Package 'logKDE'

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Type Package

Title Computing Log-Transformed Kernel Density Estimates for Positive Data

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Description Computes log-transformed kernel density estimates for positive data using a variety of kernels. It follows the methods described in Jones, Nguyen and McLachlan (2018) <doi:10.21105/joss.00870>.

License GPL-3

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RoxygenNote 7.3.3

Suggests R.rsp, testthat

VignetteBuilder R.rsp

NeedsCompilation yes

Author Hien D. Nguyen [aut],
Andrew T. Jones [aut],
Geoffrey J. McLachlan [aut],
Andrew Thomas Jones [cre]

Maintainer Andrew Thomas Jones <andrewthomasjones@gmail.com>

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Contents

bw.logCV *Optimal CV BW estimation for strictly positive distributions.*

Description

Computes least squares cross-validation (CV) bandwidth (BW) for log domain KDE.

Usage

```
bw.logCV(x, grid = 21, NB = 512)
```

Arguments

x	numeric vector of the data. Must be strictly positive, will be log transformed during estimation.
grid	number of points used for BW selection CV grid.
NB	number of points at which to estimate the KDE at during the CV loop.

Value

bw the optimal least squares CV bandwidth.

References

Silverman, B. W. (1986). Density estimation for statistics and data analysis. Monographs on Statistics and Applied Probability. 26.

Stone, C. J. (1984). An asymptotically optimal window selection rule for kernel density estimates. The Annals of Statistics, 12(4), 1285-1297.

Examples

```
bw.logCV(rchisq(100,10), grid=21, NB=512)
```

bw.logG *Bandwidth estimation for strictly positive distributions.*

Description

Computes bandwidth for log domain KDE using the Silverman rule.

Usage

```
bw.logG(x)
```

Arguments

x	numeric vector of the data. Must be strictly positive, will be log transformed during estimation.

Value

bw the optimal bandwidth.

References

Silverman, B. W. (1986). Density estimation for statistics and data analysis. Monographs on Statistics and Applied Probability. 26.

Wand, M. P., Marron, J. S., & Ruppert, D. (1991). Transformations in density estimation. Journal of the American Statistical Association, 86(414), 343-353.

Examples

```
bw.logG(rchisq(100,10))
```

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logdensity *Kernel Density Estimates of strictly positive distributions.*

Description

The function `logdensity` computes kernel density estimates (KDE) of strictly positive distributions by performing the KDE in the log domain and then transforming the result back again. The syntax and function structure is largely borrowed from the function `density` in package **stats**.

Usage

```
logdensity(
  x,
  bw = "nrd0",
  adjust = 1,
  kernel = "gaussian",
  weights = NULL,
  n = 512,
  from,
  to,
  cut = 3,
  na.rm = FALSE
)
```

Arguments

x	the data from which the estimate is to be computed.
bw	the smoothing bandwidth to be used. Can also be can also be a character string giving a rule to choose the bandwidth. Like density defaults to "nrd0". All options in help(bw.nrd) are available as well as "bw.logCV" and "bw.logG".
adjust	the bandwidth used is actually adjust*bw.
kernel	a character string giving the smoothing kernel to be used. Choose from "gaussian", "epanechnikov", "triangular", "uniform", "laplace" and "logistic". Default value is "gaussian".
weights	numeric vector of non-negative observation weights of the same length as x.
n	the number of equally spaced points at which the density is to be estimated. Note that these are equally spaced in the original domain.
from, to	the left and right-most points of the grid at which the density is to be estimated; the defaults are cut * bw outside of range(x).
cut	by default, the values of from and to are cut bandwidths beyond the extremes of the data
na.rm	logical; if TRUE, missing values are removed from x. If FALSE any missing values cause an error.

Value

An object with class "density". See help(density) for details.

References

Charpentier, A., & Flachaire, E. (2015). Log-transform kernel density estimation of income distribution. L'Actualite economique, 91(1-2), 141-159.

Wand, M. P., Marron, J. S., & Ruppert, D. (1991). Transformations in density estimation. Journal of the American Statistical Association, 86(414), 343-353.

See Also

density, plot.density, logdensity_fft, bw.nrd, bw.logCV, bw.logG.

Examples

```
logdensity(abs(rnorm(100)), from =.1, to=2, kernel='triangular')
```

logdensity_fft *Kernel Density Estimates of strictly positive distributions using FFT.*

Description

The function logdensity_fft computes kernel density estimates (KDE) of strictly positive distributions by performing the KDE via fast fourier transform utilizing the fft function. The syntax and function structure is largely borrowed from the function density in package **stats**.

Usage

```
logdensity_fft(
  x,
  bw = "nrd0",
  adjust = 1,
  kernel = "gaussian",
  weights = NULL,
  n = 512,
  from,
  to,
  cut = log(3),
  na.rm = FALSE
)
```

Arguments

x	the data from which the estimate is to be computed.
bw	the smoothing bandwidth to be used. Can also be can also be a character string giving a rule to choose the bandwidth. Like density defaults to "nrd0". All options in help(bw.nrd) are available as well as "bw.logCV" and "bw.logG".
adjust	the bandwidth used is actually adjust*bw.
kernel	a character string giving the smoothing kernel to be used. Choose from "gaussian", "epanechnikov", "triangular", "uniform", "laplace" and "logistic". Default value is "gaussian".
weights	numeric vector of non-negative observation weights of the same length as x.
n	the number of equally spaced points at which the density is to be estimated. Note that these are equally spaced in the log domain for logdensity_fft, and thus on a log scale when transformed back to the original domain.
from, to	the left and right-most points of the grid at which the density is to be estimated; the defaults are cut * bw outside of range(x).
cut	by default, the values of from and to are cut bandwidths beyond the extremes of the data
na.rm	logical; if TRUE, missing values are removed from x. If FALSE any missing values cause an error.

Value

An object with class "density". See `help(density)` for details.

References

Charpentier, A., & Flachaire, E. (2015). Log-transform kernel density estimation of income distribution. L'Actualite economique, 91(1-2), 141-159.

Cooley, J. W., & Tukey, J. W. (1965). An algorithm for the machine calculation of complex Fourier series. Mathematics of computation, 19(90), 297-301.

Wand, M. P., Marron, J. S., & Ruppert, D. (1991). Transformations in density estimation. Journal of the American Statistical Association, 86(414), 343-353.

See Also

`density`, `plot.density`, `logdensity`, `bw.nrd`, `bw.logCV`, `bw.logG`.

Examples

```
logdensity_fft(abs(rnorm(100)), from =0.01, to= 2.5, kernel = 'logistic')
```

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