Package 'lowmemtkmeans'

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Type Package

Title Low Memory Use Trimmed K-Means

Version 0.1.4

Description Performs the trimmed k-means clustering algorithm with lower memory use. It also provides a number of utility functions such as BIC calculations.

License GPL (>= 3)

LinkingTo Rcpp, RcppArmadillo

Imports Rcpp (>= 0.12.5)

RoxygenNote 7.3.3

Encoding UTF-8

Suggests testthat

NeedsCompilation yes

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Contents

cluster_BIC *Calculates BIC for a given clustering.*

Description

Computes Bayesian information criterion for a given clustering of a data set.

Usage

```
cluster_BIC(data, centres)
```

Arguments

data	a matrix (n x m). Rows are observations, columns are predictors.
centres	matrix of cluster means (k x m), where k is the number of clusters.

Details

Bayesian information criterion (BIC) is calculated using the formula, BIC = -2 * log(L) + k*log(n). k is the number of free parameters, in this case is m*k + k - 1. n is the number of observations (rows of data). L is the liklihood for the given set of cluster centres.

Value

BIC value

Examples

```
iris_mat <- as.matrix(iris[,1:4])
iris_centres2 <- tkmeans(iris_mat, 2 , 0.1, c(1,1,1,1), 1, 10, 0.001) # 2 clusters
iris_centres3 <- tkmeans(iris_mat, 3 , 0.1, c(1,1,1,1), 1, 10, 0.001) # 3 clusters
cluster_BIC(iris_mat, iris_centres2)
cluster_BIC(iris_mat, iris_centres3)
```

nearest_cluster *Allocates each rw (observation) in data to the nearest cluster centre.*

Description

For each observation the euclidean distance to each of the cluster centres is calculated and cluster with the smallest distance is return for that observation.

Usage

```
nearest_cluster(data, centres)
```

Arguments

data	a matrix (n x m) to be clustered
centres	matrix of cluster means (k x m), where k is the number of clusters.

Value

vector of cluster allocations, n values ranging from 1 to k.

Examples

```
iris_mat <- as.matrix(iris[,1:4])
centres<- tkmeans(iris_mat, 3 , 0.2, c(1,1,1,1), 1, 10, 0.001)
nearest_cluster(iris_mat, centres)
```

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scale_mat_inplace *Rescales a matrix in place.*

Description

Rescales matrix so that each column has a mean of 0 and a standard deviation of 1. The original matrix is overwritten in place. The function returns the means and standard deviations of each column used to rescale it.

Usage

```
scale_mat_inplace(M)
```

Arguments

M	matrix of data (n x m)

Details

The key advantage of this method is that it can be applied to very large matrices without having to make a second copy in memory and the original can still be restored using the saved information.

Value

Returns a matrix of size (2 x m). The first row contains the column means. The second row contains the column standard dveiations. NOTE: The original matrix, M, is overwritten.

Examples

```
m = matrix(rnorm(24, 1, 2),4, 6)
scale_params = scale_mat_inplace(m)
sweep(sweep(m,2,scale_params[2,],'*'),2,scale_params [1,], '+') # orginal matrix restored
```

`tkmeans` *Trimmed k-means clustering*

Description

Performs trimmed k-means clustering algorithm [1] on a matrix of data. Each row in the data is an observation, each column is a variable. For optimal use columns should be scaled to have the same means and variances using `scale_mat_inplace`.

Usage

```
tkmeans(
  M,
  k,
  alpha,
  weights,
  nstart = 1L,
  iter = 10L,
  tol = 1e-04,
  verbose = FALSE
)
```

Arguments

`M`	matrix (n x m). Rows are observations, columns are predictors.
`k`	number of clusters
`alpha`	proportion of data to be trimmed
`weights`	weightings for variables (columns).
`nstart`	number of restarts
`iter`	maximum number of iterations
`tol`	criteria for algorithm convergence
`verbose`	If true will output more information on algorithm progress.

Details

k is the number of clusters. alpha is the proportion of data that will be excluded in the clustering.

Algorithm will halt if either maximum number of iterations is reached or the change between iterations drops below tol.

When n_starts is greater than 1, the algorithm will run multiple times and the result with the best BIC will be returned. The centres are intialised by picking k observations.

The function only returns the k cluster centres. To calculate the nearest cluster centre for each observation use the function `nearest_cluster`.

Value

Returns a matrix of cluster means (k x m).

References

[1] Garcia-Escudero, Luis A.; Gordaliza, Alfonso; Matran, Carlos; Mayo-Iscar, Agustin. A general trimming approach to robust cluster Analysis. Ann. Statist. 36 (2008), no. 3, 1324–1345.

Examples

```
iris_mat <- as.matrix(iris[,1:4])
scale_params<-scale_mat_inplace(iris_mat)
iris_cluster<- tkmeans(iris_mat, 2 , 0.1, c(1,1,1,1), 1, 10, 0.001) # 2 clusters
```

Index