Package: scov (via r-universe)

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Type Package

Title Structured Covariances Estimators for Pairwise and Spatial Covariates

Version 2.0.0

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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>.

License GPL (>= 3)

Encoding UTF-8

RoxygenNote 7.3.2

Imports Matrix, missMDA, mvtnorm, ohenery, pracma, quadprog, withr, purrr, future, future.apply

VignetteBuilder knitr

Suggests knitr, markdown, corrplot

Config/pak/sysreqs cmake make libicu-dev libuv1-dev libx11-dev zlib1g-dev

Repository https://m-metodiev.r-universe.dev

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RemoteUrl https://github.com/m-metodiev/scov

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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,
  dataset,
  adj_matrix = NULL,
  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,
  joint_estimation = FALSE
)
```

Arguments

pairwise_covariate_matrices	named list of square matrices
dataset	the dataset given in matrix form
adj_matrix	adjacency matrix of the spatial covariate
mean_estim	mean vector estimate
sd_estim	standard deviation vector estimate
grid_size	grid-size for spatial effect
parallelize	uses parallel-processing if TRUE
ncores	number of cores for the parallelization
adj_positions	positions within the adjacency matrix
interaction_effects	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
`joint_estimation`	estimates everything jointly if TRUE, uses a 2 step procedure if FALSE

Value

Returns a named list with the following elements:

parm, estimated parameters of pairwise, spatial effects average_effects, average effects of the covariates corrmat_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, dataset, adj_matrix,
interaction_effects=list(c("X1","X2")),
parallelize=FALSE,ncores=1)
```

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