Package: NeutroIBDAnalysis (via r-universe)

June 5, 2026

Type Package

Title Neutrosophic Analysis of Incomplete Block Designs

Version 0.1.1

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Description Provides methods for neutrosophic analysis of variance (NANOVA) and neutrosophic analysis of covariance (NANCOVA) for interval-valued data arising from incomplete block design experiments. The package supports balanced incomplete block designs (BIBDs), partially balanced incomplete block designs (PBIBDs), and lattice designs. Functions are included for treatment comparisons, least significant difference (LSD) tests, and interval-based statistical inference under neutrosophic environments.

License GPL (>= 2)

Encoding UTF-8

Depends R (>= 4.0.0)

Imports MASS, stats

RoxygenNote 7.3.3

NeedsCompilation no

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Repository https://cran.r-universe.dev

Date/Publication 2026-06-05 14:50:06 UTC

RemoteUrl https://github.com/cran/NeutroIBDAnalysis

RemoteRef HEAD

RemoteSha 8eb8fa78e6e7f00e0ae84333cc87bbd5a0010c3d

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`IBDnsANCOVA` *Neutrosophic ANCOVA for Incomplete Block Designs*

Description

Performs neutrosophic analysis of covariance for incomplete block designs using interval-valued responses and covariates.

Usage

```
IBDnsANCOVA(
  Lower_y,
  Upper_y,
  Lower_z,
  Upper_z,
  design,
  alpha = 0.05,
  verbose = FALSE
)
```

Arguments

`Lower_y`	Matrix of lower interval responses.
`Upper_y`	Matrix of upper interval responses.
`Lower_z`	Matrix of lower interval covariates.
`Upper_z`	Matrix of upper interval covariates.
`design`	Incomplete block design matrix.
`alpha`	Significance level for LSD test and F-test (default = 0.05).
`verbose`	Logical. If TRUE, prints the neutrosophic ANCOVA table, significance codes, LSD interval and pairwise treatment comparisons. Default = FALSE.

Details

The rows of the response and design arrays represent blocks, while the columns represent treatment allocations within blocks.

Value

A list containing:

- STAR_NANCOVA : Neutrosophic ANCOVA table.
- LSD : Neutrosophic LSD interval.
- Comparison : Pairwise treatment comparison table.

Examples

```
Lower_y<-matrix(c(
  46.46436719,49.56056768,47.21541951,
  47.41402083,51.24762662,50.95734839,
  50.7492564,51.250892,50.01772519,
  51.72202304,53.83285904,54.53288749,
  53.71983091,55.3957797,53.85646279,
  55.29951886,57.48888886,56.81959243,
  56.01454397,57.64266115,56.15643552
),nrow=7,byrow=TRUE)

Upper_y<-matrix(c(
  49.53563281,52.43943232,52.78458049,
  52.58597917,54.75237338,53.04265161,
  53.2507436,56.749108,55.98227481,
  54.27797696,58.16714096,59.46711251,
  56.28016909,60.6042203,58.14353721,
  58.70048114,60.51111114,59.18040757,
  59.98545603,62.35733885,61.84356448
),nrow=7,byrow=TRUE)

Lower_z<-matrix(c(
  87.6024962,49.87728481,21.20537996,
  74.19109283,70.90050743,69.79918837,
  118.3567216,84.52944492,87.2387685,
  116.5444728,127.5038727,122.3890764,
  104.4945972,117.9310944,126.206537,
  101.9435439,91.18240208,81.56378309,
  92.28882349,86.13485988,83.04950126
),nrow=7,byrow=TRUE)

Upper_z<-matrix(c(
  90.3975038,60.12271519,32.79462004,
  81.80890717,73.09949257,72.20081163,
  127.6432784,97.47055508,102.7612315,
  131.4555272,136.4961273,135.6109236,
  119.5054028,122.0689056,133.793463,
  116.0564561,102.8175979,96.43621691,
  99.71117651,93.86514012,92.95049874
),nrow=7,byrow=TRUE)

design<-matrix(c(
  1,2,4,
  2,3,5,
```

```
  3,4,6,
  4,5,7,
  5,6,1,
  6,7,2,
  7,1,3
),nrow=7,byrow=TRUE)

IBDnsANCOVA(
  Lower_y = Lower_y,
  Upper_y = Upper_y,
  Lower_z = Lower_z,
  Upper_z = Upper_z,
  design = design,
  verbose = TRUE
)
```

`IBDnsANOVA` *Neutrosophic ANOVA for Incomplete Block Designs*

Description

Performs neutrosophic analysis of variance for incomplete block designs using interval-valued observations.

Usage

```
IBDnsANOVA(Lower_y, Upper_y, design, alpha = 0.05, verbose = FALSE)
```

Arguments

`Lower_y`	Matrix of lower interval responses.
`Upper_y`	Matrix of upper interval responses.
`design`	Incomplete block design matrix.
`alpha`	Significance level for LSD test and F-test (default = 0.05).
`verbose`	Logical. If TRUE, prints the neutrosophic ANOVA table, LSD interval, significance codes and pairwise treatment comparisons. Default = FALSE.

Details

The rows of the response and design arrays represent blocks, while the columns represent treatment allocations within blocks.

Value

A list containing:

- STAR_NANOVA : Neutrosophic ANOVA table.
- LSD : Neutrosophic LSD interval.
- Comparison : Pairwise treatment comparison table.

Examples

```
Lower_y <- matrix(c(
  46.46436719,49.56056768,47.21541951,
  47.41402083,51.24762662,50.95734839,
  50.74925640,51.25089200,50.01772519,
  51.72202304,53.83285904,54.53288749,
  53.71983091,55.39577970,53.85646279,
  55.29951886,57.48888886,56.81959243,
  56.01454397,57.64266115,56.15643552
), nrow = 7, byrow = TRUE)

Upper_y <- matrix(c(
  49.53563281,52.43943232,52.78458049,
  52.58597917,54.75237338,53.04265161,
  53.25074360,56.74910800,55.98227481,
  54.27797696,58.16714096,59.46711251,
  56.28016909,60.60422030,58.14353721,
  58.70048114,60.51111114,59.18040757,
  59.98545603,62.35733885,61.84356448
), nrow = 7, byrow = TRUE)

design <- matrix(c(
  1,2,4,
  2,3,5,
  3,4,6,
  4,5,7,
  5,6,1,
  6,7,2,
  7,1,3
), nrow = 7, byrow = TRUE)

IBDnsANOVA(
  Lower_y,
  Upper_y,
  design,
  verbose = TRUE
)
```

LDnsANCOVA *Neutrosophic ANCOVA for Lattice Designs*

Description

Performs neutrosophic analysis of covariance for lattice designs using interval-valued responses and covariates.

Usage

```
LDnsANCOVA(
  Lower_y,
  Upper_y,
  Lower_z,
  Upper_z,
  design,
  alpha = 0.05,
  verbose = FALSE
)
```

Arguments

Lower_y	Matrix of lower interval responses.
Upper_y	Matrix of upper interval responses.
Lower_z	Matrix of lower interval covariates.
Upper_z	Matrix of upper interval covariates.
design	Lattice design matrix.
alpha	Significance level for LSD test and F-test (default = 0.05).
verbose	Logical. If TRUE, prints the neutrosophic ANCOVA table, significance codes, LSD interval and pairwise treatment comparisons. Default = FALSE.

Details

The rows of the response and design arrays represent blocks, while the columns represent treatment allocations within blocks.

Value

A list containing:

- STAR_NANCOVA : Neutrosophic ANCOVA table.
- LSD : Neutrosophic LSD interval.
- Comparison : Pairwise treatment comparison table.

Examples

```
#' @examples
Lower_y <- matrix(c(
  86.81,81.44,89.83,
  76.14,72.77,72.93,
  92.17,58.56,70.48,
  111.43,78.95,56.87,
  84.71,74.19,98.10,
  78.91,90.49,87.52,
  99.76,80.10,94.54,
  62.05,86.81,63.06,
  67.52,70.05,68.24
```

```
), nrow=9, byrow=TRUE)

Upper_y <- matrix(c(
  89.19,88.56,94.17,
  79.86,79.23,79.07,
  95.83,65.44,79.52,
  118.57,85.05,63.13,
  89.29,77.81,105.90,
  85.09,99.51,92.48,
  104.24,87.90,99.46,
  65.95,91.19,70.94,
  72.48,79.95,75.76
), nrow=9, byrow=TRUE)

Lower_z <- matrix(c(
  27.04,24.47,20.28,
  32.31,37.02,23.16,
  12.58,8.35,22.37,
  7.31,20.02,25.12,
  9.93,33.58,12.50,
  17.74,37.01,24.99,
  22.28,4.65,22.52,
  21.71,18.47,20.41,
  35.65,17.27,23.22
), nrow=9, byrow=TRUE)

Upper_z <- matrix(c(
  36.96,27.53,26.72,
  37.69,40.98,26.84,
  17.42,15.65,32.03,
  16.69,29.78,28.28,
  16.07,36.42,21.50,
  22.26,40.99,30.01,
  25.72,13.35,30.08,
  25.49,27.53,29.19,
  44.35,24.73,30.98
), nrow=9, byrow=TRUE)

design <- matrix(c(
  1,2,3,
  7,9,8,
  6,4,5,
  1,7,4,
  8,5,2,
  3,6,9,
  1,8,6,
  4,2,9,
  3,5,7
), nrow=9, byrow=TRUE)

LDnsANCOVA(
  Lower_y = Lower_y,
  Upper_y = Upper_y,
```

```
  Lower_z = Lower_z,
  Upper_z = Upper_z,
  design = design
)
```

LDnsANOVA *Neutrosophic ANOVA for Lattice Designs*

Description

Performs neutrosophic analysis of variance for lattice designs using interval-valued observations.

Usage

```
LDnsANOVA(Lower_y, Upper_y, design, alpha = 0.05, verbose = FALSE)
```

Arguments

Lower_y	Matrix of lower interval responses.
Upper_y	Matrix of upper interval responses.
design	Lattice design matrix.
alpha	Significance level for LSD test and F-test (default = 0.05).
verbose	Logical. If TRUE, prints the neutrosophic ANOVA table, significance codes, LSD interval and pairwise treatment comparisons. Default = FALSE.

Details

The rows of the response and design arrays represent blocks, while the columns represent treatment allocations within blocks.

Value

A list containing:

- STAR_NANOVA : Neutrosophic ANOVA table.
- LSD : Neutrosophic LSD interval.
- Comparison : Pairwise treatment comparison table.

Examples

```
Lower_y <- matrix(c(
  86.81,81.44,89.83,
  76.14,72.77,72.93,
  92.17,58.56,70.48,
  111.43,78.95,56.87,
  84.71,74.19,98.10,
  78.91,90.49,87.52,
  99.76,80.10,94.54,
  62.05,86.81,63.06,
  67.52,70.05,68.24
), nrow=9, byrow=TRUE)

Upper_y <- matrix(c(
  89.19,88.56,94.17,
  79.86,79.23,79.07,
  95.83,65.44,79.52,
  118.57,85.05,63.13,
  89.29,77.81,105.90,
  85.09,99.51,92.48,
  104.24,87.90,99.46,
  65.95,91.19,70.94,
  72.48,79.95,75.76
), nrow=9, byrow=TRUE)

design <- matrix(c(
  1,2,3,
  7,9,8,
  6,4,5,
  1,7,4,
  8,5,2,
  3,6,9,
  1,8,6,
  4,2,9,
  3,5,7
), nrow=9, byrow=TRUE)

LDnsANOVA(
  Lower_y,
  Upper_y,
  design,
  verbose = TRUE
)
```

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