Package 'ICED'

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Title IntraClass Effect Decomposition

Version 0.0.1

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Description Estimate test-retest reliability for complex sampling strategies
and extract variances using IntraClass Effect Decomposition. Developed by
Brandmaier et al. (2018) ``Assessing reliability in neuroimaging research through intra-
class effect decomposition (ICED)" <doi:10.7554/eLife.35718>
Also includes functions to simulate data based on sampling strategy.
Unofficial version release name: ``Good work squirrels".

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URL https://github.com/sdparsons/ICED

BugReports https://github.com/sdparsons/ICED

Imports boot, knitr, lavaan, MASS, stringr

VignetteBuilder knitr

Encoding UTF-8

RoxygenNote 7.1.1

Suggests rmarkdown, testthat (>= 3.0.0)

Config/testthat/edition 3

NeedsCompilation no

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Contents

`iced_syntax` *iced_syntax function - generates lavaan syntax for ICED models*

Description

The function takes a dataframe describing the data structure and returns lavaan syntax to run the model

Usage

```
iced_syntax(
  structure,
  fix_lower_bounds = TRUE,
  set_variances = NULL,
  e_label = "e",
  print = TRUE,
  groups = NULL,
  groups_inequality = NULL
)
```

Arguments

`structure`	data.frame describing the structure of the data, with each variable covering a design aspect - see example. Note: currently the first variable must be time and include a different value for each repeated measure.
`fix_lower_bounds`	fixes error variance estimates to be positive, defaults to TRUE
`set_variances`	allows the user to specify a list of variances for each latent variable
`e_label`	user defined variable name of the error variance. defaults to "e"
`print`	option to print the syntax to the console. defaults to TRUE
`groups`	allows the user to specify a number or list of group names. The syntax will generate separate latent variable variances to estimate for each group
`groups_inequality`	allows the user to specify which variance components they wish to allow to vary between groups. Useful for model comparisons.

Value

returns a character string for the ICED model following lavaan syntax

Examples

```
## see online documentation for full examples
# https://github.com/sdparsons/ICED
structure <- data.frame(time = c("T1", "T2", "T3", "T4"),
                        day = c("day1","day1","day2","day2"),
                        session = c("session1", "session1","session2", "session3"))
```

`run_ICED` *run ICED models*

Description

Wrapper function for lavaan to run an ICED model generated with ICED_syntax()

Usage

```
run_ICED(model = NULL, data = NULL, boot = NULL, ncores = NULL)
```

Arguments

`model`	lavaan model syntax, generated with ICED_syntax
`data`	specify data to be analysed - repeated measures variable names must correspond to separate variables in the data (wide format)
`boot`	run bootstrapped analysis to extract 95% CIs for the ICC and ICC2 estimates
`ncores`	specify the number of cores to run with boot, defaults to 1

Value

returns a list of estimated variances and reliability coefficients and the lavaan output

Examples

```
## see online documentation for full examples
# https://github.com/sdparsons/ICED

# generate data structure and syntax
struc <- data.frame(time = c("T1", "T2", "T3", "T4"),
day = c("day1","day1","day2","day2"),
session = c("ses1", "ses1","ses2", "ses3"))

syn <- iced_syntax(struc)

# generate data
sim1 <- sim_ICED(struc,
variances = list(time = 10,
                 day = 2,
```

```
                session = 1,
                error = 3),
n = 2000)

res1 <- run_ICED(model = syn,
data = sim1$data)
```

`sim_ICED` *simulates data based on ICED model structure and list of variances*

Description

sim_ICED simulates n x p data frame based on ICED model structure, selected variance components, and specified n

Usage

```
sim_ICED(structure, variances, n, check_recovery = FALSE)
```

Arguments

`structure`	data.frame describing the structure of the data, with each variable covering a design aspect - see example. Note: currently the first variable must be time and include a different value for each repeated measure.
`variances`	list of variances corresponding to each latent variable specified in strucutre
`n`	number of participants to simulate
`check_recovery`	runs run_ICED to extract variance components in order to check the variance parameter recovery

Value

list including simulated data

Examples

```
# compare recovery of variance parameters

# ICED structure
struc <- data.frame(time = c("T1", "T2", "T3", "T4"),
day = c("day1","day1","day2","day2"),
session = c("ses1", "ses1","ses2", "ses3"))

sim_ICED(struc,
variances = list(time = 10,
                day = 2,
                session = 1,
```

```
                  error = 3),
n = 20,
check_recovery = TRUE)

sim_ICED(struc,
         variances = list(time = 10,
                          day = 2,
                          session = 1,
                          error = 3),
         n = 2000,
         check_recovery = TRUE)
```

`str2cov` *converts a ICED measurement structure data.frame and a vector*

Description

helper function to generate an expected covariance matrix from an ICED measurement structure and vector of variances. Not expected to be called directly, but used within sim_ICED

Usage

```
str2cov(structure, variances, e_label = "e")
```

Arguments

`structure`	data.frame describing the structure of the data, with each variable convering a design aspect - see example. Note: currently the first variable must be time and include a different value for each repeated measure.
`variances`	list of variances for each source of variance
`e_label`	sting label for error variance. defaults to "e"

Value

returns a matrix

Examples

```
struc <- data.frame(time = c("T1", "T2", "T3", "T4"),
day = c("day1","day1","day2","day2"),
session = c("ses1", "ses1","ses2", "ses3"))

str2cov(struc,
list(time = 10,
     day = 2,
     session = 1,
     e = 3))
```

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