Package: vscc (via r-universe)

October 27, 2026

Type Package

Title Variable Selection for Clustering and Classification

Version 0.8

Date 2025-10-08

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Description Performs variable selection/feature reduction under a clustering or classification framework. In particular, it can be used in an automated fashion using mixture model-based methods ('teigen' and 'mclust' are currently supported). Can account for mixtures of non-Gaussian distributions via Manly transform (via 'ManlyMix'). See Andrews and McNicholas (2014) <doi:10.1007/s00357-013-9139-2> and Neal and McNicholas (2023) <doi:10.48550/arXiv.2305.16464>.

License GPL (>= 2)

Imports teigen, mclust, MixGHD

Depends ManlyMix

NeedsCompilation no

Config/pak/sysreqs libgmp3-dev libgsl0-dev libmpfr-dev

Repository https://mackenzierneal.r-universe.dev

Date/Publication 2025-10-10 22:50:02 UTC

RemoteUrl https://github.com/cran/vscc

RemoteRef HEAD

RemoteSha 036f6a688e29918870c316cd79a0fb15b41a9823

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`vscc-package` *Variable Selection for Clustering and Classification*

Description

Performs variable selection under a clustering or classification framework. Automated implementation using model-based clustering is based on `teigen` and `mclust`.

Details

Package:	vscc
Type:	Package
Version:	0.8
Date:	2025-10-08
License:	GPL>="2"

Author(s)

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References

See `citation("vscc")`.

See Also

`vscc`

`plot.vscc` *Plotting for VSCC Objects*

Description

Dedicated plot function for objects of class vscc.

Usage

```
## S3 method for class 'vscc'
plot(x, ...)
```

Arguments

`x`	An object of class vscc.
`...`	Further arguments to be passed on

Details

Provides a scatterplot matrix of the selected variables with colours corresponding to each group.

Value

No return value.

Author(s)

Jeffrey L. Andrews

See Also

`vscc`

Examples

```
require("mclust")
data(banknote)
X<-banknote[,-1]
bankrun <- vscc(X)
plot(bankrun)
```

print.vscc *Printing for VSCC*

Description

Dedicated print function for objects of class vscc.

Usage

```
## S3 method for class 'vscc'
print(x, ...)
```

Arguments

x	An object of class vscc
...	Further arguments to be passed on

Details

Same as summary.

Value

No return value.

Author(s)

Jeffrey L. Andrews

See Also

summary.vscc, vscc

Examples

```
require("mclust")
data(banknote)
X<-banknote[,-1]
vscc(X)
```

summary.vscc *Summary for VSCC Objects*

Description

Dedicated summary function for objects of class vscc

Usage

```
## S3 method for class 'vscc'
summary(object, ...)
```

Arguments

object	An object of class vscc
...	Additional arguments to be passed

Value

No return value.

Author(s)

Jeffrey L. Andrews

See Also

vscc

Examples

```
require("mclust")
data(banknote)
summary(vscc(banknote[,-1]))
```

vscc *Variable Selection for Clustering and Classification*

Description

Performs variable selection under a clustering or classification framework. Automated implementation using model-based clustering is based on teigen version 2.0 and mclust version 4.0; issues *may* arise when using different versions.

Usage

```
vscc(x, G=1:9, automate = "mclust", initial = NULL, initunc=NULL, train = NULL,
    forcereduction = FALSE)
```

Arguments

x	Data frame or matrix to perform variable selection on
G	Vector for the number of groups to consider during initialization and/or post-selection analysis. Default is 1-9.
automate	Character string ("teigen", "mclust" (default), or NULL only) indicating which mixture model family to implement as initialization and/or post-selection analysis. If NULL, the function assumes manual operation of the algorithm (meaning an initial clustering vector must be given, and no post-selection analysis is performed).
initial	Optional vector giving the initial clustering.
initunc	Optional scalar indicating the total uncertainty of the initial clustering solution. Only used when initial is non-null.
train	Optional vector of training data (for classification framework).
forcereduction	Logical indicating if the full data set should be considered (FALSE) when selecting the 'best' variable subset via total model uncertainty. Not used if automate=NULL.

Value

selected	A list containing the subsets of variables selected for each relation. Each set is numbered according to the number in the exponential of the relationship. For instance, vscc_object$selected[[3]] corresponds to the variable subset selected by the cubic relationship.
family	The family used as initialization and/or post selection. (Same as user input automate, and can be NULL).
wss	The within-group variance associated with each variable from the full data set.

The remaining values are provided as long as automate is not NULL:

topselected	The best variable subset according to the total model uncertainty.
initialrun	Results from the initialization; an object of class teigen or mclust.
bestmodel	Results from the best model on the selected variable subset; an object of class teigen or mclust.
chosenrelation	Numeric indication of the relationship chosen according to total model uncertainty. The number corresponds to exponent in the relationship: for instance, a value of '4' suggests the quartic relationship. If the value "Full dataset" is given, then the unreduced data provides the best model uncertainty; can be avoided by specifying forcereduction=TRUE in the function call.
uncertainty	Total model uncertainty associated with the best relationship.
allmodelfit	List containing the results (teigen or mclust objects) from the post-selection analysis on each variable subset. Number corresponds to the exponent in the relationship. For instance, vscc_object$allmodelfit[[1]] gives the results from the analysis on the variables selected by the linear relationship.

Author(s)

Jeffrey L. Andrews, Paul D. McNicholas

References

See `citation("vscc")` for the variable selection references. See also `citation("teigen")` and `citation("mclust")` if using those families of models via the `automate` call.

See Also

`teigen`, `Mclust`

Examples

```
require("mclust")
data(banknote)
head(banknote)
bankrun <- vscc(banknote[,-1])
head(bankrun$topselected) #Show preview of selected variables
table(banknote[,1], bankrun$initialrun$classification) #Clustering results on full data set
table(banknote[,1], bankrun$bestmodel$classification) #Clustering results on reduced data set
```

`vsccmanly` *Variable Selection for Skewed Clustering and Classification*

Description

Performs variable selection under a clustering framework. Accounts for mixtures of non-Gaussian distributions via the ManlyTransform (via 'ManlyMix').

Usage

```
vsccmanly(x, G=2:9, numstart=100, selection="backward",forcereduction=FALSE,
                    initstart="k-means", seedval=2354)
```

Arguments

`x`	Data frame or matrix to perform variable selection on
`G`	Vector for the number of groups to consider during initialization and/or post-selection analysis. Default is 2-9.
`numstart`	Number of random starts.
`selection`	Forward or backward transformation parameter selection. User may also choose to fit a full Manly mixture (options are 'forward', 'backward', or 'none').
`forcereduction`	Logical indicating if the full data set should be considered (FALSE) when selecting the 'best' variable subset via total model uncertainty.
`initstart`	Method for initial starting values (options are 'k-means' or 'hierarchical').
`seedval`	Value of seed, used for k-means initialization.

Value

selected	A list containing the subsets of variables selected for each relation. Each set is numbered according to the number in the exponential of the relationship. For instance, vscc_object$selected[[3]] corresponds to the variable subset selected by the cubic relationship.
wss	The within-group variance associated with each variable from the full data set.
topselected	The best variable subset according to the total model uncertainty.
initialrun	Results from the initial model, prior to variable selection; an object of class ManlyMix.
bestmodel	Results from the best model on the selected variable subset; an object of class ManlyMix.
variables	Variables used to fit the final model.
chosenrelation	Numeric indication of the relationship chosen according to total model uncertainty. The number corresponds to exponent in the relationship: for instance, a value of '4' suggests the quartic relationship. If the value "Full dataset" is given, then the unreduced data provides the best model uncertainty; can be avoided by specifying forcereduction=TRUE in the function call.
uncertainty	Total model uncertainty associated with the best relationship.
allmodelfit	List containing the results (ManlyMix objects) from the post-selection analysis on each variable subset. Number corresponds to the exponent in the relationship. For instance, vscc_object$allmodelfit[[1]] gives the results from the analysis on the variables selected by the linear relationship.

Author(s)

Jeffrey L. Andrews, Mackenzie R. Neal, Paul D. McNicholas

References

See citation("vscc") for the variable selection references.

See Also

vscc

Examples

```
## Not run:
data(ais)
X=ais[,3:13]
aisfor=vsccmanly(as.data.frame(scale(X)),G=2:9,selection = "forward", forcereduction = TRUE,
                        initstart = "k-means",seedval=2354)
aisfor$variables #Show selected variables
table(ais[,1], aisfor$bestmodel$id) #Clustering results on reduced data set

## End(Not run)
```

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