Package 'ART'

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BugReports http://decsai.ugr.es/~pjvi

LazyData false

Title Aligned Rank Transform for Nonparametric Factorial Analysis

Type Package

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Description An implementation of the Aligned Rank Transform technique for
factorial analysis (see references below for details) including models with
missing terms (unsaturated factorial models). The function first
computes a separate aligned ranked response variable for each effect of the
user-specified model, and then runs a classic ANOVA on each of the aligned
ranked responses. For further details, see Higgins, J. J. and Tashtoush, S.
(1994). An aligned rank transform test for interaction. Nonlinear World 1
(2), pp. 201-211. Wobbrock, J.O., Findlater, L., Gergle, D. and
Higgins,J.J. (2011). The Aligned Rank Transform for nonparametric factorial
analyses using only ANOVA procedures. Proceedings of the ACM Conference on
Human Factors in Computing Systems (CHI '11). New York: ACM Press, pp.
143-146. <doi:10.1145/1978942.1978963>.

Imports stats, car

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Contents

aligned.rank.transform

Aligned Rank Transform procedure

Description

Aligned Rank Transform for Nonparametric Factorial Analysis

Usage

```
aligned.rank.transform(formula, data, perform.aov = TRUE, SS.type = c("III",
   "II", "I"), ...)
```

Arguments

formula	A formula indicating the model to be fitted.
data	A data frame containing the input data. The name of the columns should match the names used in the user-specified formula of the model that will be fitted.
perform.aov	Optional: whether separate ANOVAs should be run on the Ranked aligned responses or not. In case it should not, only the ranked aligned responses will be returned. Defaults to TRUE.
SS.type	A string indicating the type of sums of squares to be used in the ANOVA on the aligned responses. Must be one of "I", "II", "III". If perform.aov was set to FALSE, the value of SS.type will be ignored. Please note SS types coincide when the design is balanced (equal number of observations per cell) but differ otherwise. Refer to Shaw and Mitchell-Olds (1993) or Fox (1997) for further reading and recomentations on how to conduct ANOVA analyses with unbalanced designs.
...	Other arguments passed to [lm](#) when computing effect estimates via ordinary least squares for the alignment.

Details

The function computes a separate aligned response variable for each effect of an user-specified model, transform it into a ranking, and applies a separate ANOVA to every resulting ranked aligned response to check the significance of the corresponding effect.

Value

A tagged list with the following elements:

- $aligned: a data frame with the input data and additional columns to the right, containing the aligned and the ranked aligned responses for each model effect.
- $significance: (only when perform.aov = TRUE) the ANOVA table that collects every unique meaningful row of each of the separate ANOVA tables obtained from the ranked aligned responses.

Author(s)

Pablo J. Villacorta Iglesias

References

Higgins, J. J., Blair, R. C. and Tashtoush, S. (1990). The aligned rank transform procedure. Proceedings of the Conference on Applied Statistics in Agriculture. Manhattan, Kansas: Kansas State University, pp. 185-195.

Higgins, J. J. and Tashtoush, S. (1994). An aligned rank transform test for interaction. Nonlinear World 1 (2), pp. 201-211.

Mansouri, H. (1999). Aligned rank transform tests in linear models. Journal of Statistical Planning and Inference 79, pp. 141 - 155.

Wobbrock, J.O., Findlater, L., Gergle, D. and Higgins, J.J. (2011). The Aligned Rank Transform for nonparametric factorial analyses using only ANOVA procedures. Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI '11). New York: ACM Press, pp. 143-146.

Higgins, J.J. (2003). Introduction to Modern Nonparametric Statistics. Cengage Learning.

Shaw, R.G. and Mitchell-Olds, T. (1993). Anova for Unbalanced Data: An Overview. Ecology 74, 6, pp. 1638 - 1645.

Fox, J. (1997). Applied Regression Analysis, Linear Models, and Related Methods. SAGE Publications.

ARTool R package, for full models only. http://cran.r-project.org/package=ARTool

See Also

lm

Examples

```
# Input data contained in the Higgins1990-Table1.csv file distributed with ARTool
# The data were used in the 1990 paper cited in the References section
data(higgins1990, package = "ART");
# Two-factor full factorial model that will be fitted to the data
art.results = aligned.rank.transform(Response ~ Row * Column, data = data.higgins1990);
print(art.results$aligned, digits = 4);
print(art.results$significance);
```

---

higgins1990   *Dataset to be used in the ART use example*

Description

This dataset was synthetically generated for a 3x3 completely randomized design, as shown in Table 1 of the paper:

Higgins, J. J., Blair, R. C. and Tashtoush, S. (1990). The aligned rank transform procedure. Proceedings of the Conference on Applied Statistics in Agriculture. Manhattan, Kansas: Kansas State University, pp. 185-195.

Columns Aligned_Row_Column and Ranks_Row_Column of the result correspond to the values of Table 3 of the same paper.

Usage

```
higgins1990
```

Format

A table of 3 columns: two factors called Row and Column, and the Response variable. Loading this file gives access to the dataframe object `data.higgins1990`

Source

File Higgins1990-Table1.csv of the ARTool zipped downloadable file: http://depts.washington.edu/aimgroup/proj/art/ARToolExe.zip

References

Higgins, J. J., Blair, R. C. and Tashtoush, S. (1990). The aligned rank transform procedure. Proceedings of the Conference on Applied Statistics in Agriculture. Manhattan, Kansas: Kansas State University, pp. 185-195.

Wobbrock, J.O., Findlater, L., Gergle, D. and Higgins, J.J. (2011). The Aligned Rank Transform for nonparametric factorial analyses using only ANOVA procedures. Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI '11). New York: ACM Press, pp. 143-146.

ARTool: free visual software tool implementing ART, written in the C# language : http://depts.washington.edu/aimgroup/proj/art/

Index