

Package: MultiGlarmaVarSel (via r-universe)

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Type Package

Title Variable Selection in Sparse Multivariate 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. (2022), <[arXiv:2208.14721](https://arxiv.org/abs/2208.14721)>.

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

VignetteBuilder knitr

Suggests knitr, markdown, formatR

NeedsCompilation no

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 MultiGlarmaVarSel-package

Variable Selection in Sparse Multivariate GLARMA Models

Description

MultiGlarmaVarSel consists of four functions: "variable_selection.R", "grad_hess_L_gamma.R", "grad_hess_L_eta.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

This package consists of four functions: "variable_selection.R", "grad_hess_L_gamma.R", "grad_hess_L_eta.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 multivariate GLARMA models: Application to germination control by environment", arXiv:2208.14721

Examples

```

data(Y)
I=3
J=100
T=dim(Y)[2]
q=1
X=matrix(0,nrow=(I*J),ncol=I)
for (i in 1:I)
{
  X[((i-1)*J+1):(i*J),i]=rep(1,J)
}
gamma_0 = matrix(0, nrow = 1, ncol = q)
result=variable_selection(Y, X, gamma_0, k_max=1,
n_iter=100, method="min", nb_rep_ss=1000, threshold=0.6)
estim_active = result$estim_active
eta_est = result$eta_est
gamma_est = result$gamma_est
  
```

| | |
|-----------------|---|
| grad_hess_L_eta | <i>Gradient and Hessian of the log-likelihood with respect to eta</i> |
|-----------------|---|

Description

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

Usage

```
grad_hess_L_eta(Y, X, eta_vect, gamma, I, J)
```

Arguments

| | |
|----------|------------------------|
| Y | Observation matrix |
| X | Design matrix |
| eta_vect | Initial eta vector |
| gamma | Initial gamma vector |
| I | Number of conditions |
| J | Number of replications |

Value

| | |
|------------|---|
| grad_L_eta | Vector of the gradient of L with respect to eta |
| hess_L_eta | Matrix of the Hessian of L with respect to eta |

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Examples

```
data(Y)
I=3
J=100
T=dim(Y)[2]
q=1
X=matrix(0,nrow=(I*J),ncol=I)
for (i in 1:I)
{
  X[((i-1)*J+1):(i*J),i]=rep(1,J)
```

```

}
gamma_0 = matrix(0, nrow = 1, ncol = q)
eta_glm_mat_0 = matrix(0, ncol=T, nrow=I)
for (t in 1:T)
{
  result_glm_0 = glm(Y[,t]~X-1, family=poisson(link='log'))
  eta_glm_mat_0[,t]=as.numeric(result_glm_0$coefficients)
}
eta_0 = round(as.numeric(t(eta_glm_mat_0)), digits=6)
result = grad_hess_L_eta(Y, X, eta_0, gamma_0, I, J)
grad = result$grad_L_eta
Hessian = result$hess_L_eta

```

grad_hess_L_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_L_gamma(Y, X, eta, gamma, I, J)
```

Arguments

| | |
|-------|------------------------|
| Y | Observation matrix |
| X | Design matrix |
| eta | Initial eta vector |
| gamma | Initial gamma vector |
| I | Number of conditions |
| J | Number of replications |

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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Examples

```

data(Y)
I=3
J=100
T=dim(Y)[2]
q=1
X=matrix(0,nrow=(I*J),ncol=I)
for (i in 1:I)
{
  X[((i-1)*J+1):(i*J),i]=rep(1,J)
}
gamma_0 = matrix(0, nrow = 1, ncol = q)
eta_glm_mat_0 = matrix(0,ncol=T,nrow=I)
for (t in 1:T)
{
  result_glm_0 = glm(Y[,t]~X-1,family=poisson(link='log'))
  eta_glm_mat_0[,t]=as.numeric(result_glm_0$coefficients)
}
eta_0 = round(as.numeric(t(eta_glm_mat_0)),digits=6)
result = grad_hess_L_gamma(Y, X, eta_0, gamma_0, I, J)
grad = result$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, eta, gamma, I, J, n_iter = 100)
```

Arguments

| | |
|--------|--|
| Y | Observation matrix |
| X | Design matrix |
| eta | Initial eta vector |
| gamma | Initial gamma vector |
| I | Number of conditions |
| J | Number of replications |
| n_iter | Number of iterations of the algorithm. Default=100 |

Value

Estimated gamma vector

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Examples

```

data(Y)
I=3
J=100
T=dim(Y)[2]
q=1
X=matrix(0,nrow=(I*J),ncol=I)
for (i in 1:I)
{
  X[((i-1)*J+1):(i*J),i]=rep(1,J)
}
gamma_0 = matrix(0, nrow = 1, ncol = q)
eta_glm_mat_0 = matrix(0,ncol=T,nrow=I)
for (t in 1:T)
{
  result_glm_0 = glm(Y[,t]~X-1,family=poisson(link='log'))
  eta_glm_mat_0[,t]=as.numeric(result_glm_0$coefficients)
}
eta_0 = round(as.numeric(t(eta_glm_mat_0)),digits=6)
gamma_est=NR_gamma(Y, X, eta_0, gamma_0, I, J, n_iter = 100)

```

| | |
|--------------------|---------------------------|
| variable_selection | <i>Variable selection</i> |
|--------------------|---------------------------|

Description

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

Usage

```

variable_selection(Y, X, gamma, k_max = 1, n_iter = 100,
method = "min", nb_rep_ss = 1000, threshold = 0.6)

```

Arguments

| | |
|-------|----------------------|
| Y | Observation matrix |
| X | Design matrix |
| gamma | 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: "min" or "cv". In "min" the smallest lambda is chosen, in "cv" cross-validation lambda is chosen for stability selection. 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 |

Value

| | |
|--------------|--|
| estim_active | Vector of stimated active coefficients |
| eta_est | Vector of estimated eta values |
| gamma_est | Vector of estimated gamma values |

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for (i in 1:I)
{
  X[((i-1)*J+1):(i*J),i]=rep(1,J)
}
gamma_0 = matrix(0, nrow = 1, ncol = q)
result=variable_selection(Y, X, gamma_0, k_max=1,
n_iter=100, method="min", nb_rep_ss=1000, threshold=0.6)
estim_active = result$estim_active
eta_est = result$eta_est
gamma_est = result$gamma_est

```

Y *Observation matrix Y*

Description

An example of observation matrix

Usage

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

Format

The format is: num [1:300, 1:15] 3 1 1 0 0 3 2 0 3 2 ...

References

M. Gomtsyan et al. "Variable selection in sparse multivariate GLARMA models: Application to germination control by environment", arXiv:2208.14721

Examples

```
data(Y)
```


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