Package ‘GEWIST’

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**Type** Package  
**Title** Gene Environment Wide Interaction Search Threshold  
**Version** 1.20.0  
**Depends** R (>= 2.10), car  
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**Description** This ‘GEWIST’ package provides statistical tools to efficiently optimize SNP prioritization for gene-gene and gene-environment interactions.  
**License** GPL-2  
**LazyLoad** yes  
**biocViews** MultipleComparison, Genetics  
**NeedsCompilation** no

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**Description**

This ‘GEWIST’ package provides statistical tools to efficiently optimize SNP prioritization for gene-gene and gene-environment interactions.

**Details**

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Author(s)
Wei Q. Deng <dengwq@mcmaster.ca> Guillaume Pare <pareg@mcmaster.ca>

References

Description
Compute the optimal Variance Prioritization power and corresponding Levene’s test p-value threshold for prioritization given the interaction effect size distribution using GEWIST.

Usage
effectPDF(distribution = c("beta", "normal", "uniform", "weibull"),
parameter1, parameter2 = NULL, parameter3 = NULL, p, N, theta_c, M,
K = 20000, nb_incr = 50, range = NULL, verbose = FALSE)

Arguments
distribution distribution of interaction effect size. Possible distributions are:
"beta" for beta distribution
"normal" for normal distribution
"uniform" for uniform distribution
"weibull" for weibull distribution
parameter1 the first parameter used in the corresponding distribution
parameter2 the second parameter used in the corresponding distribution, could set to be null
parameter3 the third parameter used in the corresponding distribution, could set to be null
p minor allele frequency of the SNP, a number between 0 and 0.5
N sample size
theta_c proportion of quantitative trait variance explained by the covariate, should be a number between 0 and 1
M total number of SNPs to be tested
K number of GEWIST procedures, by default, set to be 20,000
number of effect size points in the range to be prioritized using GEWIST; by default set to be 50.

range

range of variance explained by interaction effect sizes, a vector of length 2

verbose

logical; if TRUE, for each interaction effect size, function returns a data.frame class object listing the VP power at each p-value, from 0.001 to 1 with 0.001 incremental increase.

Value

A list with three components:

Optimal_VP_power

VP power to detect interactions at the optimal VP p-value threshold

Conventional_power

power to detect interactions without prioritization, i.e, VP power at Levene’ test p-value of 1

Optimal_pval_threshold

levene’e test p-value at which optimal VP power is achieved

Warning

Computational time is directly proportional to nb_incr.

Author(s)

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References


Examples

# Given a SNP with minor allele frequency of 10% and a sample # of 10,000 individuals, we are interested in testing interactions # between this SNP and a covariate of effect size 10%. The # total number of SNP is 500,000. Assume the unknown interaction # effect size has a Weibull distribution in the range of 0.05% # and 0.3% variance explained with 50 increments. Repeat GEWIST # for each of the 50 interaction effect sizes.

library(GEWIST)
effectPDF(distribution = "weibull", parameter1 = 0.8, parameter2 = 0.3,
gewistLevene

## End of script

gewistLevene

*Genome Environment Wide Interaction Search Threshold with Levene’s test*

### Description

Compute the optimal Variance Prioritization power and the corresponding Levene’s test prioritization p-value threshold for a given interaction effect size.

### Usage

```r
gewistLevene(p, N, theta_gc, theta_c, M, K = 20000, verbose = FALSE)
```

### Arguments

- `p`  
  minor allele frequency of the SNP, a number between 0 and 0.5
- `N`  
  sample size
- `theta_gc`  
  proportion of quantitative trait variance explained by the interaction, should be a number between 0 and 1
- `theta_c`  
  proportion of quantitative trait variance explained by the covariate, should be a number between 0 and 1
- `M`  
  total number of SNPs to be tested
- `K`  
  number of procedures, by default, set to be 20,000
- `verbose`  
  logical; if TRUE, function returns a data.frame class object listing the VP power at each p-value, from 0.001 to 1 with 0.001 incremental increase.

### Value

A list with three components:

- `Optimal_VP_power`  
  VP power to detect interactions at the optimal Levene’s test p-value threshold
- `Conventional_power`  
  power to detect interactions without prioritization, i.e., VP power at Levene’s test p-value of 1
- `Optimal_pval_threshold`  
  Levene’s test p-value at which optimal VP power is achieved

### Author(s)

Wei Q. Deng <dengwq@mcmaster.ca> Guillaume Pare <pareg@mcmaster.ca>
gewistLevene

References


Examples

# Given a SNP with minor allele frequency of 10% and a sample
# of 15,000 individuals, we are interested in testing interactions
# between this SNP and a covariate of effect size #10%. The
# total number of SNP is 500,000. Assume the interaction
# explains 0.1% of the quantitative trait variance.

library(GEWIST)
gewistLevene(p = 0.1, N = 15000, theta_gc =0.1/100, theta_c = 0.1 , M = 500000, 
K = 20000, verbose=FALSE)
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