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Title The alpha-Spatial Median Regression for Compositional Data
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Description The alpha-spatial median regression is performed via the iteratively reweighted least squares algorithm. At first the alpha-transformation of Tsagris, Preston and Wood (2011) <doi:10.48550/arXiv.1106.1451> is applied and then the non-linear regression model is fitted.
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Compositionalasmr-package

The alpha-Spatial Median Regression for Compositional Data

Description

The *alpha*-spatial median regression is performed via the iteratively reweighted least squares (IRLS) algorithm. At first the *alpha*-transformation is applied and then the non-linear regression model is fitted.

Details

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Version:	1.0
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Maintainers

Michail Tsagris <mtsagris@uoc.gr>.

Author(s)

Michail Tsagris <mtsagris@uoc.gr>

References

Aitchison J. (1986). The statistical analysis of compositional data.

asmr

Spatial median regression with compositional data using the α -transformation

Description

Spatial median regression with compositional data using the α -transformation.

Usage

```
asmr(y, x, a, yb = NULL, xnew = NULL, maxit = 100, tol = 1e-06 )
asmr2(y, x, a = c(-1, 1), xnew = NULL, maxit = 500, tol = 1e-6)
```

Arguments

y	A matrix with the compositional data.
x	A matrix with the continuous predictor variables or a data frame including categorical predictor variables.
a	The value of the power transformation, it has to be between -1 and 1. If zero values are present it has to be greater than 0. If $\alpha = 0$ the isometric log-ratio transformation is applied and the solution exists in a closed form, since it the classical multivariate regression. For the asmr2() this is a vector with the lower and upper value of α to search for.
yb	If you have already transformed the data using the α -transformation with the same α as given in the argument "a", put it here. Otherwise leave it NULL.
xnew	If you have new data use it, otherwise leave it NULL.
maxit	The maximum number of iterations the IRLS algorithm will perform.
tol	The tolerance value to terminate the IRLS algorithm.

Details

The α -transformation is applied to the compositional data first and then non-linear spatial median regression using the iteratively reweighted least squares (IRLS) algorithm is performed.

Value

A list including:

runtime	The time required by the regression.
iters	The number of iterations required until convergence.
norm	The value of the L_1 norm.
be	The beta coefficients.
est	The fitted values for xnew if xnew is not NULL.

The asmr2() function also returns an extra outcome, the "alpha", which is the optimal value of α .

Author(s)

Michail Tsagris.

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

References

- Tsagris M. and Pantazis Y. (2026). The α -regression for compositional data: a unified framework for standard, temporal and spatial regression models including compositional predictors. <https://arxiv.org/pdf/2510.12663>
- Tsagris M. (2015). Regression analysis with compositional data containing zero values. Chilean Journal of Statistics, 6(2): 47-57. <https://arxiv.org/pdf/1508.01913v1.pdf>

Tsagris M.T., Preston S. and Wood A.T.A. (2011). A data-based power transformation for compositional data. In Proceedings of the 4th Compositional Data Analysis Workshop, Girona, Spain. <https://arxiv.org/pdf/1106.1451.pdf>

Mardia K.V., Kent J.T., and Bibby J.M. (1979). Multivariate analysis. Academic press.

Aitchison J. (1986). The statistical analysis of compositional data. Chapman & Hall.

See Also

[cv.asmr](#), [asmr.path](#)

Examples

```
y <- as.matrix(iris[, 1:3])
y <- y / rowSums(y)
x <- iris[, 4]
mod <- asmr(y, x, 0.2)
```

asmr.path

Regression with compositional data using the α -transformation

Description

Regression with compositional data using the α -transformation.

Usage

```
asmr.path(y, x, a = seq(-1, 1, by = 0.1), xnew = NULL, maxit = 100,
tol = 1e-6, ncores = 1)
```

Arguments

y	A matrix with the compositional data.
x	A matrix with the continuous predictor variables or a data frame including categorical predictor variables.
a	A vector with the α values of the power transformation, it has to be between -1 and 1.
xnew	If you have new data use it, otherwise leave it NULL.
maxit	The maximum number of iterations the IRLS algorithm will perform.
tol	The tolerance value to terminate the IRLS algorithm.
ncores	The number of cores to use for parallel computations.

Details

The α -transformation is applied to the compositional data first and then non-linear spatial median regression using the iteratively reweighted least squares (IRLS) algorithm is performed. This takes place for each value of α .

Value

For the `alfa.reg()` function a list including:

<code>runtime</code>	The time required by the regression.
<code>res</code>	A list with two components: "be", the estimated regression coefficients, and "est", the fitted values, both for each value of α .
<code>covbe</code>	The covariance matrix if <code>covb</code> was set to TRUE, otherwise NULL.

Author(s)

Michail Tsagris.

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

References

Tsagris M. and Pantazis Y. (2026). The α -regression for compositional data: a unified framework for standard, temporal and spatial regression models including compositional predictors. <https://arxiv.org/pdf/2510.12663>

Tsagris M. (2015). Regression analysis with compositional data containing zero values. Chilean Journal of Statistics, 6(2): 47-57. <https://arxiv.org/pdf/1508.01913v1.pdf>

Tsagris M.T., Preston S. and Wood A.T.A. (2011). A data-based power transformation for compositional data. In Proceedings of the 4th Compositional Data Analysis Workshop, Girona, Spain. <https://arxiv.org/pdf/1106.1451.pdf>

Mardia K.V., Kent J.T., and Bibby J.M. (1979). Multivariate analysis. Academic press.

Aitchison J. (1986). The statistical analysis of compositional data. Chapman & Hall.

See Also

[asmr](#), [cv.asmr](#)

Examples

```
y <- as.matrix(iris[, 1:3])
y <- y / rowSums(y)
x <- iris[, 4]
mod <- asmr.path(y, x, a = c(0.1, 0.2))
```

cv.asmr

K-fold cross-validation for the α -smr

Description

K-fold cross-validation for the α -smr.

Usage

```
cv.asmr(y, x, a = seq(0.1, 1, by = 0.1), maxit = 500, tol = 1e-6,
        nfolds = 10, folds = NULL, ncores = 1, seed = NULL)
```

Arguments

y	A matrix with compositional data. zero values are allowed.
x	A matrix with the continuous predictor variables or a data frame including categorical predictor variables.
a	The value of the power transformation, it has to be between -1 and 1. If zero values are present it has to be greater than 0. If $\alpha = 0$ the isometric log-ratio transformation is applied.
maxit	The maximum number of iterations the IRLS algorithm will perform.
tol	The tolerance value to terminate the IRLS algorithm.
nfolds	The number of folds to split the data.
folds	If you have the list with the folds supply it here. You can also leave it NULL and it will create folds.
ncores	The number of cores to use. IF you have a multicore computer it is advisable to use more than 1. It makes the procedure faster. It is advisable to use it if you have many observations and or many variables, otherwise it will slow down the process.
seed	You can specify your own seed number here or leave it NULL.

Details

Tuning the value of α in the α -smr takes place using K-fold cross-validation.

Value

A list including:

runtime	The runtime required by the cross-validation.
perf	A vector with the average Kullback-Leibler divergence, for every value of α .
opt	A vector with the minimum Kullback-Leibler divergence and the optimal value of α .

Author(s)

Michail Tsagris.

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

References

Tsagris M. and Pantazis Y. (2026). The α -regression for compositional data: a unified framework for standard, temporal and spatial regression models including compositional predictors. <https://arxiv.org/pdf/2510.12663>

Tsagris M. (2015). Regression analysis with compositional data containing zero values. Chilean Journal of Statistics, 6(2): 47-57. <https://arxiv.org/pdf/1508.01913v1.pdf>

Tsagris M.T., Preston S. and Wood A.T.A. (2011). A data-based power transformation for compositional data. In Proceedings of the 4th Compositional Data Analysis Workshop, Girona, Spain. <https://arxiv.org/pdf/1106.1451.pdf>

See Also

[asmr](#), [asmr.path](#)

Examples

```
y <- as.matrix(iris[, 1:3])
y <- y / rowSums(y)
x <- iris[, 4]
mod <- cv.asmr(y, x, a = c(0.5, 1))
```

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