

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](https://doi.org/10.1093/biomet/asn018)>, ICC adjusted Bonferroni method (Shi, Q., Pavey, E. S., & Carter, R. E., 2012) <[doi:10.1002/pst.1514](https://doi.org/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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corr.Bonferroni	<i>ICC adjusted Bonferroni method</i>
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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

<code>p</code>	A numeric vector. A length m P-value vector from multiple tests.
<code>ICC</code>	A number. Intraclass correlation correction factor, a real number between (0, 1).
<code>r</code>	A number. Tuning parameter for g^{**} between (0, 1). Default $r=0$.
<code>alpha</code>	A real number. $1 - \alpha$ is the confidence level, α 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 ρ , but just 1.
ρ	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 ρ , but just 1.
ρ	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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