

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

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Suggests rmarkdown, testthat (>= 3.0.0)

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NeedsCompilation no

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iced_syntax	<i>iced_syntax function - generates lavaan syntax for ICED models</i>
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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 $n \times p$ 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 structure
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 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 for each source of variance
e_label	string 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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