Package 'prefeR'

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Type Package

Title R Package for Pairwise Preference Elicitation

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Description Allows users to derive multi-objective weights from pairwise comparisons, which research shows is more repeatable, transparent, and intuitive other techniques. These weights can be rank existing alternatives or to define a multi-objective utility function for optimization.

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Imports mcmc, methods, entropy

Suggests testthat, knitr, rmarkdown

VignetteBuilder knitr

RoxygenNote 7.1.2

Encoding UTF-8

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`.calculateLogProb` *Calculates the log probability of seeing a given set of preferences*

Description

Calculates the log probability of seeing a given set of preferences

Usage

```
.calculateLogProb(x, p)
```

Arguments

`x`	A guess for our weight vector
`p`	An object of the Bayes preference class

Value

A scalar log-likelihood of the guess x

`.estimateEntropy` *Calculates the expected posterior entropy of the prefel object if x and y are compared. Ignores the odds of indifference preferences, as using them would increase runtime 50% without much gain.*

Description

Calculates the expected posterior entropy of the prefel object if x and y are compared. Ignores the odds of indifference preferences, as using them would increase runtime 50% without much gain.

Usage

```
.estimateEntropy(p, currentGuess, x, y)
```

Arguments

p	An object of class BayesPrefClass.
currentGuess	The current best estimate for our weight vector.
x	Possible comparison 1
y	Possible comparison 2

.getLogIndifProb *Evaluates the likelihood of the observed indifference preferences*

Description

Evaluates the likelihood of the observed indifference preferences

Usage

```
.getLogIndifProb(x, pref, p)
```

Arguments

x	the underlying data
pref	the stated preference
p	the preference elication object

.getLogStrictProb *Evaluates the likelihood of the observed strict preferences*

Description

Evaluates the likelihood of the observed strict preferences

Usage

```
.getLogStrictProb(x, pref, p)
```

Arguments

x	the underlying data
pref	the stated preference
p	the preference elication object

.sampleEntropy *Calculates the entropy of a matrix of samples.*

Description

Calculates the entropy of a matrix of samples.

Usage

```
.sampleEntropy(X)
```

Arguments

X	a matrix where each row is a sample of variables in different columns

BayesPrefClass *An object containing all data necessary for preference elicitation.*

Description

An object containing all data necessary for preference elicitation.

Fields

`data` A matrix or dataframe of data.

`priors` A list of functions that give the prior on each variable.

`sigma` A scalar value to use for the confusion factor (default 0.1).

`Sigma` (Internal use only) A matrix of sigma * diag(ncol(data)).

`strict` A list of lists of preferences. For each element x, x[[1]] > x[[2]].

`indif` A list of lists of indifference preferences. For each element x, x[[1]] = x[[2]].

`weights` A vector of weights determined by the inference algorithm.

Methods

`addPref(x)` Adds a preference created using %>%, %<%, or %=%.

`infer(estimate = "recommended")` Calls the "infer" function to guess weights

`rank()` Calculates the utility of each row in our dataset

`suggest(maxComparisons = 10)` Calls the "suggest" function to guess weights

Exp — *A convenience function for generating Exponential priors.*

Description

A convenience function for generating Exponential priors.

Usage

```
Exp(mu = 1)
```

Arguments

mu	The mean of the exponential distribution, i.e. $1/rate$

Value

A function yielding the log-PDF at x of a exponential distribution with given statistics.

See Also

Other priors: `Flat()`, `Normal()`

Examples

```
Exp(1)(1) == dexp(1,1, log = TRUE)
```

Flat — *A convenience function for generating a flat prior.*

Description

A convenience function for generating a flat prior.

Usage

```
Flat()
```

Value

The zero function.

See Also

Other priors: `Exp()`, `Normal()`

Examples

```
Flat()(1) == 0.0
```

infer *A function that estimates the user's underlying utility function.*

Description

A function that estimates the user's underlying utility function.

Usage

```
infer(p, estimate = "recommended", nbatch = 1000)
```

Arguments

p	A BayesPrefClass instance.
estimate	The type of posterior point-estimate returned. Valid options are "recommended" (default), "MAP", and "mean".
nbatch	If using Monte Carlo estimates, the number of samples. Defaults to 1000.

Value

A vector of parameters that best fits the observed preferences.

Examples

```
p <- prefEl(data = data.frame(c(1,0,1), c(0,1,1), c(1,1,1)),
            priors = c(Normal(0, 1), Exp(0.5), Flat()))
p$addPref(1 %>% 2)
infer(p, estimate = "MAP")
```

Normal *A convenience function for generating Normal priors.*

Description

A convenience function for generating Normal priors.

Usage

```
Normal(mu = 0, sigma = 1)
```

Arguments

mu	The mean of the normal distribution
sigma	The standard deviation of the prior

Value

A function yielding the log-PDF at x of a normal distribution with given statistics.

See Also

Other priors: `Exp()`, `Flat()`

Examples

```
Normal(0, 1)(1) == dnorm(1, log = TRUE)
```

`prefEl` *A shortcut to create objects of the class BayesPrefClass.*

Description

A shortcut to create objects of the class BayesPrefClass.

Usage

```
prefEl(data = NA, priors = list(), ...)
```

Arguments

`data`	A matrix or dataframe of data. Each column should be a variable, each row an observation.
`priors`	A list of functions that give the prior on each variable. E.g. see help(Flat)
`...`	Other parameters to pass to the class constructor. Not recommended.

Examples

```
p <- prefEl(data = data.frame(x = c(1,0,1), y = c(0, 1, 1)),
            priors = c(Normal(0,1), Flat()))
```

suggest *Suggests a good comparison for the user to make next.*

Description

Suggests a good comparison for the user to make next.

Usage

```
suggest(p, maxComparisons = 10)
```

Arguments

p	An object of class BayesPrefClass.
maxComparisons	The maximum number of possible comparisons to check. Default: 10.

Value

A two-element vector of recommended comparisons.

%=% *A helper function to add in preferences in a user-friendly way.*

Description

A helper function to add in preferences in a user-friendly way.

Usage

```
a %=% b
```

Arguments

a	The first alternative
b	The second alternative

See Also

Other preferences: %<%(), %>%()

Examples

```
1 %=% 2 # indifferent between 1 and 2
```

%>% *A helper function to add in preferences in a user-friendly way.*

Description

A helper function to add in preferences in a user-friendly way.

Usage

```
a %>% b
```

Arguments

a	The preferred row
b	The non-preferred row

See Also

Other preferences: `%<%()`, `%=%()`

Examples

```
1 %>% 2 # prefer row 1 to row 2
```

%<% *A helper function to add in preferences in a user-friendly way.*

Description

A helper function to add in preferences in a user-friendly way.

Usage

```
a %<% b
```

Arguments

a	The non-preferred row
b	The preferred row

See Also

Other preferences: `%=%()`, `%>%()`

Examples

```
1 %<% 2 # prefer row 2 to row 1
```

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