Package 'corrMCT'

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Type Package

Title Correlated Weighted Hochberg

Version 0.2.0

Description Perform additional multiple testing procedure methods to p.adjust(), such as weighted Hochberg (Tamhane, A. C., & Liu, L., 2008) <doi:10.1093/biomet/asn018>, ICC adjusted Bonferroni method (Shi, Q., Pavey, E. S., & Carter, R. E., 2012) <doi:10.1002/pst.1514> and a new correlation corrected weighted Hochberg for correlated endpoints.

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Encoding UTF-8

RoxygenNote 7.3.2

Imports dplyr, glue, magrittr, Matrix, tibble

NeedsCompilation no

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Contents

`corr.Bonferroni` *ICC adjusted Bonferroni method*

Description

`corr.Bonferroni` performs the ICC adjusted Bonferroni method proposed by Shi, Pavey, and Carter(2012). Power law approximation by `r` is tricky, suggested options was listed in the paper.

Usage

```
corr.Bonferroni(p, ICC, r = 0, alpha = 0.05)
```

Arguments

`p`	A numeric vector. A length m P-value vector from multiple tests.
`ICC`	A number. Intraclass correlation correction factor, a real number between (0, 1).
`r`	A number. Tuning parameter for g** between (0, 1). Default `r=0`.
`alpha`	A real number. $1 - \alpha$ is the confidence level, `alpha` must between (0, 1).

Value

A numeric vector of adjusted p-values.

References

Shi, Q., Pavey, E. S., & Carter, R. E. (2012). Bonferroni-based correction factor for multiple, correlated endpoints. Pharmaceutical statistics, 11(4), 300-309.

Examples

```
m <- 10
corr.Bonferroni(
  p = runif(m),
  ICC = 0.3
)
```

corr.WHC *Correlation adjusted weighted Hochberg method*

Description

A new method implement correlation correction based on weighted Hochberg. An ACF is applied for weight reduction to conserve alpha. Details see Huang et al. (2024+). A correlation structure with too many zero leads the method reduce to weighted Hochberg.

Usage

```
corr.WHC(p, w, corr.mat, a = 0.5, b = 0.6, penalty = NULL, alpha = 0.05)
```

Arguments

p	A numeric vector. A length m P-value vector from multiple tests.
w	A numeric vector. Any non-negative real numbers to denote the importance of the endpoints. Length must be equal to m. A single value, e.g. w = 1, represents equal weight. WHC can scale the weight vector as if the sum of weight is not 1.
corr.mat	A matrix. The dimension must be $m \times m$. Positive correlation is the theoretical assumption, however, it is robust to run with some negative elements in the correlation matrix.
a	A numeric number. $a \in (0, 1)$ determines the greatest penalty on weight, Default a=0.5. Details see Huang et al (2024+).
b	A numeric number. $b \in (0, 1)$ is the shape parameter of the penalty function. $b = 1$ produce a linear function.
penalty	A function. User can define their own penalty function. The basic rule is the function must be monotone decreasing from 0 to 1, and range from 1 to a where $a \in (0, 1)$. A convex function is recommended. Concave function can produce result, but have no meaning on alpha conserving.
alpha	A real number. $1 - \alpha$ is the confidence level, alpha must between (0, 1).

Value

A table contains p-values, weights, adjusted critical values, significance

References

Huang, X. -W., Hua, J., Banerjee, B., Wang, X., Li, Q. (2024+). Correlated weighted Hochberg procedure. In-preparation.

Examples

```
m <- 5
corr.WHC(
  p = runif(m),
  w = runif(m),
  corr.mat = cor(matrix(runif(10*m), ncol = m))
)
```

`corrmat_AR1` *AR(1) correlation matrix*

Description

An easy function to generate a AR(1) correlation matrix.

Usage

```
corrmat_AR1(m, rho)
```

Arguments

`m`	An integer. Dimension of the correlation matrix.
`rho`	A number. Correlation coefficient between $(0, 1)$

Value

A correlation matrix

Examples

```
corrmat_AR1(
  m = 3,
  rho = 0.2
)
```

`corrmat_block` *Block design correlation matrix*

Description

An easy function to generate a block design correlation matrix. Each diagonal element R_i is a compound symmetric matrix with dimension $d_i \times d_i$. Correlation coefficient in each block is ρ_i. All the off-diagonal elements are 0.

Usage

```
corrmat_block(d, rho)
```

Arguments

d	An integer vector. Length B of block dimensions. Element of d can be 1, it would not generate a sub-matrix with the corresponding element in rho, but just 1.
rho	A numeric vector. A length B vector of correlation coefficients, represent B different block of correlation matrix.

Value

A correlation matrix

Examples

```
corrmat_block(
  d = c(2,3,4),
  rho = c(0.1, 0.3, 0.5)
)
```

---

corrmat_blockAR1 *Block AR(1) design correlation matrix*

Description

An easy function to generate a block AR(1) design correlation matrix. Each diagonal element R_i is an AR(1) correlation matrix with dimension $d_i \times d_i$. Correlation coefficient in each block is ρ_i. All the off-diagonal elements are 0.

Usage

```
corrmat_blockAR1(d, rho)
```

Arguments

d	An integer vector. Length B of block dimensions. Element of d can be 1, it would not generate a sub-matrix with the corresponding element in rho, but just 1.
rho	A numeric vector. A length B vector of correlation coefficients, represent B different block of correlation matrix.

Value

A correlation matrix

Examples

```
corrmat_blockAR1(
  d = c(2,3,4),
  rho = c(0.1, 0.3, 0.5)
)
```

corrmat_CS *Compound symmetric correlation matrix*

Description

An easy function to generate a compound symmetric correlation matrix

Usage

```
corrmat_CS(m, rho)
```

Arguments

m	An integer. Dimension of the correlation matrix.
rho	A number. Correlation coefficient between $(0, 1)$

Value

A correlation matrix

Examples

```
corrmat_CS(
  m = 3,
  rho = 0.2
)
```

WHC *Weighted Hochberg method*

Description

WHC performs the weighted Hochberg method proposed by Tamhane and Liu (2008).

Usage

```
WHC(p, w, alpha = 0.05)
```

Arguments

p	A numeric vector. A length m P-value vector from multiple tests.
w	A numeric vector. Any non-negative real numbers to denote the importance of the endpoints. Length must be equal to m. A single value, e.g. w = 1, represents equal weight. WHC can scale the weight vector as if the sum of weight is not 1.
alpha	A real number. $1 - \alpha$ is the confidence level, alpha must between (0, 1).

Value

A table contains p-values, weights, adjusted critical values, significance

References

Tamhane, A. C., & Liu, L. (2008). On weighted Hochberg procedures. Biometrika, 95(2), 279-294.

Examples

```
m <- 5
WHC(
  p = runif(m),
  w = runif(m)
)
```

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