Package ‘asus’

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Title  Adaptive SURE Thresholding Using Side Information
Version  1.0.0
Description  Provides the ASUS procedure for estimating a high dimensional sparse parameter in the presence of auxiliary data that encode side information on sparsity. It is a robust data combination procedure in the sense that even when pooling non-informative auxiliary data ASUS would be at least as efficient as competing soft thresholding based methods that do not use auxiliary data. For more information, please see the website <http://www-bcf.usc.edu/~wenguans/Papers/ASUS.htm> and the accompanying paper.

Depends  R (>= 3.4.2)
License  GPL (>= 2)
Encoding  UTF-8
LazyData  true

URL  https://github.com/trambakbanerjee/asus#asus
Imports  rwt, wavethresh, stats, utils
RoxygenNote  6.0.1
Suggests  knitr, rmarkdown
VignetteBuilder  knitr
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Description

ASUS procedure for shrinkage estimation of a high dimensional sparse parameter.

Usage

```r
asus(d, v.d, s, k = 2, m = 50)
```

Arguments

- `d`: an n vector of primary observations
- `v.d`: an n vector of variances for each component of d
- `s`: an n vector of side information
- `k`: number of groups. Default is k=2
- `m`: partitions the support of |s| into m equidistant points. Default is m = 50

Details

Estimates a sparse high dimensional vector using the ASUS procedure described in Banerjee et al. (2017). If k = 1 then ASUS is the SureShrink estimator. The current implementation of ASUS estimates the grouping thresholds based on the magnitude of |s|. See the reference for more details.

Value

1. `est`: an n vector holding the estimates
2. `mse`: estimate of risk
3. `tau`: k-1 vector of grouping parameters if k>=2
4. `t`: k vector of thresholding parameters
5. `size`: k vector of group sizes

References


See Also

`sureshrink, ejs, sureshrink.mse`
### Examples

```r
library(asus)
set.seed(42)
d<-rnorm(10,2,1)
v.d<- rep(1,10)
set.seed(42)
s<-rnorm(10,3,0.1)
asus.out<-asus(d,v.d,s)
```

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### asus.cuts

**Risk of asus with pre-defined grouping thresholds**

### Description

Estimates the risk of asus when there are \( k(>2) \) groups with pre-defined grouping thresholds

### Usage

```r
asus.cuts(d, v.d, s, cutpoints)
```

### Arguments

- `d`: an \( n \) vector of primary observations
- `v.d`: an \( n \) vector of variances for each component of \( d \)
- `s`: an \( n \) vector of side information
- `cutpoints`: \( k-1 \) pre-defined grouping thresholds for \( k \) groups. \( k \) must be bigger than 2.

### Details

Estimates the risk of asus when there are \( k(>2) \) groups with \( k \) pre-defined grouping thresholds. This function is called when `asus` executes.

### Value

- `mse`: estimate of risk

### References


### See Also

- `asus`, `sureshrink`, `ejs`, `sureshrink.mse`
Examples

```r
library(asus)
set.seed(42)
d<-rnorm(10)
v.d<- rep(1,10)
set.seed(42)
s<-rnorm(10)
out<-asus.cuts(d,v.d,s,c(0.1,0.5,1))
```

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**ejs**  
*Extended James-Stein (ejs) estimator*

**Description**

Extended James-Stein estimator of a high dimensional sparse parameter.

**Usage**

`ejs(d, v.d)`

**Arguments**

- `d`  
an n vector of observations
- `v.d`  
an n vector of variances for each component of d

**Details**

Extended James-Stein estimator of mean from Brown (2008) and equation (7.3) in Xie et al. (2012)

**Value**

- `est`  
an n vector holding the estimates

**References**


**See Also**

`sureshrink`, `asus`
Examples

library(asus)
set.seed(42)
d<-rnorm(10,2,1)
v.d<- rep(1,10)
theta.hat<-sureshrink(d,v.d)

sureshrink

SureShrink estimator

Description

SureShrink estimator of a high dimensional sparse parameter from Donoho and Johnstone (1995)

Usage

sureshrink(d, v.d)

Arguments

d  an n vector of observations
v.d  an n vector of variances for each component of d

Details

Estimates a threshold t by minimizing the SURE function and then soft thresholds d using t.

Value

1. est - an n vector holding the estimates
2. t - estimated threshold

References


See Also

sureshrink.mse

Examples

library(asus)
set.seed(42)
d<-rnorm(10,2,1)
v.d<- rep(1,10)
theta.hat<-sureshrink(d,v.d)
sureshrink.mse

SURE estimate of risk

Description
Stein's Unbiased Risk Estimate for the sureshrink estimator

Usage
sureshrink.mse(d, v.d, type = 1, t = 0)

Arguments
d
  an n vector of observations
v.d
  an n vector of variances for each component of d
type
  set type=1 if you want the thresholding parameter t to be estimated. Otherwise set type = 0 in which case you must provide t. Default is type = 1
t
  soft thresholding parameter. If type = 1, then t is estimated whereas if type = 0 then you must provide t. Default is t = 0 (and type = 1)

Details
Estimates the risk of the surehsrink estimator of Donoho and Johnstone (1995).

Value
1. sure.est - SURE estimate of risk
2. t - estimated threshold (meaningless if type = 0)

References

See Also
sureshrink, asus

Examples
library(asus)
set.seed(42)
d<-rnorm(10,2,1)
v.d<- rep(1,10)
mses<-sureshrink.mse(d,v.d)
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