

Package ‘multilevelPSA’

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Title Multilevel Propensity Score Analysis

Type Package

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Description Conducts and visualizes propensity score analysis for multilevel,
or clustered data. Bryer & Pruzek (2011) <doi:10.1080/00273171.2011.636693>.

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URL <http://github.com/jbryer/multilevelPSA>

BugReports <https://github.com/jbryer/multilevelPSA/issues>

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multilevelPSA-package *Multilevel Propensity Score Analysis*

Description

This packages provides functions to estimate and visualize multilevel propensity score analysis.

Details

This package extends the principles put forth by the PSAgraphics (Helmreich, Pruzek, & Xiong, 2010) for multilevel, or clustered, data.

Propensity score analyses are typically done in two phases. In phase I, a statistical model predicting treatment using the available individual covariates is estimated. This package currently provides functions to perform propensity score estimates using logistic regression (see [mlpsa.logistic](#)) and conditional inference trees (see [mlpsa.ctree](#)). The latter method provides explicit stratifications as defined by each leaf node. The former however, results in a numerical value ranging from zero to one (i.e. the fitted values). A common approach is to then create stratifications using quintiles. However, other approaches such as Loess regression are also provided.

Phase II of typical propensity score analyses concerns with the comparison of an outcome between the treatment and comparison groups. The `mlpsa` method will perform this analysis in a multilevel, or clustered, fashion. That is, the results of the `mlpsa` procedure produce summary results at level one (i.e. each strata within each cluster), level two (i.e. overall results for each cluster), and overall (i.e. overall results across all clusters).

This package also provides a number of visualizations that provide a critical part in presenting, understanding, and interpreting the results. See `plot.mlpsa` for details.

Author(s)

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References

<https://CRAN.R-project.org/package=PSAgraphics> <http://www.jstatsoft.org/v29/i06/>

See Also

PSAgraphics

align.plots

Adapted from ggExtra package which is no longer available. This is related to an experimental mlpsa plot that will combine the circular plot along with the two individual distributions.

Description

Adapted from `ggExtra` package which is no longer available. This is related to an experimental `mlpsa` plot that will combine the circular plot along with the two individual distributions.

Usage

```
## S3 method for class 'plots'  
align(gl, ...)
```

Arguments

<code>gl</code>	grid.layout
<code>...</code>	graphic elements to combine.

```
as.data.frame.covariate.balance
```

Returns the overall effects as a data frame.

Description

Returns the overall effects as a data frame.

Usage

```
## S3 method for class 'covariate.balance'
as.data.frame(x, row.names = NULL,
  optional = FALSE, ...)
```

Arguments

x	results of covariate.balance .
row.names	unused.
optional	unused.
...	unused

Value

a data frame with overall covariate effects before and after adjustment.

covariate.balance	<i>Estimate covariate effect sizes before and after propensity score adjustment.</i>
-------------------	--

Description

Estimate covariate effect sizes before and after propensity score adjustment.

Usage

```
covariate.balance(covariates, treatment, level2, strata, abs = TRUE)
```

Arguments

covariates	frame or matrix of covariates.
treatment	vector of treatment indicators.
level2	vector indicating level 2 membership.
strata	strata indicators.
abs	if TRUE absolute values of effect sizes will be plotted.

covariateBalance	<i>Calculate covariate effect size differences before and after stratification.</i>
------------------	---

Description

This function is modified from the `cv.bal.psa` function in the `PSAgraphics` package.

Usage

```
covariateBalance(covariates, treatment, propensity, strata = NULL,
  int = NULL, tree = FALSE, minsize = 2, universal.psd = TRUE,
  trM = 0, absolute.es = TRUE, trt.value = NULL, use.trt.var = FALSE,
  verbose = FALSE, xlim = NULL, plot.strata = TRUE, na.rm = TRUE, ...)
```

Arguments

covariates	dataframe of interest
treatment	binary vector of 0s and 1s (necessarily? what if character, or 1, 2?)
propensity	PS scores from some method or other.
strata	either a vector of strata number for each row of covariate, or one number n in which case it is attempted to group rows by ps scores into n strata of size approximately 1/n. This does not seem to work well in the case of few specific propensity values, as from a tree.
int	either a number m used to divide [0,1] into m equal length subintervals, or a vector of cut points between 0 and 1 defining the subintervals (perhaps as suggested by <code>loess.psa</code>). In either case these subintervals define strata, so strata can be of any size.
tree	logical, if unique ps scores are few, as from a recursively partitioned tree, then TRUE will force each ps value to define a stratum.
minsize	smallest allowable stratum-treatment size. If violated, strata is removed.
universal.psd	If 'TRUE', forces standard deviations used to be unadjusted for stratification.
trM	trimming proportion for mean calculations.
absolute.es	logical, if 'TRUE' routine uses absolute values of all effect sizes.
trt.value	allows user to specify which value is active treatment, if desired.
use.trt.var	logical, if true then Rubin-Stuart method using only treatment variance with be used in effect size calculations.
verbose	logical, controls output that is visibly returned.
xlim	limits for the x-axis.
plot.strata	logical indicating whether to print strata.
na.rm	should missing values be removed.
...	currently unused.

Details

Note: effect sizes are calculated as treatment 1 - treatment 0, or treatment B - treatment A.

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cv.trans.psa

Transformation of Factors to Individual Levels

Description

The function `cv.trans.psa` takes a covariate data frame and replaces each categorical covariate of $n \geq 3$ levels with n new binary covariate columns, one for each level. Transforms covariate dataframe for use with the function `cv.bal.psa`.

Usage

```
cv.trans.psa(covariates, fcol = NULL)
```

Arguments

`covariates` A dataframe of covariates, presumably some factors.

`fcol` An optional vector containing the factor columns in the covariate data frame. In NULL (default) routine to identify factors internally.

Details

NOTE: This function originated in the PSAGraphics package. It has been adapted here for the multilevelPSA package.

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difftable.plot	<i>This function produces a ggplot2 figure containing the mean differences for each level two, or cluster.</i>
----------------	--

Description

This function produces a ggplot2 figure containing the mean differences for each level two, or cluster.

Usage

```
difftable.plot(x, fill.colors = NULL, legendlab = NULL, ...)
```

Arguments

x	the results of mlpsa .
fill.colors	the colors to use for each level two.
legendlab	the label to use for the legend, or NULL to exclude.
...	currently unused.

Value

a ggplot2 figure

getPropensityScores	<i>Returns a data frame with two columns corresponding to the level 2 variable and the fitted value from the logistic regression.</i>
---------------------	---

Description

Returns a data frame with two columns corresponding to the level 2 variable and the fitted value from the logistic regression.

Usage

```
getPropensityScores(lr.results, nStrata = 5)
```

Arguments

lr.results	the results of mlpsa.logistic
nStrata	number of strata within each level.

Value

a data frame

See Also

mlpsa.logistic

getStrata	<i>Returns a data frame with two columns corresponding to the level 2 variable and the leaves from the conditional inference trees.</i>
-----------	---

Description

Returns a data frame with two columns corresponding to the level 2 variable and the leaves from the conditional inference trees.

Usage

```
getStrata(party.results, data, level2)
```

Arguments

party.results	the results of <code>mlpsa.ctree</code>
data	the data frame to merge results to
level2	the name of the level 2 variable.

Value

a data frame

See Also

mlpsa.ctree

is.mlpsa	<i>Returns true if the object is of type mlpsa</i>
----------	--

Description

Returns true if the object is of type mlpsa

Usage

```
is.mlpsa(x)
```

Arguments

x	the object to test
---	--------------------

loess.plot	<i>Loess plot with density distributions for propensity scores and outcomes on top and right, respectively.</i>
------------	---

Description

Loess plot with density distributions for propensity scores and outcomes on top and right, respectively.

Usage

```
loess.plot(x, response, treatment, responseTitle = "",
           treatmentTitle = "Treatment", percentPoints.treat = 0.1,
           percentPoints.control = 0.01, points.treat.alpha = 0.1,
           points.control.alpha = 0.1, plot.strata, plot.strata.alpha = 0.2, ...)
```

Arguments

x	vector of propensity scores.
response	the response variable.
treatment	the treatment variable as a logical type.
responseTitle	the label to use for the y-axis (i.e. the name of the response variable)
treatmentTitle	the label to use for the treatment legend.
percentPoints.treat	the percentage of treatment points to randomly plot.
percentPoints.control	the percentage of control points to randomly plot.
points.treat.alpha	the transparency level for treatment points.
points.control.alpha	the transparency level for control points.
plot.strata	an integer value greater than 2 indicating the number of vertical lines to plot corresponding to quantiles.
plot.strata.alpha	the alpha level for the vertical lines.
...	other parameters passed to geom_smooth and stat_smooth .

Value

a ggplot2 figure

See Also

[plot.mlpsa](#)

Examples

```
## Not run:
require(multilevelPSA)
require(party)
data(pisana)
data(pisa.psa.cols)
cnt = 'USA' #Can change this to USA, MEX, or CAN
pisana2 = pisana[pisana$CNT == cnt,]
pisana2$treat <- as.integer(pisana2$PUBPRIV) %% 2
lr.results <- glm(treat ~ ., data=pisana2[,c('treat',pisa.psa.cols)], family='binomial')
st = data.frame(ps=fitted(lr.results),
math=apply(pisana2[,paste('PV', 1:5, 'MATH', sep=')], 1, mean),
pubpriv=pisana2$treat)
st$treat = as.logical(st$pubpriv)
loess.plot(st$ps, response=st$math, treatment=st$treat, percentPoints.control = 0.4,
percentPoints.treat=0.4)

## End(Not run)
```

lsos

Nicer list of objects in memory. Particularly useful for analysis of large data. [#http://stackoverflow.com/questions/1358003/tricks-to-manage-the-available-memory-in-an-r-session](http://stackoverflow.com/questions/1358003/tricks-to-manage-the-available-memory-in-an-r-session)

Description

Nicer list of objects in memory. Particularly useful for analysis of large data. [#http://stackoverflow.com/questions/1358003/tricks-to-manage-the-available-memory-in-an-r-session](http://stackoverflow.com/questions/1358003/tricks-to-manage-the-available-memory-in-an-r-session)

Usage

```
lsos(..., n = 10)
```

Arguments

...	not used.
n	the number of objects to return.

Value

a list of objects loaded sorted by size.

missing.plot	<i>Returns a heat map graphic representing missingness of variables grouped by the given grouping vector.</i>
--------------	---

Description

NOTE: This is an experimental function and the results may vary depending on the nature of the dataset.

Usage

```
missing.plot(x, grouping, grid = FALSE, widths = c(ggplot2::unit(3, "null"),
  ggplot2::unit(1, "inches")), heights = c(ggplot2::unit(1, "inches"),
  ggplot2::unit(3, "null")), color = "red", ...)
```

Arguments

x	a data frame containing the variables to visualize missingness
grouping	a vector of length nrow(vars) corresponding to how missing will be grouped by
grid	whether to draw a grid between tiles
widths	the ratio of the widths of the heatmap and histogram.
heights	the ratio of the heights of the heatmap and histogram.
color	the color used for indicating missingness.
...	currently unused.

Value

a ggplot2 expression

See Also

plot.mlpsa

mlpsa	<i>This function will perform phase II of the multilevel propensity score analysis.</i>
-------	---

Description

TODO: Need more details

Usage

```
mlpsa(response, treatment = NULL, strata = NULL, level2 = NULL,
  minN = 5, reverse = FALSE, ci.level = 0.05)
```

Arguments

response	vector containing the response values
treatment	vector containing the treatment conditions
strata	vector containing the strata for each response
level2	vector containing the level 2 specifications
minN	the minimum number of subjects per strata for that strata to be included in the analysis.
reverse	reverse the order of treatment and control for the difference calculation.
ci.level	the confidence level to use for confidence intervals. Defaults to a 95% confidence level.

Details

The `ci.adjust` provides a Bonferroni-Sidak adjusted confidence intervals based on the number of levels/clusters.

Value

a `mlpsa` class

See Also

[mlpsa.ctree](#) [mlpsa.logistic](#)

Examples

```
## Not run:
require(multilevelPSA)
require(party)
data(pisana)
data(pisa.colnames)
data(pisa.psa.cols)
mlctree = mlpsa.ctree(pisana[,c('CNT', 'PUBPRIV', pisa.psa.cols)], formula=PUBPRIV ~ ., level2='CNT')
student.party = getStrata(mlctree, pisana, level2='CNT')
student.party$mathscore = apply(student.party[,paste0('PV', 1:5, 'MATH')], 1, sum) / 5
results.psa.math = mlpsa(response=student.party$mathscore,
  treatment=student.party$PUBPRIV,
  strata=student.party$strata,
  level2=student.party$CNT, minN=5)
results.psa.math
summary(results.psa.math)

## End(Not run)
```

mlpsa.circ.plot *Plots the results of a multilevel propensity score model.*

Description

The plot created uses the ggplot2 framework. As such, additional modifications can be made. This plot is an extension of the circ.psa function in the PSAgraphics package for multilevel models.

Usage

```
mlpsa.circ.plot(x, xlab = names(multilevelPSA$level2.summary)[4],
  ylab = names(multilevelPSA$level2.summary)[5], legendlab = "Level 2",
  title = NULL, overall.col = "blue", overall.ci.col = "green",
  level1.plot = FALSE, level1.point.size = NULL, level1.rug.plot = NULL,
  level1.projection.lines = FALSE, level2.plot = TRUE,
  level2.point.size = NULL, level2.rug.plot = "tr",
  level2.projection.lines = TRUE, level2.label = FALSE,
  unweighted.means = FALSE, weighted.means = FALSE, fill.colors = NULL,
  ...)
```

Arguments

x	the results of <code>mlpsa</code> .
xlab	label for the x-axis.
ylab	label for the y-axis.
legendlab	the label for the legend, or NULL to exclude.
title	title for the figure.
overall.col	the color used for the overall results.
overall.ci.col	the color used for the confidence intervals.
level1.plot	logical value indicating whether level 1 points should be plotted.
level1.point.size	the size of level 1 points
level1.rug.plot	the placement for plotting a level 2 rug. Possible values are b1 (for left and bottom), tr (for top and right), or NULL (to exclude).
level1.projection.lines	logical value indicating whether level 1 project lines (parallel to the unit line) are drawn.
level2.plot	logical value indicating whether level 2 points should be plotted.
level2.point.size	the size of level 2 points
level2.rug.plot	the placement for plotting a level 2 rug. Possible values are b1 (for left and bottom), tr (for top and right), or NULL (to exclude).

level2.projection.lines logical value indicating whether level 2 project lines (parallel to the unit line) are drawn.

level2.label logical value indicating whether level 2 points should be labeled.

unweighted.means logical value indicating whether horizontal and vertical lines are drawn representing the unweighted (i.e. unadjusted from phase I of PSA) means for each level 2, or cluster.

weighted.means logical value indicating whether horizontal and vertical lines are drawn representing the weighted means for each level 2, or cluster.

fill.colors if specified, the colors to use for level 2 points.

... currently unused.

See Also

plot.mlpsa

Examples

```
## Not run:
data(pisana)
data(pisa.colnames)
data(pisa.psa.cols)
mlctree = mlpsa.ctree(pisana[,c('CNT', 'PUBPRIV', pisa.psa.cols)],
                     formula=PUBPRIV ~ ., level2='CNT')
student.party = getStrata(mlctree, pisana, level2='CNT')
student.party$mathscore = apply(student.party[,paste0('PV', 1:5, 'MATH')], 1, sum) / 5
results.psa.math = mlpsa(response=student.party$mathscore,
                         treatment=student.party$PUBPRIV,
                         strata=student.party$strata,
                         level2=student.party$CNT, minN=5)
mlpsa.circ.plot(results.psa.math, legendlab=FALSE)

## End(Not run)
```

mlpsa.ctree

Estimates propensity scores using the recursive partitioning in a conditional inference framework.

Description

This function will estimate propensity scores using the conditional inference framework as outlined in the party package. Specifically, a separate tree will be estimated for each level 2 (or cluster). A key advantage of this framework over other methods for estimating propensity scores is that this method will work on data sets containing missing values.

Usage

```
mlpsa.ctree(vars, formula, level2, ...)
```

Arguments

vars	a data frame containing the covariates to use for estimating the propensity scores.
formula	the model for estimating the propensity scores. For example, treat ~ .
level2	the name of the column in vars specifying the level 2 (or cluster).
...	currently unused.

Value

a list of BinaryTree-class classes for each level 2

References

Torsten Hothorn, Kurt Hornik and Achim Zeileis (2006). Unbiased Recursive Partitioning: A Conditional Inference Framework. *Journal of Computational and Graphical Statistics*, 15(3), 651–674.

See Also

[getStrata](#)

[tree.plot](#)

mlpsa.difference.plot *Creates a graphic summarizing the differences between treatment and comparison groups within and across level two clusters.*

Description

Creates a graphic summarizing the differences between treatment and comparison groups within and across level two clusters.

Usage

```
mlpsa.difference.plot(x, xlab, ylab = NULL, title = NULL,  
  overall.col = "blue", overall.ci.col = "green",  
  level2.point.size = NULL, level1.points = TRUE, errorbars = TRUE,  
  errorbars.adjusted.ci = TRUE, level2.rug.plot = TRUE, jitter = TRUE,  
  reorder = TRUE, labelLevel2 = TRUE, sd = NULL, xlim, ...)
```

Arguments

<code>x</code>	the results of <code>mlpsa</code> .
<code>xlab</code>	label for the x-axis, or NULL to exclude.
<code>ylab</code>	label for the y-axis, or NULL to exclude.
<code>title</code>	title of the figure, or NULL to exclude.
<code>overall.col</code>	the color of the overall results line.
<code>overall.ci.col</code>	the color of the overall confidence interval.
<code>level2.point.size</code>	the point size of level 2 points.
<code>level1.points</code>	logical value indicating whether level 1 strata should be plotted.
<code>errorbars</code>	logical value indicating whether error bars should be plotted for for each level 1.
<code>errorbars.adjusted.ci</code>	whether the Bonferroni adjusted error bars should be plotted (these will be dashed lines).
<code>level2.rug.plot</code>	logical value indicating whether a rug plot should be plotted for level 2.
<code>jitter</code>	logical value indicating whether level 1 points should be jittered.
<code>reorder</code>	logical value indicating whether the level two clusters should be reordered from largest difference to smallest.
<code>labelLevel2</code>	logical value indicating whether the difference for each level 2 should be labeled.
<code>sd</code>	If specified, effect sizes will be plotted instead of difference in the native unit.
<code>xlim</code>	the limits of the x-axis.
<code>...</code>	currently unused.

See Also

`plot.mlpsa`

Examples

```
## Not run:
data(pisana)
data(pisa.colnames)
data(pisa.psa.cols)
mlctree = mlpsa.ctree(pisana[,c('CNT', 'PUBPRIV', pisa.psa.cols)], formula=PUBPRIV ~ ., level2='CNT')
student.party = getStrata(mlctree, pisana, level2='CNT')
student.party$mathscore = apply(student.party[,paste0('PV', 1:5, 'MATH')], 1, sum) / 5
results.psa.math = mlpsa(response=student.party$mathscore,
  treatment=student.party$PUBPRIV,
  strata=student.party$strata,
  level2=student.party$CNT, minN=5)
mlpsa.difference.plot(results.psa.math, sd=mean(student.party$mathscore, na.rm=TRUE))

## End(Not run)
```

mlpsa.distribution.plot

Plots distribution for either the treatment or comparison group.

Description

Plots distribution for either the treatment or comparison group.

Usage

```
mlpsa.distribution.plot(x, treat, fill.colours = NULL, flip = TRUE,
  label = treat, level2.label = NULL, legendlab = NULL,
  axis.text.size = 8, fill.colors = NULL, ...)
```

Arguments

x	the results of <code>mlpsa</code> .
treat	the group to plot. This must be one of the two levels of the treatment variable.
fill.colours	if specified, the colors to use for level 2 points.
flip	if TRUE, the level 2 clusters will be on the y-axis and the outcome variable on the x-axis. Otherwise reversed.
label	the label to use for the axis.
level2.label	the axis label for the level 2 indicators.
legendlab	the label for the legend, or NULL to exclude a legend.
axis.text.size	the size of the axis text
fill.colors	if specified, the colors to use for level 2 points.
...	currently unused.

See Also

plot.mlpsa

mlpsa.logistic

Estimates propensity scores using logistic regression.

Description

This method will estimate a separate logistic regression model for each level 2 (or cluster).

Usage

```
mlpsa.logistic(vars, formula, level2, stepAIC = FALSE, ...)
```

Arguments

<code>vars</code>	data frame containing the variables to estimate the logistic regression
<code>formula</code>	the logistic regression formula to use
<code>level2</code>	the name of the column containing the level 2 specification
<code>stepAIC</code>	if true, the <code>stepAIC</code> from the MASS package will be used within each level.
<code>...</code>	currently unused.

Value

a list of glm classes for each level 2 or stepwise-selected model if `stepAIC` is true.

See Also

`getPropensityScores`

<code>pisa.colnames</code>	<i>Mapping of variables in <code>pisana</code> with full descriptions.</i>
----------------------------	--

Description

This data frame provides three variables, `Variable` corresponding to the column names in `pisana`, `ShortDesc` providing a short description of the variable as a valid R object name, and `Desc` providing a longer description of the variable.

Format

a data frame with 50 rows of 3 variables.

<code>pisa.countries</code>	<i>Data frame mapping PISA countries to their three letter abbreviation.</i>
-----------------------------	--

Description

This data frame has two columns, `CNT3` for the three letter abbreviation of each country and `Country` that provides the full country name in English.

Format

data frame with 65 rows of 2 variables.

pisa.psa.cols	<i>Character vector representing the list of covariates used for estimating propensity scores.</i>
---------------	--

Description

Character vector representing the list of covariates used for estimating propensity scores.

Format

a character vector with covariate names for estimating propensity scores.

pisana	<i>North American (i.e. Canada, Mexico, and United States) student results of the 2009 Programme of International Student Assessment.</i>
--------	---

Description

Student results from the 2009 Programme of International Student Assessment (PISA) as provided by the Organization for Economic Co-operation and Development (OECD). See <http://www.pisa.oecd.org/> for more information including the code book.

Format

a data frame with 66,548 observations of 65 variables.

Details

Note that missing values have been imputed using the <http://cran.r-project.org/web/packages/mice/index.html> package. Details on the specific procedure are in the `pisa.impute` function in the [pisa package](#).

Source

Organization for Economic Co-operation and Development

References

Organization for Economic Co-operation and Development (2009). Programme for International Student Assessment (PISA). <http://www.pisa.oecd.org/>

```
plot.covariate.balance
```

Multiple covariate balance assessment plot.

Description

A graphic based upon [cv.bal.psa](#) function in the PSAGraphics package. This graphic plots the effect sizes for multiple covariates before and after propensity score adjustment.

Usage

```
## S3 method for class 'covariate.balance'
plot(x, plot.strata = FALSE,
     order = c("unadjusted", "adjusted"), strata.size = 3,
     strata.legend.guide = "none", point.size = 3, point.alpha = 1,
     line.color = "black", line.alpha = 0.2, legend.position = c(0.8, 0.2),
     ...)
```

Arguments

<code>x</code>	results of covariate.balance .
<code>plot.strata</code>	whether individual strata should be plotted.
<code>order</code>	how to order the y-axis. Possible values are adjusted, unadjusted, or NULL (don't reorder).
<code>strata.size</code>	text size for strata if plotted.
<code>strata.legend.guide</code>	guide for legend placement for strata.
<code>point.size</code>	size of the overall effect size points.
<code>point.alpha</code>	transparency level of the overall effect size points.
<code>line.color</code>	the color of the line connecting the overall effect size points.
<code>line.alpha</code>	transparency level of the line connecting the overall effect size points.
<code>legend.position</code>	where to position the legend.
<code>...</code>	currently unused.

Value

a ggplot2 with an attribute, `effects`, that is the data frame used to create the plot.

plot.mlpsa	<i>Plots the results of a multilevel propensity score model.</i>
------------	--

Description

The plot created uses the `ggplot2` framework. As such, additional modifications can be made. This plot is an extension of the `circ.psa` function in the `PSAgraphics` package for multilevel models.

Usage

```
## S3 method for class 'mlpsa'
plot(x, ratio = c(1, 2), plotExtra = NULL, ...)
```

Arguments

<code>x</code>	the results of <code>mlpsa</code> .
<code>ratio</code>	the ratio of the size of the distribution plots (left and bottom) to the circular plot.
<code>plotExtra</code>	a plot to place in the lower left corner.
<code>...</code>	parameters passed to <code>mlpsa.circ.plot</code> and <code>mlpsa.distribution.plot</code>

Examples

```
## Not run:
require(multilevelPSA)
require(party)
data(pisana)
data(pisa.colnames)
data(pisa.psa.cols)
mlctree = mlpsa.ctree(pisana[,c('CNT', 'PUBPRIV', pisa.psa.cols)], formula=PUBPRIV ~ ., level2='CNT')
student.party = getStrata(mlctree, pisana, level2='CNT')
student.party$mathscore = apply(student.party[,paste0('PV', 1:5, 'MATH')], 1, sum) / 5
results.psa.math = mlpsa(response=student.party$mathscore,
  treatment=student.party$PUBPRIV,
  strata=student.party$strata,
  level2=student.party$CNT, minN=5)
plot(results.psa.math)

## End(Not run)
```

`plot.psrange`*Plots densities and ranges for the propensity scores.*

Description

Plots densities and ranges for the propensity scores.

Usage

```
## S3 method for class 'psrange'  
plot(x, xlab = NULL, ylab = NULL,  
      labels = c("Comparison", "Treatment"), text.ratio.size = 4,  
      text.ncontrol.size = 3, point.size = 1, point.alpha = 0.6,  
      line.width = 6, density.alpha = 0.2, rect.color = "green",  
      rect.alpha = 0.2, ...)
```

Arguments

<code>x</code>	the result of <code>psrange</code> .
<code>xlab</code>	label for x-axis.
<code>ylab</code>	label for y-axis.
<code>labels</code>	labels for the comparison and treatment legend.
<code>text.ratio.size</code>	size of the text for the ratio.
<code>text.ncontrol.size</code>	size of the text for the number of control units.
<code>point.size</code>	size of the points for the minimum and maximum ranges for each model.
<code>point.alpha</code>	the alpha (transparency) level for the points.
<code>line.width</code>	the width of the line between the median of the minimum and maximum ranges.
<code>density.alpha</code>	the alpha (transparency) level of the density curves.
<code>rect.color</code>	the color of the rectangle surrounding the range of minimum and maximum ranges.
<code>rect.alpha</code>	the alpha (transparency) level of the rectangle.
<code>...</code>	currently unused.

Value

a `ggplot2` object

```
print.covariate.balance
```

Prints the overall effects before and after propensity score adjustment.

Description

Prints the overall effects before and after propensity score adjustment.

Usage

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

Arguments

x	results of <code>covariate.balance</code> .
...	unused.

```
print.mlpsa
```

Prints basic information about a mlpsa class.

Description

Prints basic information about a mlpsa class.

Usage

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

Arguments

x	the mlpsa class.
...	unused.

print.psrange	<i>Prints information about a psrange result.</i>
---------------	---

Description

Prints information about a psrange result.

Usage

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

Arguments

x	psrange to print info about.
...	currently unused

print.xmlpsa	<i>Prints the results of mlpsa and xtable.mlpsa.</i>
--------------	--

Description

Print method for [xtable.mlpsa](#).

Usage

```
## S3 method for class 'xmlpsa'
print(x, tabular.environment = "longtable",
      floating = FALSE, ...)
```

Arguments

x	result of xtable.mlpsa
tabular.environment	see print.xtable .
floating	see print.xtable .
...	other parameters passed to print.xtable

psrange	<i>Estimates models with increasing number of comparison subjects starting from 1:1 to using all available comparison group subjects.</i>
---------	---

Description

Estimates models with increasing number of comparison subjects starting from 1:1 to using all available comparison group subjects.

Usage

```
psrange(df, treatvar, formula, nsteps = 10, nboot = 10, samples,
        type = c("logistic", "ctree"), ...)
```

Arguments

df	data frame with variables to pass to glm
treatvar	vector representing treatment placement. Should be coded as 0s (for control) and 1s (for treatment).
formula	formula for logistic regression model
nsteps	number of steps to estimate from 1:1 to using all control records.
nboot	number of models to execute for each step.
samples	the sample sizes to draw from control group for each step.
type	either logistic for Logistic regression (using glm function) or ctree for Conditional Inference Trees (using the ctree function).
...	other parameters passed to glm.

Value

a class of psrange that contains a summary data frame, a details data frame, and a list of each individual result from glm.

summary.mlpsa	<i>Provides a summary of a mlpsa class.</i>
---------------	---

Description

Provides a summary of a mlpsa class.

Usage

```
## S3 method for class 'mlpsa'
summary(object, overall.label = "Overall", ...)
```

Arguments

object the mlpsa object.
 overall.label the label to place in the strata column for the overall results.
 ... unused.

summary.psrangle *Prints the summary results of psrange.*

Description

Prints the summary results of psrange.

Usage

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

Arguments

object psrange to print summary of.
 ... currently unused.

tree.plot *Heat map representing variables used in a conditional inference tree across level 2 variables.*

Description

This figure provides a summary of the covariates used within each level two cluster along with their relative importance. Covariates are listed on the y-axis and level two clusters along the x-axis. Cells that are shaded indicate that that covariate was present in the conditional. The shade of the color represents the highest level within the tree that covariate appeared. That is, the darkest color, or depth 1, corresponds to the covariate used at the root of the tree, or the first split.

Usage

```
tree.plot(x, colNames, level2Col, colLabels = NULL, color.high = "azure",
  color.low = "steelblue", color.na = "white", ...)
```

Arguments

x	the results of <code>mlpsa.ctree</code>
colNames	the columns to include in the graphic
level2Col	the name of the level 2 column.
colLabels	column labels to use. This is a data frame with two columns, the first column should match the values in trees and the second column the description that will be used for labeling the variables.
color.high	color for variables with less relative importance as determined by occurring later in the tree (further from the root split).
color.low	color for variables with greater relative importance as determined by occurring sooner in the tree (closer to the root split).
color.na	color for variables that do not occur in the tree.
...	currently unused.

Value

a `ggplot2` expression

See Also

`plot.mlpsa`

Examples

```
## Not run:
require(party)
data(pisana)
data(pisa.colnames)
data(pisa.psa.cols)
mlctree = mlpsa.ctree(pisana[,c('CNT', 'PUBPRIV', pisa.psa.cols)], formula=PUBPRIV ~ ., level2='CNT')
student.party = getStrata(mlctree, pisana, level2='CNT')
tree.plot(mlctree, level2Col=pisana$CNT)

## End(Not run)
```

`xtable.mlpsa`

Prints the results of `mlpsa` as a LaTeX table.

Description

This function implements the `xtable` method for `mlpsa`.

Usage

```
## S3 method for class 'mlpsa'
xtable(x, caption, label, align, digits = 2, display = NULL,
       auto = FALSE, include.note = TRUE, ...)
```

Arguments

<code>x</code>	results of mlpsa
<code>caption</code>	passed through to xtable .
<code>label</code>	passed through to xtable .
<code>align</code>	Not used.
<code>digits</code>	number of digits to print.
<code>display</code>	passed through to xtable .
<code>auto</code>	passed through to xtable .
<code>include.note</code>	include a table note indicating how many rows were removed due to insufficient data within a strata.
<code>...</code>	other parameters passed to summary.mlpsa

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