Package 'localdepth'

January 2, 2012

Title Local Depth

LazyLoad yes

LazyData yes

Version 0.5-4

Author Claudio Agostinelli <claudio@unive.it> and Mario Romanazzi <romanaz@unive.it>

Maintainer Claudio Agostinelli <claudio@unive.it>

Depends circular

Date April 18, 2009.

Description Simplicial, Mahalanobis and Ellipsoid Local and Global Depth

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Repository CRAN

Date/Publication 2009-04-19 18:11:39

R topics documented:

chaetocnema *Chaetocnema dataset*

Description

The Chaetocnema dataset includes anatomical measures of 74 males of fleabeetles, of three different genera: Ch. Concinna (A, 21 cases), Ch. Heikertingeri (B, 31 cases) and Ch. Heptapotamica (C, 22 cases).

Usage

```
data(chaetocnema)
```

Format

Data frame with 74 observations on the following 8 variables.

`X10` width of the first joint of the first tarsus in microns (the sum of measurements for both tarsi)

`X12` the same for the second joint

`X14` the maximal width of the aedeagus in the fore-part in microns

`X18` the front angle of the aedeagus (1 unit = 7.5 degrees)

`X40` the maximal width of the head between teh external edges of the eyes in 0.01mm

`X48` the aedeagus width from the side in microns

`species` species of the fleabeetles. A factor with levels `A`: Ch. Concinna, `B`: Ch. Heikertingeri, `C`: Ch. Heptapotamica

`area` colletion area of specimens. A factor with levels `A`: Environs of Uljianovsk, `B`: Khvalynsk, the Volga, `C`: Pern, `D`: Environs of Leningrad, `E`: the Ukraine, `F`: Ashkhabd, Turkmenistan, `G`: France, `H`: Ustj-Zilma, `I`: Gabra, Abkhazia, `L`: Ussuri district, `M`: Yakutsk district, `N`: Khabarovsk, `O`: Germany, `P`: Environs of Lake Issyk-Kul, Kirghizia, `Q`: Alma-ata, Kazachstan, `R`: Environs of Frunza, Kirghizia

Details

The aedeagus is the median lobe of the male genital capsule that is surrounded by the phallobase and through which the sperm duct traverses.

Source

A.A. Lubischew (1962) On the use of discriminant functions in taxonomy. Biometrics, 18:4, 455–477.

References

Hand, D.J., et al. (1994) A Handbook of Small Data Sets, London: Chapman & Hall, 254-255.

See Also

The dataset is also present in lubisch.

Examples

```
data(chaetocnema)
lab <- chaetocnema[,7]
chaetocnema <- chaetocnema[,4:5]
set.seed(1234)
chaetosd <- apply(chaetocnema, 2, sd)
chaetocnema <- chaetocnema+cbind(rnorm(nrow(chaetocnema), 0, chaetosd[1]/100), rnorm(nrow(chaetocnema), 0, chaeto


gx <- seq(min(chaetocnema[,1]), max(chaetocnema[,1]), length=60)
gy <- seq(min(chaetocnema[,2]), max(chaetocnema[,2]), length=60)
y <- as.matrix(expand.grid(gx, gy))

tauvolume <- quantile.localdepth(chaetocnema, probs=0.20, use='volume')
system.time(depthcontours <- localdepth(x=chaetocnema, y=y, tau=tauvolume, use='volume', method='simplicial'))
system.time(depthcontoursapprox <- localdepth(x=chaetocnema, y=y, tau=tauvolume, use='volume', method='simplicia

par(mfrow=c(2,2))
plot(chaetocnema, pch=as.character(lab), main='Exact Simplicial Depth')
contour(x=gx, y=gy, z=matrix(depthcontours$depth/depthcontours$max.depth, nrow=length(gx), ncol=length(gy)), add

plot(chaetocnema, pch=as.character(lab), main='Approx Simplicial Depth')
contour(x=gx, y=gy, z=matrix(depthcontoursapprox$depth/depthcontoursapprox$max.depth, nrow=length(gx), ncol=leng

plot(chaetocnema, pch=as.character(lab), main='Exact Simplicial Local Depth, Tau=0.2')
contour(x=gx, y=gy, z=matrix(depthcontours$localdepth/depthcontours$max.localdepth, nrow=length(gx), ncol=length

plot(chaetocnema, pch=as.character(lab), main='Approx Simplicial Local Depth, Tau=0.2')
contour(x=gx, y=gy, z=matrix(depthcontoursapprox$localdepth/depthcontoursapprox$max.localdepth, nrow=length(gx)
```

---

cork *Cork dataset*

Description

The cork dataset (Rao, 1948) gives the weights of cork borings of the trunk for 28 trees on the north (N), east (E), south (S) and west (W) directions.

Usage

```
data(cork)
```

Format

Data frame with 28 observations on the following 4 variables.

`N` North direction

`E` East direction

`S` South direction

`W` West direction

Source

C.R. Rao (1948) Tests of significance in multivariate analysis. Biometrika, 35, 58-79.

References

K.V. Mardia, J.T. Kent and J.M. Bibby (1979) Multivariate Analysis, Academic Press.

Examples

```
data(cork)
set.seed(1234)
n <- nrow(cork)
err1 <- rnorm(n,0,sd(cork[,1])/100)
err2 <- rnorm(n,0,sd(cork[,2])/100)
err3 <- rnorm(n,0,sd(cork[,3])/100)
err4 <- rnorm(n,0,sd(cork[,4])/100)
cork <- cork + data.frame(err1,err2,err3,err4)

tau <- quantile.localdepth(cork, probs=0.1, size=TRUE, use='volume')
boxplot(tau$stats)

depth <- localdepth(x=cork, tau=tau$quantile, tol=0, method='simplicial', use='volume')
plot(depth)
abline(0, 1, lty=2)
```

---

glasses *Roman-Venetian Glass dataset*

Description

The dataset gives the compositions of 73 glass specimens excavated in a series of archeological campaign in the island of Venice lagoon and nearby borders.

Usage

```
data(glasses)
```

Format

Data frame with 73 observations on the following 14 variables.

`ID` Specimens number

`CLA` type of glass: 1, Venetian glass (XIVth-XVIth centuries); 2, Roman glass (Ist-Vth centuries A.D.); 3, Middle Ages glass (VIth-XIIIth centuries)

`SIO2` a numeric vector

`AL2O3` a numeric vector

`NA2O` a numeric vector

`K2O` a numeric vector

`CAO` a numeric vector

`MGO` a numeric vector

`FE2O3` a numeric vector

`TIO2` a numeric vector

`P2O5` a numeric vector

`CL` a numeric vector

`SO3` a numeric vector

`MNO` a numeric vector

Details

Variables SIO2 to MNO are provide composition of glass specimens on the corresponding chemical compound.

Source

Mario Romanazzi.

References

M. Verita', A. Renier and S. Zecchin (2002) Chemical analyses of ancient glass findings excavated in the venetian lagoon. Journal of Cultural Heritage, 3, 261-271.

Examples

```
glasses <- na.omit(glasses[,-1])
n <- nrow(glasses)
p <- ncol(glasses)
col <- rep("black",n)
col[glasses[,1] == 2] <- "red"
col[glasses[,1] == 3] <- "green"
lab <- rep("M",n)
lab[glasses[,1] == 1] <- "V"
lab[glasses[,1] == 2] <- "R"
lab1 <- paste(lab,1:n,sep="")
pc <- princomp(glasses[,-1],cor=TRUE)
```

```
summary(pc)
plot(scale(pc$scores[,1]),scale(pc$scores[,2]),pch=20, xlab="PC1 (36)", ylab="PC2 (28)", main="Roman Venetian Gla
text(scale(pc$scores[,1]),scale(pc$scores[,2]), labels=lab1,cex=0.6,pos=3,col=col)
abline(h=0,v=0,lty="dashed",col="grey")
plot(scale(pc$scores[,1]),scale(pc$scores[,3]),pch=20, xlab="PC1 (36)", ylab="PC3 (11)", main="Roman Venetian Gla
text(scale(pc$scores[,1]),scale(pc$scores[,3]), labels=lab1,cex=0.6,pos=3,col=col)
abline(h=0,v=0,lty="dashed",col="grey")
plot(scale(pc$scores[,2]),scale(pc$scores[,3]),pch=20, xlab="PC2 (28)", ylab="PC3 (11)", main="Roman Venetian Gla
text(scale(pc$scores[,2]),scale(pc$scores[,3]), labels=lab1,cex=0.6,pos=3,col=col)
abline(h=0,v=0,lty="dashed",col="grey")

set.seed(1234)
err1 <- rnorm(n,0,sd(glasses[,2])/100)
err2 <- rnorm(n,0,sd(glasses[,3])/100)
err3 <- rnorm(n,0,sd(glasses[,4])/100)
err4 <- rnorm(n,0,sd(glasses[,5])/100)
err5 <- rnorm(n,0,sd(glasses[,6])/100)
err6 <- rnorm(n,0,sd(glasses[,7])/100)
err7 <- rnorm(n,0,sd(glasses[,8])/100)
err8 <- rnorm(n,0,sd(glasses[,9])/100)
err9 <- rnorm(n,0,sd(glasses[,10])/100)
err10 <- rnorm(n,0,sd(glasses[,11])/100)
err11 <- rnorm(n,0,sd(glasses[,12])/100)
err12 <- rnorm(n,0,sd(glasses[,13])/100)
glasses <- glasses[,-1] + data.frame(err1,err2,err3,err4,err5,err6,err7,err8,err9, err10,err11,err12)

tau <- quantile.localdepth(glasses, probs=c(0.1, 0.9), method='mahalanobis')
gla10 <- localdepth(glasses, tau=tau[1], method='mahalanobis')
gla90 <- localdepth(glasses, tau=tau[2], method='mahalanobis')

plot(gla10)
abline(0, 1, lty=2)
plot(gla90)
abline(0, 1, lty=2)
```

`localdepth` *Local depth*

Description

The function evaluates the depth and the local depth for a set of points with respect to a dataset.

Usage

```
localdepth(x, y = NULL, tau, use = c("volume", "diameter"),
  method = c("simplicial", "ellipsoid", "halfspace", "mahalanobis"),
  type = c("exact", "approx"), nsamp = "all", nmax = 1,
  tol=10^(-9), dimension=NULL, location=NULL, covariance=NULL)
```

Arguments

x	numeric; vector, dataframe or matrix. If x is a circular vector, a circular version is used. Avoid ties by wiggling the data. The function only issues a warning for ties
y	numeric; vector, dataframe or matrix with the same number of columns as x, or NULL. If NULL, x is used
tau	numeric; threshold value for the evaluation of the local depth. Use function quantile.localdepth to evaluate tau using a quantile of the size of the objects
use	character; the statistic used to measure the size of the objects. Currently, for method equal to "simplicial" or "ellipsoid" allowed statistics are "volume" and "diameter". For method equal to "mahalanobis" this parameter is not used and the only available statistic is pairwise Mahalanobis' distance
method	character; the type of (local) depth to be evaluated
type	character; how to evaluate membership. Only active for method="simplicial". See details.
nsamp	character or numeric; the number of objects that are considered. If "all", the size of all choose(NROW(x), NCOL(x)+1) objects is evaluated. Otherwise, a simple random sample with replacement of size nsamp is performed from the set of all possible objects.
nmax	numeric; maximum fraction (in the range (0,1]) of objects to be considered when nsamp is not equal to all. If nmax=1 the number of searched objects can reach the number of possible objects (choose(NROW(x), NCOL(x)+1) for simplicial and ellipsoid depth)
tol	numeric; tolerance parameter to be fixed depending on the machine precision. Used to decide membership of points located near to the boundary of the objects
dimension	numeric; only used with method="ellipsoid". It is the squared length of the ellipsoid semimajor axis. If dimension is NULL, it is set to NCOL(x)
location	NULL or a numeric vector; the NCOL(x) means vector used in method equal to "mahalanobis". If NULL, apply(x, 2, mean) is used
covariance	NULL or a numeric matrix; the NCOL(x)*NCOL(x) covariance matrix used in method equal to "mahalanobis". If NULL, cov(x) is used

Details

With method="simplicial" and type="exact", membership of the points in simplices is evaluated; when type="approx", an approximate membership function is used. See references below.

Value

The function returns an object of class localdepth with the following components:

localdepth	vector of the local depth values for the given tau
depth	vector of the depth values
max.localdepth	max(localdepth)

max.depth	max(depth)
num	vector with two components. num[1] gives the number of objects used for the evaluation of the depth; num[2] is the number of objects used for the evaluation of the local depth
call	match.call() result. Note that this is called from the internal function
tau	value of the corresponding input parameter
use	value of the corresponding input parameter
tol	value of the corresponding input parameter
x	value of the corresponding input parameter
y	value of the corresponding input parameter
type	value of the corresponding input parameter
nsamp	value of the corresponding input parameter
method	value of the corresponding input parameter

Author(s)

Claudio Agostinelli and Mario Romanazzi

References

C. Agostinelli and M. Romanazzi (2007). Local depth of univariate distributions. Working paper n. 1/2007, Dipartimento di Statistica, Universita' Ca' Foscari, Venezia.

C. Agostinelli and M. Romanazzi (2008). Local depth of multidimensional data. Working paper n. 3/2008, Dipartimento di Statistica, Universita' Ca' Foscari, Venezia.

See Also

quantile.localdepth, plot.localdepth

Examples

```
# Iris Setosa dataset
data(iris)
setosa <- iris[iris$Species=="setosa",-5]
str(setosa)
n <- dim(setosa)[1];p <- dim(setosa)[2]
lab <- paste("U",1:n,sep="")
pairs(setosa)
# Wiggling data with gaussian error
set.seed(1234)
err <- matrix(c(rnorm(n,0,sd(setosa[,1])/1000),rnorm(n,0,sd(setosa[,2])/1000), rnorm(n,0,sd(setosa[,3])/1000),r
setosa1 <- setosa + as.data.frame(err)

## Not run:
## The following two lines may not run in your computer since all sizes are reported
qd <- quantile.localdepth(setosa1, probs=c(seq(0.01,0.09,0.01),seq(0.1,0.9,0.1)), use="diameter", method="simpli
qv <- quantile.localdepth(setosa1, probs=c(seq(0.01,0.09,0.01),seq(0.1,0.9,0.1)), use="volume", method="simplici
```

```
## End(Not run)

## Here we explore 10% of simplices (0.1*choose(50,4+1))
qd <- quantile.localdepth(setosa1, probs=c(seq(0.01,0.09,0.01),seq(0.1,0.9,0.1)), use="diameter", method="simpli
qv <- quantile.localdepth(setosa1, probs=c(seq(0.01,0.09,0.01),seq(0.1,0.9,0.1)), use="volume", method="simplici

c(mean(qd$stats),median(qd$stats))
c(mean(qv$stats),median(qv$stats))

round(qd$quantile,2)
round(qv$quantile,8)

boxplot(qd$stats,names="Diameter",xlab="Simplex Size", horizontal=TRUE,main="Iris Setosa")
boxplot(qv$stats,names="Volume",xlab="Simplex Size", horizontal=TRUE,main="Iris Setosa")

plot(qd$stats,qv$stats,xlab="Simplex Diameter",ylab="Simplex Volume", main="Iris Setosa",pch=20)

# Simplicial global/local depth

sldv10 <- localdepth(setosa1,tau=qv$quantile[10],use="volume", method="simplicial", type="exact", nsamp="all") #
str(sldv10)
sd10 <- sldv10$depth       # simplicial depth
sld10 <- sldv10$localdepth # simplicial local depth (volume, 10%)
lab[sd10 == (p+1)/n]        # convex hull vertices (25 points out of 50)
sdmax <- max(sd10);imax <- which.max(sd10);setosa[imax,] # deepest point

# DD-Plot

plot(sldv10, xlab="Simplicial Depth", ylab="Local Simplicial Depth", main="Iris Setosa",pch=20,ylim=c(0,1.02))
abline(a=0,b=1,lty="dashed")

# Mahalanobis Depth of Iris Versicolor wrt Iris Setosa

iversicolor <- iris[iris$Species == "versicolor",-5]
str(iversicolor)
set.seed(2345)
err <- matrix(c(rnorm(n,0,sd(iversicolor[,1])/1000),rnorm(n,0,sd(iversicolor[,2])/1000), rnorm(n,0,sd(iversicol
iversicolor1 <- iversicolor + as.data.frame(err)
qm <- quantile.localdepth(setosa1, probs=c(seq(0.01,0.09,0.01),seq(0.1,0.9,0.1)), method="mahalanobis",nsamp="al
round(qm$quantile,2)
vers <- localdepth(x=setosa1, y=iversicolor1, tau=qm$quantile[10], method="mahalanobis", nsamp="all")
str(vers)
round(vers$depth,6)
round(vers$localdepth,6) # identically zero
```

---

localdepth.similarity *Local depth similarity*

Description

The function evaluates depth and local depth similarity for a set of points with respect to a dataset.

Usage

```
localdepth.similarity(x, y = NULL, tau, use = c("volume", "diameter"),
  method = c("simplicial", "ellipsoid", "mahalanobis"),
  type = c("exact", "approx"), nsamp = "all", nmax = 1,
  tol = 10^(-9), dimension=NULL, location = NULL, covariance = NULL,
  weight = NULL)
```

Arguments

x	numeric; vector, dataframe or matrix. If x is a circular vector, a circular version is used. Avoid ties by wiggling the data. The function only issues a warning for ties.
y	numeric; vector, dataframe or matrix with the same number of columns as x, or NULL. If NULL, x is used
tau	numeric; threshold value for the evaluation of the local depth. Use function quantile.localdepth to evaluate tau using a quantile of the size of the objects
use	character; the statistic used to measure the size of the objects. Currently, for method equal to "simplicial" or "ellipsoid" allowed statistics are "volume" and "diameter". For method equal to "mahalanobis" this parameter is not used and the only available statistic is pairwise Mahalanobis' distance
method	character; the type of (local) depth similarity to be evaluated
type	character; how to evaluate membership. Only active for method="simplicial". See details.
nsamp	character or numeric; the number of objects that are considered. If "all", the size of all choose(NROW(x), NCOL(x)+1) objects is evaluated. Otherwise, a simple random sample with replacement of size nsamp is performed from the set of all possible objects.
nmax	numeric; maximum fraction (in the range (0,1]) of objects to be considered when nsamp is not equal to all. If nmax=1 the number of searched objects can reach the number of possible objects (choose(NROW(x), NCOL(x)+1) for simplicial and ellipsoid depth)
tol	numeric; tolerance parameter to be fixed depending on the machine precision. Used to decide membership of points located near to the boundary of the objects
dimension	numeric; only used with method="ellipsoid". It is the squared length of the ellipsoid semimajor axis. If dimension is NULL, it is set to NCOL(x)
location	NULL or a numeric vector; the NCOL(x) means vector used in method equal to "mahalanobis". If NULL, apply(x, 2, mean) is used
covariance	NULL or a numeric matrix; the NCOL(x)*NCOL(x) covariance matrix used in method equal to "mahalanobis". If NULL, cov(x) is used
weight	experimental parameter used to weight entries in the similarity matrix. Not implemented in each method, dimension.

Details

With `method="simplicial"` and `type="exact"`, membership of the points in simplices is evaluated; when `type="approx"`, an approximate membership function is used. See references below.

Value

The function returns an object of `class` `localdepth.similarity` with the following components:

`localdepth`	matrix of the local depth similarities
`depth`	matrix of the depth similarities
`max.localdepth`	`max(localdepth)`
`max.depth`	`max(depth)`
`num`	vector with two components. `num[1]` gives the number of objects used for the evaluation of the depth similarity; `num[2]` is the number of objects used for the evaluation of the local depth similarity
`call`	match.call() result. Note that this is called from the internal function
`tau`	value of the corresponding input parameter
`use`	value of the corresponding input parameter
`tol`	value of the corresponding input parameter
`x`	value of the corresponding input parameter
`y`	value of the corresponding input parameter
`type`	value of the corresponding input parameter
`nsamp`	value of the corresponding input parameter
`method`	value of the corresponding input parameter

Note

The function is not yet implemented for Ellipsoid (local) depth.

Author(s)

Claudio Agostinelli and Mario Romanazzi

References

C. Agostinelli and M. Romanazzi (2007). Local depth of univariate distributions. Working paper n. 1/2007, Dipartimento di Statistica, Universita' Ca' Foscari, Venezia.

C. Agostinelli and M. Romanazzi (2008). Local depth of multidimensional data. Working paper n. 3/2008, Dipartimento di Statistica, Universita' Ca' Foscari, Venezia.

R.Y. Liu, J.M. Parelius and K. Singh (1999) Multivariate analysis by data depth: descriptive statistics, graphics and inference. The Annals of Statistics, 27, 783-858.

See Also

`localdepth`

Examples

```
data(cork)
tau <- quantile.localdepth(cork[,c(1,3)], probs=0.1, method='simplicial')
sim <- localdepth.similarity(cork[,c(1,3)], tau=tau, method='simplicial')
plot(hclust(d=as.dist(1-sim$localdepth/sim$max.localdepth)))
plot(hclust(d=as.dist(1-sim$depth/sim$max.depth)))
```

`plot.localdepth` *A DD-plot for Local Depth versus Depth*

Description

Provides DD-plot of normalized localdepth versus normalized depth.

Usage

```
## S3 method for class 'localdepth'
plot(x, xlab="Depth", ylab="Local Depth", main="DD plot", mark=0.9, labels=NULL, ...)
```

Arguments

`x`	an object of class `localdepth`
`xlab`	a title for the x axis: see `title`
`ylab`	a title for the y axis: see `title`
`main`	an overall title for the plot: see `title`
`mark`	points with local depth or depth greater than `mark` are shown with their row indices in the dataset
`labels`	labels used to mark the points. It must have the same length as the number of rows of `x$y`
`...`	graphical parameters can be given as arguments

Value

The function returns the `x` object as `invisible`.

Author(s)

Claudio Agostinelli and Mario Romanazzi

See Also

`localdepth`

Examples

```
set.seed(1234)
x <- rnorm(20)
tau <- quantile.localdepth(x, probs=0.2, use="volume", method="simplicial")
res <- localdepth(x,tau=tau, use="volume", method="simplicial")
plot(res, xlab="Simplicial Depth", ylab="Local Simplicial Depth", pch=20)
abline(a=0,b=1,lty="dashed")
```

`quantile.localdepth` *Quantiles of the distribution of the size of simplices or ellipsoids*

Description

The function evaluates the size of the objects formed from a dataset according to a statistic and returns the corresponding quantiles. Depending on the method the objects are simplices or ellipsoids.

Usage

```
quantile.localdepth(x, probs, use = c("volume", "diameter"),
method = c("simplicial", "ellipsoid", "halfspace", "mahalanobis"),
nsamp = "all", size = FALSE, dimension = NULL, covariance=NULL, ...)
```

Arguments

`x`	numeric; vector, dataframe or matrix
`probs`	numeric; vector of probabilities with values in [0,1]. Quantile orders of the statistic
`use`	character; the statistic used to measure the size of the objects. For `method` equal to `"simplicial"` or `"ellipsoid"` allowed statistics are `"volume"` and `"diameter"`. For `method` equal to `"mahalanobis"` this parameter is not used and the only available statistic is pairwise Mahalanobis' distance
`method`	character; the type of (local) depth to be evaluated
`nsamp`	character or numeric; the number of objects that are considered. If `"all"`, the size of all `choose(NROW(x), NCOL(x)+1)` objects is evaluated. Otherwise, a simple random sample with replacement of size `nsamp` is performed from the set of all possible objects. See details below
`size`	logical; if `TRUE` the size of all possible objects is returned
`dimension`	numeric; only used with `method="ellipsoid"`. It is the squared length of the ellipsoid semimajor axis. If `dimension` is `NULL`, it is set to `NCOL(x)`
`covariance`	`NULL` or a numeric matrix; the `NCOL(x)*NCOL(x)` covariance matrix used in `method` equal to `"mahalanobis"`. If `NULL`, `cov(x)` is used
`...`	arguments passed to `quantile.default`

Details

When choosing between `nsamp='all'` or a numeric value for `nsamp` the value of `choose(NROW(x), NCOL(x)+1)` must be considered to avoid very long computing times. When the number of possible objects is greater than the maximum vector length manageable by the machine, an error is returned by the system. In this case it is necessary to use the approximated procedure through the parameter `nsamp`.

Value

If `size` is `FALSE` then a vector with the quantiles is returned, otherwise a list with the following components:

`quantile`	the requested quantiles
`stats`	the size of all objects
`call`	match.call()

Author(s)

Claudio Agostinelli and Mario Romanazzi

See Also

`localdepth`

Examples

```
set.seed(1234)
x <- matrix(rnorm(60, 0, 1), ncol=2)
volumesimplex <- quantile.localdepth(x, probs=c(0.1, 0.2), size=TRUE)
volumesimplex$quantile
diametersimplex <- quantile.localdepth(x, probs=c(0.1, 0.2), size=TRUE, use='diameter')
diametersimplex$quantile
par(mfrow=c(2,2))
plot(ecdf(volumesimplex$stats), xlab='volume', main="ECDF of the simplices's volume")
boxplot(volumesimplex$stats, xlab='volume', main="Boxplot of the simplices's volume")
plot(ecdf(diametersimplex$stats), xlab='volume', main="ECDF of the simplices's diameter")
boxplot(diametersimplex$stats, xlab='volume', main="Boxplot of the simplices's diameter")
```

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