Package ‘psychotree’

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Description  Recursive partitioning based on psychometric models, employing the general MOB algorithm (from package partykit) to obtain Bradley-Terry trees, Rasch trees, rating scale and partial credit trees, and MPT trees.

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btree  Bradley-Terry Trees

Description

Recursive partitioning (also known as trees) based on Bradley-Terry models.

Usage

btree(formula, data, na.action, cluster,
      type = "loglin", ref = NULL, undecided = NULL, position = NULL, ...)

## S3 method for class 'btree'
predict(object, newdata = NULL,
         type = c("worth", "rank", "best", "node"), ...)

Arguments

formula  A symbolic description of the model to be fit. This should be of type \( y \sim x_1 + x_2 \)
          where \( y \) should be an object of class paircomp and \( x_1 \) and \( x_2 \) are used as partitioning variables.

data  an optional data frame containing the variables in the model.

na.action  A function which indicates what should happen when the data contain \( \text{NA} \)s, defaulting to na.pass.

cluster  optional vector (typically numeric or factor) with a cluster ID to be employed for clustered covariances in the parameter stability tests.

type  character indicating the type of auxiliary model in btree and the type of predictions in the predict method, respectively. For the auxiliary model see btmodel. For the predict method, four options are available: the fitted "worth" parameter for each alternative, the corresponding "rank", the "best" alternative or the predicted "node" number.

ref, undecided, position  arguments for the Bradley-Terry model passed on to btmodel.

...  arguments passed to mob_control.

object  fitted model object of class "btree".

newdata  optionally, a data frame in which to look for variables with which to predict. If omitted, the original observations are used.
Details

Bradley-Terry trees are an application of model-based recursive partitioning (implemented in \texttt{mob}) to Bradley-Terry models for paired comparison data (implemented in \texttt{btmodel}). Details about the underlying theory and further explanations of the illustrations in the example section can be found in Strobl, Wickelmaier, Zeileis (2011).

Various methods are provided for "\texttt{bttree}" objects, most of them inherit their behavior from "\texttt{mob}" objects (e.g., \texttt{print}, \texttt{summary}, etc.). \texttt{itempar} behaves analogously to \texttt{coef} and extracts the worth/item parameters from the BT models in the nodes of the tree. The \texttt{plot} method employs the \texttt{node_btplot} panel-generating function.

Value

An object of S3 class "\texttt{bttree}" inheriting from class "\texttt{modparty}".

References


See Also

\texttt{mob}, \texttt{btmodel}

Examples

```r
o <- options(digits = 4)

## Germany's Next Topmodel 2007 data
data("Topmodel2007", package = "psychotree")

## BT tree
tm_tree <- bttree(preference ~ ., data = Topmodel2007, minsize = 5, ref = "Barbara")
plot(tm_tree, abbreviate = 1, yscale = c(0, 0.5))

## parameter instability tests in root node
library("strucchange")
sctest(tm_tree, node = 1)

## worth/item parameters in terminal nodes
itempar(tm_tree)

## CEMS university choice data
data("CEMSChoice", package = "psychotree")
summary(CEMSChoice$preference)

## BT tree
cems_tree <- bttree(preference ~ french + spanish + italian + study + work + gender + intdegree,
data = CEMSChoice, minsize = 5, ref = "London")
plot(cems_tree, abbreviate = 1, yscale = c(0, 0.5))
itempar(cems_tree)
```
options(digits = 0$digits)

CEMSChoice

CEMS University Choice Data

Description

Preferences of 303 students from WU Wien for different CEMS universities.

Usage

data("CEMSChoice")

Format

A data frame containing 303 observations on 10 variables.

- **study**: Factor coding main discipline of study: commerce, or other (economics, business administration, business education).
- **english**: Factor coding knowledge of English (good, poor).
- **french**: Factor coding knowledge of French (good, poor).
- **spanish**: Factor coding knowledge of Spanish (good, poor).
- **italian**: Factor coding knowledge of Italian (good, poor).
- **work**: Factor. Was the student working full-time while studying?
- **gender**: Factor coding gender.
- **intdegree**: Factor. Does the student intend to take an international degree?
- **preference1998**: Paired comparison of class `paircomp`. This is like `preference` but the comparisons between Barcelona an Stockholm are (erroneously) reversed, see below.

Details

Students at Wirtschaftsuniversität Wien (http://www.wu.ac.at/) can study abroad visiting one of currently 17 CEMS universities (Community of European Management Schools and International Companies). Dittrich et al. (1998) conduct and analyze a survey of 303 students to examine the student’s preferences for 6 universities: London School of Economics, HEC Paris, Università Commerciale Luigi Bocconi (Milano), Universität St. Gallen, ESADE (Barcelona), Handelshögskolan i Stockholm. To identify reasons for the preferences, several subject covariates (including foreign language competence, gender, etc.) have been assessed. Furthermore, several object covariates are attached to `preference` (and `preference1998`): the universities’ field of specialization (economics, management science, finance) and location (Latin country, or other).

The correct data are available in the online complements to Dittrich et al. (1998). However, the accompanying analysis was based on an erroneous version of the data in which the choices for the
last comparison pair (Barcelona : Stockholm) were accidentally reversed. See the corrigendum in Dittrich et al. (2001) for further details. The variable `preference` provides the correct data and can thus be used to replicate the analysis from the corrigendum (Dittrich et al. 2001). For convenience, the erroneous version is provided in `preference1998` which can therefore be used to replicate the (incorrect) original analysis (Dittrich et al. 1998).

**Source**

The Royal Statistical Society Datasets Website.

**References**


**See Also**

`paircomp`

**Examples**

```r
data("CEMSChoice", package = "psychotree")
summary(CEMSChoice$preference)
covariates(CEMSChoice$preference)
```

---

**DIFSIm**

*Artificial Data with Differential Item Functioning*

**Description**

Artificial data simulated from a Rasch model and a partial credit model, respectively, where the items exhibit differential item functioning (DIF).

**Usage**

```r
data(DIFSIm)
data(DIFSImPC)
```
Format

Two data frames containing 200 and 500 observations, respectively, on 4 variables.

- **resp** an itemresp matrix with binary or polytomous results for 20 or 8 items, respectively.
- **age** age in years.
- **gender** factor indicating gender.
- **motivation** ordered factor indicating motivation level.

Details

The data are employed for illustrations in Strobl et al. (2015) and Komboz et al. (2018). See the manual pages for raschtree and pctree for fitting the tree models.

References


See Also

- raschtree, pctree

Examples

```r
# data
data("DIFSim", package = "psychotree")
data("DIFSimPC", package = "psychotree")

# summary of covariates
summary(DIFSim[, -1])
summary(DIFSimPC[, -1])

# empirical frequencies of responses
plot(DIFSim$resp)
plot(DIFSimPC$resp)

# histogram of raw scores
hist(rowSums(DIFSim$resp), breaks = 0:20 - 0.5)
hist(rowSums(DIFSimPC$resp), breaks = 0:17 - 0.5)
```
Description

A sample of the 1999 European Values Study (EVS) containing an assessment of materialism/postmaterialism in 3584 respondents from 32 countries.

Usage

data("EuropeanValuesStudy")

Format

A data frame containing 3584 observations on 10 variables.

- country  Factor coding the country of a respondent.
- gender  Factor coding gender.
- birthyear  Numeric. Year of birth.
- eduage  Numeric. Age when full time education was or will be completed.
- employment  Ordered factor. Employment and number of working hours.
- occupation  Factor. What is/was your main job?
- income  Ordered factor. Income of household in ten categories from 10 percent lowest to 10 percent highest income category.
- paircomp  Paired comparison of class paircomp. Five pairwise choices among four important political goals derived from a double-choice task (see Details).
- country2  Factor. Country group according to postmaterialism (see Details).

Details

The data are part of a larger survey conducted in 1999 in 32 countries in Europe (see http://www.europeanvaluesstudy.eu/). Vermunt (2003) obtained a sample from 10 percent of the available cases per country, yielding 3584 valid cases.

The item in the 1999 European Values Study questionnaire aiming at recording materialism/postmaterialism reads as follows:

There is a lot of talk these days about what the aims of this country should be for the next ten years. On this card are listed some of the goals which different people would give top priority. If you had to choose, which of the things on this card would you say is most important? And which would be the next most important?

A Maintaining order in the nation
B Giving people more say in important government decisions
C Fighting rising prices
D Protecting freedom of speech
The double-choice task implies a partial ranking of the alternatives and (assuming transitivity) an incomplete set of paired comparisons for each respondent.

The country group according to postmaterialism was derived by Vermunt (2003) using a latent class model, and applied by Lee and Lee (2010) in a tree model.

Source

Latent GOLD Sample Data Sets Website.

References


See Also

paircomp

Examples

```r
## data
data("EuropeanValuesStudy", package = "psychotree")
summary(EuropeanValuesStudy$paircomp)

## Not run:
## Bradley-Terry tree resulting in similar results compared to
## the (different) tree approach of Lee and Lee (2010)
evs <- na.omit(EuropeanValuesStudy)
bttree(paircomp ~ gender + eduage + birthyear + marital + employment + income + country2,
      data = evs, alpha = 0.01)
plot(bt, abbreviate = 2)

## End(Not run)
```

mptree

*MPT Trees*

Description

Recursive partitioning (also known as trees) based on multinomial processing tree (MPT) models.

Usage

```r
mptree(formula, data, na.action, cluster, spec, treeid = NULL,
        optimargs = list(control = list(reltol = .Machine$double.eps^*(1/1.2),
                        maxit = 1000)), ...)
```
**Arguments**

- **formula**: a symbolic description of the model to be fit. This should be of type \( y \sim x_1 + x_2 \) where \( y \) should be a matrix of response frequencies and \( x_1 \) and \( x_2 \) are used as partitioning variables.

- **data**: an optional data frame containing the variables in the model.

- **na.action**: a function which indicates what should happen when the data contain NAs, defaulting to `na.pass`.

- **cluster**: optional vector (typically numeric or factor) with a cluster ID to be employed for clustered covariances in the parameter stability tests.

- **spec, treeid, optimargs**: arguments for the MPT model passed on to `mptmodel`.

- **...**: arguments passed to `mob_control`.

**Details**

MPT trees (Wickelmaier & Zeileis, 2018) are an application of model-based recursive partitioning (implemented in `mob`) to MPT models (implemented in `mptmodel`). Various methods are provided for "mpttree" objects, most of them inherit their behavior from "mob" objects (e.g., `print`, `summary`, etc.). The `plot` method employs the `node_mptplot` panel-generating function.

**Value**

An object of S3 class "mpttree" inheriting from class "modelparty".

**References**


**See Also**

`mob`, `mptmodel`.

**Examples**

```r
o <- options(digits = 4)

## Source Monitoring data
data("SourceMonitoring", package = "psychotools")

## MPT tree
sm_tree <- mpttree(y ~ sources + gender + age, data = SourceMonitoring,
                   spec = mptspec("SourceMon", .restr = list(d1 = d, d2 = d)))
plot(sm_tree, index = c("D1", "D2", "d", "b", "g"))

## extract parameter estimates
```

>`

```
node_btplot

Panel-Generating Function for Visualizing Bradley-Terry Tree Models

Description

Panel-generating function for visualizing the worth parameters from the nodes in Bradley-Terry tree models.

Usage

node_btplot(mobobj, id = TRUE,
             worth = TRUE, names = TRUE, abbreviate = TRUE, index = TRUE, ref = TRUE,
             col = "black", refcol = "lightgray", bg = "white", cex = 0.5, pch = 19,
             xscale = NULL, yscale = NULL, ylines = 1.5)

Arguments

mobobj an object of class "mob" based on Bradley-Terry models fitted by btmodel.

id logical. Should the node ID be displayed?

worth logical. Should worth parameters (or their logs) be visualized?

names logical. Should the names for the objects be displayed?

abbreviate logical or numeric. Should object names be abbreviated? If numeric this controls the length of the abbreviation.

index logical. Should different indexes for different stimuli be used?

ref logical. Should a horizontal line for the reference level be drawn? Alternatively, ref can also be numeric or character to employ a reference level different from that stored in the model object.
Panel-generating function for visualizing the model parameters from the nodes in MPT tree models.

Usage

```r
node_mptplot(mobobj, id = TRUE,
             names = TRUE, abbreviate = TRUE, index = TRUE, ref = TRUE,
             col = "black", linecol = "lightgray", bg = "white", cex = 0.5, pch = 19,
             xscale = NULL, yscale = c(0, 1), ylines = 1.5)
```

Arguments

- `mobobj` an object of class "mob" based on MPT models fitted by `mptmodel`.
- `id` logical. Should the node ID be displayed?
- `names` logical or character. Should the names for the parameters be displayed? If character, this sets the names.
- `abbreviate` logical or numeric. Should parameter names be abbreviated? If numeric this controls the length of the abbreviation.
- `index` logical or character. Should different indexes for different parameters be used? If character, this controls the order of labels given in names.
- `ref` logical. Should a horizontal line for the reference level be drawn?
- `col`, `cex`, `pch` graphical appearance of plotting symbols.
node_profileplot

linecol    line color for reference line (if ref).
bg         color for background filling.
xscale, yscale  x and y axis limits.
ylines     numeric. Number of lines used for y-axis labels.

Details

The panel-generating function node_mptplot is called by the plot method for "mpttree" objects and does not have to be called by the user directly.

Value

A panel function which can be supplied to the plot method for "mob" objects.

See Also

mpttree

Panel-Generating Function for Visualizing IRT Tree Models

Description

Panel-generating function for visualizing the parameters from the nodes in Rasch, rating scale or partial credit tree models.

Usage

node_profileplot(mobobj, what = c("items", "thresholds", "discriminations"),
    parg = list(type = NULL, ref = NULL, alias = TRUE), id = TRUE,
    names = FALSE, abbreviate = TRUE, index = TRUE, ref = TRUE, col = "black",
    border = col, linecol = "black", refcol = "lightgray", bg = "white",
    cex = 0.5, pch = 21, xscale = NULL, yscale = NULL, ylines = 2, ...)

Arguments

mobobj      an object of class "mob" based on rasch models fitted by raschmodel, rating scale models fitted by rsmodel or partial credit models fitted by pcmodel.
what        character, specifying the type of parameters to be plotted.
parg        list of arguments passed over to internal calls of itempar, threshpar or discrpar.
id          logical. Should the node ID be displayed?
names       logical or character. If TRUE, the names of the items are displayed on the x-axis. If FALSE, numbers of items are shown. Alternatively a character vector of the same length as the number of items can be supplied.
abbreviate  logical. Should item names be abbreviated? If numeric this controls the length of the abbreviation.
node_regionplot

index logical. Should different indexes for different items be used?
ref logical. Should a horizontal line for the reference level be drawn?
col, border, pch, cex
  graphical appearance of plotting symbols.
linecol, reffcol
  character, specifying the line color to use for the profile lines and reference line, respectively.
bg color for background filling.
xscale, yscale x and y axis limits.
ylines numeric. Number of lines used for y-axis labels.
... further arguments currently not used.

details

The panel-generating function node_profileplot is called by the plot method for "raschtree" objects and does not have to be called by the user directly.

Prior to version 0.13-1, node_profileplot was called node_raschplot.

value

A panel function which can be supplied to the plot method for "mob" objects.

see also

raschtree

node_regionplot  Panel-Generating Function for Visualizing Rasch, Rating Scale and Partial Credit Tree Models

description

Panel-generating function for visualizing the absolute item threshold parameters from the nodes in rasch, rating scale and partial credit tree models.

usage

node_regionplot(mobobj, names = FALSE, abbreviate = TRUE,
type = c("mode", "median", "mean"), ref = NULL, ylim = NULL,
off = 0.1, col_fun = gray.colors, bg = "white", uo_show = TRUE, uo_col = "red",
uo_lty = 2, uo_lwd = 1.25, ylines = 2)
node_regionplot

Arguments

mobobj an object of class "mob" based on rasch models fitted by raschmodel, rating scale models fitted by rsmodel or partial credit models fitted by pcmodel.

names logical or character. If TRUE, the names of the items are displayed on the x-axis. If FALSE, numbers of items are shown. Alternatively a character vector of the same length as the number of items can be supplied.

abbreviate logical. Should item names be abbreviated? If numeric this controls the length of the abbreviation.

type character, specifying which type of threshold parameters are to be used to mark the category regions per item in the plot (see regionplot for details).

ref a vector of labels or position indices of item parameters which should be used as restriction/for normalization. If NULL (the default), all items are used (sum zero restriction). See threshpar for more details.

ylim y axis limits

off numeric, the distance (in scale units) between two item rectangles.

col_fun function. Function to use for creating the color palettes for the rectangles. Per default gray.colors is used. Be aware that col_fun should accept as first argument an integer specifying the number of colors to create.

bg color for background filling.

uo_show logical. If set to TRUE (the default), disordered absolute item threshold parameters are indicated by a horizontal line (only if type is set to "mode").

uo_col character, color of indication lines (if uo_show).

uo_lty numeric. Line typ of indication lines (if uo_show).

uo_lwd numeric. Line width of indication lines (if uo_show).

ylines numeric. Number of lines used for y-axis labels.

Details

The panel-generating function node_regionplot is called by the plot method of "rstree" and "pctree" objects by default and does not have to be called by the user directly.

See regionplot for details and references of the drawn region plots and possible values and their meaning for the argument type (taken by node_regionplot).

Prior to version 0.13-1, node_regionplot was called node_effects.

Value

A panel function which can be supplied to the plot method for "mob" objects.

See Also

raschtree, rstree, pctree, regionplot
Partial Credit Trees

Description

Recursive partitioning (also known as trees) based on partial credit models.

Usage

pctree(formula, data, na.action, nullcats = c("keep", "downcode", "ignore"), reltol = 1e-10, deriv = c("sum", "diff"), maxit = 100L, ...)

Arguments

formula A symbolic description of the model to be fit. This should be of type \( y \sim x_1 + x_2 \) where \( y \) should be a matrix with items in the columns and observations in the rows and \( x_1 \) and \( x_2 \) are used as partitioning variables.

data a data frame containing the variables in the model.

na.action a function which indicates what should happen when the data contain missing values (\( \text{NAs} \)).

nullcats character. How null categories should be treated. See \text{pcmodel} for details.

deriv character. If "sum" (the default), the first derivatives of the elementary symmetric functions are calculated with the sum algorithm. Otherwise ("diff") the difference algorithm (faster but numerically unstable) is used.

reltol, maxit arguments passed via \text{pcmodel} to \text{optim}.

... arguments passed to the underlying functions, i.e., to \text{mob.control} for \text{pctree}, and to the underlying \text{predict} and \text{plot} methods, respectively.

object, x an object of class "raschtree".

newdata optional data frame with partitioning variables for which predictions should be computed. By default the learning data set is used.

type character specifying the type of predictions or plot. For the predict method, either just the ID of the terminal "node" can be predicted or some property of the model at a given person parameter (specified by \text{personpar}) is used.

personpar numeric person parameter (of length 1) at which the predictions are evaluated.

terminal_panel, \text{tp.args}, \text{tnex}, \text{drop_terminal} arguments passed to \text{plot.modelparty/plot.party}.
Details

Partial credit trees are an application of model-based recursive partitioning (implemented in `mob`) to partial credit models (implemented in `pcmodel`). Various methods are provided for "pctree" objects, most of them inherit their behavior from "modelparty" objects (e.g., `print`, `summary`, etc.). For the PCMs in the nodes of a tree, `coef` extracts all item and threshold parameters except those restricted to be zero. `itempar` and `threshpar` extract all item and threshold parameters (including the restricted ones). The plot method by default employs the `node_regionplot` panel-generating function and the `node_profileplot` panel-generating function is provided as an alternative.

Value

An object of S3 class "pctree" inheriting from class "modelparty".

References


See Also

`mob`, `pcmodel`, `rstree`, `raschtree`

Examples

```r
o <- options(digits = 4)

## verbal aggression data from package psychotools
data("VerbalAggression", package = "psychotools")

## use response to the second other-to-blame situation (train)
VerbalAggression$s2 <- VerbalAggression$resp[, 7:12]

## exclude subjects who only scored in the highest or the lowest categories
VerbalAggression <- subset(VerbalAggression, rowSums(s2) > 0 & rowSums(s2) < 12)

## fit partial credit tree model
pct <- pctree(s2 ~ anger + gender, data = VerbalAggression)

## print tree (with and without parameters)
print(pct)
print(pct, FUN = function(x) "*")

## show summary for terminal panel nodes
summary(pct)

## visualization
plot(pct, type = "regions")
plot(pct, type = "profile")

## extract item and threshold parameters
```

## raschtree

**Rasch Trees**

### Description

Recursive partitioning (also known as trees) based on Rasch models.

### Usage

```r
raschtree(formula, data, na.action,
   reltol = 1e-10, deriv = c("sum", "diff", "numeric"), maxit = 100L, 
   ...)
```

### Arguments

- **formula**: A symbolic description of the model to be fit. This should be of type `y ~ x1 + x2` where `y` should be a binary 0/1 item response matrix and `x1` and `x2` are used as partitioning variables.
- **data**: A data frame containing the variables in the model.
- **na.action**: A function which indicates what should happen when the data contain missing values (NA).
deriv  character. Which type of derivatives should be used for computing gradient and Hessian matrix? Analytical with sum algorithm ("sum"), analytical with difference algorithm ("diff", faster but numerically unstable), or numerical. Passed to raschmodel.

reltol, maxit arguments passed via raschmodel to optim.

... arguments passed to the underlying functions, i.e., to mob_control for raschtree, and to the underlying predict and plot methods, respectively.

object, x an object of class "raschtree".

newdata optional data frame with partitioning variables for which predictions should be computed. By default the learning data set is used.

type character specifying the type of predictions or plot. For the predict method, either just the ID of the terminal "node" can be predicted or some property of the model at a given person parameter (specified by personpar).

personpar numeric person parameter (of length 1) at which the predictions are evaluated.

terminal_panel, tp_args, tnex, drop_terminal arguments passed to plot.modelparty/plot.party.

Details

Rasch trees are an application of model-based recursive partitioning (implemented in mob) to Rasch models (implemented in raschmodel).

Various methods are provided for "raschtree" objects, most of them inherit their behavior from "modelparty" objects (e.g., print, summary, etc.). For the Rasch models in the nodes of a tree, coef extracts all item parameters except the first one which is always restricted to be zero. itempar extracts all item parameters (including the first one) and by default restricts their sum to be zero (but other restrictions can be used as well). The plot method by default employs the node_profileplot panel-generating function and the node_regionplot panel-generating function is provided as an alternative.

Rasch tree models are introduced in Strobl et al. (2015), whose analysis for the SPISA data is replicated in vignette("raschtree", package = "psychotree"). Their illustration employing artificial data is replicated below.

Value

An object of S3 class "raschtree" inheriting from class "modelparty".

References


See Also

mob, raschmodel, rstree, pctree
Examples

```r
## artificial data
data("DIFSim", package = "psychotree")

## fit Rasch tree model
rt <- raschtree(resp ~ age + gender + motivation, data = DIFSim)
plot(rt)

## extract item parameters
coef(rt)
itempar(rt)

## inspect parameter stability tests in all splitting nodes
library("strucchange")
sctest(rt, node = 1)
sctest(rt, node = 2)

## highlight items 3 and 14 with DIF
ix <- rep(1, 20)
ix[c(3, 14)] <- 2
plot(rt, ylines = 2.5, cex = c(0.4, 0.8)[ix],
     pch = c(19, 19)[ix], col = gray(c(0.5, 0))[ix])

options(digits = o$digits)
```

rstree

**Rating Scale Trees**

Description

Recursive partitioning (also known as trees) based on rating scale models.

Usage

```r
rstree(formula, data, na.action, reltol = 1e-10,
       deriv = c("sum", "diff"), maxit = 100L, ...)
```

## S3 method for class 'rstree'

```r
predict(object, newdata = NULL,
        type = c("probability", "cumprobability", "mode", "median", "mean",
                 "category-information", "item-information", "test-information", "node"),
        personpar = 0, ...)
```

## S3 method for class 'rstree'

```r
plot(x, type = c("regions", "profile"), terminal_panel = NULL,
     tp_args = list(...), tnex = 2L, drop_terminal = TRUE, ...)
```
Arguments

formula A symbolic description of the model to be fit. This should be of type y \sim x1 + x2 where y should be a matrix with items in the columns and observations in the rows and x1 and x2 are used as partitioning variables. Additionally each item (column) should have the same maximum value (see pctree for a way to handle variable maximum values).

data a data frame containing the variables in the model.

na.action a function which indicates what should happen when the data contain missing values (NAs).

deriv character. If "sum" (the default), the first derivatives of the elementary symmetric functions are calculated with the sum algorithm. Otherwise ("diff") the difference algorithm (faster but numerically unstable) is used.

reltol, maxit arguments passed via rsmodel to optim.

... arguments passed to the underlying functions, i.e., to mob_control for rstree, and to the underlying predict and plot methods, respectively.

object, x an object of class "raschtree".

newdata optional data frame with partitioning variables for which predictions should be computed. By default the learning data set is used.

type character specifying the type of predictions or plot. For the predict method, either just the ID of the terminal "node" can be predicted or some property of the model at a given person parameter (specified by personpar).

personpar numeric person parameter (of length 1) at which the predictions are evaluated.

terminal_panel, tp_args, tnex, drop_terminal arguments passed to plot.modelparty/plot.party.

Details

Rating scale trees are an application of model-based recursive partitioning (implemented in mob) to rating scale models (implemented in rsmodel).

Various methods are provided for "rstree" objects, most of them inherit their behavior from "mob" objects (e.g., print, summary, etc.). For the rating scale models in the nodes of a tree, coef extracts all item parameters. The plot method employs the node_regionplot panel-generating function by default.

Various methods are provided for "rstree" objects, most of them inherit their behavior from "modelparty" objects (e.g., print, summary, etc.). For the RSMs in the nodes of a tree, coef extracts all item and threshold parameters except those restricted to be zero. itempar and threshpar extract all item and threshold parameters (including the restricted ones). The plot method by default employs the node_regionplot panel-generating function and the node_profileplot panel-generating function is provided as an alternative.

Value

An object of S3 class "rstree" inheriting from class "modelparty".
Rstree

References


See Also

mob, rsmodel, pctree, rashtree

Examples

```r
o <- options(digits = 4)

## verbal aggression data from package psychotools
data("VerbalAggression", package = "psychotools")

## responses to the first other-to-blame situation (bus)
VerbalAggression$s1 <- VerbalAggression$resp[1:6]

## exclude subjects who only scored in the highest or the lowest categories
VerbalAggression <- subset(VerbalAggression, rowSums(s1) > 0 & rowSums(s1) < 12)

## fit rating scale tree model for the first other-to-blame situation
rst <- rstree(s1 ~ anger + gender, data = VerbalAggression)

## print tree (with and without parameters)
print(rst)
print(rst, FUN = function(x) "*")

## show summary for terminal panel nodes
summary(rst)

## visualization
plot(rst, type = "regions")
plot(rst, type = "profile")

## extract item and threshold parameters
coef(rst)
itempar(rst)
threshpar(rst)

## inspect parameter stability tests in all splitting nodes
library("strucchange")
sctest(rst, node = 1)
sctest(rst, node = 2)

options(digits = o$digits)
```
Description

A subsample from the general knowledge quiz “Studentenpisa” conducted online by the German weekly news magazine SPIEGEL. The data contain the quiz results from 45 questions as well as sociodemographic data for 1075 university students from Bavaria.

Usage

data("SPISA")

Format

A data frame containing 1075 observations on 6 variables.

spisa matrix with 0/1 results from 45 questions in the quiz (indicating wrong/correct answers).
gender factor indicating gender.
age age in years.
semester numeric indicating semester of university enrollment.
elite factor indicating whether the university the student is enrolled in has been granted “elite” status by the German “excellence initiative”.
spon ordered factor indicating frequency of accessing the SPIEGEL online (SPON) magazine.

Details

An online quiz for testing one’s general knowledge was conducted by the German weekly news magazine SPIEGEL in 2009. Overall, about 700,000 participants answered the quiz and a set of sociodemographic questions. The general knowledge quiz consisted of a total of 45 items from five different topics: politics, history, economy, culture and natural sciences. For each topic, four different sets of nine items were available, that were randomly assigned to the participants. A thorough analysis and discussion of the original data set is provided in Trepte and Verbeet (2010).

Here, we provide the subsample of university students enrolled in the federal state of Bavaria, who had been assigned questionnaire number 20 (so that all subjects have answered the same set of items). Excluding all incomplete records, this subsample contains 1075 observations.

The data are analyzed in Strobl et al. (2010), whose analysis is replicated in vignette("raschtree", package = "psychotree")

The full list of items in questionnaire 20 is given below.

Politics:
Who determines the rules of action in German politics according to the constitution? – The Bundeskanzler (federal chancellor).
What is the function of the second vote in the elections to the German Bundestag (federal parliament)? – It determines the allocation of seats in the Bundestag.
How many people were killed by the RAF (Red Army Faction)? – 33.
Where is Hessen (i.e., the German federal country Hesse) located? – (Indicate location on a map.)
What is the capital of Rheinland-Pfalz (i.e., the German federal country Rhineland-Palatinate)? – Mainz.
Who is this? – (Picture of Horst Seehofer.)
Which EU institution is elected in 2009 by the citizens of EU member countries? – European Parliament.
How many votes does China have in the UNO general assembly? – 1.
Where is Somalia located? – (Indicate location on a map.)

History:
The Roman naval supremacy was established through... – ... the abolition of Carthage.
In which century did the Thirty Years’ War take place? – The 17th century.
Which form of government is associated with the French King Louis XIV? – Absolutism.
What island did Napoleon die on in exile? – St. Helena.
How many percent of the votes did the NSDAP receive in the 1928 elections of the German Reichstag? – About 3 percent.
How many Jews were killed by the Nazis during the Holocaust? – About 6 Million.
Who is this? – (Picture of Johannes Rau, former German federal president.)
Which of the following countries is not a member of the EU? – Croatia.

Economy:
Who is this? – (Picture of Dieter Zetsche, CEO of Mercedes-Benz.)
What is the current full Hartz IV standard rate (part of the social welfare) for adults? – 351 Euro.
What was the average per capita gross national product in Germany in 2007? – About 29,400 Euro.
What is a CEO? – A Chief Executive Officer.
What is the meaning of the hexagonal “organic” logo? – Synthetic pesticides are prohibited.
Which company does this logo represent? – Deutsche Bank.
Which German company took over the British automobile manufacturers Rolls-Royce? – BMW.
Which internet company took over the media group Time Warner? – AOL.
What is the historic meaning of manufacturies? – Manufacturies were the precursors of industrial mass production.

Culture:
Which painter created this painting? – Andy Warhol.
What do these four buildings have in common? – All four were designed by the same architects.
Roman numbers: What is the meaning of CLVI? – 156.
What was the German movie with the most viewers since 1990? – Der Schuh des Manitu.
In which TV series was the US president portrayed by an African American actor for a long time? – 24.
What is the name of the bestselling novel by Daniel Kehlmann? – Die Vermessung der Welt (Measuring The World).
Which city is the setting for the novel ‘Buddenbrooks’? – Lübeck.
In which city is this building located? – Paris.
Which one of the following operas is not by Mozart? – Aida.

Natural sciences:
Why does an ice floe not sink in the water? – Due to the lower density of ice.
What is ultrasound not used for? – Radio.
Which sensory cells in the human eye make color vision possible? – Cones.
What is also termed Trisomy 21? – Down syndrome.
Which element is the most common in the Earth’s atmosphere? – Nitrogen.
Which kind of tree does this leaf belong to? – Maple.
Which kind of bird is this? – Blackbird.
Where is the stomach located? – (Indicate location on a map of the body.)
What is the sum of interior angles in a triangle? – 180 degrees.

References


See Also

raschtree

Examples

```r
## data
data("SPISA", package = "psychotree")

## summary of covariates
summary(SPISA[, -1])

## histogram of raw scores
hist(rowSums(SPISA$spisa), breaks = 0:45 + 0.5)

## Not run:
## See the following vignette for a tree-based DIF analysis
vignette("raschtree", package = "psychotree")

## End(Not run)
```

---

**Topmodel2007**

**Attractiveness of Germany’s Next Topmodels 2007**

**Description**

Preferences of 192 respondents judging the attractiveness of the top six contestants of the TV show *Germany’s Next Topmodel 2007* (second cycle).

**Usage**

data("Topmodel2007")
Format

A data frame containing 192 observations on 6 variables.

- **preference** Paired comparison of class `paircomp`. Preferences for all 15 paired comparisons from 6 contestants: Barbara, Anni, Hana, Fiona, Mandy, and Anja.
- **gender** Factor coding gender.
- **age** Integer. Age of the respondents in years.
- **q1** Factor. Do you recognize the women on the pictures?/Do you know the TV show Germany’s Next Topmodel?
- **q2** Factor. Did you watch Germany’s Next Topmodel regularly?
- **q3** Factor. Did you watch the final show of Germany’s Next Topmodel?/Do you know who won Germany’s Next Topmodel?

Details

Germany’s Next Topmodel is a German casting television show (based on a concept introduced in the United States) hosted by Heidi Klum (see Wikipedia 2009). The second season of the show aired March–May 2007.

A survey was conducted at the Department of Psychology, Universität Tübingen, in 2007 shortly after the final show. The sample was stratified by gender and age (younger versus older than 30 years) with 48 participants in each group.

Digital photographs (resolution 303 times 404 pixels) of the top six contestants were available from the ProSieben web page [http://www.prosieben.de/](http://www.prosieben.de/) at the time of the survey. The photos were selected to be comparable, showing the contestant’s face and the upper part of the body, all women being casually dressed.

Participants were presented with all 15 pairs of photographs. On each trial, their task was to judge which of the two women on the photos was the more attractive. In order to assess the participants’ expertise, additional questions regarding their familiarity with the show were asked after the pairwise comparisons were completed.

The actual ranking, as resulting from sequential elimination during the course of the show, was (from first to sixth place): Barbara, Anni, Hana, Fiona, Mandy, Anja.

References


See Also

- `paircomp`

Examples

data("Topmodel2007", package = "psychotree")
summary(Topmodel2007$preference)
xtabs(~ gender + I(age < 30), data = Topmodel2007)
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