

# Package ‘GDAtools’

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**Type** Package

**Title** A Toolbox for Geometric Data Analysis and More

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RColorBrewer, rlang, GGally

**Suggests** rmarkdown, knitr, rmdformats, cluster, WeightedCluster

**Description** Contains functions for 'specific' Multiple Correspondence Analysis, Class Specific Analysis, Multiple Factor Analysis, 'standardized' MCA, computing and plotting structuring factors and concentration ellipses, inductive tests and others tools for Geometric Data Analysis (Le Roux & Rouanet (2005) <doi:10.1007/1-4020-2236-0>). It also provides functions for the translation of logit models coefficients into percentages (Deauvieu (2010) <doi:10.1177/0759106309352586>), weighted contingency tables, an association measure for contingency tables ("Percentages of Maximum Deviation from Independence", aka PEM, see Cibois (1993) <doi:10.1177/075910639304000103>) and some tools to measure and plot bivariate associations between variables ( $\phi$ , Cramér V, correlation coefficient, eta-squared...).

**VignetteBuilder** knitr

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assoc.catcont	<i>Measures the association between a categorical variable and a continuous variable</i>
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### Description

Measures the association between a categorical variable and a continuous variable

### Usage

```
assoc.catcont(x,y,weights=rep(1,length(x)),
             nperm=NULL,distrib="asympt",digits=3)
```

### Arguments

x	the categorical variable (must be a factor)
y	the continuous variable (must be a numeric vector)
weights	an optional numeric vector of weights (by default, a vector of 1 for uniform weights)
nperm	numeric. Number of permutations for the permutation test of independence. If NULL (default), no permutation test is performed.
distrib	the null distribution of permutation test of independence can be approximated by its asymptotic distribution ("asympt", default) or via Monte Carlo resampling ("approx").
digits	integer. The number of digits (default is 3).

### Value

A list with the following elements :

eta.squared	eta-squared between the two variables
permutation.pvalue	p-value from a permutation (so non-parametric) test of independence
cor	point biserial correlation between the two variables, for each level of the categorical variable
cor.perm.pval	permutation p-value of the correlation between the two variables, for each level of the categorical variable

**Author(s)**

Nicolas Robette

**References**

Rakotomalala R., 'Comprendre la taille d'effet (effect size)', [http://eric.univ-lyon2.fr/~ricco/cours/slides/effect\_size.pdf]

**See Also**[assoc.twocat](#), [assoc.twocont](#), [assoc.yx](#), [condesc](#), [catdesc](#), [darma](#), [ggassoc\\_boxplot](#)**Examples**

```
## Annette Dobson (1990) "An Introduction to Generalized Linear Models".
## Page 9: Plant Weight Data.
ctl <- c(4.17,5.58,5.18,6.11,4.50,4.61,5.17,4.53,5.33,5.14)
trt <- c(4.81,4.17,4.41,3.59,5.87,3.83,6.03,4.89,4.32,4.69)
group <- gl(2, 10, 20, labels = c("Ctl","Trt"))
weight <- c(ctl, trt)
assoc.catcont(group,weight,nperm=100)
```

assoc.twocat

*Cross-tabulation and measures of association between two categorical variables***Description**

Cross-tabulation and measures of association between two categorical variables

**Usage**

```
assoc.twocat(x,y,weights=rep.int(1,length(x)),na_value=NULL,nperm=NULL,distrib="asympt")
```

**Arguments**

x	the first categorical variable (must be a factor)
y	the second categorical variable (must be a factor)
weights	an optional numeric vector of weights (by default, a vector of 1 for uniform weights)
na_value	character. Name of the level for NA category. If NULL (default), NA values are ignored.
nperm	numeric. Number of permutations for the permutation test of independence. If NULL (default), no permutation test is performed. Default is 1000.
distrib	the null distribution of permutation test of independence can be approximated by its asymptotic distribution ("asympt", default) or via Monte Carlo resampling ("approx").

**Value**

A list with the following elements :

freq	cross-tabulation
prop	percentages
rprop	row percentages
cprop	column percentages
expected	expected values
chi.squared	chi-squared value
cramer.v	Cramer's V between the two variables
permutation.pvalue	p-value from a permutation (so non-parametric) test of independence
pearson.residuals	the table of Pearson residuals, i.e. (observed - expected) / sqrt(expected).
phi	the table of the phi coefficients for each pair of levels
phi.perm.pval	the table of permutation p-values for each pair of levels
local.pem	the table of local Percentages of Maximum Deviation from Independences
global.pem	value of the global Percentage of Maximum Deviation from Independence
gather	a data frame gathering informations, with one row per cell of the cross-tabulation

**Author(s)**

Nicolas Robette

**References**

Rakotomalala R., 'Comprendre la taille d'effet (effect size)', [http://eric.univ-lyon2.fr/~ricco/cours/slides/effect\\_size.pdf](http://eric.univ-lyon2.fr/~ricco/cours/slides/effect_size.pdf)

**See Also**

[assoc.catcont](#), [assoc.twocont](#), [assoc.yx](#), [condesc](#), [catdesc](#), [darma](#), [ggassoc\\_crosstab](#), [ggassoc\\_phiplot](#)

**Examples**

```
data(Music)
assoc.twocat(Music$Jazz, Music$Age, nperm=100)
```

---

 assoc.twocont

*Measures the association between two continuous variables*


---

### Description

Measures the association between two continuous variables with Pearson, Spearman and Kendall correlations.

### Usage

```
assoc.twocont(x,y,weights=rep(1,length(x)),
              nperm=NULL,distrib="asympt")
```

### Arguments

x	a continuous variable (must be a numeric vector)
y	a continuous variable (must be a numeric vector)
weights	an optional numeric vector of weights (by default, a vector of 1 for uniform weights)
nperm	numeric. Number of permutations for the permutation test of independence. If NULL (default), no permutation test is performed.
distrib	the null distribution of permutation test of independence can be approximated by its asymptotic distribution ("asympt", default) or via Monte Carlo resampling ("approx").

### Value

A data frame with Pearson, Spearman and Kendall correlations. The correlation value is in the first row and a p-value from a permutation (so non parametric) test of independence is in the second row.

### Author(s)

Nicolas Robette

### See Also

[assoc.twocat](#), [assoc.catcont](#), [assoc.yx](#), [condesc](#), [catdesc](#), [darma](#), [ggassoc\\_scatter](#)

### Examples

```
## Hollander & Wolfe (1973), p. 187f.
## Assessment of tuna quality. We compare the Hunter L measure of
## lightness to the averages of consumer panel scores (recoded as
## integer values from 1 to 6 and averaged over 80 such values) in
## 9 lots of canned tuna.
x <- c(44.4, 45.9, 41.9, 53.3, 44.7, 44.1, 50.7, 45.2, 60.1)
y <- c( 2.6,  3.1,  2.5,  5.0,  3.6,  4.0,  5.2,  2.8,  3.8)
assoc.twocont(x,y,nperm=100)
```

---

assoc.yx	<i>Bivariate association measures between a response and predictor variables.</i>
----------	---

---

### Description

Computes bivariate association measures between a response and predictor variables (and, optionally, between every pairs of predictor variables.)

### Usage

```
assoc.yx(y, x, weights=rep(1,length(y)), xx = TRUE, twocont="kendall",
         nperm=NULL, distrib="asympt", dec=c(3,3))
```

### Arguments

y	the response variable
x	the predictor variables
weights	an optional numeric vector of weights (by default, a vector of 1 for uniform weights)
xx	whether the association measures should be computed for couples of predictor variables (default) or not. With a lot of predictors, consider setting xx to FALSE (for reasons of computation time).
twocont	character. The type of measure of correlation measure to use between two continuous variables : "pearson", "spearman" or "kendall" (default).
nperm	numeric. Number of permutations for the permutation test of independence. If NULL (default), no permutation test is performed.
distrib	the null distribution of permutation test of independence can be approximated by its asymptotic distribution ("asympt", default) or via Monte Carlo resampling ("approx").
dec	vector of 2 integers for number of decimals. The first value if for association measures, the second for permutation p-values. Default is c(3,3).

### Details

The function computes an association measure : Pearson's, Spearman's or Kendall's correlation for pairs of numeric variables, Cramer's V for pairs of factors and eta-squared for pairs numeric-factor. It can also compute the p-value of a permutation test of association for each pair of variables.

### Value

A list of the following items :

YX	: a table with the association measures between the response and predictor variables
----	--

XX : a table with the association measures between every pairs of predictor variables

In each table :

measure : name of the association measure  
association : value of the association measure  
permutation.pvalue : p-value from the permutation test

### Author(s)

Nicolas Robette

### See Also

[darma](#), [assoc.twocat](#), [assoc.twocont](#), [assoc.catcont](#), [condesc](#), [catdesc](#)

### Examples

```
data(iris)
iris2 = iris
iris2$Species = factor(iris$Species == "versicolor")
assoc.yx(iris2$Species,iris2[,1:4],nperm=100)
```

---

burt

*Computes a Burt table*

---

### Description

Computes a Burt table from a data frame composed of categorical variables.

### Usage

```
burt(data)
```

### Arguments

data : data frame with n rows (individuals) and p columns (categorical variables)

### Details

A Burt table is a symmetric table that is used in correspondence analysis. It shows the frequencies for all combinations of categories of pairs of variables.

### Value

Returns a square matrix. Its dimension is equal to the total number of categories in the data frame.



**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[dichotom](#)

**Examples**

```
## Burt table of variables in columns 1 to 5
## in the 'Music' example data set
data(Music)
burt(Music[,1:5])
```

---

catdesc

*Measures the association between a categorical variable and some continuous and/or categorical variables*

---

**Description**

Measures the association between a categorical variable and some continuous and/or categorical variables

**Usage**

```
catdesc(y, x, weights=rep(1,length(y)), min.phi=NULL,
robust=TRUE, nperm=NULL, distrib="asympt", dec=c(3,3,3,3,1,3))
```

**Arguments**

y	the categorical variable to describe (must be a factor)
x	a data frame with continuous and/or categorical variables
weights	an optional numeric vector of weights (by default, a vector of 1 for uniform weights)
min.phi	for the relationship between y and a categorical variable, only associations higher or equal to min.phi will be displayed. If NULL (default), they are all displayed.
robust	logical. If FALSE, mean and standard deviation are used instead of median and mad. Default is TRUE.

nperm	numeric. Number of permutations for the permutation test of independence. If NULL (default), no permutation test is performed.
distrib	the null distribution of permutation test of independence can be approximated by its asymptotic distribution ("asympt", default) or via Monte Carlo resampling ("approx").
dec	vector of 6 integers for number of decimals. The first value is for association measures, the second for permutation p-values, the third for percents, the fourth for phi coefficients, the fifth for medians and mads, the sixth for point biserial correlations. Default is c(3,3,3,3,1,3).

### Value

A list of the following items :

variables	associations between y and the variables in x
bylevel	a list with one element for each level of y

Each element in bylevel has the following items :

categories	a data frame with categorical variables from x and associations measured by phi
continuous.var	a data frame with continuous variables from x and associations measured by correlation coefficients

### Author(s)

Nicolas Robette

### References

Rakotomalala R., 'Comprendre la taille d'effet (effect size)', [[http://eric.univ-lyon2.fr/~ricco/cours/slides/effect\\_size.pdf](http://eric.univ-lyon2.fr/~ricco/cours/slides/effect_size.pdf)]

### See Also

[catdes](#), [condesc](#), [assoc.yx](#), [darma](#)

### Examples

```
data(Movies)
catdesc(Movies$ArtHouse, Movies[,c("Budget", "Genre", "Country")])
```

---

conc.ellipse	<i>Adds concentration ellipses to a cloud of individuals.</i>
--------------	---

---

### Description

Adds inertia ellipses to the cloud of individuals of a MCA. By default, concentration ellipses are plotted.

### Usage

```
conc.ellipse(resmca, var, sel = 1:nlevels(var), axes = c(1, 2),
  kappa=2,
  col = rainbow(length(sel)), pcol = rainbow(length(sel)), pcex = 0.2,
  lty = 1, lwd = 1, tcex = 1, text.lab = TRUE)
```

### Arguments

resmca	object of class 'MCA', 'speMCA', 'csMCA', 'multiMCA' or 'stMCA'
var	supplementary variable to plot
sel	numeric vector of indexes of the categories to plot (by default, ellipses are plotted for every categories)
axes	length 2 vector specifying the components to plot (default is c(1,2))
kappa	numeric. The kappa value (i.e. "index") of the inertia ellipses. By default, kappa = 2, which means that concentration ellipses are plotted.
col	vector of colors for the ellipses of plotted categories (by default, rainbow palette is used)
pcol	vector of colors for the points at the center of ellipses of plotted categories (by default, rainbow palette is used)
pcex	numerical value giving the amount by which points at the center of ellipses should be magnified (default is 0.2)
lty	line type for ellipses (default is 1)
lwd	line width for the ellipses (default is 1)
tcex	numerical value giving the amount by which labels at the center of ellipses should be magnified (default is 0.2)
text.lab	whether the labels at the center of ellipses should be displayed (default is TRUE)

### Details

If kappa=2, ellipses are called "concentration" ellipses and, for a normally shaped subcloud, contain 86.47 percents of the points of the subcloud. If kappa=1, ellipses are "indicator" ellipses and contain 39.35 percents of the points of the subcloud. If kappa=1.177, ellipses are "median" ellipses and contain 50 percents of the points of the subcloud. This function has to be used after the cloud of individuals has been drawn.

**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[plot.speMCA](#), [plot.csMCA](#), [plot.multiMCA](#), [plot.stMCA](#)

**Examples**

```
## Performs specific MCA (excluding 'NA' categories) of 'Taste' example data set,
## plots the cloud of categories
## and adds concentration ellipses for gender variable
data(Taste)
mca <- speMCA(Taste[,1:11],excl=c(3,6,9,12,15,18,21,24,27,30,33))
plot(mca,type='i')
conc.ellipse(mca,Taste$Gender)

## Draws a blue concentration ellipse for men only
plot(mca,type='i')
conc.ellipse(mca,Taste$Gender,sel=1,col='blue')
```

---

condesc

*Measures the association between a continuous variable and some continuous and/or categorical variables*

---

**Description**

Measures the association between a continuous variable and some continuous and/or categorical variables

**Usage**

```
condesc(y, x, weights=rep(1,length(y)), min.cor=NULL,
robust=TRUE, nperm=NULL, distrib="asympt", dec=c(3,3,0,3))
```

**Arguments**

y	the continuous variable to describe
x	a data frame with continuous and/or categorical variables
weights	an optional numeric vector of weights (by default, a vector of 1 for uniform weights)
min.cor	for the relationship between y and a categorical variable, only associations higher or equal to min.cor will be displayed. If NULL (default), they are all displayed.
robust	logical. If FALSE, mean and standard deviation are used instead of median and mad. Default is TRUE.
nperm	numeric. Number of permutations for the permutation test of independence. If NULL (default), no permutation test is performed.
distrib	the null distribution of permutation test of independence can be approximated by its asymptotic distribution ("asympt", default) or via Monte Carlo resampling ("approx").
dec	vector of 4 integers for number of decimals. The first value is for association measures, the second for permutation p-values, the third for medians and mads, the fourth for point biserial correlations. Default is c(3,3,0,3).

**Value**

A list of the following items :

variables	associations between y and the variables in x
categories	a data frame with categorical variables from x and associations measured by point biserial correlation

**Author(s)**

Nicolas Robette

**References**

Rakotomalala R., 'Comprendre la taille d'effet (effect size)', [[http://eric.univ-lyon2.fr/~ricco/cours/slides/effect\\_size.pdf](http://eric.univ-lyon2.fr/~ricco/cours/slides/effect_size.pdf)]

**See Also**

[condes](#), [catdesc](#), [assoc.yx](#), [darma](#)

**Examples**

```
data(Movies)
condesc(Movies$BoxOffice, Movies[,c("Budget", "Genre", "Country")])
```

---

`contrib`*Computes contributions for a MCA*

---

**Description**

From MCA results, computes contributions of categories and variables to the axes and the overall cloud.

**Usage**

```
contrib(resmca)
```

**Arguments**

`resmca` object of class 'MCA', 'speMCA' or 'csMCA'

**Details**

The contribution of a point to an axis depends both on the distance from the point to the origin point along the axis and on the weight of the point. The contributions of points to axes are the main aid to interpretation (see Le Roux and Rouanet, 2004 and 2010).

**Value**

A list of data frames:

<code>ctr</code>	Data frame with the contributions of categories to axes
<code>var.ctr</code>	Data frame with the contributions of variables to axes
<code>ctr.cloud</code>	Data frame with the contributions of categories to the overall cloud
<code>vctr.cloud</code>	Data frame with the contributions of variables to the overall cloud

**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[MCA](#), [speMCA](#), [csMCA](#), [varsup](#)

**Examples**

```
## Performs a specific MCA on the 'Music' example data set
## and compute contributions
data(Music)
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
contrib(mca)
```

csMCA

*Performs a 'class specific' MCA***Description**

Performs a 'class specific' Multiple Correspondence Analysis, i.e. a variant of MCA consisting in analyzing a subcloud of individuals.

**Usage**

```
csMCA(data, subcloud = rep(TRUE, times = nrow(data)), excl = NULL, ncp = 5,
row.w = rep(1, times = nrow(data)))
```

**Arguments**

data	data frame with n rows (individuals) and p columns (categorical variables)
subcloud	a vector of logical values and length n. The subcloud of individuals analyzed with 'class specific' MCA is made of the individuals with value TRUE.
excl	numeric vector indicating the indexes of the 'junk' categories (default is NULL). See <a href="#">getindexcat</a> to identify these indexes.
ncp	number of dimensions kept in the results (default is 5)
row.w	an optional numeric vector of row weights (by default, a vector of 1 for uniform row weights)

**Details**

This variant of MCA is used to study a subset of individuals with reference to the whole set of individuals, i.e. to determine the specific features of the subset. It consists in proceeding to the search of the principal axes of the subcloud associated with the subset of individuals (see Le Roux and Rouanet, 2004 and 2010).

**Value**

Returns an object of class 'csMCA', i.e. a list including:

eig	a list of vectors containing all the eigenvalues, the percentage of variance, the cumulative percentage of variance, the modified rates and the cumulative modified rates
call	a list with informations about input data

ind	a list of matrices containing the results for the individuals (coordinates, contributions)
var	a list of matrices containing all the results for the categories and variables (weights, coordinates, square cosine, categories contributions to axes and cloud, test values (v.test), square correlation ratio (eta2), variable contributions to axes and cloud)

**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[getindexcat](#), [plot.csMCA](#), [varsup](#), [contrib](#), [modif.rate](#), [dimdescr](#), [speMCA](#), [MCA](#)

**Examples**

```
## Performs a 'class specific' MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## and focusing on the subset of women.
data(Music)
female <- Music$Gender=='Women'
mca <- csMCA(Music[,1:5], subcloud=female, excl=c(3,6,9,12,15))
plot(mca)
```

---

darma

*Describes Associations as in a Regression Model Analysis.*

---

**Description**

Computes bivariate association measures between a response and predictor variables, producing a summary looking like a regression analysis.

**Usage**

```
darma(y, x, weights=rep(1,length(y)), target=1, twocont="kendall",
      nperm=NULL, distrib="asympt", dec=c(1,3,3))
```



**Arguments**

y	the response variable
x	the predictor variables
weights	an optional numeric vector of weights (by default, a vector of 1 for uniform weights)
target	rank or name of the category of interest when y is categorical
twocont	character. The type of measure of correlation measure to use between two continuous variables : "pearson", "spearman" or "kendall" (default).
nperm	numeric. Number of permutations for the permutation test of independence. If NULL (default), no permutation test is performed.
distrib	the null distribution of permutation test of independence can be approximated by its asymptotic distribution ("asympt", default) or via Monte Carlo resampling ("approx").
dec	vector of 3 integers for number of decimals. The first value if for percents or medians, the second for association measures, the third for permutation p-values. Default is c(1,3,3).

**Details**

The function computes association measures (phi, correlation coefficient, Kendall's correlation) between the variable of interest and the other variables. It can also compute the p-values permutation tests.

**Value**

A data frame

**Author(s)**

Nicolas Robette

**See Also**

[assoc.yx](#), [assoc.twocat](#), [assoc.twocont](#), [assoc.catcont](#), [condesc](#), [catdesc](#)

**Examples**

```
data(iris)
iris2 = iris
iris2$Species = factor(iris$Species == "versicolor")
darma(iris2$Species, iris2[,1:4], target=2, nperm=100)
```

dichotom

*Dichotomizes the variables in a data frame*

---

**Description**

Dichotomizes the variables in a data frame exclusively composed of categorical variables

**Usage**

```
dichotom(data, out = "numeric")
```

**Arguments**

data	data frame of categorical variables
out	character string defining the format for dichotomized variables in the output data frame. Format may be 'numeric' or 'factor' (default is 'numeric').

**Value**

Returns a data frame with dichotomized variables. The number of columns is equal to the total number of categories in the input data.

**Author(s)**

Nicolas Robette

**Examples**

```
## Dichotomizes 'Music' example data frame
data(Music)
dic <- dichotom(Music[,1:5])
str(dic)

## with output variables in factor format
dic <- dichotom(Music[,1:5], out='factor')
str(dic)
```

---

dimcontrib*Describes the contributions to axes for a MCA*

---

**Description**

Identifies the categories and individuals that contribute the most to each dimension obtained by a Multiple Correspondence Analysis. It allows to analyze variants of MCA, such as 'specific' MCA or 'class specific' MCA.

**Usage**

```
dimcontrib(resmca, dim = c(1,2), best = TRUE)
```

**Arguments**

resmca	object of class 'MCA', 'speMCA', or 'csMCA'
dim	dimensions to describe (default is c(1,2))
best	if FALSE, displays all the categories; if TRUE (default), displays only categories and individuals with contributions higher than average

**Details**

Contributions are sorted and assigned a positive or negative sign according to the corresponding categories or individuals' coordinates, so as to facilitate interpretation.

**Value**

Returns a list:

var	a list of categories' contributions to axes
ind	a list of individuals' contributions to axes

**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[dimdescr](#), [dimeta2](#), [dimtypicality](#), [condes](#), [speMCA](#), [csMCA](#)

**Examples**

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## and then describes the contributions to axes.
data(Music)
getindexcat(Music[,1:5])
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
dimcontrib(mca)
```

---

 dimdescr

*Describes the dimensions of a MCA*


---

### Description

Identifies the variables and the categories that are the most characteristic according to each dimension obtained by a MCA. It is inspired by `dimdesc` function in FactoMineR package (see Husson et al, 2010), but allows to analyze variants of MCA, such as 'specific' MCA or 'class specific' MCA.

### Usage

```
dimdescr(resmca, vars=NULL, dim = c(1,2), min.cor = NULL,
nperm = 100, distrib = "asympt")
```

### Arguments

<code>resmca</code>	object of class MCA, speMCA, csMCA, stMCA or multiMCA
<code>vars</code>	data frame of variables to describes the MCA dimensions with. If NULL (default), the active variables of the MCA will be used.
<code>dim</code>	the axes which are described. Default is <code>c(1,2)</code>
<code>min.cor</code>	for the relationship between y and a categorical variable, only associations higher or equal to <code>min.cor</code> will be displayed. If NULL (default), they are all displayed.
<code>nperm</code>	numeric. Number of permutations for the permutation test of independence. If NULL, no permutation test is performed.
<code>distrib</code>	the null distribution of permutation test of independence can be approximated by its asymptotic distribution (" <code>asympt</code> ", default) or via Monte Carlo resampling (" <code>approx</code> ").

### Details

See [condesc](#).

### Value

Returns a list of ncp lists including:

<code>variables</code>	associations between y and the variables in x
<code>categories</code>	a data frame with categorical variables from x and associations measured by correlation coefficients

### Author(s)

Nicolas Robette

**References**

Husson, F., Le, S. and Pages, J. (2010). *Exploratory Multivariate Analysis by Example Using R*, Chapman and Hall.

**See Also**

[condesc](#), [speMCA](#), [csMCA](#), [dimdesc](#)

**Examples**

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## and then describe the dimensions.
data(Music)
getindexcat(Music[,1:5])
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
dimdescr(mca,min.cor=0.1,nperm=10)
```

---

dimeta2

*Describes the eta2 of supplementary variables for the axes of a MCA*

---

**Description**

Computes eta2 for a list of supplementary variables. It allows to analyze variants of MCA, such as 'specific' MCA or 'class specific' MCA.

**Usage**

```
dimeta2(resmca, vars, dim = c(1,2))
```

**Arguments**

resmca	object of class MCA, speMCA, csMCA, stMCA or multiMCA
vars	a data frame of supplementary variables
dim	the axes for which eta2 are computed. Default is c(1,2)

**Value**

Returns a data frame with supplementary variables as rows and axes as columns.

**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[dimdesc](#), [dimdescr](#), [dimcontrib](#), [condes](#), [speMCA](#), [csMCA](#), [dimtypicality](#)

**Examples**

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## and then describes the eta2 for Gender and Age (axes 1 and 2).
data(Music)
getindexcat(Music[,1:5])
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
dimeta2(mca, Music[,c("Gender","Age")])
```

---

dimtypicality

*Typicality tests for supplementary variables of a MCA*

---

**Description**

Computes typicality tests for a list of supplementary variables. It allows to analyze variants of MCA, such as 'specific' MCA or 'class specific' MCA.

**Usage**

```
dimtypicality(resmca, vars, dim = c(1,2), max.pval=1)
```

**Arguments**

resmca	object of class MCA, speMCA, csMCA, stMCA or multiMCA
vars	a data frame of supplementary variables
dim	the axes for which typicality tests are computed. Default is c(1,2)
max.pval	only categories with a p-value lower or equal to max.pval are displayed. By default, all categories are displayed

**Value**

Returns a list of data frames giving the test statistics and p-values of the supplementary categories for the different axes.

**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[dimdesc](#), [dimdescr](#), [dimeta2](#), [dimcontrib](#), [condes](#), [speMCA](#), [csMCA](#)

**Examples**

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## and then computes the typicality tests for Gender and Age (axes 1 and 2).
data(Music)
getindexcat(Music[,1:5])
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
dimtypicality(mca, Music[,c("Gender", "Age")])
```

---

 flip.mca

---

*Flips the coordinates of a MCA*


---

**Description**

Flips the coordinates of the individuals and the categories on one or more dimensions of a MCA.

**Usage**

```
flip.mca(resmca, dim=1)
```

**Arguments**

resmca	object of class MCA, speMCA, csMCA, stMCA or multiMCA
dim	the dimensions for which the coordinates are flipped. By default, only the 1st dimension is flipped

**Value**

Returns an object of the same class as resmca

**Author(s)**

Nicolas Robette

## References

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

## See Also

[MCA](#), [speMCA](#), [csMCA](#)

## Examples

```
## Flips dimensions 1 and 2
## of the MCA of 'Music' example data set
data(Music)
mca <- speMCA(Music[,1:5])
ggcloud_variables(mca, legend="none")
flipped_mca <- flip.mca(mca, dim=c(1,2))
ggcloud_variables(flipped_mca, legend="none")
```

---

getindexcat

*Returns the names of the categories in a data frame*

---

## Description

Returns a vector of names corresponding to the categories in a data frame exclusively composed of categorical variables.

## Usage

```
getindexcat(data)
```

## Arguments

data            data frame of categorical variables

## Details

This function may be useful prior to a 'specific' MCA, to identify the indexes of the 'junk' categories to exclude.

## Value

Returns a character vector with the names of the categories of the variables in the data frame

## Author(s)

Nicolas Robette



**See Also**

[speMCA](#), [csMCA](#)

**Examples**

```
data(Music)
getindexcat(Music[,1:5])
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
```

---

ggadd_attractions	<i>Adds attractions between categories via segments to a cloud of variables</i>
-------------------	---

---

**Description**

Adds attractions between categories, as measured by phi coefficients or percentages of maximum deviation (PEM), by plotting segments onto a MCA cloud of variables, using the ggplot2 framework.

**Usage**

```
ggadd_attractions(p, resmca, axes=c(1,2), measure="phi", min.asso=0.3,
  col.segment="lightgray", col.text="black", text.size=3)
```

**Arguments**

<code>p</code>	ggplot object with the cloud of variables
<code>resmca</code>	object of class MCA, speMCA, csMCA, stMCA or multiMCA.
<code>axes</code>	numeric vector of length 2, specifying the components (axes) to plot. Default is <code>c(1,2)</code> .
<code>measure</code>	character. The measure for attractions: "phi" (default) for phi coefficients, "pem" for percentages of maximum deviation (PEM).
<code>min.asso</code>	numerical value between 0 and 1. The minimal attraction value for segments to be plotted. Default is 0.3.
<code>col.segment</code>	Character. Color of the segments. Default is lightgray.
<code>col.text</code>	Character. Color of the labels of the categories. Default is black.
<code>text.size</code>	Size of the labels of categories. Default is 3.

**Value**

a ggplot object

**Author(s)**

Nicolas Robette

## References

Cibois, Philippe. *Les méthodes d'analyse d'enquêtes*. Nouvelle édition [en ligne]. Lyon: ENS Éditions, 2014. Disponible sur Internet : <<http://books.openedition.org/enseditions/1443>>

## See Also

[ggcloud\\_variables](#), [ggcloud\\_indiv](#), [ggadd\\_ellipses](#), [ggadd\\_corr](#), [ggadd\\_interaction](#), [ggadd\\_density](#)

## Examples

```
## Performs a specific MCA on 'Taste' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## draws the cloud of categories
## and adds segments between categories with attractions.
data(Taste)
getindexcat(Taste[,1:11])
mca <- speMCA(Taste[,1:11],excl=c(3,6,9,12,15,18,21,24,27,30,33))
p <- ggcloud_variables(mca, col="white", legend="none")
ggadd_attractions(p, mca, measure="phi", min.asso=0.1)
```

---

ggadd\_chulls

*Adds convex hulls to a cloud of individuals*

---

## Description

Adds convex hulls for a categorical variable to a MCA cloud of individuals, using the ggplot2 framework.

## Usage

```
ggadd_chulls(p, resmca, var, sel=1:nlevels(var), axes=c(1,2),
  col=NULL, alpha=0.2, label=TRUE, label.size=5, legend="right")
```

## Arguments

p	ggplot object with the cloud of variables
resmca	object of class MCA, speMCA, csMCA, stMCA or multiMCA
var	Factor. The categorical variable used to plot ellipses.
sel	numeric vector of indexes of the categories to plot (by default, ellipses are plotted for every categories)
axes	numeric vector of length 2, specifying the components (axes) to plot. Default is c(1,2).
col	Colors for the ellipses and labels of the categories. Can be the name of a palette from the RcolorBrewer package, 'bw' for a black and white palette (uses scale_color_grey()), a character vector of colors for a custom palette, or the name of a color for a single color. If NULL (default), the default palette of ggplot2 is used.

alpha	Numerical value from 0 to 1. Transparency of the polygon's fill. Default is 0.2
label	Logical. Should the labels of the categories be plotted at the center of ellipses ? Default is TRUE.
label.size	Size of the labels of the categories at the center of ellipses. Default is 5.
legend	the position of legends ("none", "left", "right", "bottom", "top", or two-element numeric vector). Default is right.

**Value**

a ggplot object

**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[ggcloud\\_variables](#), [ggcloud\\_indiv](#), [ggadd\\_supvar](#), [ggadd\\_corr](#), [ggadd\\_interaction](#), [ggadd\\_density](#), [ggadd\\_kellipses](#), [ggadd\\_ellipses](#)

**Examples**

```
## Performs a specific MCA on 'Taste' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## then performs hierarchical clustering and
## partitions the individuals into 3 clusters,
## draws the cloud of individuals
## and adds convex hulls for the clusters.

data(Taste)
getindexcat(Taste)
mca <- speMCA(Taste[,1:11],excl=c(3,6,9,12,15,18,21,24,27,30,33))
d <- dist(mca$ind$coord[,c(1,2)])
hca <- hclust(d, "ward.D2")
cluster <- factor(cutree(hca, 3))
p <- ggcloud_indiv(mca, col='black')
ggadd_chulls(p, mca, cluster)
```

---

ggadd_corr	<i>Adds a heatmap of under/over-representation of a supplementary variable to a cloud of individuals</i>
------------	--

---

### Description

Adds a heatmap representing the correlation coefficients to a MCA cloud of individuals, for a numerical supplementary variable or one category of a categorical supplementary variable, using the ggplot2 framework.

### Usage

```
ggadd_corr(p, resmca, var, cat=levels(var)[1], axes=c(1,2),
           xbins=20, ybins=20, min.n=1, pal="RdYlBu", limits=NULL, legend="right")
```

### Arguments

p	ggplot object with the cloud of variables
resmca	object of class MCA, speMCA, csmCA, stmCA or multiMCA
var	factor or numerical vector. The supplementary variable used for the heatmap.
cat	character string. numeric vector of indexes of the categories to plot (by default, ellipses are plotted for every categories). Only used if var is a factor.
axes	numeric vector of length 2, specifying the components (axes) to plot. Default is c(1,2).
xbins	integer. Number of bins in the x axis. Default is 20.
ybins	integer. Number of bins in the y axis. Default is 20.
min.n	integer. Minimal number of points for a tile to be drawn. By default, every tiles are drawn.
pal	character string. Name of a diverging ColorBrewer palette. Default is "RdYlBu".
limits	numerical vector of length 2. Lower and upper limits of the correlation coefficients for the color scale. Should be centered around 0 for a better view of under/over-representations (for example c(-0.2,0.2)). By default, the maximal absolute value of the correlation coefficients is used.
legend	the position of legends ("none", "left", "right", "bottom", "top", or two-element numeric vector). Default is right.

### Details

For each tile of the heatmap, a correlation coefficient is computed between the supplementary variable and the fact of belonging to the tile. This gives a view of the under/over-representation of the supplementary variable according to the position in the cloud of individuals.

### Value

a ggplot object

**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[ggcloud\\_variables](#), [ggcloud\\_indiv](#), [ggadd\\_supvar](#), [ggadd\\_interaction](#), [ggadd\\_ellipses](#), [ggadd\\_density](#)

**Examples**

```
## Performs a specific MCA on 'Taste' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## draws the cloud of categories
## and adds a correlation heatmap for Age=50+.
data(Taste)
getindexcat(Taste[,1:11])
mca <- speMCA(Taste[,1:11],excl=c(3,6,9,12,15,18,21,24,27,30,33))
p <- ggcloud_indiv(mca, col='lightgrey')
ggadd_corr(p, mca, var=Taste$Age, cat="50+", xbins=10, ybins=10)
```

---

ggadd_density	<i>Adds a density layer to the cloud of individuals for a category of a supplementary variable</i>
---------------	--

---

**Description**

For a given category of a supplementary variable, adds a layer representing the density of points to the cloud of individuals, either with contours or areas.

**Usage**

```
ggadd_density(p, resmca, var, cat=levels(var)[1], axes=c(1,2),
density="contour", col.contour="darkred", pal.area="viridis", alpha.area=0.2,
ellipse=FALSE, col.ellipse="black")
```

**Arguments**

p	ggplot object with the cloud of variables
resmca	object of class MCA, speMCA, csMCA, stMCA or multiMCA
var	factor or numerical vector. The supplementary variable used for the heatmap.
cat	character string. numeric vector of indexes of the categories to plot (by default, ellipses are plotted for every categories)
axes	numeric vector of length 2, specifying the components (axes) to plot. Default is c(1,2).
density	If "contour", density is plotted with contours. If "area", density is plotted with areas.
col.contour	character string. The color of the contours.
pal.area	character string. The name of a viridis palette for areas.
alpha.area	numeric. Transparency of the areas. Default is 0.2.
ellipse	logical. If TRUE, a concentration ellipse is added.
col.ellipse	character string. The color of the ellipse. Default is black.

**Value**

a ggplot object

**Author(s)**

Nicolas Robette

**References**

- Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).
- Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[ggcloud\\_variables](#), [ggcloud\\_indiv](#), [ggadd\\_supvar](#), [ggadd\\_interaction](#), [ggadd\\_ellipses](#), [ggadd\\_corr](#)

**Examples**

```
## Performs a specific MCA on 'Taste' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## draws the cloud of categories
## and adds a density layer for Age=50+.
data(Taste)
getindexcat(Taste[,1:11])
mca <- speMCA(Taste[,1:11],excl=c(3,6,9,12,15,18,21,24,27,30,33))
p <- ggcloud_indiv(mca, col='lightgrey')
```

```
# density layer with contours
ggadd_density(p, mca, var=Taste$Age, cat="50+")

# density layer with areas
ggadd_density(p, mca, var=Taste$Age, cat="50+", density="area")
```

---

ggadd\_ellipses      *Adds confidence ellipses to a cloud of individuals*

---

### Description

Adds confidence ellipses for a categorical variable to a MCA cloud of individuals, using the ggplot2 framework.

### Usage

```
ggadd_ellipses(p, resmca, var, sel=1:nlevels(var), axes=c(1,2),
  level=0.05, label=TRUE, label.size=3, col=NULL, size=0.5, points=TRUE, legend='right')
```

### Arguments

p	ggplot object with the cloud of variables
resmca	object of class MCA, speMCA, csMCA, stMCA or multiMCA
var	Factor. The categorical variable used to plot ellipses.
sel	numeric vector of indexes of the categories to plot (by default, ellipses are plotted for every categories)
axes	numeric vector of length 2, specifying the components (axes) to plot. Default is c(1,2).
level	The level at which to draw an ellipse (see stat_ellipse). Default is 0.05, which means 95 percents confidence ellipses are plotted.
label	Logical. Should the labels of the categories be plotted at the center of ellipses ? Default is TRUE.
label.size	Size of the labels of the categories at the center of ellipses. Default is 3.
col	Colors for the ellipses and labels of the categories. Can be the name of a palette from the RcolorBrewer package, 'bw' for a black and white palette (uses scale_color_grey()), a character vector of colors for a custom palette, or the name of a color for a single color. If NULL (default), the default palette of ggplot2 is used.
size	Size of the lines of the ellipses. Default is 0.5.
points	If TRUE (default), the points are coloured according to their subcloud.
legend	the position of legends ("none", "left", "right", "bottom", "top", or two-element numeric vector). Default is right.

**Details**

A confidence ellipse aims at measuring how the "true" mean point of a category differs from its observed mean point. This is achieved by constructing a confidence zone around the observed mean point. If we choose a conventional level alpha (e.g. 0.05), a (1 - alpha) (e.g. 95 percents) confidence zone is defined as the set of possible mean points that are not significantly different from the observed mean point.

**Value**

a ggplot object

**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[ggcloud\\_variables](#), [ggcloud\\_indiv](#), [ggadd\\_supvar](#), [ggadd\\_corr](#), [ggadd\\_interaction](#), [ggadd\\_density](#), [ggadd\\_kellipses](#)

**Examples**

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## draws the cloud of categories
## and adds confidence ellipses for Age.
data(Music)
getindexcat(Music[,1:5])
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
p <- ggcloud_indiv(mca, col='lightgrey')
ggadd_ellipses(p, mca, Music$Age)
```

---

ggadd_interaction	<i>Adds the interaction between two categorical supplementary variables to a cloud of variables</i>
-------------------	---

---

**Description**

Adds the interaction between two categorical supplementary variables to a MCA cloud of variables, using the ggplot2 framework.



**Usage**

```
ggadd_interaction(p, resmca, v1, v2, sel1=1:nlevels(v1), sel2=1:nlevels(v2),
  axes=c(1,2), col=NULL, textsize=5, legend='right')
```

**Arguments**

p	ggplot object with the cloud of variables
resmca	object of class MCA, speMCA, csMCA, stMCA or multiMCA.
v1	Factor. The first categorical supplementary variable.
v2	Factor. The second categorical supplementary variable.
sel1	Numeric vector of indexes of the categories of the first supplementary variable to be used in interaction. By default, every categories are used.
sel2	Numeric vector of indexes of the categories of the second supplementary variable to be used in interaction. By default, every categories are used.
axes	numeric vector of length 2, specifying the components (axes) to plot. Default is c(1,2).
col	Colors for the labels of the categories. Can be the name of a palette from the RcolorBrewer package, 'bw' for a black and white palette (uses scale_color_grey()), a character vector of colors for a custom palette, or the name of a color for a single color. If NULL (default), the default palette of ggplot2 is used.
textsize	Size of the labels of categories. Default is 5.
legend	the position of legends ("none", "left", "right", "bottom", "top", or two-element numeric vector). Default is right.

**Value**

a ggplot object

**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[ggcloud\\_variables](#), [ggadd\\_supvar](#), [ggcloud\\_indiv](#), [ggadd\\_corr](#), [ggadd\\_ellipses](#), [ggadd\\_density](#)

## Examples

```
## Performs a specific MCA on 'Taste' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## draws the cloud of categories
## and adds the interaction between Gender and Age.
data(Taste)
getindexcat(Taste[,1:11])
mca <- speMCA(Taste[,1:11],excl=c(3,6,9,12,15,18,21,24,27,30,33))
p <- ggcloud_variables(mca, col='lightgrey', shapes=FALSE)
ggadd_interaction(p, mca, Taste$Gender, Taste$Age)
```

---

ggadd_kellipses	<i>Adds k-inertia ellipses to a cloud of individuals</i>
-----------------	--

---

## Description

Adds k-inertia ellipses for a categorical variable to a MCA cloud of individuals, using the ggplot2 framework. By default, concentration ellipses are plotted.

## Usage

```
ggadd_kellipses(p, resmca, var, sel=1:nlevels(var), axes=c(1,2),
kappa=2, label=TRUE, label.size=3, col=NULL, size=0.5, points=TRUE, legend='right')
```

## Arguments

p	ggplot object with the cloud of variables
resmca	object of class MCA, speMCA, csMCA, stMCA or multiMCA
var	Factor. The categorical variable used to plot ellipses.
sel	numeric vector of indexes of the categories to plot (by default, ellipses are plotted for every categories)
axes	numeric vector of length 2, specifying the components (axes) to plot. Default is c(1,2).
kappa	numeric. The kappa value (i.e. "index") of the inertia ellipses. By default, kappa = 2, which means that concentration ellipses are plotted.
label	Logical. Should the labels of the categories be plotted at the center of ellipses ? Default is TRUE.
label.size	Size of the labels of the categories at the center of ellipses. Default is 3.
col	Colors for the ellipses and labels of the categories. Can be the name of a palette from the RcolorBrewer package, 'bw' for a black and white palette (uses scale_color_grey()), a character vector of colors for a custom palette, or the name of a color for a single color. If NULL (default), the default palette of ggplot2 is used.
size	Size of the lines of the ellipses. Default is 0.5.
points	If TRUE (default), the points are coloured according to their subcloud.
legend	the position of legends ("none", "left", "right", "bottom", "top", or two-element numeric vector). Default is right.

**Details**

If  $\kappa=2$ , ellipses are called "concentration" ellipses and, for a normally shaped subcloud, contain 86.47 percents of the points of the subcloud. If  $\kappa=1$ , ellipses are "indicator" ellipses and contain 39.35 percents of the points of the subcloud. If  $\kappa=1.177$ , ellipses are "median" ellipses and contain 50 percents of the points of the subcloud. This function has to be used after the cloud of individuals has been drawn.

**Value**

a ggplot object

**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[ggcloud\\_variables](#), [ggcloud\\_indiv](#), [ggadd\\_supvar](#), [ggadd\\_corr](#), [ggadd\\_interaction](#), [ggadd\\_density](#), [ggadd\\_ellipses](#)

**Examples**

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## draws the cloud of categories
## and adds concentration ellipses for Age.
data(Music)
getindexcat(Music[,1:5])
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
p <- ggcloud_indiv(mca, col='lightgrey')
ggadd_kellipses(p, mca, Music$Age)
```

---

ggadd\_supind

*Adds supplementary individuals to a cloud of individuals*


---

**Description**

Adds supplementary individuals to a MCA cloud of the individuals, using the ggplot2 framework.

**Usage**

```
ggadd_supind(p, resmca, dfsup, axes=c(1,2), col="black", textsize=5, pointsize=2)
```

**Arguments**

<code>p</code>	ggplot object with the cloud of variables
<code>resmca</code>	object of class MCA, speMCA, csMCA, stMCA or multiMCA.
<code>dfsup</code>	data frame with the supplementary individuals. It must have the same factors as the data frame used as input for the initial MCA.
<code>axes</code>	numeric vector of length 2, specifying the dimensions (axes) to plot (default is <code>c(1,2)</code> )
<code>col</code>	color for the labels and points of the individuals (default is black)
<code>textsize</code>	Size of the labels of the individuals. Default is 5.
<code>pointsize</code>	Size of the points of the individuals. If NULL, only labels are plotted. Default is 2.

**Details**

The function uses the row names of `dfsup` as labels for the individuals.

**Author(s)**

Nicolas Robette

**See Also**

[indsup](#), [ggcloud\\_indiv](#)

**Examples**

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## plots the cloud of individuals,
## and then adds individuals 1, 20 and 300 as supplementary individuals.
data(Music)
rownames(Music) <- paste0("i", 1:nrow(Music))
mca <- speMCA(Music[,1:5], excl=c(3,6,9,12,15))
p <- ggcloud_indiv(mca, col="lightgrey")
ggadd_supind(p, mca, Music[c(1,20,300),1:5])
```

---

ggadd\_supvar

*Adds a categorical supplementary variable to a cloud of variables*

---

**Description**

Adds a categorical supplementary variable to a MCA cloud of variables, using the ggplot2 framework.

**Usage**

```
ggadd_supvar(p, resmca, var, sel=1:nlevels(var), axes=c(1,2), col='black',
  shape=1, prop=NULL, textsize=3, segment=FALSE, vname=NULL)
```

**Arguments**

p	ggplot object with the cloud of variables
resmca	object of class MCA, speMCA, csMCA, stMCA or multiMCA.
var	Factor. The categorical supplementary variable. It does not need to have been used at the MCA step.
sel	Numeric vector of indexes of the categories of the supplementary variable to be added to the plot. By default, labels are plotted for every categories.
axes	numeric vector of length 2, specifying the components (axes) to plot. Default is c(1,2).
col	Character. Color of the shapes and labels of the categories. Default is black.
shape	Symbol to be used in addition the the labels of categories (default is 1). If NULL, only labels are plotted.
prop	If NULL, the size of the labels (if shape=NULL) or the shapes (otherwise) is constant. If 'n', the size is proportional the the weights of categories; if 'vtest1', the size is proportional to the test values of the categories on the first dimension of the plot; if 'vtest2', the size is proportional to the test values of the categories on the second dimension of the plot; if 'cos1', the size is proportional to the cosines of the categories on the first dimension of the plot; if 'cos2', the size is proportional to the cosines of the categories on the second dimension of the plot; if 'cos12', the size is proportional to the total cosines of the categories on the two dimensions of the plot.
textsize	Size of the labels of categories if shape is not NULL, or if shape=NULL and prop=NULL. Default is 3.
segment	Logical. Should one add lines between categories ? Default is FALSE.
vname	A character string to be used as a prefix for the labels of the categories. If NULL (default), no prefix is added.

**Value**

a ggplot object

**Author(s)**

Nicolas Robette

**References**

- Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).
- Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[ggcloud\\_variables](#), [ggcloud\\_indiv](#), [ggadd\\_ellipses](#), [ggadd\\_corr](#), [ggadd\\_interaction](#), [ggadd\\_density](#)

**Examples**

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## draws the cloud of categories
## and adds Age as a supplementary variable.
data(Music)
getindexcat(Music[,1:5])
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
p <- ggcloud_variables(mca, palette='lightgrey', shapes=FALSE)
ggadd_supvar(p, mca, Music$Age, segment=TRUE)
```

---

ggassoc\_boxplot

*Boxplots with violins*

---

**Description**

Displays of boxplot and combines it with a violin plot, using ggplot2.

**Usage**

```
ggassoc_boxplot(data, mapping, axes.labs=TRUE, ticks.labs=TRUE,
text.size=3, box=TRUE, notch=FALSE, violin=TRUE)
```

**Arguments**

data	dataset to use for plot
mapping	aesthetic being used. It must specify x and y.
axes.labs	Whether to display the labels of the axes, i.e. the names of x and y. Default is TRUE.
ticks.labs	Whether to display the labels of the categories of x and y. Default is TRUE.
text.size	Size of the association measure. If NULL, the text is not added to the plot.
box	Whether to draw boxplots. Default is TRUE.
notch	If FALSE (default) make a standard box plot. If TRUE, make a notched box plot. Notches are used to compare groups; if the notches of two boxes do not overlap, this suggests that the medians are significantly different.
violin	Whether to draw a violin plot. Default is TRUE.

**Details**

Eta-squared measure of global association between x and y is displayed in upper-left corner of the plot.

This function can be used as a high-level plot with ggduo and ggpairs functions of the GGally package.

**Value**

a ggplot object

**Author(s)**

Nicolas Robette

**See Also**

[assoc.catcont](#), [condesc](#), [assoc.yx](#), [darma](#), [ggpairs](#)

**Examples**

```
data(decathlon, package="FactoMineR")
ggassoc_boxplot(decathlon, mapping = ggplot2::aes(x = Javeline, y = Competition))
```

---

ggassoc\_crosstab

*Plots counts and associations of a crosstabulation*


---

**Description**

For a cross-tabulation, plots the number of observations by using rectangles with proportional areas, and the phi measures of association between the categories with a diverging gradient of colour, using ggplot2.

**Usage**

```
ggassoc_crosstab(data, mapping, max.phi=.8, sort="none",
  axes.labs=TRUE, ticks.labs=TRUE, text.size=3)
```

**Arguments**

<code>data</code>	dataset to use for plot
<code>mapping</code>	aesthetic being used. It must specify x and y.
<code>max.phi</code>	numeric value, specifying the lower and upper limit of the scale for the color gradient filling the rectangles, i.e. for the phi measures of association. It corresponds to the maximum absolute value of phi one wants to represent in the plot.
<code>sort</code>	character. If "both", rows and columns are sorted according to the first factor of a correspondence analysis of the contingency table. If "x", only rows are sorted. If "y", only columns are sorted. If "none" (default), no sorting is done.
<code>axes.labs</code>	Whether to display the labels of the axes, i.e. the names of x and y. Default is TRUE.
<code>ticks.labs</code>	Whether to display the labels of the categories of x and y. Default is TRUE.
<code>text.size</code>	Size of the association measure. If NULL, the text is not added to the plot.

## Details

The phi measure of association measures how much each combination of categories of x and y is over/under-represented.

Cramer's V measure of global association between x and y is displayed in upper-left corner of the plot.

This function can be used as a high-level plot with `ggduo` and `ggpairs` functions of the `GGally` package.

## Value

a `ggplot` object

## Author(s)

Nicolas Robette

## See Also

[assoc.twocat](#), [phi.table](#), [catdesc](#), [assoc.yx](#), [darma](#), [ggassoc\\_phiplot](#), [ggpairs](#)

## Examples

```
data(Taste)
ggassoc_crosstab(data=Taste, mapping=ggplot2::aes(x=Age, y=Classical))
```

---

ggassoc\_phiplot

*Bar plot of phi measures of association of a crosstabulation*

---

## Description

For a cross-tabulation, plots the phi measures of association with bars of varying height, using `ggplot2`.

## Usage

```
ggassoc_phiplot(data, mapping, measure="phi", max.asso=NULL,
sort="none", axes.labs=TRUE, ticks.labs=TRUE, text.size=3)
```

## Arguments

<code>data</code>	dataset to use for plot
<code>mapping</code>	aesthetic being used. It must specify x and y.
<code>measure</code>	character. The measure for attractions: "phi" (default) for phi coefficients, "pem" for percentages of maximum deviation (PEM).



<code>max.asso</code>	numeric value, specifying the lower and upper limit of the scale for the color gradient filling the rectangles, i.e. for the measures of association. It corresponds to the maximum absolute value of association one wants to represent in the plot. If NULL (default), the limit is automatically adjusted to the data.
<code>sort</code>	character. If "both", rows and columns are sorted according to the first factor of a correspondence analysis of the contingency table. If "x", only rows are sorted. If "y", only columns are sorted. If "none" (default), no sorting is done.
<code>axes.labs</code>	Whether to display the labels of the axes, i.e. the names of x and y. Default is TRUE.
<code>ticks.labs</code>	Whether to display the labels of the categories of x and y. Default is TRUE.
<code>text.size</code>	Size of the association measure. If NULL, the text is not added to the plot.

### Details

The phi measure of association measures how much each combination of categories of x and y is over/under-represented. The bars vary in width according to the number of observations in the categories of the x variables. They vary in height according to the phi measure of association. Bars are black if phi is positive and white if phi is negative.

Cramer's V measure of global association between x and y is displayed in upper-left corner of the plot.

This function can be used as a high-level plot with `ggduo` and `ggpairs` functions of the `GGally` package.

### Value

a ggplot object

### Author(s)

Nicolas Robette

### References

Cibois Philippe, 2004, *Les écarts à l'indépendance. Techniques simples pour analyser des données d'enquêtes*, Collection "Méthodes quantitatives pour les sciences sociales"

### See Also

[assoc.twocat](#), [phi.table](#), [catdesc](#), [assoc.yx](#), [darma](#), [ggassoc\\_crosstab](#), [ggpairs](#)

### Examples

```
data(Taste)
ggassoc_phiplot(data=Taste, mapping=ggplot2::aes(x=Age, y=Classical))
```

---

ggassoc_scatter	<i>Scatter plot with a smoothing line</i>
-----------------	---

---

### Description

Displays of scatter plot and adds a smoothing line, using ggplot2.

### Usage

```
ggassoc_scatter(data, mapping, axes.labs=TRUE, ticks.labs=TRUE,  
text.size=3)
```

### Arguments

data	dataset to use for plot
mapping	aesthetic being used. It must specify x and y.
axes.labs	Whether to display the labels of the axes, i.e. the names of x and y. Default is TRUE.
ticks.labs	Whether to display the labels of the categories of x and y. Default is TRUE.
text.size	Size of the association measure. If NULL, the text is not added to the plot.

### Details

Kendall's tau rank correlation between x and y is displayed in upper-left corner of the plot.

Smoothing is performed with gam.

This function can be used as a high-level plot with ggduo and ggpairs functions of the GGally package.

### Value

a ggplot object

### Author(s)

Nicolas Robette

### See Also

[assoc.twocont](#), [condesc](#), [assoc.yx](#), [darma](#), [ggpairs](#)

### Examples

```
data(decathlon, package="FactoMineR")  
ggassoc_scatter(decathlon, mapping = ggplot2::aes(x = Javeline, y = Points))
```

ggcloud\_indiv

*Plots MCA cloud of individuals with ggplot2***Description**

Plots a Multiple Correspondence Analysis cloud of individuals, using ggplots functions.

**Usage**

```
ggcloud_indiv(resmca, type='i', points='all', axes=1:2,
col='dodgerblue4', palette='Set2', size = 0.5, alpha=0.6, repel=FALSE,
density=NULL, col.contour="darkred", hex.bins=50, hex.pal="viridis")
```

**Arguments**

resmca	object of class MCA, speMCA, csMCA, stMCA or multiMCA
type	If 'i', points are plotted; if 'inames', labels of individuals are plotted.
points	character string. If 'all' all points are plotted (default); if 'besth' only those who contribute most to horizontal axis are plotted; if 'bestv' only those who contribute most to vertical axis are plotted; if 'best' only those who contribute most to horizontal or vertical axis are plotted.
axes	numeric vector of length 2, specifying the components (axes) to plot. Default is c(1,2).
col	If a factor, points or labels are colored according to their category regarding this factor. If a string with color name, every points or labels have the same color. Default is 'dodgerblue4'.
palette	If col is a factor, can be the name of a RColorBrewer palette, 'bw' for a black and white palette (uses scale_color_grey()) or a character vector with a custom palette. If NULL, ggplot2 palette is used. Default is 'Set2'.
size	Size of the points or labels of individuals. Default is 0.5.
alpha	Transparency of the points or labels of individuals. Default is 0.6.
repel	Logical. When type='inames', should labels of individuals be repelled? Default is FALSE.
density	If NULL (default), no density layer is added. If "contour", density is plotted with contours. If "hex", density is plotted with hexagon bins.
col.contour	character string. The color of the contours. Only used if density="contour".
hex.bins	integer. The number of bins in both vertical and horizontal directions. Only used if density="hex".
hex.pal	character string. The name of a viridis palette for hexagon bins. Only used if density="hex".

**Details**

Sometimes the dots are too many and overlap. It is then difficult to get an accurate idea of the distribution of the cloud of individuals. The "density" option allows you to add an additional layer to represent the density of points in the plane, in the form of contours or hexagonal areas.

**Value**

a ggplot object

**Author(s)**

Anton Perdoncin, Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[ggcloud\\_variables](#), [ggadd\\_ellipses](#), [ggadd\\_supvar](#), [ggadd\\_corr](#), [ggadd\\_interaction](#), [ggadd\\_density](#)

**Examples**

```
## Performs a specific MCA on 'Taste' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## and then draws the cloud of individuals.
data(Taste)
getindexcat(Taste[,1:11])
mca <- speMCA(Taste[,1:11],excl=c(3,6,9,12,15,18,21,24,27,30,33))
ggcloud_indiv(mca)

# Points are colored according to gender
ggcloud_indiv(mca, col=Taste$Gender, palette='Set2')

# A density layer of contours is added
ggcloud_indiv(mca, density="contour")

# A density layer of hexagon bins is added
ggcloud_indiv(mca, density="hex", hex.bin=10)
```

---

ggcloud\_variables      *Plots MCA cloud of variables with ggplot2*

---

## Description

Plots a Multiple Correspondence Analysis cloud of variables, using ggplots functions.

## Usage

```
ggcloud_variables(resmca, axes=c(1,2), points='all',
  min.ctr=NULL, max.pval=0.01, face="pp",
  shapes=TRUE, prop=NULL, textsize=3, shapsize=3,
  col=NULL, palette=NULL, col.by.group=TRUE, alpha=1,
  segment.alpha=0.5, vlab=TRUE, sep='.', legend='right')
```

## Arguments

resmca	object of class MCA, speMCA, csMCA, stMCA or multiMCA.
axes	numeric vector of length 2, specifying the components (axes) to plot. Default is c(1,2).
points	character string. If 'all' all categories are plotted (default); if 'besth' only those who contribute most to horizontal axis are plotted; if 'bestv' only those who contribute most to vertical axis are plotted; if 'best' only those who contribute most to horizontal or vertical axis are plotted.
min.ctr	Numerical value between 0 and 100. The minimum contribution (in percent) for a category to be displayed if the points argument is equal to "best", "besth" or "bestv" and resmca is of type MCA, speMCA or csMCA. If NULL (default), only the categories that contribute more than the average (i.e. 100 / number of modalities) are displayed.
max.pval	Numerical value between 0 and 100. The maximal p-value derived from test-values for a category to be displayed if the points argument is equal to "best", "besth" or "bestv" and resmca is of type stMCA or multiMCA.
face	character string. Changes the face of the category labels when their contribution is greater than min.ctr. The first letter refers to the first represented axis, the second letter to the second. "p" is for plain text, "u" for underlined, "i" for italic and "b" for bold. For example, "ui" means that the labels of the most contributing categories on the first axis will be underlined and the labels of the most contributing categories on the second axis will be italicized. By default ("pp"), no font face change is made. Translated with <a href="http://www.DeepL.com/Translator">www.DeepL.com/Translator</a> (free version)
shapes	Logical. Should shapes be plotted for categories (in addition to labels) ? Default is TRUE.
prop	If NULL, the size of the labels (if shapes=FALSE) or the shapes (if shapes=TRUE) is constant. If 'n', the size is proportional the the weights of categories; if 'ctr1',

the size is proportional to the contributions of the categories on the first dimension of the plot; if 'ctr2', the size is proportional to the contributions of the categories on the second dimension of the plot; if 'ctr.cloud', the size is proportional to the total contributions of the categories on the whole cloud; if 'cos1', the size is proportional to the cosines of the categories on the first dimension of the plot; if 'cos2', the size is proportional to the cosines of the categories on the second dimension of the plot; if 'cos12', the size is proportional to the total cosines of the categories on the two dimensions of the plot; if 'vtest1', the size is proportional to the test-values of the categories on the first dimension of the plot; if 'vtest2', the size is proportional to the test-values of the categories on the second dimension of the plot.

textsize	Size of the labels of categories if shapes=TRUE, or if shapes=FALSE and prop=NULL. Default is 3.
shapsize	Size if the shapes of categories if shapes=TRUE and prop=FALSE. Default is 3.
col	Character. A unique color for the shapes and labels of the categories. Default is NULL, which means a palette will be used instead of a unique color (see palette argument).
palette	Character string or character vector. Only used if col is NULL. Colors for the shapes and labels of the categories, differentiated by variable. Can be the name of a palette from the RcolorBrewer package, "bw" for a black and white palette (uses scale_color_grey()) or a character vector of colors for a custom palette. If NULL (default), the default palette of ggplot2 is used.
col.by.group	Logical. If resmca is of type multimCA, categories are colored by group from the MFA if TRUE (default) and by variable if FALSE.
alpha	Transparency of the shapes and labels of categories. Default is 1.
segment.alpha	Transparency of the line segment beside labels of categories. Default is 0.5.
vlab	Logical. Should the variable names be used as a prefix for the labels of the categories. Default is TRUE.
sep	Character string used as a separator if vlab=TRUE.
legend	the position of legends ("none", "left", "right", "bottom", "top", or two-element numeric vector). Default is right.

### Value

a ggplot object

### Author(s)

Anton Perdoncin, Nicolas Robette

### References

- Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).
- Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[ggcloud\\_indiv](#), [ggadd\\_supvar](#), [ggadd\\_ellipses](#), [ggadd\\_corr](#), [ggadd\\_interaction](#), [ggadd\\_density](#)

**Examples**

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## and then draws the cloud of categories.
data(Music)
getindexcat(Music[,1:5])
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
ggcloud_variables(mca)
ggcloud_variables(mca, points='best', prop='n', palette='Set2')
ggcloud_variables(mca, shapes=FALSE, legend="none", col="black", face="ui")
```

---

homog.test

*Computes a homogeneity test for a categorical supplementary variable*

---

**Description**

From MCA results, computes a homogeneity test for a categorical supplementary variable, i.e. characterizes the homogeneity of several subclouds.

**Usage**

```
homog.test(resmca, var, dim=c(1,2))
```

**Arguments**

resmca	object of class MCA, speMCA, csMCA, stMCA or multiMCA
var	the categorical supplementary variable. It does not need to have been used at the MCA step.
dim	the axes which are described. Default is c(1,2)

**Value**

Returns a list of lists, one for each selected dimension in the MCA. Each list has 2 elements :

test.stat	The square matrix of test statistics
p.values	The square matrix of p.values

**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[speMCA](#), [csMCA](#), [stMCA](#), [multiMCA](#), [textvarsup](#)

**Examples**

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## and then computes a homogeneity test for age supplementary variable.
data(Music)
getindexcat(Music)
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
homog.test(mca,Music$Age)
```

---

indsup

*Computes statistics for supplementary individuals*

---

**Description**

From MCA results, computes statistics (coordinates, squared cosines) for supplementary individuals.

**Usage**

```
indsup(resmca, supdata)
```

**Arguments**

resmca	object of class 'MCA', 'speMCA' or 'csMCA'
supdata	data frame with the supplementary individuals. It must have the same factors as the data frame used as input for the initial MCA.

**Value**

Returns a list:

coord	matrix of individuals' coordinates
cos2	matrix of individuals' square cosines

**Author(s)**

Nicolas Robette



**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[textindsup](#), [speMCA](#), [csmCA](#), [varsup](#)

**Examples**

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## and then computes statistics for supplementary individuals.
data(Music)
getindexcat(Music)
mca <- speMCA(Music[3:nrow(Music),1:5],excl=c(3,6,9,12,15))
indsup(mca,Music[1:2,1:5])
```

---

medoids

*Computes the medoids of clusters*

---

**Description**

Computes the medoids of a cluster solution.

**Usage**

```
medoids(D, cl)
```

**Arguments**

D                    square distance matrix (n rows \* n columns, i.e. n individuals) or dist object  
 cl                    vector with the clustering solution (its length should be n)

**Details**

Medoids are representative objects of a cluster whose average dissimilarity to all the objects in the cluster is minimal. Medoids are always members of the data set (contrary to means or centroids).

**Value**

Returns a numeric vector with the indexes of medoids.

**Author(s)**

Nicolas Robette

**References**

Kaufman, L. and Rousseeuw, P.J. (1990). *Finding Groups in Data: An Introduction to Cluster Analysis*. Wiley, New York.

Anja Struyf, Mia Hubert & Peter J. Rousseeuw (1996). "Clustering in an Object-Oriented Environment". *Journal of Statistical Software*.

**See Also**

[dist](#), [cluster](#), [hclust](#), [cutree](#), [pam](#)

**Examples**

```
## Performs of classification of the 'Music' example data set,
## a clustering in 3 groups
## and then computes the medoids.
data(Music)
temp <- dichotom(Music[,1:5])
d <- dist(temp)
clus <- cutree(hclust(d),3)
medoids(d,clus)
```

---

modif.rate

*Computes Benzecri's modified rates of variance of a MCA*


---

**Description**

Computes the modified rates of variance of a multiple correspondence analysis.

**Usage**

```
modif.rate(resmca)
```

**Arguments**

resmca            object of class MCA, speMCA, csMCA, stMCA or multiMCA

**Details**

As MCA clouds often have a high dimensionality, the variance rates of the first principle axes may be quite low, which makes them hard to interpret. Benzecri (1992, p.412) proposed to use *modified rates* to better appreciate the relative importance of the principal axes.

**Value**

Returns a data frame with 2 variables:

mrate	Numeric vector of modified rates
cum.mrate	Numeric vector of cumulative modified rates

**Author(s)**

Nicolas Robette

**References**

Benzecri J.P., *Correspondence analysis handbook*, New-York: Dekker (1992).

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[MCA](#), [speMCA](#), [csMCA](#)

**Examples**

```
## Computes the modified rates of variance
## of the MCA of 'Music' example data set
data(Music)
mca <- speMCA(Music[,1:5])
modif.rate(mca)
```

---

Movies

*Movies (data)*

---

**Description**

The data concerns a sample of 1000 Movies which were on screens in France and come of their characteristics.

**Usage**

```
data(Movies)
```

**Format**

A data frame with 1000 observations and the following 7 variables:

Budget numeric vector of movie budgets

Genre is a factor with 9 levels

Country is a factor with 4 level. Country of origin of the movie.

ArtHouse is a factor with levels No, Yes. Whether the movie had the "Art House" label.

Festival is a factor with levels No, Yes. Whether the movie was selected in Cannes, Berlin or Venise film festivals.

Critics numeric vector of average ratings from intellectual criticism.

BoxOffice numeric vector of number of admissions.

**Examples**

```
data(Movies)
str(Movies)
```

---

multiMCA

*Performs Multiple Factor Analysis*


---

**Description**

Performs Multiple Factor Analysis, drawing on the work of Escoffier and Pages (1994). It allows the use of MCA variants (e.g. specific MCA or class specific MCA) as inputs.

**Usage**

```
multiMCA(l_mca, ncp = 5, compute.rv = FALSE)
```

**Arguments**

<code>l_mca</code>	a list of objects of class MCA, speMCA or csmCA
<code>ncp</code>	number of dimensions kept in the results (default is 5)
<code>compute.rv</code>	whether RV coefficients should be computed or not (default is FALSE, which makes the function execute faster)

**Details**

This function binds individual coordinates from every MCA in `l_mca` argument, weights them by the first eigenvalue, and the resulting data frame is used as input for Principal Component Analysis (PCA).

**Value**

Returns an object of class 'multiMCA', i.e. a list:

<code>eig</code>	a list of numeric vector for eigenvalues, percentage of variance and cumulative percentage of variance
<code>var</code>	a list of matrices with results for input MCAs components (coordinates, correlation between variables and axes, square cosine, contributions)
<code>ind</code>	a list of matrices with results for individuals (coordinates, square cosine, contributions)
<code>call</code>	a list with informations about input data
<code>VAR</code>	a list of matrices with results for categories and variables in the input MCAs (coordinates, square cosine, test-values, variances)
<code>my.mca</code>	lists the content of the objects in <code>l_mca</code> argument
<code>RV</code>	a matrix of RV coefficients

**Author(s)**

Nicolas Robette

**References**

Escofier, B. and Pages, J. (1994) "Multiple Factor Analysis (AFMULT package)". *Computational Statistics and Data Analysis*, 18, 121-140.

**See Also**

[plot.multimCA](#), [varsup](#), [speMCA](#), [csMCA](#), [MFA](#), [PCA](#)

**Examples**

```
## Performs a specific MCA on music variables of 'Taste' example data set,  
## another one on movie variables of 'Taste' example data set,  
## and then a Multiple Factor Analysis.  
data(Taste)  
getindexcat(Taste[,1:5])  
mca1 <- speMCA(Taste[,1:5],excl=c(3,6,9,12,15))  
getindexcat(Taste[,6:11])  
mca2 <- speMCA(Taste[,6:11],excl=c(3,6,9,12,15,18))  
mfa <- multimCA(list(mca1,mca2))  
plot.multimCA(mfa)
```

---

Music

*Music (data)*

---

**Description**

The data concerns tastes for music of a set of 500 individuals. It contains 5 variables of likes for music genres (french pop, rap, rock, jazz and classical), 2 about music listening and 2 additional variables (gender and age).

**Usage**

```
data(Music)
```

**Format**

A data frame with 500 observations and the following 7 variables:

FrenchPop is a factor with levels No, Yes, NA

Rap is a factor with levels No, Yes, NA

Rock is a factor with levels No, Yes, NA

Jazz is a factor with levels No, Yes, NA

Classical is a factor with levels No, Yes, NA

Gender is a factor with levels Men, Women

Age is a factor with levels 15-24, 25-49, 50+

OnlyMus is a factor with levels Daily, Often, Rare, Never, indicating how often one only listens to music.

Daily is a factor with levels No, Yes indicating if one listens to music every day.

### Details

'NA' stands for 'not available'

### Examples

```
data(Music)
str(Music)
```

---

pem	<i>Computes the local and global Percentages of Maximum Deviation from Independence (PEM)</i>
-----	---

---

### Description

Computes the local and global Percentages of Maximum Deviation from Independence (PEM) of a contingency table.

### Usage

```
pem(x,y,weights=rep(1,length(x)),digits=1,sort=TRUE)
```

### Arguments

x	the first categorical variable
y	the second categorical variable
weights	an optional numeric vector of weights (by default, a vector of 1 for uniform weights)
digits	integer. The number of digits (default is 3).
sort	logical. Whether rows and columns are sorted according to a correspondence analysis or not (default is TRUE).

### Details

The Percentage of Maximum Deviation from Independence (PEM) is an association measure for contingency tables and also provides attraction (resp. repulsion) measures in each cell of the crosstabulation (see Cibois, 1993). It is an alternative to khi2, Cramer's V coefficient, etc.

**Value**

Returns a list:

peml	Table with local percentages of maximum deviation from independence
pemg	Numeric value, i.e. the global percentage of maximum deviation from independence

**Author(s)**

Nicolas Robette

**References**

Cibois P., 1993, Le PEM, pourcentage de l'ecart maximum : un indice de liaison entre modalites d'un tableau de contingence, *Bulletin de methodologie sociologique*, n40, p.43-63. <https://cibois.pagesperso-orange.fr/bms93.pdf>

**See Also**

[table](#), [chisq.test](#), [phi.table](#), [assocstats](#)

**Examples**

```
## Computes the PEM for the contingency table
## of jazz and age variables
## from the 'Music' example data set
data(Music)
pem(Music$Jazz,Music$Age)
```

---

phi.table

*Computes the phi coefficient for every cells of a contingency table*

---

**Description**

Computes the phi coefficient for every cells of the cross-tabulation between two categorical variables

**Usage**

```
phi.table(x,y,weights=rep(1,length(x)),digits=3)
```

**Arguments**

x	the first categorical variable
y	the second categorical variable
weights	an optional numeric vector of weights (by default, a vector of 1 for uniform weights)
digits	integer. The number of digits (default is 3).

**Value**

A table with the phi coefficients

**Author(s)**

Nicolas Robette

**References**

Rakotomalala R., 'Comprendre la taille d'effet (effect size)', [http://eric.univ-lyon2.fr/~ricco/cours/slides/effect\\_size.pdf](http://eric.univ-lyon2.fr/~ricco/cours/slides/effect_size.pdf)

**See Also**

[assoc.twocat](#), [assoc.catcont](#), [condesc](#), [catdesc](#)

**Examples**

```
data(Music)
phi.table(Music$Jazz, Music$Age)
```

---

plot.csMCA

*Plots 'class specific' MCA results*

---

**Description**

Plots a 'class specific' Multiple Correspondence Analysis (resulting from `csMCA` function), i.e. the clouds of individuals or categories.

**Usage**

```
## S3 method for class 'csMCA'
plot(x, type = "v", axes = 1:2, points = "all", col = "dodgerblue4", app = 0, ...)
```

**Arguments**

<code>x</code>	object of class 'csMCA'
<code>type</code>	character string: 'v' to plot the categories (default), 'i' to plot individuals' points, 'inames' to plot individuals' names
<code>axes</code>	numeric vector of length 2, specifying the components (axes) to plot (c(1,2) is default)
<code>points</code>	character string. If 'all' all points are plotted (default); if 'besth' only those who contribute most to horizontal axis are plotted; if 'bestv' only those who contribute most to vertical axis are plotted; if 'best' only those who contribute most to horizontal or vertical axis are plotted.
<code>col</code>	color for the points of the individuals or for the labels of the categories (default is 'dodgerblue4')



app	numerical value. If 0 (default), only the labels of the categories are plotted and their size is constant; if 1, only the labels are plotted and their size is proportional to the weights of the categories; if 2, points (triangles) and labels are plotted, and points size is proportional to the weight of the categories.
...	further arguments passed to or from other methods, such as cex, cex.main, ...

### Details

A category is considered to be one of the most contributing to a given axis if its contribution is higher than the average contribution, i.e. 100 divided by the total number of categories.

### Author(s)

Nicolas Robette

### References

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

### See Also

[csMCA](#), [textvarsup](#), [conc.ellipse](#)

### Examples

```
## Performs a class specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories
## and focusing on the subset of women,
## and then draws the cloud of categories.
data(Music)
female <- Music$Gender=='Women'
getindexcat(Music[,1:5])
mca <- csMCA(Music[,1:5],subcloud=female,excl=c(3,6,9,12,15))
plot(mca)
plot(mca,axes=c(2,3),points='best',col='darkred',app=1)
```

### Description

Plots Multiple Factor Analysis data, resulting from `multiMCA` function.

**Usage**

```
## S3 method for class 'multiMCA'
plot(x, type = "v", axes = c(1, 2), points = "all", threshold = 2.58,
     groups = 1:x$call$ngroups, col = rainbow(x$call$ngroups), app = 0, ...)
```

**Arguments**

x	object of class 'multiMCA'
type	character string: 'v' to plot the categories (default), 'i' to plot individuals' points, 'inames' to plot individuals' names
axes	numeric vector of length 2, specifying the components (axes) to plot (c(1,2) is default)
points	character string. If 'all' all points are plotted (default); if 'besth' only those who are the most correlated to horizontal axis are plotted; if 'bestv' only those who are the most correlated to vertical axis are plotted; if 'best' only those who are the most coorelated to horizontal or vertical axis are plotted.
threshold	numeric value. V-test minimal value for the selection of plotted categories.
groups	numeric vector specifying the groups of categories to plot. By default, every groups of categories will be plotted
col	a color for the points of the individuals or a vector of colors for the labels of the groups of categories (by default, rainbow palette is used)
app	numerical value. If 0 (default), only the labels of the categories are plotted and their size is constant; if 1, only the labels are plotted and their size is proportional to the weights of the categories; if 2, points (triangles) and labels are plotted, and points size is proportional to the weight of the categories.
...	further arguments passed to or from other methods, such as cex, cex.main, ...

**Details**

A category is considered to be one of the most correlated to a given axis if its test-value is higher than 2.58 (which corresponds to a 0.05 threshold).

**Author(s)**

Nicolas Robette

**References**

Escofier, B. and Pages, J. (1994) "Multiple Factor Analysis (AFMULT package)". *Computational Statistics and Data Analysis*, 18, 121-140.

**See Also**

[multiMCA](#), [textvarsup](#), [speMCA](#), [csMCA](#), [MFA](#)

## Examples

```
## Performs a specific MCA on music variables of 'Taste' example data set,
## another one on movie variables of 'Taste' example data set,
## and then a Multiple Factor Analysis and plots the results.
data(Taste)
mca1 <- speMCA(Taste[,1:5],excl=c(3,6,9,12,15))
mca2 <- speMCA(Taste[,6:11],excl=c(3,6,9,12,15,18))
mfa <- multiMCA(list(mca1,mca2))
plot.multiMCA(mfa,col=c('darkred','darkblue'))
plot.multiMCA(mfa,groups=2,app=1)
```

---

plot.speMCA	<i>Plots 'specific' MCA results</i>
-------------	-------------------------------------

---

## Description

Plots a 'specific' Multiple Correspondence Analysis (resulting from [speMCA](#) function), i.e. the clouds of individuals or categories.

## Usage

```
## S3 method for class 'speMCA'
plot(x, type = "v", axes = 1:2, points = "all", col = "dodgerblue4", app = 0, ...)
```

## Arguments

x	object of class 'speMCA'
type	character string: 'v' to plot the categories (default), 'i' to plot individuals' points, 'inames' to plot individuals' names
axes	numeric vector of length 2, specifying the components (axes) to plot (c(1,2) is default)
points	character string. If 'all' all points are plotted (default); if 'besth' only those who contribute most to horizontal axis are plotted; if 'bestv' only those who contribute most to vertical axis are plotted; if 'best' only those who contribute most to horizontal or vertical axis are plotted.
col	color for the points of the individuals or for the labels of the categories (default is 'dodgerblue4')
app	numerical value. If 0 (default), only the labels of the categories are plotted and their size is constant; if 1, only the labels are plotted and their size is proportional to the weights of the categories; if 2, points (triangles) and labels are plotted, and points size is proportional to the weight of the categories.
...	further arguments passed to or from other methods, such as cex, cex.main, ...

## Details

A category is considered to be one of the most contributing to a given axis if its contribution is higher than the average contribution, i.e. 100 divided by the total number of categories.

**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[speMCA](#), [textvarsup](#), [conc.ellipse](#)

**Examples**

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## and then draws the cloud of categories.
data(Music)
getindexcat(Music[,1:5])
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
plot(mca)
plot(mca,axes=c(2,3),points='best',col='darkred',app=1)
```

---

plot.stMCA

*Plots 'standardized' MCA results*


---

**Description**

Plots a 'standardized' Multiple Correspondence Analysis (resulting from [stMCA](#) function), i.e. the clouds of individuals or categories.

**Usage**

```
## S3 method for class 'stMCA'
plot(x, type = "v", axes = 1:2, points = "all", threshold = 2.58, groups=NULL,
      col = "dodgerblue4", app = 0, ...)
```

**Arguments**

x	object of class 'stMCA'
type	character string: 'v' to plot the categories (default), 'i' to plot individuals' points, 'inames' to plot individuals' names
axes	numeric vector of length 2, specifying the components (axes) to plot (c(1,2) is default)

points	character string. If 'all' all points are plotted (default); if 'besth' only those who are the most correlated to horizontal axis are plotted; if 'bestv' only those who are the most correlated to vertical axis are plotted; if 'best' only those who are the most coorelated to horizontal or vertical axis are plotted.
threshold	numeric value. V-test minimal value for the selection of plotted categories.
groups	only if x\$call\$input.mca = 'multiMCA', i.e. if the MCA standardized to x object was a multiMCA object. Numeric vector specifying the groups of categories to plot. By default, every groups of categories will be plotted
col	color for the points of the individuals or for the labels of the categories (default is 'dodgerblue4')
app	numerical value. If 0 (default), only the labels of the categories are plotted and their size is constant; if 1, only the labels are plotted and their size is proportional to the weights of the categories; if 2, points (triangles) and labels are plotted, and points size is proportional to the weight of the categories.
...	further arguments passed to or from other methods, such as cex, cex.main, ...

### Details

A category is considered to be one of the most correlated to a given axis if its test-value is higher than 2.58 (which corresponds to a 0.05 threshold).

### Author(s)

Nicolas Robette

### References

Robette, Bry and Roueff, 2014, "Un dialogue de sourds dans le theatre statistique? Analyse geometrique des donnees et effets de structure", *forthcoming*

### See Also

[stMCA](#), [textvarsup](#), [conc.ellipse](#)

### Examples

```
## Performs a standardized MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories
## and controlling for age,
## and then draws the cloud of categories.
data(Music)
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
stmca <- stMCA(mca,control=list(Music$Age))
plot(stmca)
plot(stmca,axes=c(2,3),points='best',col='darkred',app=1)
```

speMCA

*Performs a 'specific' MCA***Description**

Performs a 'specific' Multiple Correspondence Analysis, i.e. a variant of MCA that allows to treat undesirable categories as passive categories.

**Usage**

```
speMCA(data, excl = NULL, ncp = 5, row.w = rep(1, times = nrow(data)))
```

**Arguments**

data	data frame with n rows (individuals) and p columns (categorical variables)
excl	numeric vector indicating the indexes of the "junk" categories (default is NULL). See "getindexcat" to identify these indexes.
ncp	number of dimensions kept in the results (default is 5)
row.w	an optional numeric vector of row weights (by default, a vector of 1 for uniform row weights)

**Details**

Undesirable categories may be of several kinds: infrequent categories (say, <5 percents), heterogeneous categories (e.g. 'others') or uninterpretable categories (e.g. 'not available'). In these cases, 'specific' MCA may be useful to ignore these categories for the determination of distances between individuals (see Le Roux and Rouanet, 2004 and 2010).

**Value**

Returns an object of class 'speMCA', i.e. a list including:

eig	a list of vectors containing all the eigenvalues, the percentage of variance, the cumulative percentage of variance, the modified rates and the cumulative modified rates
call	a list with informations about input data
ind	a list of matrices containing the results for the individuals (coordinates, contributions)
var	a list of matrices containing all the results for the categories and variables (weights, coordinates, square cosine, categories contributions to axes and cloud, test values (v.test), square correlation ratio (eta2), variable contributions to axes and cloud)

**Author(s)**

Nicolas Robette

## References

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

## See Also

[getindexcat](#), [plot.speMCA](#), [varsup](#), [contrib](#), [modif.rate](#), [dimdescr](#), [MCA](#), [csMCA](#)

## Examples

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories.
data(Music)
getindexcat(Music[,1:5])
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
str(mca)
```

---

stMCA

*Performs a 'standardized' MCA*

---

## Description

Performs a 'standardized' Multiple Correspondence Analysis, i.e it takes MCA results and forces all the dimensions to be orthogonal to a supplementary 'control' variable.

## Usage

```
stMCA(resmca, control)
```

## Arguments

resmca	an object of class 'MCA', 'speMCA', 'csMCA' or 'multimCA'
control	a list of 'control' variables

## Details

Standardized MCA unfolds in several steps. First, for each dimension of an input MCA, individual coordinates are used as dependent variable in a linear regression model and the 'control' variable is included as covariate in the same model. The residuals from every models are retained and bound together. The resulting data frame is composed of continuous variables and its number of columns is equal to the number of dimensions in the input MCA. Lastly, this data frame is used as input in a Principal Component Analysis.

**Value**

Returns an object of class "stMCA". This object will be similar to resmca argument, still it does not comprehend modified rates, categories contributions and variables contributions.

**Author(s)**

Nicolas Robette

**References**

Robette, Bry and Roueff, 2014, "Un dialogue de sourds dans le theatre statistique? Analyse geometrique des donnees et effets de structure", [<http://nicolas.robette.free.fr/publis.html>], *forthcoming*.

**See Also**

[plot.stMCA](#), [MCA](#), [speMCA](#), [csMCA](#), [multiMCA](#), [PCA](#)

**Examples**

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## and then performs a 'standardized' MCA controlling for age.
data(Music)
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
plot(mca)
textvarsup(mca,Music$Age,col='red')
stmca <- stMCA(mca,control=list(Music$Age))
plot(stmca)
textvarsup(stmca,Music$Age,col='red')
```

---

tabcontrib

*Displays the categories contributing most to axes for a MCA*

---

**Description**

Identifies the categories that contribute the most to a given dimension of a Multiple Correspondence Analysis and organizes these informations into a fancy table. It allows to analyze variants of MCA, such as 'specific' MCA or 'class specific' MCA.

**Usage**

```
tabcontrib(resmca, dim = 1)
```

**Arguments**

resmca	object of class MCA, speMCA, or csMCA
dim	dimension to describe (default is 1st dimension)



**Details**

Best contributions - i.e. higher than average - are assigned a positive or negative sign according to the corresponding categories' coordinates, so as to facilitate interpretation. Then they are sorted and organized according to the most contributing variables.

**Value**

Returns a data frame with the following columns:

var	the names of the most contributing variables
moda	the names of the most contributing categories
ctr1	'negative' contributions, i.e. corresponding to categories with coordinates lower than zero
ctr2	'positive' contributions, i.e. corresponding to categories with coordinates higher than zero
weight	weight of the categories
ctrtot	sum of the best contributions for a given variable
cumctrtot	cumulated contributions

**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[dimcontrib](#), [dimdesc](#), [dimdescr](#), [dimeta2](#), [condes](#), [speMCA](#), [csMCA](#)

**Examples**

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## and then describes the contributions to axes.
data(Music)
getindexcat(Music[,1:5])
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
tabcontrib(mca,1)
tabcontrib(mca,2)
```

---

Taste

*Taste (data)*

---

### Description

The data concerns tastes for music and movies of a set of 2000 individuals. It contains 5 variables of likes for music genres (french pop, rap, rock, jazz and classical), 6 variables of likes for movie genres (comedy, crime, animation, science fiction, love, musical) and 2 additional variables (gender and age).

### Usage

```
data(Taste)
```

### Format

A data frame with 500 observations and the following 13 variables:

FrenchPop is a factor with levels No, Yes, NA

Rap is a factor with levels No, Yes, NA

Rock is a factor with levels No, Yes, NA

Jazz is a factor with levels No, Yes, NA

Classical is a factor with levels No, Yes, NA

Comedy is a factor with levels No, Yes, NA

Crime is a factor with levels No, Yes, NA

Animation is a factor with levels No, Yes, NA

SciFi is a factor with levels No, Yes, NA

Love is a factor with levels No, Yes, NA

Musical is a factor with levels No, Yes, NA

Gender is a factor with levels Men, Women

Age is a factor with levels 15-24, 25-49, 50+

Educ is a factor with levels none, low, medium, high

### Details

'NA' stands for 'not available'

### Examples

```
data(Taste)  
str(Taste)
```

---

textindsup	<i>Adds supplementary individuals to a MCA graph</i>
------------	--

---

### Description

Adds supplementary individuals to a MCA graph of the cloud of the individuals.

### Usage

```
textindsup(resmca, supdata, axes = c(1, 2), col = "darkred")
```

### Arguments

resmca	object of class 'MCA', 'speMCA', or 'csMCA'
supdata	data frame with the supplementary individuals. It must have the same factors as the data frame used as input for the initial MCA.
axes	numeric vector of length 2, specifying the dimensions (axes) to plot (default is c(1,2))
col	color for the labels of the categories (default is 'darkred')

### Author(s)

Nicolas Robette

### See Also

[indsup](#), [plot.speMCA](#), [plot.csMCA](#)

### Examples

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## plots the cloud of individuals,
## and then adds supplementary individuals.
data(Music)
getindexcat(Music)
mca <- speMCA(Music[3:nrow(Music),1:5],excl=c(3,6,9,12,15))
plot(mca,type='i')
textindsup(mca,Music[1:2,1:5])
```

---

textvarsup                      *Adds a categorical supplementary variable to a MCA graph*

---

### Description

Adds a categorical supplementary variable to a MCA graph of the cloud of categories.

### Usage

```
textvarsup(resmca, var, sel = 1:nlevels(var), axes = c(1, 2),
           col = "black", app = 0, vname = NULL)
```

### Arguments

resmca	object of class 'MCA', 'speMCA', 'csMCA', 'stMCA' or 'multiMCA'
var	the categorical supplementary variable. It does not need to have been used at the MCA step.
sel	numeric vector of indexes of the categories of the supplementary variable to be added to the plot (by default, labels are plotted for every categories)
axes	numeric vector of length 2, specifying the dimensions (axes) to plot (default is c(1,2))
col	color for the labels of the categories (default is black)
app	numerical value. If 0 (default), only the labels are plotted and their size is constant; if 1, only the labels are plotted and their size is proportional to the weights of the categories; if 2, points (triangles) and labels are plotted, and points size is proportional to the weight of the categories.
vname	a character string to be used as a prefix for the labels of the categories (null by default)

### Author(s)

Nicolas Robette

### See Also

[plot.speMCA](#), [plot.csMCA](#), [plot.stMCA](#), [plot.multiMCA](#), [varsup](#)

### Examples

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## plots the cloud of categories,
## and then adds gender and age supplementary categories.
data(Music)
getindexcat(Music)
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
```

```
plot(mca,col='gray')
textvarsup(mca,Music$Gender,col='darkred')
textvarsup(mca,Music$Age,sel=c(1,3),col='orange',vname='age',app=1)
```

---

translate.logit	<i>Translates logit regression coefficients into percentages</i>
-----------------	--

---

## Description

Performs a logit regression and then computes the effects of covariates expressed in percentages (through two methods: 'pure' effects and 'experimental' effects; see Deauvieu, 2010)

## Usage

```
translate.logit(formula,data,nit=0)
```

## Arguments

formula	an object of class formula (or one that can be coerced to that class): a symbolic description of the model to be fitted. Every variables have to be factors.
data	a data frame containing the variables in the model
nit	number of bootstrap iterations for confidence interval computation. Default is 0, i.e. no confidence interval is computed.

## Details

This function works with binomial as well as multinomial regression models. If the dependant variable has two factors, `glm` is used, if it has more than two factors `multinom` function (from `nnet` package) is used. The function expresses the regression coefficients as percentages through three distinct methods: raw percentages, 'pure effects' percentages and 'experimental effects' percentages (see Deauvieu, 2010). Bootstrap confidence interval are available only for binomial regressions.

## Value

The function returns a list:

glm	An object of class glm or nnet (depending on the number of factors of the dependent variable)
summary	The results of summary function applied to reg element
percents	A matrix or a list of matrices (depending on the number of factors of the dependent variable) with regression coefficients expressed as percentages
boot.ci	A matrix or a list of matrices (depending on the number of factors of the dependent variable) with confidence intervals computed with bootstrap

## Author(s)

Nicolas Robette

## References

Deauvieux, J. (2010), 'Comment traduire sous forme de probabilités les résultats d'une modélisation logit ?', *Bulletin of Sociological Methodology / Bulletin de Methodologie Sociologique* 105(1), 5-23.

Deauvieux, J. (2011), 'Est-il possible et souhaitable traduire sous forme de probabilités un coefficient logit ? Réponse aux remarques formulées par Marion Selz à propos de mon article paru dans le BMS en 2010', *Bulletin of Sociological Methodology / Bulletin de Methodologie Sociologique* 112(1), 32-42.

Deauvieux, J. (2019), 'Comparer les résultats d'un modèle logit dichotomique ou polytomique entre plusieurs groupes à partir des probabilités estimées', *Bulletin of Sociological Methodology / Bulletin de Methodologie Sociologique* 142(1), 7-31.

## See Also

[glm](#), [multinom](#)

## Examples

```
## An example for binomial logit regression
data(Music)
translate.logit(Daily ~ Gender + Age, Music)

## An example for multinomial logit regression
translate.logit(OnlyMus ~ Gender + Age, Music)
```

---

varsup

*Computes statistics for a categorical supplementary variable*

---

## Description

From MCA results, computes statistics (weights, coordinates, contributions, test-values, variances) for a categorical supplementary variable.

## Usage

```
varsup(resmca, var)
```

## Arguments

resmca	object of class MCA, speMCA, csMCA, stMCA or multiMCA
var	the categorical supplementary variable. It does not need to have been used at the MCA step.

**Value**

Returns a list:

weight	numeric vector of categories weights
coord	data frame of categories coordinates
cos2	data frame of categories square cosine
var	data frame of categories within variances, variance between and within categories and variable square correlation ratio (eta2)
typic	data frame of categories typicality test statistics
pval	data frame of categories p-values from typicality test statistics
cor	data frame of categories correlation coefficients

**Author(s)**

Nicolas Robette

**References**

Le Roux B. and Rouanet H., *Multiple Correspondence Analysis*, SAGE, Series: Quantitative Applications in the Social Sciences, Volume 163, CA:Thousand Oaks (2010).

Le Roux B. and Rouanet H., *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*, Kluwer Academic Publishers, Dordrecht (June 2004).

**See Also**

[speMCA](#), [csMCA](#), [multiMCA](#), [textvarsup](#)

**Examples**

```
## Performs a specific MCA on 'Music' example data set
## ignoring every 'NA' (i.e. 'not available') categories,
## and then computes statistics for age supplementary variable.
data(Music)
getindexcat(Music)
mca <- speMCA(Music[,1:5],excl=c(3,6,9,12,15))
varsup(mca,Music$Age)
```

---

wtable

---

*Computes a (possibly weighted) contingency table*


---

**Description**

Computes a contingency table from one or two vectors, with the possibility of specifying weights.

**Usage**

```
wtable(x,y=NULL,weights=rep.int(1,length(x)),stat="freq",
       digits=1,mar=TRUE,na_value=NULL)
```

**Arguments**

x	an object which can be interpreted as factor
y	an optional object which can be interpreted as factor
weights	an optional numeric vector of weights (by default, a vector of 1 for uniform weights)
stat	character. Whether to compute a contingency table ("freq", default, percentages ("prop"), row percentages ("rprop") or column percentages ("cprop").
digits	integer indicating the number of decimal places (default is 1)
mar	logical. If TRUE (default), margins are computed
na_value	character. Name of the level for NA category. If NULL (default), NA values are ignored.

**Value**

Returns a contingency table.

**Author(s)**

Nicolas Robette

**See Also**

[table](#), [assoc.twocat](#)

**Examples**

```
## Computes a contingency table
## of jazz and age variables
## from the 'Music' example data set
## with or without weights
data(Music)
wtable(Music$Jazz)
wtable(Music$Jazz,Music$Age)

weight <- rep(c(0,0.5,1,1.5,2), length.out=nrow(Music))
wtable(Music$Jazz,w=weight,digits=1)
wtable(Music$Jazz,Music$Age,weight,1)
```



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