

Package: coRanking (via r-universe)

October 3, 2026

Title Co-Ranking Matrix

Version 0.2.5

Description Calculates the co-ranking matrix to assess the quality of a dimensionality reduction.

URL <https://coranking.guido-kraemer.com/>

BugReports <https://github.com/gdkrmr/coRanking/issues>

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Encoding UTF-8

Imports methods, graphics, stats

RoxygenNote 7.3.2

Collate 'coranking-package.R' 'coranking.R' 'coranking_internals.R'
'lcmc.R' 'criteria.R' 'image.R' 'rankmatrix.R' 'submatrix.R'
'r_nx.R'

Suggests testthat, knitr, rmarkdown, Rtsne, scatterplot3d

VignetteBuilder knitr

Repository <https://gdkrmr.r-universe.dev>

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coRanking-package	<i>Methods for the co-ranking matrix</i>
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Description

coRanking provides methods for the calculation of the co-ranking matrix and derived measures to assess the quality of a dimensionality reduction

Details

This package provides functions for calculating the co-ranking matrix, plotting functions and some derived measures for quality assessment of dimensionality reductions.

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Author(s)

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References

Chen, L., Buja, A., 2006. Local Multidimensional Scaling for Nonlinear Dimension Reduction, Graph Layout and Proximity Analysis.

Lee, J.A., Lee, J.A., Verleysen, M., 2009. Quality assessment of dimensionality reduction: Rank-based criteria. Neurocomputing 72.

Lueks, W., Mokbel, B., Biehl, M., & Hammer, B. (2011). How to Evaluate Dimensionality Reduction? - Improving the Co-ranking Matrix. ArXiv:1110.3917 [Cs]. <http://arxiv.org/abs/1110.3917>

Lee, J. A., Peluffo-Ordóñez, D. H., & Verleysen, M., 2015. Multi-scale similarities in stochastic neighbour embedding: Reducing dimensionality while preserving both local and global structure. Neurocomputing, 169, 246–261. <https://doi.org/10.1016/j.neucom.2014.12.095>

See Also

Useful links:

- <https://coranking.guido-kraemer.com/>
- Report bugs at <https://github.com/gdkrmr/coRanking/issues>

AUC _{ln_K}	<i>Area under the R_{NX} curve</i>
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Description

Area under the $R_{NX}(K)$ curve when K is put on a logarithmic scale.

Usage

AUC_{ln_K}(R_{NX})

Arguments

R_{NX} The R_{NX} curve, a vector of values

Details

It is calculated as:

$$AUC_{\ln K}(R_{NX}(K)) = \left(\sum_{K=1}^{N-2} R_{NX}(K)/K \right) / \left(\sum_{K=1}^{N-2} 1/K \right)$$

Value

A value, the area under the curve.

Author(s)

Guido Kraemer

References

Lee, J. A., Peluffo-Ordóñez, D. H., & Verleysen, M., 2015. Multi-scale similarities in stochastic neighbour embedding: Reducing dimensionality while preserving both local and global structure. *Neurocomputing*, 169, 246–261. <https://doi.org/10.1016/j.neucom.2014.12.095>

`coranking`*Co-Ranking Matrix*

Description

Calculate the co-ranking matrix to assess the quality of a dimensionality reduction.

Usage

```
coranking(  
  Xi,  
  X,  
  input_Xi = c("data", "dist", "rank"),  
  input_X = input_Xi,  
  use = "C"  
)
```

Arguments

<code>Xi</code>	high dimensional data
<code>X</code>	low dimensional data
<code>input_Xi</code>	type of input of Xi (see. details)
<code>input_X</code>	type of input of X (see. details)
<code>use</code>	R or C backend

Details

Calculate the coranking matrix, to assess the quality of a dimensionality reduction. `Xi` is input in high dimensions, `X` is input in low dimensions the type of input is given in `input_Xi` and `input_X`, they can be one of `c('data', 'dist', 'rank')`.

Value

a matrix of class `'coranking'`

Author(s)

Guido Kraemer

See Also

[rankmatrix](#)

imageplot

Image function for the co-ranking matrix

Description

Plots the co-ranking matrix nicely

Usage

```
imageplot(
  Q,
  lwd = 2,
  bty = "n",
  main = "co-ranking matrix",
  xlab = expression(R),
  ylab = expression(Ro),
  col = colorRampPalette(colors = c("gray85", "red", "yellow", "green", "blue"))(100),
  axes = FALSE,
  legend = TRUE,
  ...
)
```

Arguments

Q	of class coranking.
lwd	linewidth in legend
bty	boxtype of legend
main	title of plot
xlab	label of the x axis
ylab	label of the y axis
col	a palette for coloring
axes	logical draw axes
legend	if T plot a legend.
...	parameters for the image function.

Details

Plots the co-ranking matrix nicely for visual inspection. uses the `image` function internally, ... is passed down to the `image` function. The values in the co-ranking matrix are logscaled for better contrast.

Author(s)

Guido Kramer

LCMC

*The local continuity meta-criterion***Description**

Calculate the local continuity meta-criterion from a co-ranking matrix.

Usage

```
LCMC(Q, K = 1:nrow(Q))
```

Arguments

Q a co-ranking matrix
K vector of integers describing neighborhood size

Details

The local continuity meta-criterion (Chen and Buja, 2006) is defined as

$$LCMC = \frac{K}{1-N} + \frac{1}{NK} \sum_{(k,l) \in UL_K} q_{kl}$$

Higher values mean a better performance of the dimensionality reduction.

Value

A number, the local continuity meta-criterion

Author(s)

Guido Kraemer

plot_R_NX

*Plot the $R_{NX}(K)$ curve***Description**

Produces a plot with the $R_{NX}(K)$ curves from the arguments

Usage

```
plot_R_NX(R_NXs, pal = grDevices::palette(), ylim = c(0, 0.9), ...)
```

Arguments

R_NXs	A list of R_NX curves, names from the list will appear in the legend
pal	a vector of colors
ylim	set the y-axis limits of the plot
...	options for the plotting function

Value

Nothing, produces a plot.

Author(s)

Guido Kraemer

References

Lee, J. A., Peluffo-Ordóñez, D. H., & Verleysen, M., 2015. Multi-scale similarities in stochastic neighbour embedding: Reducing dimensionality while preserving both local and global structure. *Neurocomputing*, 169, 246–261. <https://doi.org/10.1016/j.neucom.2014.12.095>

Q_NX	<i>The $Q_{NX}(K)$ criterion</i>
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Description

A curve indicating the percentage of points that are mild in- and extrusions or keep their rank.

Usage

Q_NX(Q)

Arguments

Q	a co-ranking matrix
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Details

$$Q_{NX}(K) = \frac{1}{KN} \sum_{k=1}^K \sum_{l=1}^K Q_{kl}$$

Value

A vector with the values for Q_NX(K)

Author(s)

Guido Kraemer

References

Lueks, W., Mokbel, B., Biehl, M., & Hammer, B. (2011). How to Evaluate Dimensionality Reduction? - Improving the Co-ranking Matrix. ArXiv:1110.3917 [Cs]. <http://arxiv.org/abs/1110.3917>

R_NX

The $R_{NX}(K)$ criterion

Description

A curve indicating the improvement of the embedding over a random embedding for the neighborhood size K . Values range from 0, for a random embedding, to 1 for a perfect embedding.

Usage

$R_{NX}(Q)$

Arguments

Q a co-ranking matrix

Details

$R_{NX}(K)$ is calculated as follows:

$$Q_{NX}(K) = \sum_{1 \leq k \leq K} \sum_{1 \leq l \leq K} \frac{q_{kl}}{KN}$$

Counts the upper left K -by- K block of Q , i.e. it considers the preserved ranks on the diagonal and the permutations within a neighborhood.

$$R_{NX}(K) = \frac{(N-1)Q_{NX}(K) - K}{N-1-K}$$

A resulting value of 0 corresponds to a random embedding, a value of 1 to a perfect embedding of the K -ary neighborhood.

Value

A vector with the values for $R_{NX}(K)$

Author(s)

Guido Kraemer

References

- Lee, J.A., Lee, J.A., Verleysen, M., 2009. Quality assessment of dimensionality reduction: Rank-based criteria. *Neurocomputing* 72.
- Lee, J. A., Peluffo-Ordóñez, D. H., & Verleysen, M., 2015. Multi-scale similarities in stochastic neighbour embedding: Reducing dimensionality while preserving both local and global structure. *Neurocomputing*, 169, 246–261. <https://doi.org/10.1016/j.neucom.2014.12.095>

rankmatrix

Rank matrix

Description

Replaces the elements of X with their rank in the column vector of the distance matrix

Usage

```
rankmatrix(X, input = c("data", "dist"), use = "C")
```

Arguments

<code>X</code>	data, dist object, or distance matrix
<code>input</code>	type of input
<code>use</code>	if 'C' uses the compiled library, else uses the native R code

Details

Each column vector in the distance matrix (or the distance matrix computed from the input) is replaced by a vector indicating the rank of the distance inside that vector.

This is a computation step necessary for the co-ranking matrix and provided mainly so that the user has the possibility to save computation time.

Value

returns a matrix of class 'rankmatrix'

Author(s)

Guido Kraemer

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