

Package ‘DVS’

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Type Package

Title Stability Selection with Lasso after Variable Decorrelation

Version 0.0.1

Description Implements stability selection with Lasso after variable decorrelation for identifying relevant variables in high-dimensional data. The method applies Air-HOLP screening and Gram-Schmidt orthogonalization before Lasso-based stability selection.

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Imports glmnet, cmna

Encoding UTF-8

URL <https://github.com/MahdiNouraie/DVS>,
<https://doi.org/10.1007/s11222-026-10916-7>

BugReports <https://github.com/MahdiNouraie/DVS/issues>

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Suggests testthat (>= 3.0.0)

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DVS-package

DVS: Decorrelation for Variable Selection

Description

Tools for decorrelation-based variable selection using Air-HOLP, Gram-Schmidt orthogonalization, and stability selection with the Lasso.

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See Also

Useful links:

- <https://github.com/MahdiNouraie/DVS>
- [doi:10.1007/s11222026109167](https://doi.org/10.1007/s11222026109167)
- Report bugs at <https://github.com/MahdiNouraie/DVS/issues>

DVS

DVS: Decorrelation for Variable Selection

Description

This package contains a main function: DVS. The DVS function first decorrelates predictors using Air-HOLP and Gram-Schmidt orthogonalization, and then applies stability selection with the Lasso to identify relevant variables.

Usage

```
DVS(x, y, B, Threshold = 10)
```

Arguments

x	A numeric matrix of predictors.
y	A numeric vector of response values.
B	An integer specifying the number of sub-samples in the stability selection.
Threshold	An integer specifying the number of variables retained by Air-HOLP during the initial screening step before decorrelation. The Threshold parameter controls the number of variables retained after Air-HOLP screening. It should typically be chosen as a small multiple of the expected number of relevant variables.

Value

A list containing either:

- `lambda.stable` and its associated stability value, if a stable tuning parameter is found;
- otherwise, `lambda.stable.1sd` and its associated stability value.

In both cases, the returned list also contains a data frame of selected variables and their selection frequencies.

References

- Nourai, M., Smith, C. & Muller, S. (2026). Stability selection via variable decorrelation. *Statistics and Computing* 36, 160.
- Joudah, I., Muller, S., & Zhu, H. (2025). Air-HOLP: adaptive regularized feature screening for high dimensional correlated data. *Statistics and Computing*, 35(3), 63.
- Nourai, M., & Muller, S. (2024). On the Selection Stability of Stability Selection and Its Applications. *arXiv preprint arXiv:2411.09097*.
- Nogueira, S., Sechidis, K., & Brown, G. (2018). On the stability of feature selection algorithms. *Journal of Machine Learning Research*, 18(174), 1-54.
- Meinshausen, N., & Bühlmann, P. (2010). Stability selection. *Journal of the Royal Statistical Society Series B: Statistical Methodology*, 72(4), 417-473.
- Tibshirani, R. (1996). Regression shrinkage and selection via the lasso. *Journal of the Royal Statistical Society Series B: Statistical Methodology*, 58(1), 267-288.

Examples

```
set.seed(123)
n <- 100 # Number of observations
rho <- 0.8 # Correlation coefficient for the predictors
x1 <- matrix(rnorm(n * 3), ncol = 3) # First 3 independent predictors
x2 <- rho * x1[, rep(1:3, length.out = 7)] +
  sqrt(1 - rho^2) * matrix(rnorm(n * 7), ncol = 7) # Make next 7 predictors correlated with x1
x <- cbind(x1, x2) # Combine independent and correlated predictors
colnames(x) <- paste0("X", 1:10) # Assign column names
beta <- c(1, 2, 3, rep(0, 7)) # Create regression coefficients vector
y <- x %*% beta + rnorm(n) # Generate response variable with some noise
B <- 10 # Number of sub-samples for stability selection
DVS(x, y, B, Threshold = 10) # Example usage of the DVS function
```

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