

# Package ‘rankCorr’

March 31, 2025

**Type** Package

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

**Version** 1.0.2

**Date** 2025-03-29

**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.

**License** GPL (>= 2)

**Encoding** UTF-8

**Imports** rms (>= 6.3.0), rankICC (>= 1.0.1)

**Suggests** mvtnorm (>= 1.1.3)

**Collate** 'rankCorrCluster.R' 'rcc\_internal\_functions.R'

**RoxygenNote** 7.2.3

**NeedsCompilation** no

**Author** Shengxin Tu [aut, cre],  
Chun Li [aut],  
Bryan Shepherd [aut]

**Maintainer** Shengxin Tu <[shengxin.tu@vanderbilt.edu](mailto:shengxin.tu@vanderbilt.edu)>

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## Contents

rankCorrCluster . . . . .	2
<b>Index</b>	<b>5</b>

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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 confidence interval (CI).
- '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 confidence interval (CI).
- '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 confidence interval (CI).
- '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, 4375-4385.
- 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")
```

# Index

rankCorrCluster, [2](#)