

Package ‘CompositionalZADR’

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Type Package

Title Compositional Data Analysis with the Zero Adjusted Dirichlet Distribution

Version 1.0

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Depends R (>= 4.0)

Imports Compositional, graphics, grDevices, Rfast, stats

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>.

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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: 1.0
 Date: 2026-08-20

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^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

<code>phi</code>	A value with the concentration parameter.
<code>mu</code>	A vector with the mean vector (3 values) in the simplex.
<code>n</code>	The number of grid points to consider over which the density is calculated.
<code>y</code>	This is either NULL (no data) or contains a 3 column matrix with compositional data.
<code>cont.line</code>	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 some 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)
```

Arguments

y A matrix with the compositional data.

Details

A zero adjusted Dirichlet distribution is being fitted and its parameters are estimated.

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.
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](#)

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

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 continuous or categorical or both.

<code>con</code>	If this is TRUE (default) then the constant term is estimated, otherwise the model includes no constant term.
<code>xnew</code>	If you have new data use it, otherwise leave it NULL.
<code>tol</code>	The tolerance value to terminate the IRLS algorithm.
<code>maxit</code>	The maximum number of iterations allowed in the IRLS algorithm.

Details

A zero adjusted Dirichlet regression is being fitted. The likelihood consists 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:

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

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](#)

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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