Package 'frt'

February 19, 2015

Version 0.1

Date 2011-12-31

Title Full Randomization Test

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Description Perform full randomization tests.

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URL http://www.r-project.org

Repository CRAN

Date/Publication 2012-10-29 08:58:47

NeedsCompilation no

R topics documented:

bin *Transform decimal into binary*

Description

bin transforms a decimal number into a binary one in vectorial form.

Usage

```
bin(x)
```

Arguments

x	an integer

Details

bin takes as input an integer and transforms it into the corresponding binary number. The output is a vector whose elements are the coefficients of increasing powers of 2, i.e., the *i*th item is the coefficient for 2^{i-1}. For instance, bin(4) returns $(0, 0, 1)$.

Value

a vector of 0/1

Author(s)

Lucia Tamburino, Giangiacomo Bravo

Examples

```
for (i in 0:10) print(bin(i))
```

comb *Build a matrix with combinations of zeros and ones.*

Description

Internal function, generally not called by users.

Usage

```
comb(m, n)
```

Arguments

m	an integer, corresponding to the number of zeros. It must be greater or equal to zero.
n	an integer, corresponding to the number of ones. It must be greater or equal to zero.

Details

comb builds the matrix with all combinations of *m* zeros and *n* ones. The output matrix will hence have as number of columns $n_c = m+n$ and as number of rows $n_r = (m+n)!/(m!n!)$, which is the number of all the possible combinations. Each row will contain one of the n_r possible combinations of *m* zeros and *n* ones.

Value

A matrix

Author(s)

Lucia Tamburino

Examples

```
comb(3,2)
```

---

concat *Combine rows of two input matrices*

Description

Internal function, generally not called by users.

Usage

```
concat(x1, x2)
```

Arguments

x1	A matrix. It can have any numbers of columns and rows, but cannot be empty
x2	A matrix. It can have any numbers of columns and rows, but cannot be empty

Details

This function takes as input two matrices and builds a matrix with all the possible combinations of the rows of the first input matrix, with the rows of the second one. If r_1 and c_1 (resp. r_2 and c_2) are the row and the column number of the matrix *x1* (resp. *x2*), then the output matrix will have $c_1 + c_2$ columns and $r_1 r_2$ rows. Therefore, each row of the output matrix is composed by any of the rows of *x1* (in the first c_1 columns) and any of the rows of *x2* (in the column from $c_1 + 1$ to $c_1 + c_2$).

Value

A matrix.

Author(s)

Lucia Tamburino

Examples

```
m1 <- matrix(1:6, nrow=2, ncol=3)
print(m1)
m2 <- matrix(c(0,0,0,1,1,0,1,1), nrow=4, ncol=2)
print(m2)
concat(m1,m2)
```

---

frt *Full randomization test*

Description

Performs a two sample full randomization test on vectors of data.

Usage

```
frt(x, y, alternative = "two.sided")
```

Arguments

x	a numeric vector
y	a numeric vector
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less". You can specify just the initial letter.

Details

The function tests all the $(n + m)!/n!m!$ possible arrangements, where *n* and *m* are the lengths of x and y respectively. This number (just as computational times and memory requirements) grows extremely fast with *n* and *m*.

Value

numeric	the probability of the null hypothesis of no difference between means.

Author(s)

Giangiacomo Bravo

References

Box, G.E.P, Hunter, J.S. and Hunter, G.W. (2005), *Statistics for Experimenters: Design, Innovation, and Discovery. Second Edition*. Hoboken, NJ: Wiley.

See Also

frt.paired

Examples

```
# Tomato yield example in Box et al. (2005, 78--80)
data(tomatoes)
attach(tomatoes)
x <- pounds[fertilizer == "A"]
y <- pounds[fertilizer == "B"]
frt(x, y, alt="l")
detach(tomatoes)
```

---

frt.paired *Full randomization paired test*

Description

Performs a full randomization test on paired vectors of data.

Usage

```
frt.paired(x, y, alternative = "two.sided")
```

Arguments

x	a numeric vector
y	a numeric vector
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less". You can specify just the initial letter.

Details

x and y must have the same length.

The function tests 2^n possible arrangements, where n is the length of x and y. This number (just as computational times and memory requirements) grows rapidly with n.

Value

numeric	the probability of the null hypothesis of no difference between means.

Author(s)

Giangiacomo Bravo

References

Box, G.E.P, Hunter, J.S. and Hunter, G.W. (2005), *Statistics for Experimenters: Design, Innovation, and Discovery. Second Edition*. Hoboken, NJ: Wiley.

See Also

frt

Examples

```
# Boys' shoes example in Box et al. (2005, 81--84)
data(shoes)
attach(shoes)
frt.paired(matA, matB, alt="l")
detach(shoes)
```

---

shoes *Boys' shoes data*

Description

Data for the boys' shoes example in Box et al. (2005, 81–84).

Usage

```
data(shoes)
```

Format

A data frame with 10 observations on the following 6 variables.

`boy` a numeric vector

`matA` a numeric vector

`sideA` a factor with levels `L` `R`

`matB` a numeric vector

`sideB` a factor with levels `L` `R`

`diff` a numeric vector

Source

Box, G.E.P, Hunter, J.S. and Hunter, G.W. (2005), *Statistics for Experimenters: Design, Innovation, and Discovery. Second Edition*. Hoboken, NJ: Wiley.

Examples

```
data(shoes)
print(shoes)
```

`tomatoes` *Tomato yield example*

Description

Data for the Tomato yield example in Box et al. (2005, 78–80)

Usage

```
data(tomatoes)
```

Format

A data frame with 11 observations on the following 4 variables.

`run` a numeric vector

`position` a numeric vector

`fertilizer` a factor with levels `A` `B`

`pounds` a numeric vector

Source

Box, G.E.P, Hunter, J.S. and Hunter, G.W. (2005), *Statistics for Experimenters: Design, Innovation, and Discovery. Second Edition*. Hoboken, NJ: Wiley.

Examples

```
data(tomatoes)
print(tomatoes)
```

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