Package ‘localgauss’

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Type Package
Title Estimating Local Gaussian Parameters
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Depends ggplot2, MASS, foreach, matrixStats
Description Computational routines for estimating and visualizing 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.
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**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 exit flags 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

plot.localgauss.

Examples

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

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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 `xyNmat` 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 insignificantly 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

plot.localgauss.indtest.

Examples

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

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
- `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.
divergent.col.grad If TRUE, a divergent color gradient between lowcol and highcol with 0 as midpoint is used. If FALSE a ordinary color gradient between lowcol and highcol is used.

References

See Also
localgauss.

Examples
```
x=rnorm(n=1000)
y=x^R + rnorm(n=1000)
lgobj = localgauss(x,y)
plot(lgobj)
```
Arguments

- **x**: S3 object of class "localgauss.indtest" produced by the `localgauss.indtest` function
- **...**: Not used.
- **plot.points**: If TRUE, the original observations are overlain.
- **poscol**: Color indicating +1 test result
- **negcol**: Color indicating -1 test result
- **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.

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)
plot(lgind)
```
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