

Package ‘scov’

October 25, 2025

Type Package

Title Structured Covariances Estimators for Pairwise and Spatial Covariates

Version 0.1.2

Description Implements estimators for structured covariance matrices in the presence of pairwise and spatial covariates.

Metodiev, Perrot-Dockès, Ouadah, Fosdick, Robin, Latouche & Raftery (2025)
[<doi:10.48550/arXiv.2411.04520>](https://doi.org/10.48550/arXiv.2411.04520).

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Encoding UTF-8

RoxxygenNote 7.3.2

Imports Matrix, missMDA, mvtnorm, ohenry, pracma, quadprog, withr, purrr

VignetteBuilder knitr

Suggests knitr, markdown, corrplot

NeedsCompilation no

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Repository CRAN

Date/Publication 2025-10-25 12:20:02 UTC

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scov*Computes a structured estimator for covariance matrices*

Description

This function computes the WSCE, SCE or IVE estimator for large covariances in the presence of pairwise and spatial covariates from Metodiev et al. (2024).

Usage

```
scov(
  pairwise_covariate_matrices,
  adj_matrix,
  dataset,
  mean_estim = NULL,
  sd_estim = NULL,
  grid_size = 100,
  parallelize = FALSE,
  ncores = 8,
  adj_positions = 1:nrow(adj_matrix),
  interaction_effects = list(),
  init = NULL,
  use_bootstrap = FALSE,
  num_bootstrap_iters = 100,
  semiparametric = FALSE,
  misspecification = FALSE,
  seed = 0,
  verbose = TRUE
)
```

Arguments

<code>pairwise_covariate_matrices</code>	named list of square matrices
<code>adj_matrix</code>	adjacency matrix of the spatial covariate
<code>dataset</code>	the dataset given in matrix form
<code>mean_estim</code>	mean vector estimate
<code>sd_estim</code>	standard deviation vector estimate
<code>grid_size</code>	grid-size for spatial effect
<code>parallelize</code>	uses parallel-processing if TRUE
<code>ncores</code>	number of cores for the parallelization
<code>adj_positions</code>	positions within the adjacency matrix
<code>interaction_effects</code>	list of interaction effects

```

init           the initialization parameter vector
use_bootstrap uses bootstrapping if TRUE
num_bootstrap_iters
               number of bootstrap simulations
semiparametric computes the IVE if TRUE, the SCE else
misspecification
               computes the WSCE if TRUE, the WSCE else
seed           a seed (can't be set to NULL)
verbose        prints progress if TRUE

```

Value

Returns a named list with the following elements:

parm, estimated parameters of pairwise, spatial effects average_effects, average effects of the covariates cormat_estim, estimator of the correlation matrix covmat_estim, estimator of the covariance matrix bic, the Bayesian information criterion (BIC) lambda, the asymptotically optimal weight of the WSCE

References

Metodiev, M., Perrot-Dockès, M., Ouadah, S., Fosdick, B. K., Robin, S., Latouche, P., & Raftery, A. E. (2024). A Structured Estimator for large Covariance Matrices in the Presence of Pairwise and Spatial Covariates. arXiv preprint arXiv:2411.04520.

Examples

```

intercept = matrix(1,ncol=4,nrow=4)
X1 = rbind(c(1,1,1,0),c(1,1,1,0),c(1,1,1,0),c(0,0,0,1))
X2 = rbind(c(1,0,0,0),c(0,1,1,1),c(0,1,1,1),c(0,1,1,1))
covar_mats = list(intercept=intercept,X1=X1,X2=X2)
adj_matrix = rbind(c(0,1,0,0),c(1,0,0,0),c(0,0,0,1),c(0,0,1,0))
mean = rep(0,4)
sigma = 0.05*intercept+0.2*X1+0.2*X2+0.1*X2*X1+0.4*(diag(4) + adj_matrix)
diag(sigma) = 1
dataset = mvtnorm::rmvnorm(1000,mean=mean,sigma=sigma)
scov(covar_mats, adj_matrix, dataset,
interaction_effects=list(c("X1","X2")),
parallelize=FALSE,ncores=1)

```

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