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), <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

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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.

Author(s)

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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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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)
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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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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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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n=50
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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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