# Package 'gfilogisreg'

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**Title** Generalized Fiducial Inference for Binary Logistic Regression Models

**Version** 1.0.3

**Description** Fiducial framework for the logistic regression model. The fiducial distribution of the parameters of the logistic regression is simulated, allowing to perform statistical inference on any parameter of interest. The algorithm is taken from Jessi Cisewski's PhD thesis: Jessi Cisewski (2012), ``Generalized fiducial inference for mixed linear models".

**License** GPL-3

**Encoding** UTF-8

**RoxygenNote** 7.1.1

**SystemRequirements** C++17, gmp

**Imports** rcdd, lazyeval, spatstat (>= 2.0.0), spatstat.geom, EigenR, stats, Rcpp

**LinkingTo** Rcpp, RcppArmadillo, roptim, BH

**Suggests** knitr, rmarkdown

**VignetteBuilder** knitr

**NeedsCompilation** yes

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**Repository** CRAN

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## gfiCDF *Fiducial cumulative distribution function*

### Description

Fiducial cumulative distribution function of a parameter of interest.

### Usage

```
gfiCDF(parameter, fidsamples)
```

### Arguments

| | |
|---|---|
| parameter | a right-sided formula defining the parameter of interest |
| fidsamples | fiducial samples, the output of gfilogisreg |

### Value

The fiducial cumulative distribution function of the parameter.

### Examples

```
y <- c(
  0, 0, 0, 1,
  0, 1, 1, 1
)
group <- gl(2, 4)
fidsamples <- gfilogisreg(y ~ 0 + group, N = 500) # (N=500 is not serious)
fcdf <- gfiCDF(~ exp(group1) / exp(group2), fidsamples)
fcdf(1)
plot(fcdf)
```

## gfiConfInt *Fiducial confidence interval*

### Description

Fiducial confidence interval of a parameter of interest.

### Usage

```
gfiConfInt(parameter, fidsamples, conf = 0.95)
```

### Arguments

| | |
|---|---|
| parameter | a right-sided formula defining the parameter of interest |
| fidsamples | fiducial samples, the output of gfilogisreg |
| conf | confidence level |

### Value

The fiducial confidence interval of the parameter.

### Examples

```
y <- c(
  0, 0, 0, 1,
  0, 1, 1, 1
)
group <- gl(2, 4)
fidsamples <- gfilogisreg(y ~ 0 + group, N = 500) # (N=500 is not serious)
expit <- function(x) exp(x) / (1+exp(x))
gfiConfInt(~ expit(group1) - expit(group2), fidsamples)
```

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## gfilogisreg *Generalized fiducial inference for logistic regression*

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### Description

Simulates the fiducial distribution of a logistic regression model.

### Usage

```
gfilogisreg(
  formula,
  data = NULL,
  N,
  thresh = N/2,
  progress = TRUE,
  gmp = FALSE,
  ufactr = .Machine$double.eps^(-0.5),
  vfactr = .Machine$double.eps^(-0.38)
)
```

### Arguments

| | |
|---|---|
| formula | formula describing the model |
| data | dataframe containing the variables in the model |
| N | number of fiducial simulations |
| thresh | threshold criterion for the alteration; expert usage only |

| | |
|---|---|
| progress | whether to print messages showing the progress of the algorithm |
| gmp | whether to use exact arithmetic in the algorithm (experimental) |
| ufactr, vfactr | these are control parameters of an optimization performed in the algorithm; these parameters should not be changed except if you encounter some messages about convergence issues |

## Value

A list with two fields: Beta, the fiducial simulations of the parameters, and Weights, their weight.

## Examples

```
y <- c(0, 0, 1, 1, 1)
x <- c(-2, -1, 0, 1, 2)
gf <- gfilogisreg(y ~ x, N = 400) # (N=400 is not serious)
gfiSummary(gf)
glm(y ~ x, family = binomial())
```

---

# gfiQuantile *Fiducial quantiles*

---

## Description

Quantiles of the fiducial distribution of a parameter of interest.

## Usage

```
gfiQuantile(parameter, fidsamples, probs)
```

## Arguments

| | |
|---|---|
| parameter | a right-sided formula defining the parameter of interest |
| fidsamples | fiducial samples, the output of gfilogisreg |
| probs | numeric vector of probabilities |

## Value

Numeric vector of quantiles, of the same length as probs.

## Examples

```
y <- c(
  0, 0, 0, 1,
  0, 1, 1, 1
)
group <- gl(2, 4)
fidsamples <- gfilogisreg(y ~ 0 + group, N = 500) # (N=500 is not serious)
gfiQuantile(~ group2 - group1, fidsamples, c(25, 50, 75)/100)
```

gfiSummary *Summary of fiducial samples*

## Description

Summary of the fiducial samples.

## Usage

```
gfiSummary(fidsamples, conf = 0.95)
```

## Arguments

| | |
|---|---|
| fidsamples | fiducial samples, the output of gfilogisreg |
| conf | confidence level |

## Value

A matrix with summary statistics: means, medians, and confidence intervals.

## Examples

```
y <- c(0, 0, 1, 1, 1)
x <- c(-2, -1, 0, 1, 2)
fidsamples <- gfilogisreg(y ~ x, N = 400) # (N=400 is not serious)
gfiSummary(fidsamples)
```

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