# Package 'Bayesrel'

January 20, 2019

**Type** Package

**Title** Bayesian Reliability Estimation

**Version** 0.1.0

**Author** Julius Pfadt and Don van den Bergh

**Maintainer** Julius Pfadt <julius.pfadt@gmail.com>

**Description** So far, it provides the most common single test reliability estimates, being:
Coefficient Alpha, Guttman's lambda-2/-4/-6, greatest lower bound and Mcdonald's Omega.
The Bayesian estimates are provided with credible intervals.
The method for the Bayesian estimates, except for omega, is sampling from the posterior inverse Wishart for the covariance matrix based measures.
See Murphy (2007) <https://www.seas.harvard.edu/courses/cs281/papers/murphy-2007.pdf>.
Gibbs Sampling from the joint conditional distributions of a single factor model in the case of omega.
See Lee (2007, ISBN:978-0-470-02424-9).
Methods for the glb are from Moltner and Revelle (2018) <https://www.rdocumentation.org/packages/psych/versions/1.8.10/topics/glb.algebraic>;
lambda-4 is from Benton (2015) <doi:10.1007/978-3-319-07503-7_19>;
the principal factor analysis is from Schlegel (2017) <https://www.r-bloggers.com/iterated-principal-factor-method-of-factor-analysis-with-r/>;
and the analytic alpha interval is from Bonnett and Wright (2014) <doi:10.1002/job.1960>.

**License** GPL-3

**Encoding** UTF-8

**LazyData** true

**Imports** LaplacesDemon, Rcsdp, MASS, ggplot2, ggridges, lavaan, plotrix, coda, methods, stats, graphics, Rdpack

**RdMacros** Rdpack

**RoxygenNote** 6.1.0

**Depends** R (>= 2.10)

**NeedsCompilation** no

**Repository** CRAN

**Date/Publication** 2019-01-20 16:40:02 UTC

# R topics documented:



---

`cavalini` *8-Item Questionnaire Data from Cavalini*

---

## Description

A dataset consisting of eight item questionnaire data. It's likert scaled from 0-3. It is data measuring how annoyed people were by malodors

## Usage

```
cavalini
```

## Format

The format is a 8-column datamatrix containing 828 observations

## Source

Doctoral Dissertation

## References

Cavalini, P. M. (1992). It's an ill wind that brings no good: Studies on odour annoyance and the dispersion of odorant concentrations from industries. Rijksuniversiteit Groningen.

---

`plotstrel` *plot function for an single test reliability estimate's posterior sample*

---

## Description

gives posterior and prior distribution and pie plots input is the main reliability estimation object and the estimate to be plotted

## Usage

```
plotstrel(x, estimate, blackwhite = FALSE, criteria = TRUE,
  cuts = c(0.7, 0.8), twopie = FALSE)
```

### Arguments

| | |
|---|---|
| x | A strel output object (list) |
| estimate | A character string indicating what estimate to plot from the strel output object |
| blackwhite | A logical indicating if the plot should be in black and white |
| criteria | A logical indicating if cutoff criteria should be drawn |
| cuts | A two element vector indicating what the cutoffs should be |
| twopie | A logical indicating if an additional pie plot with the prior should be drawn |

### Examples

```
plotstrel(strel(cavalini, "lambda2"), "lambda2")
```

---

## plotstrel.id *plots posterior distributions of chosen estimate and the item-dropped cases in one plot*

---

### Description

gives posterior densities of original dataset together with the the posteriors of datasets with items deleted. Can be ordered for the change item deleting brings about

### Usage

```
plotstrel.id(x, estimate, ordering = FALSE)
```

### Arguments

| | |
|---|---|
| x | A strel output object (list) |
| estimate | A character string indicating what estimate to plot from the strel output object |
| ordering | A logical indicating if the densities in the plot should be ordered |

### Examples

```
plotstrel.id(strel(cavalini, "lambda2", item.dropped = TRUE), "lambda2")
```

## pstrel *probability of estimate being bigger than threshold*

### Description

takes a mcmc posterior sample of any of the single test reliability estimates and calculates any given probability of the estimate being bigger or smaller than an arbitrary value

### Usage

```
pstrel(x, estimate, low.bound)
```

### Arguments

| | |
|---|---|
| x | A strel output object (list) |
| estimate | A character string indicating what estimate to plot from the strel output object |
| low.bound | A number for the threshold to be tested against |

### Examples

```
pstrel(strel(cavalini, "lambda2"), "lambda2", .80)
```

## strel *calculate single test reliability estimates*

### Description

calculate Bayesian and frequentist single test reliability measures. Reported are Bayesian credible intervals (HDI) and frequentist confidence intervals (non parametric or parametric bootstrap). The estimates supported are Cronbach alpha, lambda2/4/6, the glb, and Mcdonald omega.

### Usage

```
strel(x, estimates = c("alpha", "lambda2", "glb", "omega"),
  interval = 0.95, n.iter = 2000, n.burnin = 50, boot.n = 1000,
  omega.freq.method = "cfa", omega.fit = FALSE, n.obs = NULL,
  alpha.int.analytic = FALSE, bayes = TRUE, freq = TRUE,
  para.boot = FALSE, prior.samp = FALSE, item.dropped = FALSE)
```

## Arguments

| | |
|---|---|
| x | A dataset or covariance matrix |
| estimates | A character vector containing the estimands, we recommend using lambda4 with only a few items due to the computation time |
| interval | A number specifying the uncertainty interval |
| n.iter | A number for the iterations of the Gibbs Sampler |
| n.burnin | A number for the burnin in the Gibbs Sampler |
| boot.n | A number for the bootstrap samples |
| omega.freq.method | A character string for the method of frequentist omega, either pfa or cfa |
| omega.fit | A logical for calculating the fit of the single factor model |
| n.obs | A number for the sample observations when a covariance matrix is supplied and the factor model is calculated |
| alpha.int.analytic | A logical for calculating the alpha confidence interval analytically |
| bayes | A logical for calculating the Bayesian estimates |
| freq | A logical for calculating the frequentist estimates |
| para.boot | A logical for calculating the parametric bootstrap, the default is the non-parametric |
| prior.samp | A logical for calculating the prior distributions (necessary for plot functions) |
| item.dropped | A logical for calculating the if-item-dropped statistics |

## References

Murphy KP (2007). "Conjugate Bayesian analysis of the Gaussian distribution." University of British Columbia. Lee S (2007). *Structural equation modeling: A Bayesian approach*, volume 711. John Wiley \& Sons.

## Examples

```
summary(strel(cavalini, estimates = "lambda2"))
summary(strel(cavalini, estimates = "lambda2", item.dropped = TRUE))
```

# Index