Package 'GlarmaVarSel'

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Type Package

Title Variable Selection in Sparse GLARMA Models

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Description Performs variable selection in high-dimensional sparse GLARMA models. For further details we refer the reader to the paper Gomtsyan et al. (2020), <doi:10.48550/arXiv.2007.08623v1>.

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Depends R (>= 3.5.0), Matrix, glmnet, stats, ggplot2

VignetteBuilder knitr

Suggests knitr, markdown, formatR, doMC

NeedsCompilation no

Repository CRAN

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Contents

`GlarmaVarSel-package` *Variable Selection in Sparse GLARMA Models*

Description

GlarmaVarSel consists of four functions: "variable_selection.R", "grad_hess_beta.R", "grad_hess_gamma.R" and "NR_gamma.R" For further information on how to use these functions, we refer the reader to the vignette of the package.

Details

GlarmaVarSel consists of four functions: "variable_selection.R", "grad_hess_beta.R", "grad_hess_gamma.R" and "NR_gamma.R" For further information on how to use these functions, we refer the reader to the vignette of the package.

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References

M. Gomtsyan et al. "Variable selection in sparse GLARMA models", arXiv:2007.08623v1

Examples

```
n=50
p=30
X = matrix(NA,(p+1),n)
f = 1/0.7
for(t in 1:n){X[,t]<-c(1,cos(2*pi*(1:(p/2))*t*f/n),sin(2*pi*(1:(p/2))*t*f/n))}
gamma0 = c(0)
data(Y)
result = variable_selection(Y, X, gamma0, k_max=2, n_iter=100, method="min",
nb_rep_ss=1000, threshold=0.7, parallel=FALSE, nb.cores=1)
beta_est = result$beta_est
Estim_active = result$estim_active
gamma_est = result$gamma_est
```

grad_hess_beta *Gradient and Hessian of the log-likelihood with respect to beta*

Description

This function calculates the gradient and Hessian of the log-likelihood with respect to beta.

Usage

```
grad_hess_beta(Y, X, beta0, gamma0)
```

Arguments

Y	Observation matrix
X	Design matrix
beta0	Initial beta vector
gamma0	Initial gamma vector

Value

grad_L_beta	Vector of the gradient of L with respect to beta
hess_L_beta	Matrix of the Hessian of L with respect to beta

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for(t in 1:n){X[,t]<-c(1,cos(2*pi*(1:(p/2))*t*f/n),sin(2*pi*(1:(p/2))*t*f/n))}
gamma0 = c(0)
data(Y)
glm_pois<-glm(Y~t(X)[,2:(p+1)],family = poisson)
beta0<-as.numeric(glm_pois$coefficients)
result = grad_hess_beta(Y, X, beta0, gamma0)
grad = result$grad_L_beta
Hessian = result$hess_L_beta
```

grad_hess_gamma *Gradient and Hessian of the log-likelihood with respect to gamma*

Description

This function calculates the gradient and Hessian of the log-likelihood with respect to gamma

Usage

```
grad_hess_gamma(Y, X, beta0, gamma0)
```

Arguments

Y	Observation matrix
X	Design matrix
beta0	Initial beta vector
gamma0	Initial gamma vector

Value

grad_L_gamma	Vector of the gradient of L with respect to gamma
hess_L_gamma	Matrix of the Hessian of L with respect to gamma

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f = 1/0.7
for(t in 1:n){X[,t]<-c(1,cos(2*pi*(1:(p/2))*t*f/n),sin(2*pi*(1:(p/2))*t*f/n))}
gamma0 = c(0)
data(Y)
glm_pois<-glm(Y~t(X)[,2:(p+1)],family = poisson)
beta0<-as.numeric(glm_pois$coefficients)
result = grad_hess_gamma(Y, X, beta0, gamma0)
grad = result$grad_L_gamma
Hessian = result$hess_L_gamma
```

NR_gamma *Newton-Raphson method for estimation of gamma*

Description

This function estimates gamma with Newton-Raphson method

Usage

```
NR_gamma(Y, X, beta0, gamma0, n_iter)
```

Arguments

Y	Observation matrix
X	Design matrix
beta0	Initial beta vector
gamma0	Initial gamma vector
n_iter	Number of iterations of the algorithm. Default=100

Value

gamma	Estimated gamma vector

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f = 1/0.7
for(t in 1:n){X[,t]<-c(1,cos(2*pi*(1:(p/2))*t*f/n),sin(2*pi*(1:(p/2))*t*f/n))}
gamma0 = c(0)
data(Y)
glm_pois<-glm(Y~t(X)[,2:(p+1)],family = poisson)
beta0<-as.numeric(glm_pois$coefficients)
gamma_est = NR_gamma(Y, X, beta0, gamma0, n_iter=100)
```

`variable_selection` *Variable selection*

Description

This function performs variable selection, estimates a new vector beta and a new vector gamma

Usage

```
variable_selection(Y, X, gamma0, k_max = 2, n_iter = 100, method = "min",
  nb_rep_ss = 1000, threshold = 0.8, parallel = FALSE, nb.cores = 1)
```

Arguments

`Y`	Observation matrix
`X`	Design matrix
`gamma0`	Initial gamma vector
`k_max`	Number of iteration to repeat the whole algorithm
`n_iter`	Number of iteration for Newton-Raphson algorithm
`method`	Stability selection method: "fast", "min" or "cv". In "min" the smallest lambda is chosen, in "cv" cross-validation lambda is chosen for stability selection. "fast" is a fater stability selection approach. The default is "min"
`nb_rep_ss`	Number of replications in stability selection step. The default is 1000
`threshold`	Threshold for stability selection. The default is 0.9
`parallel`	Whether to parallelize stability selection step or not. The default is FALSE
`nb.cores`	Number of cores for parallelization. The default is 1

Value

`estim_active`	Estimated active coefficients
`beta_est`	Vector of estimated beta values
`gamma_est`	Vector of estimated gamma values

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X = matrix(NA,(p+1),n)
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for(t in 1:n){X[,t]<-c(1,cos(2*pi*(1:(p/2))*t*f/n),sin(2*pi*(1:(p/2))*t*f/n))}
gamma0 = c(0)
data(Y)
result = variable_selection(Y, X, gamma0, k_max=2, n_iter=100, method="min",
nb_rep_ss=1000, threshold=0.7, parallel=FALSE, nb.cores=1)
beta_est = result$beta_est
Estim_active = result$estim_active
gamma_est = result$gamma_est
```

Y *Observation matrix Y*

Description

An example of observation matrix

Usage

```
data("Y")
```

Format

The format is: num [1:50] 11 8 3 3 3 4 4 4 3 1 ...

References

M. Gomtsyan et al. "Variable selection in sparse GLARMA models", arXiv:2007.08623v1

Examples

```
data(Y)
```

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