Package: mr.genius (via r-universe)

May 19, 2026

Title GENIUS-MAWII: For Robust Mendelian Randomization with Many Weak Invalid Instruments

Version 0.1.0

Description Mendelian randomization (MR) has become a popular approach to study causal effects by using genetic variants as instrumental variables. This package implements GENIUS-MAWII. Reference: Ting Ye, Zhonghua Liu, Baoluo Sun, and Eric Tchetgen Tchetgen (2021). GENIUS-MAWII: For Robust Mendelian Randomization with Many Weak Invalid Instruments. Available at https://arxiv.org/abs/2107.06238.

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Imports lmtest, rootSolve, sandwich, ggplot2

Encoding UTF-8

LazyData true

RoxygenNote 7.3.3

Repository https://mrcieu.r-universe.dev

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RemoteUrl https://github.com/remlapmot/mr.genius

RemoteRef suggestions

RemoteSha 129fdb43f77409b3d0dcc5209c42b6d3347c9173

Contents

data_gen *Simulate dataset*

Description

Simulate dataset

Usage

```
data_gen(m, n, beta0, gamma, case = "case2")
```

Arguments

m	Number of SNPs
n	Sample size
beta0	True causal effect
gamma	A parameter that controls the magnitude of heteroscedasticity, i.e., the identification strength
case	Simulation scenarios used in Table 1 in Ye et al., (2021)

Value

A list

z A n*m matrix of SNPs.

a A n-dimentional vector for the exposure.

y A n-dimentional vector for the outcome.

References

Ting Ye, Zhonghua Liu, Baoluo Sun, and Eric Tchetgen Tchetgen (2021). GENIUS-MAWII: For Robust Mendelian Randomization with Many Weak Invalid Instruments.https://arxiv.org/abs/2107.06238.

Examples

```
df<-data_gen(m=100,n=1e5,beta=0.4,gamma=0.1)
```

data_gen_x *Simulate a dataset with covariates*

Description

Simulate a dataset with covariates

Usage

```
data_gen_x(m, n, beta0, gamma)
```

Arguments

m	Number of SNPs
n	Sample size
beta0	True causal effect
gamma	A parameter that controls the magnitude of heteroscedasticity, i.e., the identification strength

Value

A list

z A n*m matrix of SNPs.

a A n-dimentional vector for the exposure.

y A n-dimentional vector for the outcome.

x A n*2 matrix for the covariate.

References

Ting Ye, Zhonghua Liu, Baoluo Sun, and Eric Tchetgen Tchetgen (2021). GENIUS-MAWII: For Robust Mendelian Randomization with Many Weak Invalid Instruments.https://arxiv.org/abs/2107.06238.

Examples

```
df<-data_gen_x(m=100,n=1e5,beta=0.4,gamma=0.1)
```

`mr.genius` *Main function for GENIUS-MAWII*

Description

Main function for GENIUS-MAWII

Usage

```
mr.genius(z, a, y, x = NULL, alpha = 0.05, diagnostics = FALSE)
```

Arguments

`z`	A n*m matrix of SNPs, where n is the sample size, m is the number of SNPs
`a`	A n-dimentional vector for the exposure
`y`	A n-dimentional vector for the outcome
`x`	A n*p matrix for the covariate, where p is the number of covariates. Default is NULL, when there is no covariates
`alpha`	Confidence interval has level 1-alpha. Default is 0.05
`diagnostics`	Should the function returns the residual plot for assumption diagnosis. Default is FALSE

Value

A list

beta.hat Estimated causal effect

beta.se Standard error of `beta.hat`

ci A 1-alpha confidence interval

J J statistic, which is often used to test overidentification. J statistic larger than 1-alpha quantile of chi-square distribution (df=dim(Z)-1) indicates that not all SNPs satisfy our assumptions.

f.statistic F-statistic as a measure of weak identification. It is recommended to be larger than 2.

References

Ting Ye, Zhonghua Liu, Baoluo Sun, and Eric Tchetgen Tchetgen (2021). GENIUS-MAWII: For Robust Mendelian Randomization with Many Weak Invalid Instruments.https://arxiv.org/abs/2107.06238.

Examples

```
df<-data_gen(m=20,n=1e5,beta=0.4,gamma=0.1)
mr.genius(df$z,df$a,df$y,diagnostics=TRUE)

  df<-data_gen_x(m=10,n=2e3,beta=0.4,gamma=1)
  mr.genius(df$z,df$a,df$y,df$x)
```

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