Package 'dualScale'

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Title Dual Scaling Analysis of Data

Version 1.0.0

Description Dual Scaling, developed by Professor Shizuhiko Nishisato (1994, ISBN: 0-9691785-3-6), is a fundamental technique in multivariate analysis used for data scaling and correspondence analysis. Its utility lies in its ability to represent multidimensional data in a lower-dimensional space, making it easier to visualize and understand underlying patterns in complex data. This technique has been implemented to handle various types of data, including Contingency and Frequency data (CF), Multiple-Choice data (MC), Sorting data (SO), Paired-Comparison data (PC), and Rank-Order data (RO), providing users with a powerful tool to explore relationships between variables and observations in various fields, from sociology to ecology, enabling deeper and more efficient analysis of multivariate datasets.

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Encoding UTF-8

RoxygenNote 7.2.3

Depends R (>= 3.5.0)

LazyData true

Imports eba, ff, ggplot2, ggrepel, grid, Matrix, matrixcalc, stats, RColorBrewer, glue, utils

Suggests testthat (>= 3.0.0), vdiffr

Config/testthat/edition 3

NeedsCompilation no

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Contents

`bad_coded` *Nishisato and Clavel, artificial set of data*

Description

10 observation and 3 variables erroneously coded.

Usage

```
bad_coded
```

Format

A data set with 10 observations on the following 3 variables:

`V2` Option 1 is omited

`V3` Options go from 1 to 8

`V4` Option 1 omited, other are not consecutive and there is NA

Details

The data were collected from 23 participants at a workshop in Singapore in 1985

Source

Nishisato, S. and Baba, Y. (1999). On contingency, projection and forced classification of dual scaling. *Behaviormetrika*, 26, 207–219.

References

Nishisato, S. (2007). *Multidimensional Nonlinear Descriptive Analysis*. Chapman & Hall/CRC.

`christmas` *Christmas party plans*

Description

As a course assignment for Nishisato's class, Ian Wiggins, a student, collected paired comparison data from 14 researchers at a research institute on his eight Christmas party plans.

Usage

```
christmas
```

Format

A subset of the original data set of 14 subjects on 15 pairs of 6 plans:

`plan1` A pub/restaurant crawl after work

`plan2` A reasonably priced lunch in an area restaurant

`plan3` Keep to one's self

`plan4` An evening banquet at a restaurant

`plan5` A pot-luck at someone's home after work

`plan6` A ritzy lunch at a good restaurant (tablecloths)

Details

The data were originally collected from 14 participants by 28 pairs of plans with elements 1 for the choice of the first plan and 2 for the choice of the second plan. For computations, `2` is converted to `-1`.

Source

Nishisato, S. and Nishisato, I.(1994). *Dual Scaling in a Nutshell*. Toronto: MicroStats.

References

Nishisato, S. (2022). Optimal Quantification and Symmetry. *Behaviormetrika*, 12, 137.

curricula *Curricula and Social classes*

Description

Hollingshead (1949) found that the members of a small Middle Western community in the United States divided themselves into 5 social classes. He investigated his prediction that adolescents in the different social classes would enroll in different curricula

Usage

```
curricula
```

Format

A data set of 390 subjects on 5 social classes and 3 different curricula:

`s.class1` Merged social classes I and II because the frequencies were small

`s.class2` Social class III

`s.class3` Social class IV

`s.class4` Social class V

`curricula1` College Prep curriculum

`curricula2` General curriculum

`curricula3` Commercial curriculum

Details

The data were originally collected from 390 participants in terms of their social classes and actual curriculum enrollments.

Source

Nishisato, S. and Nishisato, I.(1994). *Dual Scaling in a Nutshell*. Toronto: MicroStats.

References

Hollingshead, A.B. (1949). Elmtown's Youth: The Impact of Social Classes on Adolescents. *Wiley*.

ds_cf *Contingency and frequency data analysis*

Description

Contingency and frequency data analysis

Usage

```
ds_cf(input, solutions = NULL)
```

Arguments

input	A data set with valid data
solutions	Optional arguments. A number of intended solutions

Value

call	Call with all of the specified arguments are specified by their full names
orig_data	Initial data
item_op_lbl	Item options labels
sub_lbl	Subjects options labels
tot_row	Sum of subject values
tot_row	Sum of item values
solutions	Maximum possible solutions
out	Results obtained
norm_opt	Normed option weights
proj_opt	Projected option weights
norm_sub	Normed subject scores
proj_sub	Projected subject scores
appro0	Order 0 approximation for initial data
approx	Order k approximation for each solution
residual0	Residual matrix for initial data
residual	Residual matrix k for each solution

Examples

```
ds_cf(curricula)
ds_cf(preferences)
```

ds_mc *Multiple choice data analysis*

Description

Multiple choice data analysis

Usage

```
ds_mc(input, solutions = NULL, mode = c("rad", "act"))
```

Arguments

input	A data set with valid data
solutions	Optional argument. A number of intended solutions
mode	Optional argument. In case of NA values, the action to be taken. See help("ds_mc_check") for more information. Radical action by default.

Value

call	Call with all of the specified arguments are specified by their full names
orig_data	Initial data
item_op_lbl	Item options labels
sub_lbl	Subjects options labels
solutions	Maximum possible solutions
out	Results obtained
item_stat	Item statistics
info	Distribution of component
rij	Inter item correlation
proj_opt	Projected option weights
proj_sub	Projected subject scores
norm_opt	Normed option weights
norm_sub	Normed subject scores

See Also

ds_mc_check()

Examples

```
ds_mc(singaporean)
ds_mc(singaporean, solutions = 2)
```

ds_mcf *Forced multiple choice data analysis*

Description

Forced multiple choice data analysis

Usage

```
ds_mcf(input, crit, solutions = NULL, mode = c("rad", "act"))
```

Arguments

input	A data set with valid data
crit	Used to determine a criterion item for forced classification analysis
solutions	Optional argument. A number of intended solutions
mode	Correction mode to incorrect data.

Details

There are three types of outputs: Forced classification of the criterion item (type A); dual scaling of non-criterion items by ignoring the criterion item (type B); dual scaling of non-criterion items after eliminating the influence of the criterion item (type C). These three types correspond to, respectively, dual scaling of data projected onto the subspace of the criterion item, dual scaling of non-criterion items, and dual scaling of data in the complementary space of the criterion item.

Value

call	Call with all of the specified arguments are specified by their full names
orig_data	Initial data
crit_item	The criterion item for forced classification
item_op_lbl	Item options labels
sub_lbl	Subjects options labels
solutions_mcf	Maximum possible solutions for forced multiple choice
solutions_mc	Maximum possible solutions for multiple choice
info_\emph{x}	Distribution of component information according to output
out_\emph{x}	Results obtained according to output
item_stat_\emph{x}	Item statistics according to output (Not type C)
rij_\emph{x}	Inter item correlation according to output (Not type C)
proj_opt_\emph{x}	Projected option weights according to output

proj_sub_\emph{x}
: Projected subject scores according to output

norm_opt_\emph{x}
: Normed option weights according to output

norm_sub_\emph{x}
: Normed subject scores according to output

match_missmatch
: Match-mismatch tables

predict
: Percentage of correct classification

comp_cont
: Component contamination

tot_cont
: Total contamination

See Also

ds_mc_check()

Examples

```
ds_mcf(singaporean, crit = 1)
```

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ds_mc_check *Function to identify incorrect Multiple Choice input data*

Description

Function to identify incorrect Multiple Choice input data

Usage

```
ds_mc_check(input, mode = c("rad", "act"))
```

Arguments

input
: The input data to be checked

mode
: Do you want to use a radical ("rad") correction mode or active ("act") allocations?

Value

A list with the original input and the converted input

Examples

```
ds_mc_check(singaporean)
ds_mc_check(bad_coded)
```

ds_pc *Paired comparison data analysis*

Description

Paired comparison data analysis

Usage

```
ds_pc(input, solutions = NULL)
```

Arguments

input	A data set with valid data
solutions	Optional argument. A number of intended solutions

Value

call	Call with all of the specified arguments are specified by their full names
orig_data	Initial data
item_op_lbl	Item options labels
sub_lbl	Subjects options labels
solutions	Maximum possible solutions
out	Results obtained
mat_e	Matrix E
norm_opt	Normed option weights
proj_opt	Projected option weights
norm_sub	Normed subject scores
proj_sub	Projected subject scores

Examples

```
ds_pc(christmas)
```

ds_ro *Rank order data analysis*

Description

Rank order data analysis

Usage

```
ds_ro(input, solutions = NULL)
```

Arguments

input	A data set with valid data
solutions	Optional argument. A number of intended solutions

Value

call	Call with all of the specified arguments are specified by their full names
orig_data	Initial data
item_op_lbl	Item options labels
sub_lbl	Subjects options labels
solutions	Maximum possible solutions
out	Results obtained
mat_e	Matrix E
norm_opt	Normed option weights
proj_opt	Projected option weights
norm_sub	Normed subject scores
proj_sub	Projected subject scores
out_rank	Results obtained by rank analysis
norm_opt_rank	Normed option weights by rank analysis
proj_opt_rank	Projected option weights by rank analysis
norm_rank	Normed rank scores
proj_rank	Projected rank scores

Examples

```
ds_ro(goverment)
```

goverment *Goverment services and facilities*

Description

A data set collected in Nishisato's scaling class (1982) in which 31 students on 10 municipal services in Toronto.

Usage

```
goverment
```

Format

A subset of the original data of 10 subjects on 10 municipal services in Toronto:

- A Public transit system
- B Postal service
- C Medical care, including hospitals and clinics
- D Sports, recreational facilities
- E Police protection
- F public libraries
- G cleaning streets
- H restaurants
- I theatres
- J Overall planning and development

Details

The data were originally collected to ranked the "most satisfactory" service, the "second most satisfactory", and so on until the "least satisfactory".

Source

Nishisato, S. and Nishisato, I.(1994). *Dual Scaling in a Nutshell*. Toronto: MicroStats.

References

Nishisato, S. and Nishisato, I.(1994). *Dual Scaling in a Nutshell*. Toronto: MicroStats.

`plot.dualScale` *Plot of Dual Scale analysis*

Description

Plot of Dual Scale analysis

Usage

```
## S3 method for class 'dualScale'
plot(x, dim1 = 1, dim2 = 2, type = c("Asy1", "Asy2", "Sub", "Ite"), ...)
```

Arguments

`x`	A Dual Scale object
`dim1`	Component for the horizontal axis. Default dimension 1
`dim2`	Component for the vertical axis. Default dimension 2
`type`	Graph type **Asy1** Assymetric graph for projected options versus normed subjects (default) **Asy2** Assymetric graph for normed options versus projected subjects **Sub** Only subjects graph **Ite** Only items graph
`...`	Arguments to be passed to methods

Value

A plot of the available information from the object

See Also

`plot()`,`ggplot2::ggplot2()`

Examples

```
plot(ds_cf(curricula))
plot(ds_mc(singaporean))
plot(ds_mcf(singaporean, crit = 1))
plot(ds_pc(christmas))
plot(ds_ro(goverment))
```

plot_data *Obtain the data used in the graphs*

Description

Obtain the data used in the graphs

Usage

```
plot_data(x, dim1 = 1, dim2 = 2, type = c("Asy1", "Asy2", "Sub", "Ite"), ...)
```

Arguments

x	A Dual Scale object
dim1	Component for the horizontal axis. Default dimension 1
dim2	Component for the vertical axis. Default dimension 2
type	Graph type **Asy1** Assymetric graph for projected options versus normed subjects (default) **Asy2** Assymetric graph for normed options versus projected subjects **Sub** Only subjects graph **Ite** Only items graph
...	Arguments to be passed to methods

Value

A dataframe with the data used

Examples

```
plot_data(ds_cf(curricula))
plot_data(ds_mc(singaporean))
plot_data(ds_mcf(singaporean, crit = 1))
plot_data(ds_pc(christmas))
plot_data(ds_ro(goverment))
```

preferences *Preferences, artificial set of data*

Description

Artificial set of data where 13 people were asked two questions.

Usage

```
preferences
```

Format

A data set of contingency responses:

`A, B, C` Do you prefer coffee to tea? (Yes, Not always, No)

`Y, N` Do you smoke? (Yes, No)

Details

Artificial set of data where 13 people were asked two questions.

Source

Nishisato, S. (1980). *Analysis of categorical data: Dual Scaling and its Applications*. University of Toronto: Heritage.

References

Nishisato, S. (1980). *Analysis of categorical data: Dual Scaling and its Applications*. University of Toronto: Heritage.

print.dualScale *Print of Dual Scale analysis*

Description

`print` method for package "dualScale"

Usage

```
## S3 method for class 'dualScale'
print(x, ...)
```

Arguments

x	An dualScale object for which a summary is desired
...	Arguments to be passed to methods

Value

A print of the available information from the object

See Also

print()

Examples

```
print(ds_cf(curricula))
print(ds_cf(preferences))
print(ds_mc(singaporean))
print(ds_mcf(singaporean, crit = 1))
print(ds_pc(christmas))
print(ds_ro(goverment))
```

---

singaporean *Singaporean children as viewed by adults*

Description

A short survey on childrem in Singapore.

Usage

```
singaporean
```

Format

A data set of 23 subjects on 4 multiple-choice questions:

- A How old are you? (1 = 20-29, 2 = 30-39, 3 = 40 or over)
- B Children today are not as disciplined as when I was a child (1 = agree, 2 = disagree, 3 = I cannot tell)
- C Children today are not as fortunate as when I was a child (1 = agree, 2 = disagree, 3 = I cannot tell)
- D Religions should be taught at school (1 = agree, 2 = disagree, 3 = Indifferent)

Details

The data were collected from 23 participants at a workshop in Singapore in 1985

Source

Nishisato, S. and Nishisato, I.(1994). *Dual Scaling in a Nutshell*. Toronto: MicroStats.

References

Nishisato, S. (2007). *Multidimensional Nonlinear Descriptive Analysis*. Chapman & Hall/CRC.

`summary.dualScale` *Summary of Dual Scale analysis*

Description

`summary` method for class "dualScale"

Usage

```
## S3 method for class 'dualScale'
summary(object, ...)
```

Arguments

`object`	An dualScale object for which a summary is desired
`...`	Arguments to be passed to methods

Value

A summary of the available information from the object

See Also

`summary()`

Examples

```
summary(ds_cf(curricula))
summary(ds_cf(preferences))
summary(ds_mc(singaporean))
summary(ds_mcf(singaporean, crit = 1))
summary(ds_pc(christmas))
summary(ds_ro(goverment))
```

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