

# Package ‘Wrapped’

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**Type** Package

**Title** Computes Pdf, Cdf, Quantile, Random Numbers and Provides Estimation for any Univariate Wrapped Distributions

**Version** 2.0

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**Depends** R (>= 3.0.1)

**Imports** metRology, AdequacyModel, evd, sn, ald, NormalLaplace, GeneralizedHyperbolic, glogis, irtProb, sld, normalp, gamlss.dist, sgt, SkewHyperbolic, fBasics, cubfits, lqmm, LCA, GEVStableGarch, VarianceGamma, VGAM, ordinal

**Suggests** R.rsp

**VignetteBuilder** R.rsp

**Description** Computes the pdf, cdf, quantile, random numbers for any wrapped G distributions. Computes maximum likelihood estimates of the parameters, standard errors, 95 percent confidence intervals, value of Cramer-von Misses statistic, value of Anderson Darling statistic, value of Kolmogorov Smirnov test statistic and its  $p$ -value, value of Akaike Information Criterion, value of Consistent Akaike Information Criterion, value of Bayesian Information Criterion, value of Hannan-Quinn information criterion, minimum value of the negative log-likelihood function and convergence status when the wrapped distribution is fitted to some data.

**License** GPL (>= 2)

**NeedsCompilation** no

**Repository** CRAN

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 Wrapped-package

*Computes Pdf, Cdf, Quantile, Random Numbers and Provides Estimation for any Wrapped Distribution*


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## Description

Computes the probability density function, cumulative distribution function, quantile function and random numbers for any univariate wrapped distribution. Also computes maximum likelihood estimates of the parameters, standard errors, 95 percent confidence intervals, value of Cramer-von Misses statistic, value of Anderson Darling statistic, value of Kolmogorov Smirnov test statistic and its  $p$ -value, value of Akaike Information Criterion, value of Consistent Akaike Information Criterion, value of Bayesian Information Criterion, value of Hannan-Quinn information criterion, minimum value of the negative log-likelihood function and convergence status when some data are fitted by one of the following wrapped distributions: wrapped normal, wrapped Gumbel, wrapped logistic, wrapped Student's  $t$ , wrapped Cauchy, wrapped skew normal, wrapped skew  $t$ , wrapped skew Cauchy, wrapped asymmetric Laplace, wrapped normal Laplace, wrapped generalized logistic, wrapped skew Laplace, wrapped exponential power, wrapped skew exponential type 1, wrapped skew exponential type 2, wrapped skew exponential type 3, wrapped skew exponential type 4, wrapped normal exponential  $t$ , wrapped skew normal type 2, wrapped ex Gaussian, wrapped skew  $t$  type 1, wrapped skew  $t$  type 3, wrapped skew  $t$  type 4, wrapped skew  $t$  type 5, wrapped sinh arcsinh, wrapped exponential generalized beta type 2, wrapped Johnson's  $S_u$ , wrapped skew generalized  $t$ , wrapped skew hyperbolic, wrapped asymmetric Laplace, wrapped polynomial tail Laplace, wrapped generalized asymmetric  $t$ , wrapped variance gamma, wrapped normal inverse Gaussian, wrapped hyperbolic, wrapped skew Laplace, wrapped slash, wrapped beta normal, wrapped Laplace, wrapped short tailed symmetric, wrapped log gamma distributions.

## Details

Package: Wrapped  
 Type: Package  
 Version: 2.0  
 Date: 2017-08-21  
 License: GPL(>=2)

probability density function, cumulative distribution function, quantile function, random numbers and measures of inference

## Author(s)

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## References

S. Nadarajah and Y. Zhang, Wrapped: An R package for wrapped distributions, submitted.

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 wrappedg

*Wrapped G Distribution*


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### Description

Computes the pdf, cdf, quantile, random numbers for any wrapped G distributions. Computes maximum likelihood estimates of the parameters, standard errors, 95 percent confidence intervals, value of Cramer-von Misses statistic, value of Anderson Darling statistic, value of Kolmogorov Smirnov test statistic and its  $p$ -value, value of Akaike Information Criterion, value of Consistent Akaike Information Criterion, value of Bayesian Information Criterion, value of Hannan-Quinn information criterion, minimum value of the negative log-likelihood function and convergence status when the wrapped distribution is fitted to some data

### Usage

```
dwrappedg(x, spec, K = K, ...)
pwrappedg(x, spec, K = K, ...)
qwrappedg(p, spec, K = K, ...)
rwrappedg(n, spec, ...)
mwrappedg(g, data, starts, K = K, method = "BFGS")
plotfour(g, K = K, para, plotit)
```

### Arguments

x	scaler or vector of values at which the pdf or cdf needs to be computed
p	scaler or vector of probabilities at which the quantile needs to be computed
n	number of random numbers to be generated
K	the limit used to approximate the wrapped G distribution, for example, the wrapped G pdf is approximated by the sum of $g(x+2\pi k, \dots)$ from $k=-K$ to $k=K$ , where $g$ denotes the pdf specified by <code>spec</code>
spec	a character string specifying the distribution of $G$ and $g$ (for example, "norm" if $G$ and $g$ correspond to the standard normal).
...	other parameters
g	same as <code>spec</code> but must be one of normal ("norm", package base), Gumbel ("gumbel", package evd), logistic ("logis", package base), Student t ("t.scaled", package metRology), Cauchy ("cauchy", package base), skew normal ("sn", package sn), skew t ("st", package sn), asymmetric Laplace ("ald", package ald), normal Laplace ("nl", NormalLaplace), skew Laplace ("skewlap", Generalized-Hyperbolic), generalized logistic ("glogis", package glogis), skew logistic ("sl", package sld), exponential power ("normalp", package normalp), skew exponential power of type 1 ("SEP1", package gamlss.dist), skew exponential power of type 2 ("SEP2", package gamlss.dist), skew exponential power of type 3 ("SEP3", package gamlss.dist), skew exponential power of type 4 ("SEP4", package gamlss.dist), normal exponential t ("NET", package gamlss.dist), skew

normal type 2 ("SN2", package gamlss.dist), skew generalized t ("sgt", package sgt), skew hyperbolic ("skewhyp", package SkewHyperbolic), asymmetric Laplace ("asl", package cubfits), asymmetric Laplace ("asla", package cubfits), asymmetric Laplace ("al", package lqmm), polynomial tail Laplace ("ptl", package LCA), generalized asymmetric t ("gat", package GEVStableGarch), variance gamma ("vg", package VarianceGamma), normal inverse gamma ("nig", package GeneralizedHyperbolic), skew Cauchy ("sc", package sn), slash ("slash", package VGAM), generalized hyperbolic Student t ("ght", package fBasics), ex Gaussian ("exGAUS", package gamlss.dist) and log gamma ("lgamma", package ordinal). For details including the density function and parameter specifications see Nadarajah and Zhang (2017)

data	a vector of data values for which the distribution is to be fitted
starts	initial values for the parameters of the distributions specified by g
method	the method for optimizing the log likelihood function. It can be one of "Nelder-Mead", "BFGS", "CG", "L-BFGS-B" or "SANN". The default is "BFGS". The details of these methods can be found in the manual pages for <code>optim</code>
para	a list with four components, each component is a vector specifying the parameter values of the specified wrapped distribution
plotit	a character string saying what is to be plotted. It should take one of "pdf", "cdf", "quantile" or "random".

### Value

An object of the same length as `x`, giving the pdf or cdf values computed at `x` or an object of the same length as `p`, giving the quantile values computed at `p` or an object of the same length as `n`, giving the random numbers generated or an object giving the values of Cramer-von Misses statistic, Anderson Darling statistic, Kolmogorov Smirnov test statistic and p-value, maximum likelihood estimates, Akaike Information Criterion, Consistent Akaike Information Criterion, Bayesian Information Criterion, Hannan-Quinn information criterion, standard errors of the maximum likelihood estimates, minimum value of the negative log-likelihood function and convergence status. `plotfour` draws four plots of the PDF, CDF, quantile function or the histogram of the radii of 100 random numbers of a specified wrapped distribution.

### Author(s)

Saralees Nadarajah, Yuanyuan Zhang

### References

S. Nadarajah and Y. Zhang, Wrapped: An R package for wrapped distributions, submitted

### Examples

```
x=runif(10,min=-1,max=1)
dwrappedg(x,"norm",mean=1,sd=1,K=1000)
pwrappedg(x,"norm",mean=1,sd=1,K=1000)
qwrappedg(runif(10,min=0,max=1),"norm",mean=1,sd=1,K=1000)
rwrappedg(10,"norm",mean=1,sd=1)
```

```
mwrappedg("norm",runif(100,min=-1,max=1),starts=c(1,1),K=10,method="BFGS")  
plotfour("norm",K=100,para=list(c(0,0.1),c(0,2),c(0,5),c(0,20)),  
plotit="pdf")
```

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