Package ‘CONSTANd’

May 17, 2024

Type Package
Title Data normalization by matrix raking
Version 1.12.0
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Description Normalizes a data matrix `data` by raking (using the RAS method by Bacharach, see references) the Nrows by Ncols matrix such that the row means and column means equal 1. The result is a normalized data matrix `K=RAS`, a product of row multipliers `R` and column multipliers `S` with the original matrix `A`. Missing information needs to be presented as `NA` values and not as zero values, because CONSTANd is able to ignore missing values when calculating the mean. Using CONSTANd normalization allows for the direct comparison of values between samples within the same and even across different CONSTANd-normalized data matrices.

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Encoding UTF-8
LazyData true
biocViews MassSpectrometry, Cheminformatics, Normalization, Preprocessing, DifferentialExpression, Genetics, Transcriptomics, Proteomics
NeedsCompilation no
Depends R (>= 4.1)
Suggests BiocStyle, knitr, rmarkdown, tidyr, ggplot2, gridExtra, magick, Cairo, limma

BugReports https://github.com/PDiracDelta/CONSTANd/issues
URL qcquan.net/constand
VignetteBuilder knitr
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Data normalization by matrix raking

Description

Normalizes the data matrix by raking the Nrows by Ncols matrix such that the row means and column means equal Ncols and Nrows, respectively.

Usage

CONSTANd(data, precision=1e-5, maxIterations=50, target=1)

Arguments

data Nrows by Ncols matrix.
precision Combined allowed deviation (residual error) of col and row means from target value.
maxIterations Maximum amount of iterations (1x row and 1x col per iteration).
target The mean value of quantifications in each row and column after normalization.

Details

Normalizes the data matrix <data> by raking (using the RAS method by Bacharach, see references) the Nrows by Ncols matrix such that the row means and column means equal 1. The result is a normalized data matrix K=RAS, a product of row multipliers R and column multipliers S with the original matrix A. Missing information needs to be presented as nan values and not as zero values, because CONSTANd is able to ignore nan-values when calculating the mean. The variable <maxIterations> is an integer value that denotes the number of raking cycles. The variable <precision> defines the stopping criteria based on the L1-norm as defined by Friedrich Pukelsheim, Bruno Simeone in "On the Iterative Proportional Fitting Procedure: Structure of Accumulation Points and L1-Error Analysis".
**Value**

- `normalized_data`
  Normalized data matrix ‘K=RAS’ in the RAS-formulation of the problem.
- `convergence_trail`
  Precision acquired after each raking iteration (last value is the final precision).
- `R`
  Row multipliers in the ‘K=RAS’ formulation of the problem.
- `S`
  Column multipliers in the ‘K=RAS’ formulation of the problem.

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**References**


**Examples**

```r
# generic use (mock data)
data_matrix <- matrix(runif(20), c(5,4))
normalized_matrix <- CONSTANd(data_matrix)$normalized_data

# customize parameters
result <- CONSTANd(data_matrix, precision=1e-3, maxIterations=30)

# explore parts of the result object
normalized_matrix <- result$normalized_data
num_iterations_performed <- length(result$convergence_trail)
attempted_precision <- result$convergence_trail[num_iterations_performed]
```
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