Package ‘localgauss’

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Type Package

Title Estimating Local Gaussian Parameters

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Depends MASS, foreach, matrixStats, ggplot2

Description Computational routines for estimating local Gaussian parameters. Local Gaussian parameters are useful for characterizing and testing for non-linear dependence within bivariate data. See e.g. Tjostheim and Hufthammer, Local Gaussian correlation: A new measure of dependence, Journal of Econometrics, 2013, Volume 172 (1), pages 33-48 <DOI:10.1016/j.jeconom.2012.08.001>.

License GPL-2

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**local Gaussian parameters**

**Description**

Routine for estimating local Gaussian parameters based on a sample from the bivariate distribution under consideration. The routine can either estimate local parameters on a grid covering the data controlled by the gsize and hthresh parameters. Otherwise, local Gaussian parameters can be estimated at coordinates specified by the user in xy.mat.

**Usage**

```r
localgauss(x,y,b1=1,b2=1,gsize=15,hthresh=0.001,xy.mat=NULL)
```

**Arguments**

- `x,y` The two data vectors
- `b1,b2` The bandwidth in the x-direction and y-direction, respectively
- `gsize` The gridsize (only used if xy.mat is not specified).
- `hthresh` Gridpoints where a non-parametric density estimate is lower than hthresh are omitted (only used if xy.mat is not specified).
- `xy.mat` A M times 2 matrix of points where the local parameters are to be estimated.

**Details**

The objective function is maximized using a modified Newton method. The user should check whether the field eflag in the returned object is zero for all estimates. If not, the optimizer has not converged and the estimates should not be trusted. For more details, see [Reference to article].

**Value**

S3 object of type localgauss containing the fields:

- `par.est` M times 5 matrix of parameter estimates, with columns mu1,mu2,sigma1,sigma2,rho.
- `eflag` M-vector of exitflags from the optimizer. Estimations with exit flags other than 0 should not be trusted.
- `hessian` The negative Hessian of the objective function.

**References**

See Also

localgauss.indtest.

Examples

```r
x = rnorm(n=1000)
y = x^2 + rnorm(n=1000)
lgobj = localgauss(x, y)
```

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**localgauss.indtest**  
*Pointwise Independence test based on local Gaussian correlation*

**Description**

Routine for testing for local independence based on local Gaussian parameters. It accepts an S3 object produced by localgauss(), and performs a bootstrap-based test with null-hypothesis being that x and y are independent.

**Usage**

```r
localgauss.indtest(locobj, R = 10, alpha = 0.10, seed = 1)
```

**Arguments**

- `locobj`: localgauss-object
- `R`: Number of bootstrap replica
- `alpha`: significance level (note: two sided test)
- `seed`: Random seed in used for bootstrap

**Details**

The test is based on producing a null-distribution of local Gaussian correlations were the original data are resampled from their empirical marginal distributions. The bootstrap-based null-distribution is produced for each point specified in `xy.mat` in `locobj`. An estimated local correlation for the original data significantly larger than the null-distribution is indicated with +1 (returned in the vector `test.results`). An estimated local correlation for the original data insignificant with respect to the null-distribution is indicated with 0. An estimated local correlation for the original data significantly smaller than the null-distribution is indicated with -1.

**Value**

S3 object of type `localgauss.indtest` containing the fields:

- `localgauss`: simply returns `locobj`
- `upper`: Vector containing the 1-alpha/2 quantiles of the null-distributions.
- `lower`: Vector containing the alpha/2 quantiles of the null-distributions.
- `test.results`: Vector containing the test results.
References


See Also

localgauss.

Examples

```r
x=rnorm(n=100)
y=x^2 + rnorm(n=100)
lgobj = localgauss(x,y,gsize=8)
lgind = localgauss.indtest(lgobj)
```

Description

Plots estimates of local Gaussian correlation.

Usage

```r
## S3 method for class 'localgauss'
plot(x,...,plot.text=TRUE,plot.points=FALSE,tsize=3,
     lowcol="cyan",highcol="magenta",point.col="black",
     point.size=NULL,xlab="",ylab="",divergent.col.grad=T)
```

Arguments

- `x` S3 object of class "localgauss" produced by the localgauss-function
- `...` Not used.
- `plot.text` If TRUE, the numerical values of the estimated local correlation are added to each tile.
- `plot.points` If TRUE, the original observations are overlain.
- `tsize` The font size used if plot.text is TRUE
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lowcol     The color used to indicate negative correlation of -1
highcol    The color used to indicate positive correlation of 1
point.col  The colour used for observations points if plot.points is TRUE.
point.size The size of observations points if plot.points is TRUE.
xlab, ylab The label of x-axis and y-axis, respectively.
dergent.col.grad
     If TRUE, a divergent color gradient between lowcol and highcol with 0 as mid-
     point is used. If FALSE a ordinary color gradient between lowcol and highcol
     is used.

References

Geir Drage Berentsen, Tore Selland Kleppe, Dag Tjostheim, Introducing localgauss, an R Package
for Estimating and Visualizing Local Gaussian Correlation, Journal of Statistical Software, 56(12),
1-18, 2014, (http://www.jstatsoft.org/v56/i12/). See also Tjoestheim, D. and Hufthammer K. O.,
33-48,2013, for a detailed description of local Gaussian correlation.

See Also

localgauss.

Examples

```r
x=rnorm(n=1000)
y=x^2 + rnorm(n=1000)
lgobj = localgauss(x,y)
plot(lgobj)
```
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