Package 'midnight'

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Type Package

Title A 'tidymodels' Engine and Other Extensions for the 'midr' Package

Version 0.2.0

Description
Provides a 'parsnip' engine for the 'midr' package, enabling users to fit, tune, and evaluate Maximum Interpretation Decomposition (MID) models within the 'tidymodels' framework. Developed through research by the Moonlight Seminar 2025, a study group of actuaries from the Institute of Actuaries of Japan, to enhance practical applications of interpretable modeling. Detailed methodology is available in Asashiba et al. (2025) <doi:10.48550/arXiv.2506.08338>.

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Encoding UTF-8

Imports graphics, midr (>= 0.6.0), rlang, Rcpp, stats, utils

Suggests colormap, DALEX, ggbeeswarm, ggforce, ggplot2, MetBrewer, parsnip

RoxygenNote 7.3.2

URL https://github.com/ryo-asashi/midnight, https://ryo-asashi.github.io/midnight/

BugReports https://github.com/ryo-asashi/midnight/issues

LinkingTo Rcpp, RcppEigen

Config/Needs/website rmarkdown

NeedsCompilation yes

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Contents

`fastLmMatrix` *Fit Multivariate Linear Models*

Description

`fastLmMatrix()` estimates the linear model for multivariate response using one of several methods implemented using the `Eigen` linear algebra library.

Usage

```
fastLmMatrix(x, ...)

## Default S3 method:
fastLmMatrix(x, y, tol = 1e-07, method = 0L, ...)

## S3 method for class 'formula'
fastLmMatrix(formula, data = list(), method = 0L, ...)
```

Arguments

`x`	a model matrix X.
`...`	optional parameters passed to methods.
`y`	the response matrix Y.
`tol`	tolerance for the rank calculation.
`method`	an integer with value `0` for the column-pivoted QR decomposition, `1` for the unpivoted QR decomposition, `2` for the LLT Cholesky, `3` for the LDLT Cholesky, and `4` for the Jacobi singular value decomposition (SVD). Default is zero.
`formula`	an object of class "formula" (or one that can be coerced to that class): a symbolic description of the model to be fitted.
`data`	an optional data frame, list or environment (or object coercible by `as.data.frame` to a data frame) containing the variables in the model.

Details

`fastLmMatrix()` is a performance-optimized version of the standard `lm.fit()` function. Unlike `RcppEigen::fastLm()`, it is specifically designed to handle multivariate responses (Y as a matrix). It leverages the Eigen C++ template library for high-performance linear algebra, providing several decomposition methods with different trade-offs between speed and numerical stability.

Value

`fastLmMatrix()` returns a list with the following components:

`coefficients`	$p \times k$ matrix of coefficients.
`fitted.values`	$n \times k$ matrix of fitted values.
`residuals`	$n \times k$ matrix of residuals.
`rank`	an integer giving the numeric rank of the model matrix X.

See Also

`lm.fit`, `fastLm`

`ggmid.midimp` *Plot MID Importance with ggplot2*

Description

The **midnight** package extends `midr::ggmid()` to provide modern distribution plots for MID feature importance. Added types include sina, beeswarm, and violin plots.

Usage

```
## S3 method for class 'midimp'
ggmid(object, type = NULL, theme = NULL, terms = NULL, max.nterms = 30, ...)
```

Arguments

`object`	a "midimp" object to be visualized.
`type`	the plotting style. In addition to standard types ("barplot", "boxplot", "dotchart", "heatmap"), this extended method supports "violinplot", "sinaplot", and "beeswarm".
`theme`	a character string or object defining the color theme. See `color.theme` for details.
`terms`	an optional character vector specifying which terms to display.
`max.nterms`	an integer specifying the maximum number of terms to display. Defaults to 30.
`...`	optional parameters passed on to the layers.

Details

This is an S3 method for the `midr::ggmid()` generic for "midimp" objects created by `midr::mid.importance()`. This method replaces the primary layer with modern distribution geoms when `type` is one of the extended options.

Value

`ggmid.midimp()` returns a "ggplot" object.

Note

This S3 method is **NOT** registered automatically when the **midnight** package is loaded, and activated when `nightfall()` is explicitly called.

See Also

`nightfall`, `mid.importance`

`nightfall` *Transition into and out of Midnight*

Description

`nightfall()` activates the extended features provided by the **midnight** package. It overrides specific S3 methods (such as `ggmid.midimp`), switches the underlying solvers to highly optimized Eigen-based routines via global options, and applies midnight-themed color palettes.

`daybreak()` reverses these changes, restoring the default behavior, solvers, and themes of the **midr** package.

Usage

```
nightfall(methods = TRUE, solvers = TRUE, themes = TRUE)

daybreak(methods = TRUE, solvers = TRUE, themes = TRUE)
```

Arguments

`methods`	logical. If `TRUE`, overrides (or restores) the `ggmid.midimp` S3 method.
`solvers`	logical. If `TRUE`, sets (or restores) calculation solvers via `options()` (e.g., `midr.solver.qr`, `midr.solver.svd`). These optimized solvers can be utilized by specifying the corresponding method in `interpret()` (e.g., `method = "qr"`).
`themes`	logical. If `TRUE`, applies (or restores) color themes by setting `options()` for `midr.qualitative`, `midr.sequential`, and `midr.diverging`.

Value

`nightfall()` and `daybreak()` return an invisible list containing the previous options for solvers and themes.

persp.mid *Perspective Plot of MID Effects*

Description

Visualizes the combined effect of two variables from a "mid" object using a 3D perspective plot.

Usage

```
## S3 method for class 'mid'
persp(object, xvar, yvar = NULL, ..., xval = NULL, yval = NULL)
```

Arguments

object	a "mid" object, typically the result of `midr::interpret()`.
xvar	a character string with the name of the variable for the x-axis. Alternatively, a single string in the format `xvar:yvar` can be provided, in which case `yvar` can be omitted.
yvar	a character string with the name of the variable for the y-axis.
...	additional arguments passed on to `graphics::persp.default()`. Used to customize the plot's appearance, such as view angles (`theta`, `phi`) or color (`col`).
xval	a numeric or character vector specifying the sequence of values for the x-axis.
yval	a numeric or character vector specifying the sequence of values for the y-axis.

Details

This is an S3 method for the `persp()` generic that calculates the sum of the main effects of `xvar` and `yvar` and their interaction effect (`xvar:yvar`). The resulting sum is plotted as the height on the z-axis.

Value

`persp.mid()` invisibly returns the viewing transformation matrix, see `persp` for details. This function is primarily called for its side effect of creating a plot.

See Also

`persp`

Examples

```
mid <- midr::interpret(mpg ~ wt * hp + factor(am), data = mtcars, lambda = .5)

# Create a basic perspective plot
persp(mid, xvar = "wt", yvar = "hp")

# Customize the plot by passing arguments to graphics:::persp.default()
persp(mid, "wt", "hp", theta = 210, phi = 20, col = "lightblue", shade = .5)
persp(mid, "factor(am):wt", theta = 210, shade = .2)
```

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