

Package ‘rankCorr’

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Type Package

Title Total, Between-, and Within-Cluster Spearman Rank Correlations
for Clustered Data

Version 1.0.3

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Description Estimates the total, between-, and within-cluster Spearman rank correlations for continuous and ordinal clustered data. See Tu et al. (2024) <[DOI:10.1002/sim.10326](https://doi.org/10.1002/sim.10326)> for details.

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Encoding UTF-8

Imports rms (>= 6.3.0), rankICC (>= 1.0.2)

Suggests mvtnorm (>= 1.1.3)

Collate 'rankCorrCluster.R' 'rcc_internal_functions.R'

RoxygenNote 7.3.2

NeedsCompilation no

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rankCorrCluster	<i>Total, between-, and within-cluster Spearman rank correlations for clustered data</i>
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Description

rankCorrCluster computes the total, between-, and within-cluster Spearman rank correlations between two variables using two-level clustered data. It can be used with any orderable variable, including continuous and discrete variables. Two weighting methods are provided, including assigning equal weights to observations or to clusters.

Usage

```
rankCorrCluster(
  x,
  y,
  cluster,
  link.x = c("probit", "logistic", "cauchit", "loglog", "cloglog"),
  link.y = c("probit", "logistic", "cauchit", "loglog", "cloglog"),
  weights = c("obs", "clusters"),
  methods_between_corr = c("cluster-median", "approx", "both"),
  conf.int = 0.95,
  fisher = FALSE,
  na.rm = FALSE
)
```

Arguments

x	a numeric or factor vector.
y	a numeric or factor vector.
cluster	a vector of cluster index corresponding to x and y.
link.x, link.y	the link family to be used for the ordinal models of x and y on cluster index. Defaults to 'logit'. Other options are 'probit', 'cloglog', 'cauchit', and 'logistic' (equivalent with 'logit').
weights	a character string indicating which weighting method is used. Should be one of the strings "obs" and "clusters". Default is "obs". See Details.
methods_between_corr	a character string indicating which estimation method of the between-cluster correlation is used. Should be one of the strings "cluster-median", "approx", and "both". Default is "cluster-median". See Details.
conf.int	numeric specifying confidence interval level.
fisher	logical, indicating whether to apply Fisher transformation to compute confidence intervals.
na.rm	logical. Should missing values be removed?

Details

The weighting method "obs" assigns equal weights to observations; $w_{ij} = 1/N$, where N is the total number of observations. The weighting method "clusters" assigns equal weights to clusters; $w_{ij} = 1/(nk_i)$, where n is the total number of clusters and k_i is the cluster size. The estimation method "cluster-median" estimates the between-cluster Spearman rank correlation using the coefficients from the cumulative probability models of x and y on cluster index `cluster`. The estimation method "approx" estimates the between-cluster Spearman rank correlation using the approximated linear relationship between the total, between-, and within-cluster Spearman rank correlations.

Value

a list with following components.

- 'Total' the total Spearman rank correlation, including the estimate (Estimate), the standard error (SE), the lower and upper bounds (Lower and Upper), and the 95% confidence interval (CI) (LowerCI and UpperCI).
- 'Within' the within-cluster Spearman rank correlation, including the estimate (Estimate), the standard error (SE), the lower and upper bounds (Lower and Upper), and the 95% confidence interval (CI) (LowerCI and UpperCI).
- 'Between' the between-cluster Spearman rank correlation estimated, including the estimation method name, the estimate (Estimate), the standard error (SE), the lower and upper bounds (Lower and Upper), and the 95% confidence interval (CI) (LowerCI and UpperCI).
- 'Rank ICC' the rank intraclass correlation coefficients of x and y . It would be presented in the output if 'approx' is used.

References

- Tu, S., Li, C., Zeng, D., and Shepherd, B. E. (2023). Rank intraclass correlation for clustered data. *Statistics in Medicine* 42, 4373-4384.
- Shih, J. H. and Fay, M. P. (2017). Pearson's chi-square test and rank correlation inferences for clustered data. *Biometrics* 73, 803-811.
- Tu, S., Li, C., and Shepherd, B. E. (2024). Between- and within-cluster Spearman rank correlations. *Statistics in Medicine*, 44(1), 1-12.

Examples

```
library(mvtnorm)
k <- 50; m <- 5
sigma.u <- matrix(c(1, 0.6, 0.6, 4), ncol=2); sigma.e <- matrix(c(1, 0.6, 0.6, 1), ncol=2)
u <- rmvnorm(k, c(1, -1), sigma.u)
x1 <- matrix(NA, k, m)
y1 <- matrix(NA, k, m)
for (i in 1:k){
  r <- rmvnorm(m, c(0, 0), sigma.e)
  x1[i,] <- u[i, 1] + r[, 1]
  y1[i,] <- u[i, 2] + r[, 2]
}
x <- as.vector(t(x1))
y <- as.vector(t(y1))
cluster <- rep(1:k, each=m)
rankCorrCluster(x, y, cluster, link.x = "probit", link.y = "probit",
```

```
methods_between_corr = "approx")
idx <- sample(1:250, 200, replace = TRUE)
rankCorrCluster(x[idx], y[idx], cluster[idx], link.x = "probit", link.y = "probit",
weights = "clusters")
```

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