Package 'clusterCrit'

August 31, 2015

Type Package

Title Clustering Indices

Version 1.2.6

Date 2015-08-31

Author Bernard Desgraupes (University of Paris Ouest - Lab Modal'X)

Maintainer Bernard Desgraupes <bernard.desgraupes@u-paris10.fr>

Description Compute clustering validation indices.

License GPL (>= 2)

URL http:www.r-project.org

Collate main.R zzz.R

Encoding latin1

Suggests RUnit, rbenchmark

R topics documented:

---

bestCriterion *Best clustering index*

Description

bestCriterion returns the best index value according to a specified criterion.

Usage

```
bestCriterion(x, crit)
```

Arguments

x	[matrix] : a numeric vector of quality index values.
crit	[character] : a string specifying the name of the criterion which was used to compute the quality indices.

Details

Given a vector of several clustering quality index values computed with a given criterion, the function bestCriterion returns the index of the *"best"* one in the sense of the specified criterion. Typically, a set of data has been clusterized several times (using different algorithms or specifying a different number of clusters) and a clustering index has been calculated each time : the bestCriterion function tells which value is considered the best according to the given clustering index. For instance, if one uses the Calinski_Harabasz index, the best value is the largest one.

A list of all the supported criteria can be obtained with the getCriteriaNames function. The criterion name (crit argument) is case insensitive and can be abbreviated.

Value

The index in vector x of the best value according to the criterion specified by the crit argument.

Author

Bernard Desgraupes
<bernard.desgraupes@u-paris10.fr>
University of Paris Ouest - Nanterre
Lab Modal'X (EA 3454)

See Also

getCriteriaNames, intCriteria.

Examples

```
# Create some spheric data around three distinct centers
x <- rbind(matrix(rnorm(100, mean = 0, sd = 0.5), ncol = 2),
        matrix(rnorm(100, mean = 2, sd = 0.5), ncol = 2),
        matrix(rnorm(100, mean = 4, sd = 0.5), ncol = 2))
vals <- vector()
for (k in 2:6) {
   # Perform the kmeans algorithm
   cl <- kmeans(x, k)
   # Compute the Calinski_Harabasz index
   vals <- c(vals,as.numeric(intCriteria(x,cl$cluster,"Calinski_Harabasz")))
}
idx <- bestCriterion(vals,"Calinski_Harabasz")
cat("Best index value is",vals[idx],"\n")
```

---

clusterCrit *~ Overview: Clustering Indices ~*

Description

Package:	clusterCrit
Type:	Package
Version:	1.2.6
Date:	2015-08-31
License:	GPL (>= 2)

Details

clusterCrit computes various clustering validation or quality criteria and partition comparison indices. Type

```
library(help="clusterCrit")
```

for more info about the available functions.

Author

Bernard Desgraupes
<bernard.desgraupes@u-paris10.fr>
University of Paris Ouest - Nanterre
Lab Modal'X (EA 3454)

References

For more information about the algebraic background of clustering indices and their definition, see the vignette accompanying this package. To display the vignette, type the following instruction in the R console :

```
> vignette("clusterCrit")
```

See Also

extCriteria, getCriteriaNames, intCriteria, bestCriterion, concordance.

---

concordance *Compute Concordance Matrix*

Description

concordance calculates the concordance matrix between two partitions of the same data.

Usage

```
concordance(part1, part2)
```

Arguments

part1	[vector] : the first partition vector.
part2	[vector] : the second partition vector.

Details

Given two partitions, the function concordance calculates the number of pairs classified as belonging or not belonging to the same cluster with respect to partitions part1 or part2.

Value

A 2x2 matrix of the form :

```
   | P1  | P2  |
_____________________
P1 | Nyy | Nyn |
P2 | Nny | Nnn |
_____________________
```

where

- Nyy is the number of points belonging to the same cluster both in part1 and part2
- Nyn is the number of points belonging to the same cluster in part1 but not in part2
- Nny is the number of points belonging to the same cluster in part2 but not in part1
- Nnn is the number of points *not* belonging to the same cluster both in part1 and part2

Author

Bernard Desgraupes
<bernard.desgraupes@u-paris10.fr>
University of Paris Ouest - Nanterre
Lab Modal'X (EA 3454)

See Also

extCriteria, intCriteria.

Examples

```
# Generate two artificial partitions
part1<-sample(1:3,150,replace=TRUE)
part2<-sample(1:5,150,replace=TRUE)

# Compute the table of concordances and discordances
concordance(part1,part2)
```

extCriteria *Compute external clustering criteria*

Description

extCriteria calculates various external clustering comparison indices.

Usage

```
extCriteria(part1, part2, crit)
```

Arguments

part1	[vector] : the first partition vector.
part2	[vector] : the second partition vector.
crit	[vector] : a vector containing the names of the indices to compute.

Details

The function extCriteria calculates external clustering indices in order to compare two partitions. The list of all the supported criteria can be obtained with the getCriteriaNames function.

The currently available indices are :

- "Czekanowski_Dice"
- "Folkes_Mallows"
- "Hubert"
- "Jaccard"
- "Kulczynski"
- "McNemar"
- "Phi"
- "Precision"
- "Rand"
- "Recall"
- "Rogers_Tanimoto"
- "Russel_Rao"
- "Sokal_Sneath1"
- "Sokal_Sneath2"

All the names are case insensitive and can be abbreviated. The keyword "all" can also be used as a shortcut to calculate all the external indices.

The partition vectors should not have empty subsets. No attempt is made to verify this.

Value

A list containing the computed criteria, in the same order as in the crit argument.

Author

Bernard Desgraupes
<bernard.desgraupes@u-paris10.fr>
University of Paris Ouest - Nanterre
Lab Modal'X (EA 3454)

References

See the bibliography at the end of the vignette.

See Also

getCriteriaNames, intCriteria, bestCriterion, concordance.

Examples

```
# Generate two artificial partitions
part1<-sample(1:3,150,replace=TRUE)
part2<-sample(1:5,150,replace=TRUE)

# Compute all the external indices
extCriteria(part1,part2,"all")
# Compute some of them
extCriteria(part1,part2,c("Rand","Folkes"))
# The names are case insensitive and can be abbreviated
extCriteria(part1,part2,c("ra","fo"))
```

---

getCriteriaNames *Get clustering criteria names*

Description

getCriteriaNames returns the available clustering criteria names.

Usage

```
getCriteriaNames(isInternal)
```

Arguments

isInternal	[logical] : get internal indices if TRUE, external indices otherwise.

Details

getCriteriaNames returns a list of the available internal or external clustering indices depending on the isInternal logical argument.

The internal indices can be used in the crit argument of the intCriteria function and the external indices similarly in the extCriteria function.

Value

A character vector containing the supported criteria names.

Author

Bernard Desgraupes
<bernard.desgraupes@u-paris10.fr>
University of Paris Ouest - Nanterre
Lab Modal'X (EA 3454)

References

See the bibliography at the end of the vignette.

See Also

intCriteria, extCriteria, bestCriterion.

Examples

```
getCriteriaNames(TRUE)
getCriteriaNames(FALSE)
```

---

intCriteria *Compute internal clustering criteria*

Description

intCriteria calculates various internal clustering validation or quality criteria.

Usage

```
intCriteria(traj, part, crit)
```

Arguments

traj	[matrix] : the matrix of observations (trajectories).
part	[vector] : the partition vector.
crit	[vector] : a vector containing the names of the indices to compute.

Details

The function intCriteria calculates internal clustering indices. The list of all the supported criteria can be obtained with the getCriteriaNames function.

The currently available indices are :

- "Ball_Hall"
- "Banfeld_Raftery"
- "C_index"
- "Calinski_Harabasz"
- "Davies_Bouldin"
- "Det_Ratio"
- "Dunn"

- "Gamma"
- "G_plus"
- "GDI11"
- "GDI12"
- "GDI13"
- "GDI21"
- "GDI22"
- "GDI23"
- "GDI31"
- "GDI32"
- "GDI33"
- "GDI41"
- "GDI42"
- "GDI43"
- "GDI51"
- "GDI52"
- "GDI53"
- "Ksq_DetW"
- "Log_Det_Ratio"
- "Log_SS_Ratio"
- "McClain_Rao"
- "PBM"
- "Point_Biserial"
- "Ray_Turi"
- "Ratkowsky_Lance"
- "Scott_Symons"
- "SD_Scat"
- "SD_Dis"
- "S_Dbw"
- "Silhouette"
- "Tau"
- "Trace_W"
- "Trace_WiB"
- "Wemmert_Gancarski"
- "Xie_Beni"

All the names are case insensitive and can be abbreviated. The keyword "all" can also be used as a shortcut to calculate all the internal indices.

The GDI (*Generalized Dunn Indices*) are designated by the following convention: GDI*mn*, where the integers *m* (*1<=m<=5*) and *n* (*1<=n<=3*) correspond to the between-group and within-group distances respectively. See the vignette for a comprehensive definition of the various distances. GDI alone is synonym of GDI11 and is the genuine Dunn's index.

Value

A list containing the computed criteria, in the same order as in the crit argument.

Author

Bernard Desgraupes
<bernard.desgraupes@u-paris10.fr>
University of Paris Ouest - Nanterre
Lab Modal'X (EA 3454)

References

See the bibliography at the end of the vignette.

See Also

getCriteriaNames, extCriteria, bestCriterion.

Examples

```
# Create some data
x <- rbind(matrix(rnorm(100, mean = 0, sd = 0.5), ncol = 2),
           matrix(rnorm(100, mean = 1, sd = 0.5), ncol = 2),
           matrix(rnorm(100, mean = 2, sd = 0.5), ncol = 2))
# Perform the kmeans algorithm
cl <- kmeans(x, 3)
# Compute all the internal indices
intCriteria(x,cl$cluster,"all")
# Compute some of them
intCriteria(x,cl$cluster,c("C_index","Calinski_Harabasz","Dunn"))
# The names are case insensitive and can be abbreviated
intCriteria(x,cl$cluster,c("det","cal","dav"))
```

Index