

Package ‘SFtools’

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Type Package

Title Space Filling Based Tools for Data Mining

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Description Contains space filling based tools for machine learning and data mining. Some functions offer several computational techniques and deal with the out of memory for large big data by using the ff package.

Imports wordspace, doParallel, ff, parallel, stats

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URL <https://sites.google.com/site/mohamedlaibwebpage/>

BugReports <https://github.com/mLaib/SFtools/issues>

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Note The GPU computing version can be found soon, on following url
<https://sites.google.com/site/mohamedlaibwebpage/Software>.

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Sftools-package

SFtools: Space Filling Based Tools for Data Mining

Description

Contains space filling based tools for machine learning and data mining. Some functions offer several computational techniques and deal with the out of memory for large big data by using the ff package.

Author(s)

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References

M. Laib and M. Kanevski (2017). Unsupervised Feature Selection Based on Space Filling Concept, [arXiv:1706.08894](#).
J. A. Royle, D. Nychka, An algorithm for the construction of spatial coverage designs with implementation in Splus, Computers and Geosciences 24 (1997) p. 479–488.
J. Franco, Planification d’expériences numériques en phase exploratoire pour la simulation des phénomènes complexes, Thesis (2008) 282.
D. Dupuy, C. Helbert, J. Franco (2015). DiceDesign and DiceEval: Two R Packages for Design and Analysis of Computer Experiments. Journal of Statistical Software, 65(11), 1-38. [Jstatsoft](#).

See Also

Useful links:

- <https://sites.google.com/site/mohamedlaibwebpage/>
- Report bugs at <https://github.com/mlaib/Sftools/issues>

Infinity

Simulated dataset

Description

Generates a simulated dataset (the Infinity dataset)

Usage

```
Infinity(n=1000)
```

Arguments

`n` Number of generated data points (by default: `n=1000`).

Value

A `data.frame` of simulated dataset, with 7 features (4 of them are redundants)

Author(s)

Mohamed Laib <Mohamed.Laib@unil.ch>

Examples

```
infinity<-Infinity(n=1000)
plot(infinity$x1,infinity$x2)

## Not run:

#### Visualisation of the infinity dataset (3D) ####
require(rgl)
require(colorRamps)

c <- cut(infinity$z,breaks=100)
cols <- matlab.like(100)[as.numeric(c)]
plot3d(infinity$x1,infinity$x2,infinity$z,radius=0.01, col=cols,
type="s",xlab="x1",ylab="x2",zlab="z",box=F)
grid3d(c("x","y","z"),col="black",lwd=1)

## End(Not run)
```

UfsCov

UfsCov algorithm for unsupervised feature selection

Description

Applies the UfsCov algorithm based on the space filling concept, by using a sequential forward search (SFS).

Usage

```
UfsCov(data)
```

Arguments

`data` Data of class: `matrix` or `data.frame`.

Details

Since the algorithm is based on pairwise distances, and according to the computing power of your machine, large number of data points can take much time and needs more memory. See [UfsCov_par](#) for parallel computing, or [UfsCov_ff](#) for memory efficient storage of large data on disk and fast access (by using the `ff` and the `ffbase` packages).

Value

A list of two elements:

- `CovD` a vector containing the coverage measure of each step of the SFS.
- `IdR` a vector containing the added variables during the selection procedure.

Note

The algorithm does not deal with missing values and constant features. Please make sure to remove them.

Author(s)

Mohamed Laib <Mohamed.Laib@unil.ch>

References

M. Laib and M. Kanevski (2017). Unsupervised Feature Selection Based on Space Filling Concept, [arXiv:1706.08894](#).

Examples

```
infinity<-Infinity(n=800)
Results<- UfsCov(infinity)

cou<-colnames(infinity)
nom<-cou[Results[[2]]]
par(mfrow=c(1,1), mar=c(5,5,2,2))
names(Results[[1]])<-cou[Results[[2]]]
plot(Results[[1]] ,pch=16,cex=1,col="blue", axes = FALSE,
xlab = "Added Features", ylab = "Coverage measure")
lines(Results[[1]] ,cex=2,col="blue")
grid(lwd=1.5,col="gray" )
box()
axis(2)
axis(1,1:length(nom),nom)
which.min(Results[[1]])

## Not run:

#### UfsCov on the Butterfly dataset ####
require(IDmining)

N <- 1000
```

```

raw_dat <- Butterfly(N)
dat<-raw_dat[,-9]

Results<- UfsCov(dat)
cou<-colnames(dat)
nom<-cou[Results[[2]]]
par(mfrow=c(1,1), mar=c(5,5,2,2))
names(Results[[1]])<-cou[Results[[2]]]

plot(Results[[1]] ,pch=16,cex=1,col="blue", axes = FALSE,
xlab = "Added Features", ylab = "Coverage measure")
lines(Results[[1]] ,cex=2,col="blue")
grid(lwd=1.5,col="gray" )
box()
axis(2)
axis(1,1:length(nom),nom)
which.min(Results[[1]])

## End(Not run)

```

UfsCov_ff

UfsCov for unsupervised features selection

Description

Applies the UfsCov algorithm based on the space filling concept, by using a sequential forward search (for memory efficient storage of large data on disk and fast access).

Usage

```
UfsCov_ff(data, blocks=2)
```

Arguments

data	Data of class: matrix or data.frame.
blocks	Number of splits to facilitate the computation of the distance matrix (by default: blocks=2).

Value

A list of two elements:

- CovD a vector containing the coverage measure of each step of the SFS.
- IdR a vector containing the added variables during the selection procedure.

Note

This function is still under developement.

Author(s)

Mohamed Laib <Mohamed.Laib@unil.ch>

References

M. Laib and M. Kanevski (2017). Unsupervised Feature Selection Based on Space Filling Concept, [arXiv:1706.08894](#).

Examples

```
## Not run:
#### Infinity dataset ####
N <- 1000
dat<-Infinity(N)
Results<- UfsCov_ff(dat)

cou<-colnames(dat)
nom<-cou[Results[[2]]]
par(mfrow=c(1,1), mar=c(5,5,2,2))
names(Results[[1]])<-cou[Results[[2]]]
plot(Results[[1]] ,pch=16,cex=1,col="blue", axes = FALSE,
xlab = "Added Features", ylab = "Coverage measure")
lines(Results[[1]] ,cex=2,col="blue")
grid(lwd=1.5,col="gray" )
box()
axis(2)
axis(1,1:length(nom),nom)
which.min(Results[[1]])

#### Butterfly dataset ####

require(IDmining)
N <- 1000
raw_dat <- Butterfly(N)
dat<-raw_dat[,-9]

Results<- UfsCov_ff(dat)

## End(Not run)
```

UfsCov_par

UfsCov algorithm for unsupervised feature selection

Description

Applies the UfsCov algorithm based on the space filling concept, by using a sequential forward search (SFS). This function offers a parallel computing.

Usage

```
UfsCov_par(data, ncores=2)
```

Arguments

data	Data of class: matrix or data.frame.
ncores	Number of cores to use (by default: ncores=2).

Details

Since the algorithm is based on pairwise distances, and according to the computing power of your machine, large number of data points needs more memory. See [UfsCov_ff](#) for memory efficient storage of large data on disk and fast access (by using the `ff` and the `ffbase` packages).

Value

A list of two elements:

- CovD a vector containing the coverage measure of each step of the SFS.
- IdR a vector containing the added variables during the selection procedure.

Note

The algorithm does not deal with missing values and constant features. Please make sure to remove them. Note that it is not recommended to use this function with small data, it takes more time than using the standard [UfsCov](#) function.

Author(s)

Mohamed Laib <Mohamed.Laib@unil.ch>

References

M. Laib and M. Kanevski (2017). Unsupervised Feature Selection Based on Space Filling Concept, [arXiv:1706.08894](#).

See Also

[UfsCov](#), [UfsCov_ff](#)

Examples

```
N <- 800
dat<-Infinity(N)
Results<- UfsCov_par(dat,ncores=2)

cou<-colnames(dat)
nom<-cou[Results[[2]]]
par(mfrow=c(1,1), mar=c(5,5,2,2))
names(Results[[1]])<-cou[Results[[2]]]
```

```
plot(Results[[1]] ,pch=16,cex=1,col="blue", axes = FALSE,
     xlab = "Added Features", ylab = "Coverage measure")
lines(Results[[1]] ,cex=2,col="blue")
grid(lwd=1.5,col="gray" )
box()
axis(2)
axis(1,1:length(nom),nom)
which.min(Results[[1]])

## Not run:

N<-5000
dat<-Infinity(N)

## Little comparison:
system.time(Uf<-UfsCov(dat))
system.time(Uf.p<-UfsCov_par(dat, ncores = 4))

## End(Not run)
```

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