

Package: localgauss (via r-universe)

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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](https://doi.org/10.1016/j.jeconom.2012.08.001)>.

License GPL-2

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localgauss *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

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

Arguments

| | |
|----------------------|--|
| <code>x, y</code> | The two data vectors |
| <code>b1, b2</code> | The bandwidth in the x-direction and y-direction, respectively |
| <code>gsize</code> | The gridsize (only used if <code>xy.mat</code> is not specified). |
| <code>hthresh</code> | Gridpoints where a non-parametric density estimate is lower than <code>hthresh</code> are omitted (only used if <code>xy.mat</code> is not specified). |
| <code>xy.mat</code> | 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:

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

References

Geir Drage Berentsen, Tore Selland Kleppe, Dag Tjøstheim, Introducing `localgauss`, an R Package for Estimating and Visualizing Local Gaussian Correlation, *Journal of Statistical Software*, 56(12), 1-18, 2014, doi: [10.18637/jss.v056.i12](https://doi.org/10.18637/jss.v056.i12) See also Tjøstheim, D. and Hufthammer K. O., Local Gaussian correlation: A new measure of dependence, *Journal of Econometrics*, 172(1), pages 33-48, 2013, for a detailed description of local Gaussian correlation.

See Also[localgauss.indtest](#).**Examples**

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

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|--------------------|--|
| localgauss.indtest | <i>Pointwise Independence test based on local Gaussian correlation</i> |
|--------------------|--|

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

```
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 <code>locobj</code> . |
| 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

Geir Drage Berentsen, Tore Selland Kleppe, Dag Tjøstheim, 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/>). Note that for compability reasons, the graphics routines described in the paper have been taken out from release 0.40. See also Tjøstheim, D. and Hufthammer K. O., Local Gaussian correlation: A new measure of dependence, Journal of Econometrics, 172(1),pages 33-48,2013, for a detailed description of local Gaussian correlation and Berentsen, G.D. and Tjøstheim D., Recognizing and visualizing departures from independence in bivariate data using local Gaussian correlation, <http://people.uib.no/gbe062/local-gaussian-correlation/> for a description of the local independence test.

See Also

[localgauss](#).

Examples

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

| | |
|-----------------|--|
| plot.localgauss | <i>Local Gaussian correlation plot</i> |
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Description

Plots estimates of local Gaussian correlation.

Usage

```
## 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 |

| | |
|---------------------------------|--|
| <code>lowcol</code> | The color used to indicate negative correlation of -1 |
| <code>highcol</code> | The color used to indicate positive correlation of 1 |
| <code>point.col</code> | The colour used for observations points if <code>plot.points</code> is TRUE. |
| <code>point.size</code> | The size of observations points if <code>plot.points</code> is TRUE. |
| <code>xlab, ylab</code> | The label of x-axis and y-axis, respectively. |
| <code>divergent.col.grad</code> | If TRUE, a divergent color gradient between <code>lowcol</code> and <code>highcol</code> with 0 as mid-point is used. If FALSE a ordinary color gradient between <code>lowcol</code> and <code>highcol</code> 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., Local Gaussian correlation: A new measure of dependence, *Journal of Econometrics*, 172(1), pages 33-48, 2013, for a detailed description of local Gaussian correlation.

See Also

[localgauss.](#)

Examples

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

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