

Package ‘QCAtools’

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Title Helper Functions for QCA in R

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Description Helper functions for Qualitative Comparative Analysis: evaluate and plot Boolean formulae on fuzzy set score data, apply Boolean operations, compute consistency and coverage measures.

Depends R (>= 3.1.0)

Imports stringr (>= 0.6.2), ggplot2 (>= 0.9.3.1), directlabels (>= 2013.6.15), graphics, QCAGUI (>= 2.0)

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and

And

Description

Logical 'and' of two conditions

Logical 'or' of two conditions

Logical 'not' of a condition

Usage

`and(v1, v2)`

`or(v1, v2)`

`not(v)`

Arguments

`v1` A vector of fuzzy set scores of cases

`v2` A vector of fuzzy set scores of cases

`v` A vector of fuzzy set scores of cases

Value

the fuzzy set scores of the logical conjunction of `v1` and `v2` for each case, i.e. the minimum in each component

the fuzzy set scores of the logical disjunction of `v1` and `v2` for each case, i.e. the maximum in each component

the fuzzy set scores of the negation of `v` for each case, i.e. $1-v$

Examples

```
and(c(0,0.5,1), c(0.25, 0.75, 0.75))
```

```
or(c(0,0.5,1), c(0.25, 0.75, 0.75))
```

```
not(c(0,0.5,1))
```

consistency	<i>Compute the consistency value</i>
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Description

Computes the consistency score of "formula1 -> formula2" (sufficient condition) or "formula1 <- formula2" (necessary condition), depending on whether type is "->" or "<-". If type is "<->" it computes an equivalence score of formula1 and formula2 via the formula $\frac{\text{sum}(\min(X, Y))}{\text{sum}(\max(X, Y))}$

Usage

```
consistency(formula1, type = "->", formula2, data)
```

Arguments

formula1	A string, list of strings or function representing a Boolean formula in disjunctive normal form
type	either "->", "<-" or "<->", depending on the direction of the implication that is to be evaluated
formula2	A string, list of strings or function representing a Boolean formula in disjunctive normal form
data	A data frame where the rows represent cases and the columns the sets. Column names must be as in the formula.

Details

Compute a consistency score for an implication/necessity/sufficiency statement.

If formula is a function, it must take a data.frame and return a vector.

If formula is a string or list of strings, the following conventions hold: Set names must be capitalized in the formula and the data; if they are lowercase, they are interpreted as the negation of the set. If formula is a string, logical 'or' is expressed as a '+', and logical 'and' as a '*'. If formula is a list of strings, the strings are assumed to be the disjuncts and are concatenated with '+'. The formula must be in disjunctive normal form, i.e. it must be a disjunction of conjunctions of elementary or negated elementary sets. Example: A*b*C + a*B

Value

the consistency score of the implication described by formula1, type and formula2

Examples

```
require(QCAGUI)
data(d.urban)
consistency("MLC + FRB", "->", "CP", d.urban)
```

evaluate_dnf	<i>Evaluate a formula</i>
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Description

When given a Boolean formula (see details) and a `data.frame` of cases and fuzzy set score for conditions, computes for each case the score of the membership in the set described by the formula

Usage

```
evaluate_dnf(data, formula)
```

Arguments

<code>data</code>	A data frame where the rows represent cases and the columns the sets. Column names must be as in the formula.
<code>formula</code>	A string, list of strings or function representing a Boolean formula in disjunctive normal form

Details

If `formula` is a function, it must take a `data.frame` and return a vector.

If `formula` is a string or list of strings, the following conventions hold: Set names must be capitalized in the formula and the data; if they are lowercase, they are interpreted as the negation of the set. If `formula` is a string, logical 'or' is expressed as a '+', and logical 'and' as a '*'. If `formula` is a list of strings, the strings are assumed to be the disjuncts and are concatenated with '+'. The formula must be in disjunctive normal form, i.e. it must be a disjunction of conjunctions of elementary or negated elementary sets. Example: $A*b*C + a*B$

Value

the fuzzy set score of the set described by the formula for each case in the data

Examples

```
require(QCAGUI)
data(d.urban)
evaluate_dnf(d.urban, "MLC*frb + CP")
```

format_dnf	<i>Rewrite a list of clauses to a string containing a Boolean formula in disjunctive normal form</i>
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Description

Rewrite a list of clauses to a string containing a Boolean formula in disjunctive normal form

Usage

```
format_dnf(dnf)
```

Arguments

dnf	list of clauses
-----	-----------------

Value

string containing a Boolean formula in disjunctive normal form

formula_to_function	<i>Convert formula to function</i>
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Description

When given a Boolean formula (in disjunctive normal form, see details), this function produces a function that takes a data.frame of a QCA data table and computes the fuzzy set score for each case of membership in the set described by the formula

Usage

```
formula_to_function(formula)
```

Arguments

formula	A string or vector of strings containing a Boolean formula in disjunctive normal form
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Details

Set names must be capitalized in the formula and the data; if they are lowercase, they are interpreted as the negation of the set. If formula is a string, logical 'or' is expressed as a '+', and logical 'and' as a '*'. If formula is a list of strings, the strings are assumed to be the disjuncts and are concatenated with '+'. Disjunctive normal form means that the formula must be a disjunction of conjunctions of elementary or negated elementary sets. Example: A*b*C + a*B

Value

a function that takes a data.frame and computes the fuzzy set score of the set described by the formula for each case into a vector

Examples

```
formula_to_function("A*b*C + a*B")
```

plot.qca	<i>Plot the fuzzy set scores of the solution and the outcome against each other</i>
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Description

Plot the fuzzy set scores of the solution and the outcome against each other

Usage

```
## S3 method for class 'qca'
plot(x, ...)
```

Arguments

x an object of class qca as returned by [eqmcc](#) of the package QCA
 ... further arguments passed on to [xyplot](#)

Value

the ggplot plot object

Examples

```
require(QCAGUI)
data(d.urban)
solution <- eqmcc(d.urban, outcome="RT", conditions=c("MLC", "FRB", "CP", "WSR"))
plot(solution)
```

QCAtools	<i>QCAtools.</i>
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Description

Several convenience functions for QCA in R

`xyplot`*Plot fuzzy set score of two sets against each other*

Description

Plot fuzzy set score of two sets against each other

Usage

```
xyplot(x, y, data, labels = FALSE, main.diagonal = TRUE,  
       anti.diagonal = FALSE)
```

Arguments

<code>x</code>	Formula that describes the fuzzy set to plot along the x axis
<code>y</code>	Formula that describes the fuzzy set to plot along the y axis
<code>data</code>	Data set of basic fuzzy set scores
<code>labels</code>	flag whether to label individual points with the case names
<code>main.diagonal</code>	flag whether to plot the main diagonal
<code>anti.diagonal</code>	flag whether to plot the anti diagonal

Value

the ggplot plot object

Examples

```
require(QCAGUI)  
data(d.urban)  
xyplot("MLC", "WSR", d.urban)
```

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