Package ‘rlcv’

March 7, 2022

Title Robust Likelihood Cross Validation Bandwidth Selection

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License GPL (>= 3)

Encoding UTF-8

RoxygenNote 7.1.2

Imports statmod, stats

Suggests rmarkdown, knitr, copula

VignetteBuilder knitr

URL https://sites.google.com/tamu.edu/ximingwu/

NeedsCompilation no

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Univariate kernel density

Usage

kde(x.obs, x.new = NULL, h)

Arguments

x.obs       Training (observed) data (n1 vector)
 x.new      Evaluation data (n2 vector); default to x.obs
       h       Bandwidth

Value

Density evaluated at x.new

Author(s)

Ximing Wu <xwu@tamu.edu>

References


Examples

x=rnorm(100)
x.new=seq(-5.5, length=50)
h=1.06*sd(x)*(length(x))^(1/5)
f=kde(x.new=x.new, x.obs=x, h=h)
Multivariate kernel density

**Usage**

```r
kde_d(x.obs, x.new = NULL, h, stud = FALSE)
```

**Arguments**

- `x.obs`: Training (observed) data (n1 by d matrix, d>=2)
- `x.new`: Evaluation data (n2 by d matrix, d>=2); default to x.obs
- `h`: Bandwidth (d vector)
- `stud`: Indicator for whether data are studentized; default to FALSE

**Details**

For multivariate distributions, bandwidth is calculated for studentized data.

**Value**

Density evaluated at x.new

**Author(s)**

Ximing Wu <xwu@tamu.edu>

**References**


**Examples**

```r
x = matrix(rnorm(200), ncol=2)
x.new = matrix(rnorm(100), ncol=2)
h = c(1,1)
f = kde_d(x.new = x.new, x.obs = x, h = h)
```
**lcv**

*Likelihood cross validation bandwidth for univariate densities*

### Description

Likelihood cross validation bandwidth for univariate densities

### Usage

```r
lcv(x.obs, x.new = NULL)
```

### Arguments

- **x.obs**: Training (observed) data
- **x.new**: Evaluation data; default to `x.obs`

### Value

- `fhat`: density evaluated at `x.new`
- `h`: bandwidth

### Author(s)

Ximing Wu <xwu@tamu.edu>

### References


### Examples

```r
x <- rt(200, df=5)
x.new <- seq(-5, 5, length=100)
fit <- lcv(x.obs = x, x.new = x.new)
# Mean squared errors
f0 <- dt(x.new, df=5)
mean((f0 - fit$fhat)^2)
matplot(x.new, cbind(f0, fit$fhat), type='l')
```
lcv_d  

**Description**

Likelihood cross validation bandwidth for multivariate kernel densities

**Usage**

```r
lcv_d(x.obs, x.new = NULL)
```

**Arguments**

- `x.obs`: Training (observed) data (n1 by d matrix, d>=2)
- `x.new`: Evaluation data (n2 by d matrix, d>=2); default to `x.obs`

**Value**

- `fhat`: density evaluated at `x.new`
- `h`: bandwidth

**Author(s)**

Ximing Wu <xwu@tamu.edu>

**References**


**Examples**

```r
# old faithful data
x=datasets::faithful
x=cbind(x[,1],x[,2])
fit=lcv_d(x.obs=x)
# evaluation data
x1=seq(min(x[,1])*0.8,max(x[,1])*1.2,length=30)
x2=seq(min(x[,2])*0.8,max(x[,2])*1.2,length=30)
x11=rep(x1,each=30)
x22=rep(x2,30)
fhat=kde_d(x.new=cbind(x11,x22),x.obs=x,h=fit$h)
persp(x1,x2,matrix(fhat,30,30))
```
Robust likelihood cross validation bandwidth for univariate densities

Usage

rlcv(x.obs, x.new = NULL)

Arguments

x.obs  
Training (observed) data

x.new  
Evaluation data; default to x.obs

Value

fhat: density evaluated at x.new; h: bandwidth

Author(s)

Ximing Wu <xwu@tamu.edu>

References


Examples

x=r(t(200,df=5)
x.new=seq(-5,5,length=100)
fit=rlcv(x.obs=x,x.new=x.new)
# Mean squared errors
f0=dt(x.new,df=5)
mean((f0-fit$fhat)^2)

matplot(x.new,cbind(f0,fit$fhat),type='l')
rlcv_d

Robust likelihood cross validation bandwidth for multivariate kernel densities

Description
Robust likelihood cross validation bandwidth for multivariate kernel densities

Usage
rlcv_d(x.obs, x.new = NULL)

Arguments
- x.obs: Training (observed) data (n1 by d matrix, d>=2)
- x.new: Evaluation data (n2 by d matrix, d>=2); default to x.obs

Value
fhat: density evaluated at x.new; h: bandwidth

Author(s)
Ximing Wu <xwu@tamu.edu>

References

Examples
# old faithful data
x=datasets::faithful
x=cbind(x[,1],x[,2])
fit=rlcv_d(x.obs=x)
# evaluation data
x1=seq(min(x[,1])*0.8,max(x[,1])*1.2,length=30)
x2=seq(min(x[,2])*0.8,max(x[,2])*1.2,length=30)
x11=rep(x1,each=30)
x22=rep(x2,30)
fhat=kde_d(x.new=cbind(x11,x22),x.obs=x,h=fit$h)
persp(x1,x2,matrix(fhat,30,30))
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