Package 'ACE.CoCo'

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Title Analysis of Correlated High-Dimensional Expression (ACE) Data

Version 0.1

Description A function for estimating factor models. Give factor-adjusted statistics, factor-adjusted mean estimation (one-sample test) or factor-adjusted mean difference estimation (two-sample test).

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Encoding UTF-8

Depends R (>= 3.6.0)

Imports quantreg

Suggests mvtnorm, MASS

URL https://github.com/hongyuan-cao/ACE

RoxygenNote 7.2.3

NeedsCompilation no

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Description

A function for estimating factor models, giving factor-adjusted statistics.

Usage

```
ACE(Z, X, H0_indicator, gama)
```

Arguments

Z	The observed data matrix with the variables in rows and samples in columns. It is a p-by-n_1 matrix.
X	(Optional) The observed data matrix with the variables in rows and samples in columns. It is a p-by-n_2 matrix. If X is present, then perform the two-sample test; otherwise, perform one-sample test.
H0_indicator	(Optional) A p-dimensional vector containing only 0 and 1. A value of 1 means the variable/gene is non-null and a value of 0 means the gene is null.
gama	FDR control level.

Value

An object with S3 class ACE containing the following items will be returned:

FDP If H0_indicator exists, FDP is true FDP, otherwise, it is estimated FDP.

Power If H0_indicator exists, power is output which is defined as the ratio of the number of correctly rejected to the number of non-nulls.

Rejection The number of rejections.

Adjusted_mean_difference Factor-adjusted mean difference which is a p-dimensional vector.

Adjusted_statistics Factor-adjusted statistics (p-dimensional vector).

Threshold A critical value. When absolute factor-adjusted statistics is larger than the threshold, we reject it.

Estimated_number_factor The estimated number of factors.

pai1_hat The estimated proportion of non-nulls.

References

Cao, H., & Kosorok, M. R. (2011). Simultaneous critical values for t-tests in very high dimensions. Bernoulli, 17, 347.

Wang, P., Lyu, P., Peddada, S., Cao, H. (2023+). A powerful methodology for analyzing correlated high dimensional data using factor models. results not shown.

Examples

```
library(mvtnorm); library(quantreg)
p <- 200; n <- 100; h <- 3 # the number of variables, samples and factors
berlii <- rbinom(p, 1, 0.2) # 1 means the variable is non-null and 0 means it is null.
index0 <- which(berlii == 0); index1 <- which(berlii == 1)

mu <- matrix(rep(0, 1*p), nrow=p)
mu[index1] <- runif(length(index1), min=0.4, max=0.7) # expectation of data
B <- matrix(runif(h*p, min=-1, max=1), nrow=p) # factor loading matrix
t_error <- t(rmvt(n, sigma = diag(p), df = 10)) # error term followed t-distribution
f <- t(rmvt(n, diag(h), df = 4))/sqrt(4/(4-2)) # factor followed t-distribution
Y <- mu %*% matrix(rep(1, n*1), nrow=1) + B %*% f + t_error # data
res <- ACE(Z = Y, H0_indicator = berlii, gama = 0.05)
res$FDP # true FDP
res$Power # power
```

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