

Package ‘supportInt’

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Type Package

Title Calculates Likelihood Support Intervals for Common Data Types

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Author Derek Smith

Maintainer Derek Smith <derek.smith@vanderbilt.edu>

Description Calculates likelihood based support intervals for several common data types including binomial, Poisson, normal, `lm()`, and `glm()`. For the binomial, Poisson, and normal data likelihood intervals are calculated via root finding algorithm. Additional parameters allow the user to specify whether they would like to receive a parametric bootstrap estimate of the confidence level of said support interval. For `lm()` and `glm()`, the function returns profile likelihoods for each coefficient in the model.

Imports ProfileLikelihood, splines

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supportInt-package *Calculates Likelihood Support Intervals for Common Data Types*

Description

Calculates likelihood based support intervals for several common data types including binomial, Poisson, normal, `lm()`, and `glm()`. For the binomial, Poisson, and normal data likelihood intervals are calculated via root finding algorithm. Additional parameters allow the user to specify whether they would like to receive a parametric bootstrap estimate of the confidence level of said support interval. For `lm()` and `glm()`, the function returns profile likelihoods for each coefficient in the model.

Author(s)

Derek Smith

Maintainer: Derek Smith <derek.smith@vanderbilt.edu>

Examples

```
#Binomial data
binLikSI(4, 10, 8)

#Poisson data returning the estimated confidence level
poisLikSI(4, 8, conf=TRUE)

#GLM coefficients
set.seed(10)
x <- rnorm(50, 0, 5)
expit <- function(z) exp(z)/(1+exp(z))
p <- expit(.1+ .4*x)
y <- sapply(1:length(p), function(z) rbinom(1,1, p[z]))
glm.obj <- glm(y~x, family="binomial")
glmLikSI(glm.obj, 8)
```

binLikSI *Binomial support interval calculation*

Description

This function takes binomial data and using a root finding algorithm to calculate the support interval at the user's specified level. If `conf=T`, the function will attempt to estimate the confidence level of the support interval using a modified parametric bootstrap approach.

Usage

```
binLikSI(dat, n, level, tol = 0.001, conf = F, B = 500)
```

Arguments

dat	number of success in binomial experiment
n	number of trials in binomial experiment
level	desired support level
tol	tolerance passed to uniroot for finding SI endpoints
conf	Logical, whether or not bootstrap should be performed to estimate confidence level
B	Number of bootstraps to be performed

Value

si	The desired support interval
conf.equiv	The estimated confidence level of the SI

Author(s)

Derek Smith

Examples

```
set.seed(10)
binLikSI(dat=4, n=10, level=9)
binLikSI(dat=4, n=10, level=8, conf=TRUE)
```

calibSI	<i>Attempts to find a support interval with the desired confidence level for binomial, poisson or normal data.</i>
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Description

This function performs a grid search to find the lowest support level that has the desired coverage probability. It begins by searching a grid of relative likelihood values using a fixed number of parametric bootstraps at each point. The likelihood value is then refined using a golden section based search.

Usage

```
calibSI(dat, n = NULL, family, conf.level = 0.95, B = 2000,
gridlo = 4, gridhi = 20, gridix = 2, tol = 0.03)
```

Arguments

dat	This argument is the number of success if family='binomial', the number of occurrences if family='poisson', or a vector of normal draws if family='normal'.
n	Number of trials if family='binomial'
family	Data type entered, accepts "binomial", "poisson", "pois", "gaussian", "normal"
conf.level	target confidence level
B	Number of parametric bootstraps to use to estimate coverage probability after the initial grid search.
gridlo	Lowest relative likelihood considered in the initial grid search
gridhi	Highest relative likelihood considered in the initial grid search
gridix	size of steps to be checked between gridlo and gridhi in initial search
tol	acceptable error in the likelihood support level returned

Value

si	The support interval estimated to have the desired confidence level
support.level	The relative likelihood defining the interval's endpoints
init.grid	Relative likelihoods checked as part of the initial gridsearch and their estimated coverage

Author(s)

Derek Smith

Examples

```
set.seed(10)
calibSI(rnorm(15), family="normal", conf.level=.95, B=1000)
```

glmLikSI

Profile support intervals for glm coefficients

Description

Calculates profile likelihood intervals using data returned from the 'ProfileLikelihood' package for each coefficient of a glm.

Usage

```
glmLikSI(glm.mod, level)
```

Arguments

glm.mod	A fit glm object.
level	Desired level of support interval (1/level).

Value

a matrix of support intervals for each coefficient

Author(s)

Derek Smith

Examples

```
set.seed(10)
x <- rnorm(50, 0, 5)
expit <- function(z) exp(z)/(1+exp(z))
p <- expit(.1+ .4*x)
y <- sapply(1:length(p), function(z) rbinom(1,1, p[z]))
glm.obj <- glm(y~x, family="binomial")
glmLikSI(glm.obj, 8)
```

 lmLikSI

Profile support intervals for lm coefficients

Description

Calculates profile likelihood intervals using data returned from the 'ProfileLikelihood' package for each coefficient of a lm.

Usage

```
lmLikSI(lm.mod, level)
```

Arguments

lm.mod	A fit lm object.
level	Desired level of support interval (1/level).

Value

a matrix of support intervals for each coefficient

Author(s)

Derek Smith

Examples

```
set.seed(10)
x <- rnorm(50, 0, 5)
y <- sapply(1:length(x), function(z) 3+.5*x[z]+rnorm(1, 0, 5))
lm.obj <- lm(y~x)
lmLikSI(lm.obj, 8)
```

normLikSI	<i>Normal support interval calculation.</i>
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Description

This function calculates support intervals for the mean of normal data. Confidence levels are calculated from the formula if conf=T.

Usage

```
normLikSI(dat, level, tol = 0.001, conf = F, B=500)
```

Arguments

dat	a numeric vector
level	support interval relative likelihood
tol	tolerance passed to uniroot for finding likelihood endpoints
conf	Logical, whether or not confidence levels should be returned.
B	Number of bootstrap iterations to verify coverage level

Value

si	1/level support interval
conf.equiv	Calculated confidence level

Author(s)

Derek Smith

Examples

```
set.seed(10)
normLikSI(rnorm(10), 9)
normLikSI(rnorm(10), 9, conf=TRUE)
```

`poisLikSI`*Poisson support interval calculation*

Description

This function takes Poisson data and using a root finding algorithm to calculate the support interval at the user's specified level. If `conf=T`, the function will attempt to estimate the confidence level of the support interval using a parametric bootstrap approach.

Usage

```
poisLikSI(dat, level, tol = 0.001, conf = F, B = 500)
```

Arguments

<code>dat</code>	Numeric; outcome from a Poisson experiment
<code>level</code>	Desired support level
<code>tol</code>	tolerance argument passed to <code>uniroot</code> for finding SI endpoints
<code>conf</code>	Logical; Whether or not to simulate the confidence level of the SI
<code>B</code>	Number of simulations to determine coverage if <code>conf=T</code>

Value

<code>si</code>	1/level support interval
<code>conf.equiv</code>	estimated confidence level of interval returned

Author(s)

Derek Smith

Examples

```
poisLikSI(4, 8)
poisLikSI(4, 8, conf=TRUE)
```

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