> term object.
<code>data</code>	Analysis-ready data frame.

Value

Sparse `ngCMatrix` mapping observations to strata columns.

Functions

- `elgm_matrix(dirichlet_multinom)`: Case-crossover stratum map for AD shards.
- `design(dirichlet_multinom)`: Design method (not used).
- `precision(dirichlet_multinom)`: Precision method (not used).
- `theta_info(dirichlet_multinom)`: Theta info for overdispersion sd.
- `beta_info(dirichlet_multinom)`: Beta info method (not used).
- `random_info(dirichlet_multinom)`: Random info method (not used).

Slots

by Character vector of stratification variables for the case-crossover design.

Slots (inherited from model)

ad_fun Character scalar "dirichlet_multinomial".

ad_kind Character scalar "observations".

package Character scalar "hpolcc".

get_ad_fun_raw_obs	<i>Build observation-shard ad_fun_ptr in this package's shared library.</i>
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Description

Build observation-shard ad_fun_ptr in this package's shared library.

Usage

```
get_ad_fun_raw_obs(model, config, name)
```

Arguments

model ad_data S4 object.

config Model configuration list.

name Observation density name (e.g. "dirichlet_multinomial").

Value

External pointer of class ad_fun_ptr.

get_ad_fun_raw_parameters	<i>Build parameters-shard ad_fun_ptr in this package's shared library.</i>
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Description

Build parameters-shard ad_fun_ptr in this package's shared library.

Usage

```
get_ad_fun_raw_parameters(model, config, name)
```

Arguments

model	ad_data S4 object.
config	Model configuration list.
name	Parameters density name (e.g. "dirichlet_multinomial_extra").

Value

External pointer of class `ad_fun_ptr`.

hnlm	<i>Fit Hierarchical Non-Linear Models</i>
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Description

Fits a hierarchical case-crossover model with a `dirichlet_multinom` response term, using **adlaplace** automatic differentiation and Laplace approximation.

Usage

```
hnlm(
  formula,
  data,
  config = list(transform_theta = TRUE),
  control = list(maxit = 1000, trace = 3, REPORT = 1),
  control_inner = list(report.level = 0),
  for_dev = FALSE,
  ...
)
```

Arguments

formula	Model formula with a <code>dirichlet_multinom(...)</code> response on the LHS.
data	Data frame containing variables referenced in formula.
config	Configuration list passed to adlaplace . Common entries: <code>transform_theta</code> If TRUE (default), optimize log-scale hyperparameters. <code>num_threads</code> OpenMP threads for inner optimization and derivative evaluation (default 1L). <code>num_shards</code> Target number of observation shards for parallel evaluation (default 1000L). <code>num_sim</code> Number of conditional simulation draws from <code>adlaplaceHgp::cond_sim_iwp</code> (default 500). <code>verbose</code> Verbosity level; values above 1 enable extra adlaplace logging.
control	Control list passed to outer optim.
control_inner	Control list passed to inner optimization.
for_dev	If TRUE, return intermediate objects for development.
...	Unused.

Value

When `for_dev = TRUE`, a development bundle of class `c("hnlm_dev", "hnlm")`. Otherwise a fitted object of class `hnlm` with primary slots `coefficients`, `log_lik`, `optim`, `converged`, `extra` (Laplace output), `hessian`, `info`, optional `sample`, and `call` (fit metadata including `config`, `terms`, and the original `match.call`).

<code>remove_holidays</code>	<i>Remove Holidays from Data</i>
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Description

This function removes holidays from a dataset based on the specified type.

Usage

```
remove_holidays(data, type = "rm_all")
```

Arguments

<code>data</code>	A data frame containing a 'date' column.
<code>type</code>	A character string specifying the type of holiday removal. Options are "rm_none", "rm_all".

Value

A data frame with holidays removed according to the specified type.

<code>summary.hnlm</code>	<i>Summary method for hnlm fits</i>
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Description

Returns `coefficients$parameters` from the fit, including `mle` and `se` (when the outer Hessian was available at fit time).

Usage

```
## S3 method for class 'hnlm'
summary(object, ...)

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

Arguments

object	A fitted hnlm object.
...	Not used.
x	A summary.hnlm object.
digits	Number of significant digits to print.

Value

An object of class `summary.hnlm` with the parameters table, variance matrix, log-likelihood, and convergence flag.

vcov.hnlm	<i>Variance-covariance matrix of outer parameters</i>
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Description

Inverse of the outer Hessian from profile likelihood optimization (`hessian$outer`). Falls back to a Moore-Penrose inverse with a warning if the Hessian is singular.

Usage

```
## S3 method for class 'hnlm'
vcov(object, ...)
```

Arguments

object	A fitted hnlm object.
...	Not used.

Value

Variance-covariance matrix on the optimization scale of `optim$par`.

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