Package: MaximinInfer (via r-universe)

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Type Package

Title Inference for Maximin Effects in High-Dimensional Settings

Version 2.1.0

Description Implementation of the sampling and aggregation method for the covariate shift maximin effect, which was proposed in <doi:10.48550/arXiv.2011.07568>. It constructs the confidence interval for any linear combination of the high-dimensional maximin effect.

License GPL-3

Encoding UTF-8

RoxygenNote 7.2.3

Suggests knitr, rmarkdown

Imports MASS, stats, CVXR (>= 1.8), glmnet, intervals, SIHR

Depends R (>= 4.3.0)

NeedsCompilation no

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Contents

decide_delta *Decide ridge penalty data-dependently*

Description

To tell if the estimator is stable or not without ridge penalty at first. If instable, it picks a ridge penalty data-dependently.

Usage

```
decide_delta(
  obj,
  gen.size = 500,
  step_delta = 0.1,
  MAX_iter = 100,
  verbose = FALSE
)
```

Arguments

obj	The returned list of Maximin
gen.size	The generating sample size (Default = 500)
step_delta	The step size of searching delta (Default = 0.1)
MAX_iter	Maximum of iterations for searching (Default = 100)
verbose	Print information about delta and reward (Default = FALSE)

Value

delta	The data-dependent ridge penalty
reward.ratio	The ratio of penalized reward over non-penalized reward

Infer *Inference method*

Description

Given the returned list of Maximin, compute the Point estimator and Confidence interval.

Usage

```
Infer(
  obj,
  delta = 0,
  gen.size = 500,
  threshold = 0,
  alpha = 0.05,
  alpha.thres = 0.01
)
```

Arguments

obj	returned list of Maximin
delta	The ridge penalty (Default = 0)
gen.size	The generating sample size (Default = 500)
threshold	Should generated samples be filtered or not? if 0, use normal threshold to filter; if 1, use chi-square threshold to filter; if 2, do not filter (Default = 0)
alpha	confidence value to construct confidence interval (Default = 0.05)
alpha.thres	confidence value to select generated samples (Default = 0.01)

Value

weight	The weight vector for groups, of length L
mm.effect	The aggregated maximin effect (coefficients), of length p or $p+1$
mminfer	The list of length $n.loading$, each contains the point estimator and confidence interval

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Maximin *Returns a list that provides materials for later inference method.*

Description

Given list of observations, compute the bias-corrected initial estimators and do bias-correction to the regressopm covariance matrix.

Usage

```
Maximin(
  Xlist,
  Ylist,
  loading.mat,
  X0 = NULL,
  cov.shift = TRUE,
  cov0 = NULL,
  intercept = TRUE,
```

```
  intercept.loading = FALSE,
  lambda = NULL,
  verbose = FALSE
)
```

Arguments

Xlist	list of design matrix for source data, of length L
Ylist	list of outcome vector for source data, of length L
loading.mat	Loading matrix, of dimension $n.loading$ x p, each column corresponds to a loading of interest
X0	design matrix for target data, of dimension $n0$ x p (default = NULL)
cov.shift	Covariate shifts or not between source and target data (default = TRUE)
cov0	Covariance matrix for target data, of dimension p x p (default = NULL)
intercept	Should intercept be fitted for the initial estimator (default = TRUE)
intercept.loading	Should intercept term be included for the loading (default = FALSE)
lambda	The tuning parameter in fitting initial model. If NULL, it will be picked by cross-validation. (default = NULL)
verbose	Should intermediate message(s) be printed. (default = FALSE)

Details

The algorithm implemented scenarios with or without covariate shift. If cov0 is specified, the X0 will be ignored; if not, while X0 is specified, cov0 will be estimated by X0. If both are not specified, the algorithm will automatically set cov.shift as FALSE.

Value

The returned list contains the following components:

Gamma.plugin	The plugin regression covariance matrix
Gamma.debias	The proposed debiased regression covariance matrix
Var.Gamma	The variance matrix for sampling the regression covariance matrix
fits.info	The list of length L, that contains the initial coefficient estimators and variance of fitted residuals.
Points.info	The list of length L, that contains the initial debiased estimator for linear combinations and its corresponding standard error.

Examples

```
L = 2
n1 = n2 = 100; p = 4
X1 = MASS::mvrnorm(n1, rep(0,p), Sigma=diag(p))
X2 = MASS::mvrnorm(n2, rep(0,p), Sigma=0.5*diag(p))
b1 = seq(1,4)/10; b2 = rep(0.2, p)
```

```
y1 = as.vector(X1%*%b1+rnorm(n1)); y2 = as.vector(X2%*%b2+rnorm(n2))
loading1 = rep(0.4, p)
loading2 = c(-0.5, -0.5, rep(0,p-2))
loading.mat = cbind(loading1, loading2)
cov0 = diag(p)
mm = Maximin(list(X1,X2),list(y1,y2),loading.mat,cov0=cov0)

# inference
out = Infer(mm, gen.size=10)
```

`measure_instability` *measurement of instability*

Description

compute the instability measurement given a specific ridge penalty

Usage

```
measure_instability(
  obj,
  delta = 0,
  gen.size = 500,
  threshold = 0,
  alpha.thres = 0.01
)
```

Arguments

`obj`	The returned list of Maximin
`delta`	The ridge penalty (Default = 0)
`gen.size`	The generating sample size (Default = 500)
`threshold`	Should generated samples be filtered or not? if 0, use normal threshold to filter; if 1, use chi-square threshold to filter; if 2, do not filter. (Default = 0)
`alpha.thres`	The confidence value to select generated samples (Default = 0.01)

Value

The measurement of instability

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