Package 'CompositionalZADR'

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Type Package

Title Compositional Data Analysis with the Zero Adjusted Dirichlet Distribution

Version 1.2

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Imports Compositional, graphics, grDevices, Rfast, stats, Rcpp

LinkingTo Rcpp, RcppArmadillo

Suggests Rfast2

Description Regression, discriminant analysis, maximum likelihood estimation, random values generation, and contour plots of the zero adjusted Dirichlet distribution. The relevant paper is Tsagris M. and Stewart C. (2018). ``A Dirichlet regression model for compositional data with zeros". Lobachevskii Journal of Mathematics, 39(3): 398--412. <doi:10.1134/S1995080218030198>.

License GPL (>= 2)

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CompositionalZADR-package

Compositional Data Analysis with the Zero Adjusted Dirichlet Distribution

Description

Compositional Data Analysis with the Zero Adjusted Dirichlet Distribution. The package has extra capabilities not contained in the paper or the package "Compositional".

Details

Package:	CompositionalZADR
Type:	Package
Version:	1.2
Date:	2026-11-16

Maintainers

Michail Tsagris <mtsagris@uoc.gr>.

Author(s)

Michail Tsagris <mtsagris@uoc.gr>

References

Tsagris M. and Stewart C. (2018). A Dirichlet regression model for compositional data with zeros. Lobachevskii Journal of Mathematics, 39(3): 398–412.

Contour plot of the zero adjusted Dirichlet distribution in S^2

Contour plot of the zero adjusted Dirichlet distribution in $S\hat{}2$

Description

Contour plot of the zero adjusted Dirichlet distribution in S^2.

Usage

```
zad.contour(phi, mu, n = 100, y = NULL, cont.line = FALSE)
```

Arguments

`phi`	A value with the concentration parameter.
`mu`	A vector with the mean vector (3 values) in the simplex.
`n`	The number of grid points to consider over which the density is calculated.
`y`	This is either NULL (no data) or contains a 3 column matrix with compositional data.
`cont.line`	Do you want the contour lines to appear? If yes, set this TRUE.

Details

The user can plot only the contour lines of a zero adjusted Dirichlet distribution with som given parameters, or can also add the relevant data should he/she wish to.

Value

A ternary diagram with the points and the zero adjusted Dirichlet contour lines.

Author(s)

Michail Tsagris.

R implementation and documentation: Michail Tsagris <mtsagris@uoc.gr>.

References

Tsagris M. and Stewart C. (2018). A Dirichlet regression model for compositional data with zeros. Lobachevskii Journal of Mathematics, 39(3): 398–412.

Preprint available from https://arxiv.org/pdf/1410.5011.pdf

See Also

`dzad`

Examples

```
y <- as.matrix(iris[, 1:3])
y <- y / rowSums(y)
y[sample(1:450, 15) ] <- 0
y <- y / rowSums(y)
mod <- zad.mle(y)

zad.contour( phi = mod$phi, mu = mod$mu )
```

`Density values of the zero adjusted Dirichlet distribution`
Density values of the zero adjusted Dirichlet distribution

Description

Density values of the zero adjusted Dirichlet distribution.

Usage

```
dzad(y, phi, mu, logged = TRUE)
```

Arguments

`y`	A matrix with compositional data with zero values.
`phi`	The concentration parameter.
`mu`	The mean vector.
`logged`	A boolean variable specifying whether the logarithm of the density values to be returned. It is set to TRUE by default.

Details

The density values of the zero adjusted Dirichlet distribution are computed.

Value

A vector with the density values.

Author(s)

Michail Tsagris.

R implementation and documentation: Michail Tsagris <mtsagris@uoc.gr>.

References

Tsagris M. and Stewart C. (2018). A Dirichlet regression model for compositional data with zeros. Lobachevskii Journal of Mathematics, 39(3): 398–412.

Preprint available from https://arxiv.org/pdf/1410.5011.pdf

See Also

`zad.mle`, `zadr`

Examples

```
y <- as.matrix(iris[, 1:3])
y <- y / rowSums(y)
y[sample(1:450, 15) ] <- 0
y <- y / rowSums(y)
mod <- zad.mle(y)
f <- dzad(y, mod$phi, mod$mu)
```

`MLE of the zero adjusted Dirichlet distribution`

MLE of the zero adjusted Dirichlet distribution

Description

MLE of the zero adjusted Dirichlet distribution.

Usage

```
zad.mle(y, tol = 1e-6, maxit = 100)
```

Arguments

`y`	A matrix with the compositional data.
`tol`	The tolerance value to terminate the Fisher scoring algorithm.
`maxit`	The maximum number of iterations allowed.

Details

A zero adjusted Dirichlet distribution is being fitted and its parameters are estimated. The estimation is performed in C++ via Fisher scoring for the mean vector (in its additive logistic parametrisation) and Newton-Raphson for the precision parameter, as in `zadr.irls`. Since there are no covariates, the computations are carried out per zero pattern rather than per observation.

Value

A list including:

`loglik`	The value of the log-likelihood.
`phi`	The precision parameter. If covariates are linked with it (function "diri.reg2"), this will be a vector.
`mu`	The mean vector of the distribution.
`patterns`	A matrix with the patterns of zeros, where the value of 0 indicates the presence of a zero, and the last column contains the percentage of occurrence each pattern. This is useful for the random values simulation.
`iters`	The number of iterations required by the algorithm.
`runtime`	The time required by the model.

Author(s)

Michail Tsagris.

R implementation and documentation: Michail Tsagris <mtsagris@uoc.gr>.

References

Tsagris M. and Stewart C. (2018). A Dirichlet regression model for compositional data with zeros. Lobachevskii Journal of Mathematics, 39(3): 398–412.

Preprint available from https://arxiv.org/pdf/1410.5011.pdf

See Also

zadr, zadr.irls, rzad

Examples

```
y <- as.matrix(iris[, 1:3])
y <- y / rowSums(y)
y[sample(1:450, 15) ] <- 0
y <- y / rowSums(y)
mod <- zad.mle(y)
```

Random values simulation from the zero adjusted Dirichlet distribution

Random values simulation from the zero adjusted Dirichlet distribution

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Description

Random values simulation from the zero adjusted Dirichlet distribution.

Usage

```
rzad(n, phi, mu, patterns)
```

Arguments

n	The number of compositional vectors to simulate.
phi	The concentration parameter.
mu	The mean vector.
patterns	A matrix with the patterns of zeros, where the value of 0 indicates the presence of a zero, and the last column contains the percentage of occurrence each pattern.

Details

Random values from the zero adjusted Dirichlet distribution are generated.

Value

A matrix with values generated from the zero adjusted Dirichlet distribution.

Author(s)

Michail Tsagris.

R implementation and documentation: Michail Tsagris <mtsagris@uoc.gr>.

References

Tsagris M. and Stewart C. (2018). A Dirichlet regression model for compositional data with zeros. Lobachevskii Journal of Mathematics, 39(3): 398–412.

Preprint available from https://arxiv.org/pdf/1410.5011.pdf

See Also

zad.mle, zadr

Examples

```
y <- as.matrix(iris[, 1:3])
y <- y / rowSums(y)
y[sample(1:450, 15) ] <- 0
y <- y / rowSums(y)
mod <- zad.mle(y)
phi <- mod$phi
mu <- mod$mu
patterns <- mod$patterns
x <- rzad(100, phi, mu, patterns)
```

Zero adjusted Dirichlet regression

Zero adjusted Dirichlet regression

Description

Zero adjusted Dirichlet regression.

Usage

```
zadr(y, x, con = TRUE, xnew = NULL)
zadr2(y, x, con = TRUE, xnew = NULL)
zadr.irls(y, x, xnew = NULL, tol = 1e-6, maxit = 100)
```

Arguments

y	A matrix with the compositional data (dependent variable). The number of observations (vectors) with no zero values should be more than the columns of the predictor variables. Otherwise, the initial values will not be calculated.
x	The predictor variable(s), they can be either continnuous or categorical or both.
con	If this is TRUE (default) then the constant term is estimated, otherwise the model includes no constant term.
xnew	If you have new data use it, otherwise leave it NULL.
tol	The tolerance value to terminate the IRLS algorithm.
maxit	The maximum number of iterations allowed in the IRLS algortihm.

Details

A zero adjusted Dirichlet regression is being fitted. The likelihood conists of two components. The contributions of the non zero compositional values and the contributions of the compositional vectors with at least one zero value. The second component may have many different sub-categories, one for each pattern of zeros. The function "zadr2()" links the covariates to the alpha parameters of the Dirichlet distribution, i.e. it uses the classical parametrization of the distribution. This means, that there is a set of regression parameters for each component. The zadr.irls() function implements the IRLS algorithm.

Value

A list including:

runtime	The time required by the regression.
loglik	The value of the log-likelihood.
iters	The iterations required by the IRLS algorithm.
phi	The precision parameter, ϕ.
be	The beta coefficients.
seb	The standard error of the beta coefficients.
sigma	Th covariance matrix of the regression parameters (for the mean vector and the ϕ parameter).
est	The fitted or the predicted values (if xnew is not NULL).

Author(s)

Michail Tsagris and Christos Adam.

R implementation and documentation: Michail Tsagris <mtsagris@uoc.gr> and Christos Adam <pada4m4@gmail.com>.

References

Tsagris M. and Stewart C. (2018). A Dirichlet regression model for compositional data with zeros. Lobachevskii Journal of Mathematics,39(3): 398–412.

Preprint available from https://arxiv.org/pdf/1410.5011.pdf

See Also

zad.mle

Examples

```
x <- as.vector(iris[, 4])
y <- as.matrix(iris[, 1:3])
y <- y / rowSums(y)
y[sample(1:450, 15) ] <- 0
y <- y / rowSums(y)
mod2 <- zadr(y, x)
```

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