Package ‘curvetest’

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Type Package

Title The package will formally test two curves represented by discrete data sets to be statistically equal or not when the errors of the two curves were assumed either equal or not using the tube formula to calculate the tail probabilities.

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Description Test Equality of Curves with Homoscedastic or Heteroscedastic Errors.

License GPL-2

LazyLoad yes

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R topics documented:

alpha2h — *Test Equality of Curves with Homoscedastic or Heteroscedastic Errors.*

Description

For each value at in the defining interval, find a bandwidth h so that alpha*100 percent of data points specified in $xseq$ should be within the $(x-h, x+h)$ window. This is a utility function.

Usage

```
alpha2h(alpha, at, xseq)
```

Arguments

alpha	Smoothing parameter that for each point in the domain, use a windown width that should have alpha*100 percent of data points falling in the window.
at	a point in the x domain.
xseq	Sequence of the data points.

Value

A numeric value h that will be used as bandwidth in the next curve fitting process.

Author(s)

Zhongfa Zhang, Jiayang Sun

References

Zhongfa Zhang, et al: Test Equality of Curves with Homoscedastic or Heteroscedastic Errors. To appear.

See Also

curvetest, curvefit, print.curvetest, plot.curvetest

Examples

```
  x= runif(100)
(h=alpha2h(0.3, at=0.5, xseq=x))  ##get the window width h around x=.5 so that 30% data points of xseq fall in the
```

curvefit — *Test Equality of Curves with Homoscedastic or Heteroscedastic Errors.*

Description

Fit the smoothing curves.

Usage

```
curvefit(formula, data, kernel = "Quartic", alpha = 0.5, bw = NULL, myx, bcorrect = "simple", getit = F)
## S3 method for class 'curvefit'
print(x,...)
## S3 method for class 'curvefit'
plot(x,y=NULL, add = F, get.data = TRUE, ...)
## S3 method for class 'curvefit'
lines(x,...)
```

Arguments

formula	A formula to the data set such as y~x.
data	A data frame of 2 columns representing the underlying curve. The column names must agree with the names in formula.
alpha	Smoothing parameter. Default=0.5.
bw	Window bandwidth for fitting the curve.
kernel	One of the kernel functions to use to fit the curves. Must be one of "Triangle", "Gaussian", "Trio","Uniform", "Triweight", "Epanechnikov", "Quartic". partial match is allowed.
myx	x-values in the test domain to calculate the curve values.
bcorrect	Boundary correction method. Right now, except for 'none', meaning no corrections, the only other opton is 'simple'.
getit	unused for this function.
add	logical, Tf true, add the curves to the plot.Otherwise, add fitted lines to the plot.
get.data	logical, not used in this function.
x	The fitted results from fitting the first or second curve by curvefit procedure.
y	dummy variable for compatible with parameters in the base definition of plot.
...	parameters for plot such as pch, lty, col etc.

Details

For a 2 column data, the curve will be fitted according to formula using local regression method. Boundary corrections can be made. The fitted result will be returned as a 'curvefit' object, that can be plotted and printted by the associated S3 method print and plot.

Value

An R object of class 'curvefit' will be generated including the fitted values of the curves with original specification of parameters.

Author(s)

Zhongfa Zhang, Jiayang Sun

References

Zhongfa Zhang, et al: Test Equality of Curves with Homoscedastic or Heteroscedastic Errors. To appear

See Also

curvefit, print.curvetest, plot.curvetest

Examples

```
x=seq(0,1, length=n<-150);
f<-function(x){x*(1-x)+sin(2*pi*x)};
y=f(x)+rnorm(n, 0, 0.5)
fit<-curvefit(y~x,data.frame(x=x,y=y), bw=0.4,getit=T)
plot(fit)
lines(fit)
fit ##print
```

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curvetest *Test Equality of Curves with Homoscedastic or Heteroscedastic Errors.*

Description

Main test routine for formally testing the equality of two curves represented by discrete data points over a domain with homoscedacity or heteroscedacity errors. curvetest is the wrapper of curvetest.raw.

Usage

```
curvetest(formula, data1 = NULL, data2 = NULL, equal.var = TRUE, alpha = 0.5, bw = NULL, plotit = TRUE, co
curvetest.raw(fits1, fits2, equal.var, conf.level, plotit)
## S3 method for class 'curvetest'
print(x,...)
```

Arguments

formula	A formula to the data set such as y~x.
data1	A data frame of 2 columns representing the underlying curve 1. The column names must agree with the names in formula.
data2	A data frame for curve 2. If it is NULL, the test is whether curve 1 is statistically equal to 0 over the defining domain.
equal.var	Whether the variances are equal. Default to TRUE.
alpha	Smoothing parameter.
bw	Window bandwidth for both curves.
plotit	WHether plot the fitted curves or not. Default: FALSE.
conf.level	The confidence level to claim the curves are different. Default: 0.05.
kernel	One of the kernel functions to use to fit the curves. Must be one of "Triangle", "Gaussian", "Trio","Uniform", "Triweight", "Epanechnikov", "Quartic". partial match is allowed.
nn	Number of data points in the test domain to calculate the curve values.
myx	x-values in the test domain to calculate the curve values. If it is specified, nn will be suppressed.
bcorrect	Boundary correction method. Right now, except for 'none', meaning no corrections, the only other opton is 'simple'.
...	When plotit is true, plot parameters can be specified such as pch, lty, col etc.
fits1,fits2	The fitted results from fitting the first or second curve by curvefit procedure.
x	Test results from curvetest.

Details

The algorithm works by first fitting the curves using local regression method specified by formula on data1 and/or data 2 with smoothing parameters specified in the function calls. Then it will test on the fitted curve 1 and curve 2 to see if they are statistically equal or not.

Value

An R object of class curvetest will be generatd, containing curve fitting and testing results.

Statistic,p	Test statistic and p value of testing whether $f_1(x)==f_2(x)$ or $f_1(x)==0$.
eDF	Estimated degree of freedom of the fitting.
equal.var	The model specification of whether the two variances are equal or not
esigma1,esigma2	Estimated varaince of the fitted curves.
k0	The calculated value from the tube. See detail in paper.
fits1,fits2	Objects of class 'curvefit' from curvefit ruotine.

Author(s)

Zhongfa Zhang, Jiayang Sun

References

Zhongfa Zhang, et al: Test Equality of Curves with Homoscedastic or Heteroscedastic Errors. To appear

See Also

curvefit, print.curvetest, plot.curvetest

Examples

```
n1=150; n2=155 ##numbers of data points for the two curves.
f1<-f2<-function(x){x*(1-x)+sin(2*pi*x)}; ##True functions.
x1=seq(0,1, length=n1);
x2=seq(0, 1, length=n2);
y1=f1(x1)+rnorm(n1, 0, 0.2)
y2=f2(x2)+rnorm(n2, 0, 0.2) ###Measured data for the two curves with noises.
curvetest(y~x,data.frame(x=x1,y=y1), data.frame(x=x2,y=y2), alpha = 0.7, equal.var=TRUE,plotit=TRUE)
```

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get.weight.function — *Test Equality of Curves with Homoscedastic or Heteroscedastic Errors.*

Description

For each kernel, return a function corresponding to the name specified. This is a utility function.

Usage

```
get.weight.function(type)
```

Arguments

type	A character string of the name for the kernel type function.

Value

A kernel function will be returned with attribute 'name' storing the function name for future possible identification of the kernel function.

Examples

```
get.weight.function("Uniform")
```

`getoptimalalpha` *Test Equality of Curves with Homoscedastic or Heteroscedastic Errors.*

Description

To calculate the optiomal smoothing alpha if it si not specified.

Usage

```
getoptimalalpha(formula, data, plotit = F)
```

Arguments

`formula`	Formula to do the regression.
`data`	A data frame of n rows by 2 columns. The column names should agree with the variable names specified in the formula.
`plotit`	Whether plot will be geneated to show how the different choices of alpha will affect the generalized cross validation values.

Details

When this routine is invoked, it will fit a sereies regressions specified by the formula on data set. For each one, the generalized cross validation will be calculated and the "best" (minimal) GCV will be found with the corresponding alpha returned.

Value

A numeric value of alpha value will be returned.

Author(s)

Zhongfa Zhang, Jiayang Sun

References

Zhongfa Zhang, et al: Test Equality of Curves with Homoscedastic or Heteroscedastic Errors. To appear

See Also

curvefit, curvetest.

Examples

```
x1=seq(0,1, length=n1<-50); f1<-function(x){x*(1-x)+sin(2*pi*x)};
y1=f1(x1)+rnorm(n1, 0, 0.2)
getoptimalalpha(formula=y~x, data.frame(x=x1, y=y1), plotit = TRUE)
```

getWV *Test Equality of Curves with Homoscedastic or Heteroscedastic Errors.*

Description

This is a utility function.

Usage

```
getWV(x, myx, kernel = kernel, alpha = NULL, bw = NULL, bc = "simple", getit =TRUE)
```

Arguments

x	The x values in the data set that defines the curve.
myx	The x-values in the x-domain that will be used to calculate the curve values.
kernel	Kernel functions.
alpha	Smoothing parameter.
bw	Bandwidth. If both alpha and bw are specified, hh will be used instead.
bc	Boundary correction method.
getit	Logical, tell the algorithm whether to calculate or to laod the file to speed up calculation.

Details

This function will accomplish the bulk load of calculations in the algorithm. If getit=TRUE, the algorithm will run the calculation and save the result in somewhere for future load. Otherwise, it will just load the saved output. This will save a lot of time when do a simulation for a large number of iterations.

Value

The function will return the calculated k0, delta,delta2, degree of freedon vv, etc that will be used in the curve fit and test step.

Index