

Package ‘corTest’

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Type Package

Title Robust Tests for Equal Correlation

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Description There are 6 novel robust tests for equal correlation. They are all based on logistic regressions. The score statistic U is proportion to difference of two correlations based on different types of correlation in 6 methods. The ST1() is based on Pearson correlation. ST2() improved ST1() by using median absolute deviation. ST3() utilized type M correlation and ST4() used Spearman correlation. ST5() and ST6() used two different ways to combine ST3() and ST4(). We highly recommend ST5() according to the article titled "New Statistical Methods for Constructing Robust Differential Correlation Networks to characterize the interactions among microRNAs" published in Scientific Reports. Please see the reference: Yu et al. (2019) <doi:10.1038/s41598-019-40167-8>.

License GPL (>= 2)

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fisher_transfer_test *Test for equal correlation*

Description

Compute p-value with Fisher's Z-transformation test. If biasCorrection is true, the corrected correlation is used. The formula is $\text{rho.corrected} = \text{rho} - \text{rho}/(2*(n-1))$.

Usage

```
fisher_transfer_test(x1, z1, x0, z0, biasCorrection = TRUE)
```

Arguments

x1	a numeric vector
z1	a numeric vector with same length as x1
x0	a numeric vector
z0	a numeric vector with same length as x0
biasCorrection	a boolean value

Value

p-value of test for testing if correlation between x1 and z1 is the same as that between x0 and z0

Author(s)

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References

Danyang Yu, Zeyu Zhang, Kimberly Glass, Jessica Su, Dawn L. DeMeo, Kelan Tantisira, Scott T. Weiss, Weiliang Qiu(corresponding author). New Statistical Methods for Constructing Robust Differential Correlation Networks to characterize the interactions among microRNAs. Scientific Reports 9, Article number: 3499 (2019)

Examples

```
x1 = ghdist(n = 100, g = 0.2, h = 0.2)
x0 = ghdist(n = 100, g = 0.2, h = 0.2)
z1 = x1 + ghdist(n = 100, g = 0.2, h = 0.2)
z0 = x0 + ghdist(n = 100, g = 0.2, h = 0.2)
p = fisher_transfer_test(x1, z1, x0, z0)
print(p)
```

ghdist	<i>generating variables from g-and-h distribution</i>
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Description

generating variables from g-and-h distribution

Usage

```
ghdist(n, g = 0, h = 0)
```

Arguments

n	the number of the variables you want to generate
g	the parameter g of g-and-h distribution
h	the parameter h of g-and-h distribution

Value

n variables generated from g-and-h distribution

Examples

```
x = ghdist(50, 0.2, 0.2)
print(x)
```

st1	<i>Test Differential Correlation Using st1 Method</i>
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Description

Compute p-value for the equal correlation test with Pearson correlation based on a logistic regression model corresponding to two independent groups

Usage

```
st1(x1, z1, x0, z0)
```

Arguments

x1	a numeric vector
z1	a numeric vector with same length as x1
x0	a numeric vector
z0	a numeric vector with same length as x0

Value

stat	Test statistic for testing if correlation between x1 and z1 is the same as that between x0 and z0
p-value	p-value of test
signedStat	Signed test statistic

Author(s)

Danyang Yu <dyu33@jhu.edu>, Weiliang Qiu <weiliang.qiu@gmail.com>

References

Danyang Yu, Zeyu Zhang, Kimberly Glass, Jessica Su, Dawn L. DeMeo, Kelan Tantisira, Scott T. Weiss, Weiliang Qiu(corresponding author). New Statistical Methods for Constructing Robust Differential Correlation Networks to characterize the interactions among microRNAs. Scientific Reports 9, Article number: 3499 (2019)

Examples

```
x1 = ghdist(n = 100, g = 0.2, h = 0.2)
x0 = ghdist(n = 100, g = 0.2, h = 0.2)
z1 = x1 + ghdist(n = 100, g = 0.2, h = 0.2)
z0 = x0 + ghdist(n = 100, g = 0.2, h = 0.2)
p = st1(x1, z1, x0, z0)
print(p)
```

st2

Test Differential Correlation Using st2 Method

Description

Compute p-value for the equal correlation test with mad-replacing-Pearson correlation based on a logistic regression model corresponding to two independent groups

Usage

```
st2(x1, z1, x0, z0)
```

Arguments

x1	a numeric vector
z1	a numeric vector with same length as x1
x0	a numeric vector
z0	a numeric vector with same length as x0

Value

stat	Test statistic for testing if correlation between x1 and z1 is the same as that between x0 and z0
p-value	p-value of test
signedStat	Signed test statistic

Author(s)

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References

Danyang Yu, Zeyu Zhang, Kimberly Glass, Jessica Su, Dawn L. DeMeo, Kelan Tantisira, Scott T. Weiss, Weiliang Qiu (corresponding author). New Statistical Methods for Constructing Robust Differential Correlation Networks to characterize the interactions among microRNAs. Scientific Reports 9, Article number: 3499 (2019)

Examples

```
x1 = ghdist(n = 100, g = 0.2, h = 0.2)
x0 = ghdist(n = 100, g = 0.2, h = 0.2)
z1 = x1 + ghdist(n = 100, g = 0.2, h = 0.2)
z0 = x0 + ghdist(n = 100, g = 0.2, h = 0.2)
p = st2(x1, z1, x0, z0)
print(p)
```

st3

Test Differential Correlation Using st3 Method

Description

Compute p-value for the equal correlation test with percentage bend correlation based on a logistic regression model corresponding to two independent groups

Usage

```
st3(x1, z1, x0, z0)
```

Arguments

x1	a numeric vector
z1	a numeric vector with same length as x1
x0	a numeric vector
z0	a numeric vector with same length as x0

Value

stat	Test statistic for testing if correlation between x1 and z1 is the same as that between x0 and z0
p-value	p-value of test
signedStat	Signed test statistic

Author(s)

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References

Danyang Yu, Zeyu Zhang, Kimberly Glass, Jessica Su, Dawn L. DeMeo, Kelan Tantisira, Scott T. Weiss, Weiliang Qiu (corresponding author). New Statistical Methods for Constructing Robust Differential Correlation Networks to characterize the interactions among microRNAs. Scientific Reports 9, Article number: 3499 (2019)

Examples

```
x1 = ghdist(n = 100, g = 0.2, h = 0.2)
x0 = ghdist(n = 100, g = 0.2, h = 0.2)
z1 = x1 + ghdist(n = 100, g = 0.2, h = 0.2)
z0 = x0 + ghdist(n = 100, g = 0.2, h = 0.2)
p = st3(x1, z1, x0, z0)
print(p)
```

st4

Test Differential Correlation Using st4 Method

Description

Compute p-value for the equal correlation test with Spearman correlation based on a logistic regression model corresponding to two independent groups

Usage

```
st4(x1, z1, x0, z0)
```

Arguments

x1	a numeric vector
z1	a numeric vector with same length as x1
x0	a numeric vector
z0	a numeric vector with same length as x0

Value

stat	Test statistic for testing if correlation between x1 and z1 is the same as that between x0 and z0
p-value	p-value of test
signedStat	Signed test statistic

Author(s)

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References

Danyang Yu, Zeyu Zhang, Kimberly Glass, Jessica Su, Dawn L. DeMeo, Kelan Tantisira, Scott T. Weiss, Weiliang Qiu(corresponding author). New Statistical Methods for Constructing Robust Differential Correlation Networks to characterize the interactions among microRNAs. Scientific Reports 9, Article number: 3499 (2019)

Examples

```
x1 = ghdist(n = 100, g = 0.2, h = 0.2)
x0 = ghdist(n = 100, g = 0.2, h = 0.2)
z1 = x1 + ghdist(n = 100, g = 0.2, h = 0.2)
z0 = x0 + ghdist(n = 100, g = 0.2, h = 0.2)
p = st4(x1, z1, x0, z0)
print(p)
```

st5

Test Differential Correlation Using st5 Method

Description

Compute p-value for the equal correlation test with combination of Spearman correlation and percentage bend correlation based on a logistic regression model corresponding to two independent groups

Usage

```
st5(x1, z1, x0, z0)
```

Arguments

x1	a numeric vector
z1	a numeric vector with same length as x1
x0	a numeric vector
z0	a numeric vector with same length as x0

Value

stat	Test statistic for testing if correlation between x1 and z1 is the same as that between x0 and z0
p-value	p-value of test
signedStat	Signed test statistic

Author(s)

Danyang Yu <dyu33@jhu.edu>, Weiliang Qiu <weiliang.qiu@gmail.com>

References

Danyang Yu, Zeyu Zhang, Kimberly Glass, Jessica Su, Dawn L. DeMeo, Kelan Tantisira, Scott T. Weiss, Weiliang Qiu(corresponding author). New Statistical Methods for Constructing Robust Differential Correlation Networks to characterize the interactions among microRNAs. Scientific Reports 9, Article number: 3499 (2019)

Examples

```
x1 = ghdist(n = 100, g = 0.2, h = 0.2)
x0 = ghdist(n = 100, g = 0.2, h = 0.2)
z1 = x1 + ghdist(n = 100, g = 0.2, h = 0.2)
z0 = x0 + ghdist(n = 100, g = 0.2, h = 0.2)
p = st5(x1, z1, x0, z0)
print(p)
```

st6

Test Differential Correlation Using st6 Method

Description

Compute p-value for the equal correlation test with another way to combine Spearman correlation and percentage bend correlation based on a multiple logistic regression model corresponding to two independent groups

Usage

```
st6(x1, z1, x0, z0)
```

Arguments

x1	a numeric vector
z1	a numeric vector with same length as x1
x0	a numeric vector
z0	a numeric vector with same length as x0

Value

p-value of test for testing if correlation between x_1 and z_1 is the same as that between x_0 and z_0

Author(s)

Danyang Yu <dyu33@jhu.edu>, Weiliang Qiu <weiliang.qiu@gmail.com>

References

Danyang Yu, Zeyu Zhang, Kimberly Glass, Jessica Su, Dawn L. DeMeo, Kelan Tantisira, Scott T. Weiss, Weiliang Qiu(corresponding author). New Statistical Methods for Constructing Robust Differential Correlation Networks to characterize the interactions among microRNAs. Scientific Reports 9, Article number: 3499 (2019)

Examples

```
x1 = ghdist(n = 100, g = 0.2, h = 0.2)
x0 = ghdist(n = 100, g = 0.2, h = 0.2)
z1 = x1 + ghdist(n = 100, g = 0.2, h = 0.2)
z0 = x0 + ghdist(n = 100, g = 0.2, h = 0.2)
p = st6(x1, z1, x0, z0)
print(p)
```

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