Package 'glsm'

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Title Generalized Logistic Saturated Models

Version 0.1.0

Description Implements generalized logistic saturated models (GLSM) with support for saturated likelihood, deviance tests, predictions and visualization.

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Imports ggplot2, stats

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Config/testthat/edition 3

VignetteBuilder knitr

URL https://github.com/unfresh25/glsm

BugReports https://github.com/unfresh25/glsm/issues

Contents

confint.glsm *Confidence intervals for GLSM coefficients*

Description

Computes confidence intervals for the coefficients of a fitted glsm model, along with the intervals for the corresponding odds ratios.

Usage

```
## S3 method for class 'glsm'
confint(object, parm, level = 0.95, ...)
```

Arguments

object	An object of class glsm returned by glsm().
parm	Optional. A single coefficient name to extract its interval. If missing, intervals are computed for all coefficients.
level	Confidence level. A single number between 0 and 1. Defaults to 0.95.
...	Additional arguments (currently unused).

Details

By default, the function returns the Wald-type confidence intervals for all coefficients. The odds ratios (exponentiated coefficients) are also provided.

Value

A list of class confint.glsm with elements:

confint	A matrix of lower and upper confidence limits for the coefficients.
OR	The same intervals transformed to the odds ratio scale.
level	The confidence level used (in percent).

See Also

glsm()

`glsm` *Generalized Logistic Saturated Model (GLSM)*

Description

Fits a multinomial logistic regression model with a saturated structure. The function estimates the coefficients using an Iteratively Reweighted Least Squares (IRLS) algorithm, calculates log-likelihoods for the null, complete, and saturated models, and returns detailed outputs for model comparison, predicted probabilities, odds, and odds ratios.

Usage

```
glsm(formula, data, ref = NaN)
```

Arguments

`formula`	A formula specifying the dependent and independent variables, e.g., `y ~ x1 + x2`.
`data`	A `data.frame` containing the variables used in the formula.
`ref`	A character string indicating the reference category of the dependent variable. If `NaN`, the first level is used by default.

Details

This implementation works for categorical outcomes with 3 or more levels. For binary logistic regression, use `lsm()` instead. The function automatically computes:

- Log-likelihoods for null, complete, logit, and saturated models.
- Deviance and p-values for model comparisons.
- Coefficients, standard errors, Wald statistics, and odds ratios.

Value

An object of class `glsm` containing:

coefficients The estimated coefficients.

Std.Error Standard errors of the coefficients.

ExpB Exponentiated coefficients (odds ratios).

Log.Lik Log-likelihoods for the different models.

Deviance Deviances and tests for model comparisons.

Odds Fitted odds and odds ratios.

Probabilities Fitted category probabilities.

call The original function call.

Examples

```
## Not run:
data(mydata)
model <- glsm(prog ~ ses + write + read, data = mydata, ref = "academic")
summary(model)
confint(model, parm = "write:vocation")
predict(model, type = "response")
plot(model)

## End(Not run)
```

`plot.glsm` *Plot method for GLSM objects*

Description

Plots the estimated coefficients or odds ratios with confidence intervals from a fitted `glsm` model using `ggplot2`.

Usage

```
## S3 method for class 'glsm'
plot(x, type = c("coef", "OR"), level = 0.95, ...)
```

Arguments

`x`	An object of class `glsm` returned by `glsm()`.
`type`	Type of plot: `"coef"` for log-odds coefficients or `"OR"` for odds ratios. Defaults to `"coef"`.
`level`	Confidence level for the intervals. Defaults to `0.95`.
`...`	Additional arguments (currently unused).

Details

This plot shows point estimates with horizontal confidence intervals. A vertical dashed line is drawn at zero (for coefficients) or one (for odds ratios).

The function requires the `ggplot2` package.

Value

A `ggplot` object is produced and displayed.

See Also

`glsm()`

`predict.glsm` *Predict method for GLSM objects*

Description

Computes predictions from a fitted `glsm` model. Supported prediction types include linear predictors (link), fitted probabilities (response), odds, and odds ratios (OR).

Usage

```
## S3 method for class 'glsm'
predict(object, newdata = NULL, type = NULL, level = 0.95, ...)
```

Arguments

`object`	An object of class `glsm` returned by `glsm()`.
`newdata`	An optional data frame in which to look for variables with which to predict. Currently, passing `newdata` is not supported.
`type`	Type of prediction to compute. One of `"link"` (linear predictor), `"response"` (probabilities), `"odd"` (odds), or `"OR"` (odds ratios). Defaults to `"response"`.
`level`	Confidence level for the linear predictor interval. Only used if `type = "link"`.
`...`	Additional arguments (currently unused).

Details

The function returns the requested type of prediction:

- `"link"`: Linear predictors with confidence intervals.
- `"response"`: Predicted class probabilities.
- `"odd"`: Estimated odds.
- `"OR"`: Odds ratios relative to the reference category.

Value

A list with predictions and confidence intervals if `type = "link"`, otherwise a matrix of predicted values.

See Also

`glsm()`

print.confint.glsm *Print method for confidence intervals of a GLSM*

Description

Prints the confidence intervals and odds ratios computed by `confint.glsm()`.

Usage

```
## S3 method for class 'confint.glsm'
print(x, ...)
```

Arguments

`x`	An object of class `confint.glsm`.
`...`	Further arguments (unused).

Value

Prints output to the console.

print.glsm *Print method for GLSM objects*

Description

Displays the call, the number of populations in the saturated model, the estimated coefficients with standard errors and odds ratios, and the log-likelihoods for the different models.

Usage

```
## S3 method for class 'glsm'
print(x, ...)
```

Arguments

`x`	An object of class `glsm`, typically the result of a call to `glsm()`.
`...`	Additional arguments (currently unused).

Details

This function provides a clean summary output when you type the model object in the console.

Value

Prints formatted model information to the console. Invisibly returns `NULL`.

See Also

`glsm()`, `summary.glsm()`, `plot.glsm()`

print.summary.glsm *Print method for summary.glsm objects*

Description

Nicely prints the output of `summary.glsm()`, including coefficients and deviance comparisons.

Usage

```
## S3 method for class 'summary.glsm'
print(x, ...)
```

Arguments

`x`	An object of class `summary.glsm`.
`...`	Additional arguments (currently unused).

Value

Prints the summary tables to the console. Invisibly returns `NULL`.

See Also

`summary.glsm()`, `glsm()`

summary.glsm *Summary method for GLSM objects*

Description

Produces a detailed summary of a `glsm` object, including the estimated coefficients, standard errors, odds ratios, Wald statistics, degrees of freedom, p-values, and an analysis of deviance comparing models.

Usage

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

Arguments

`object`	An object of class `glsm`, returned by `glsm()`.
`...`	Additional arguments (currently unused).

Details

The summary includes:

- A table of coefficients, standard errors, odds ratios, Wald tests, degrees of freedom, and p-values.
- A deviance table comparing the null, complete, logit, and saturated models.

Value

An object of class `summary.glsm` containing the summary tables.

See Also

`glsm()`, `print.summary.glsm()`

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