Package 'stat.extend'

March 25, 2020

Type Package

Title Add functions for distributions in the stats package

Version 0.1.0

Date 9 January 2020

Author Ben O'Neill [aut], Neal Fultz [ctb, cre]

Maintainer Neal Fultz <nfultz@gmail.com>

Description
This package adds a HDR function for dealing with probability distributions in the stats package.

License MIT + file LICENSE

Encoding UTF-8

LazyData true

Imports matrixStats, sets

RoxygenNote 7.0.2

R topics documented:

`HDR` *Highest density region (HDR)*

Description

`HDR.xxxx` returns the highest density region (HDR) for a chosen distribution.

Usage

```
HDR.norm(
  cover.prob,
  mean = 0,
  sd = 1,
  gradtol = 1e-10,
  steptol = 1e-10,
```

```
  iterlim = 100
)

HDR.lnorm(
  cover.prob,
  meanlog = 0,
  sdlog = 1,
  gradtol = 1e-10,
  steptol = 1e-10,
  iterlim = 100
)

HDR.t(cover.prob, df, ncp = 0, gradtol = 1e-10, steptol = 1e-10, iterlim = 100)

HDR.cauchy(
  cover.prob,
  location = 0,
  scale = 1,
  gradtol = 1e-10,
  steptol = 1e-10,
  iterlim = 100
)

HDR.f(
  cover.prob,
  df1,
  df2,
  ncp = 0,
  gradtol = 1e-10,
  steptol = 1e-10,
  iterlim = 100
)

HDR.beta(
  cover.prob,
  shape1,
  shape2,
  ncp = 0,
  gradtol = 1e-10,
  steptol = 1e-10,
  iterlim = 100
)

HDR.chisq(
  cover.prob,
  df,
  ncp = 0,
  gradtol = 1e-10,
  steptol = 1e-10,
  iterlim = 100
)
```

```
HDR.gamma(
  cover.prob,
  shape,
  rate = 1,
  scale = 1/rate,
  gradtol = 1e-10,
  steptol = 1e-10,
  iterlim = 100
)

HDR.weibull(
  cover.prob,
  shape,
  scale = 1,
  gradtol = 1e-10,
  steptol = 1e-10,
  iterlim = 100
)

HDR.exp(cover.prob, rate, gradtol = 1e-10, steptol = 1e-10, iterlim = 100)

HDR.unif(
  cover.prob,
  min = 0,
  max = 1,
  gradtol = 1e-10,
  steptol = 1e-10,
  iterlim = 100
)

HDR.hyper(cover.prob, m, n, k, gradtol = 1e-10, steptol = 1e-10, iterlim = 100)

HDR.geom(cover.prob, prob, gradtol = 1e-10, steptol = 1e-10, iterlim = 100)

HDR.binom(
  cover.prob,
  size,
  prob,
  gradtol = 1e-10,
  steptol = 1e-10,
  iterlim = 100
)

HDR.pois(cover.prob, lambda, gradtol = 1e-10, steptol = 1e-10, iterlim = 100)

HDR.nbinom(
  cover.prob,
  size,
  prob,
  mu,
  gradtol = 1e-10,
  steptol = 1e-10,
```

```
  iterlim = 100
)
```

Arguments

`cover.prob`	The probability coverage for the HDR (scalar between zero and one). The significance level for the HDR i is `1-cover.prob`.
`gradtol`	Parameter for the nlm optimisation - a positive scalar giving the tolerance at which the scaled gradient is considered close enough to zero to terminate the algorithm (see [`nlm` doccumentation](https://stat.ethz.ch/R-manual/R-patched/library/stats/html/nlm.h
`steptol`	Parameter for the nlm optimisation - a positive scalar providing the minimum allowable relative step length (see [`nlm` doccumentation](https://stat.ethz.ch/R-manual/R-patched/library/stats/html/nlm.html)).
`iterlim`	Parameter for the nlm optimisation - a positive integer specifying the maximum number of iterations to be performed before the program is terminated (see [`nlm` doccumentation](https://stat.ethz.ch/R-manual/R-patched/library/stats/html/nlm.html)).
`shape1, shape2, ncp, location, scale, df, rate, df1, df2, meanlog, sdlog, mean, sd, min,`	Distribution parameters.

Details

This function computes the highest density region (HDR) for a univariate distribution in the `stats` package. The functions for the HDR for different distributions are named in the form `HDR.xxxx` where the `xxxx` refers to the distribution (e.g., `HDR.chisq`, `HDR.gamma`, `HDR.norm`, etc.). The user can use any univariate distribution in the `stats` package, and the function accepts parameters from the specified distribution (see table below). The output of the function is an interval of classes `hdr` and `interval` giving the highest density region and some related information pertaining to the distribution and the computation of the HDR (for information on intervals, see the `sets` package). If the input distribution is continuous then the HDR is a real interval, and if the input distribution discrete then the HDR is a discrete interval. For non-trivial cases the computation is done by optimisation using the `nlm` function.

HDR.beta	shape1	shape2	ncp
HDR.cauchy	location	scale	
HDR.chisq	df	ncp	
HDR.exp	rate		
HDR.f	df1	df2	ncp
HDR.gamma	shape	rate	scale
HDR.lnorm	meanlog	sdlog	
HDR.norm	mean	sd	
HDR.t	df	ncp	
HDR.unif	min	max	
HDR.weibull	shape	scale	
HDR.binom	size	prob	
HDR.geom	prob		
HDR.hyper	m	n	k
HDR.nbinom	size	prob	mu
HDR.pois	lambda		

The table above shows the parameters in each of the distributions. Some have default values, but most need to be specified. (For the gamma distribution you should specify either the `rate` or

`scale` but not both.)

Value

An interval object with classes `hdr` and `interval` containing the highest density region and related information.

Examples

```
HDR.norm(.05)
```

Index