Package ‘automultinomial’

October 31, 2018

Type Package
Title Models for Spatially Correlated Data
Version 2.0.0
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Imports Matrix, igraph, numDeriv, stats
Suggests utils, rmarkdown, knitr, ggplot2
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Description Fits the autologistic model described in Besag's famous 1974 paper on auto- models <http://www.jstor.org/stable/2984812>. Fits a multicategory generalization of the autologistic model when there are more than 2 response categories. Provides support for both asymptotic and bootstrap confidence intervals. For full model descriptions and a guide to the use of this package, please see the vignette.

License GPL-2
Encoding UTF-8
LazyData true
RoxygenNote 6.1.0

BugReports https://github.com/stephenberg/automultinomial/issues
VignetteBuilder knitr
NeedsCompilation no
Repository CRAN
Date/Publication 2018-10-31 18:10:03 UTC

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drawSamples  

Simulate data from auto-models

Description
Generates data from the autologistic and automultinomial models via Gibbs sampling. See the vignette for an example of use.

Usage
drawSamples(beta, gamma, X, A, burnIn = 300, nSamples, y = NULL)

Arguments
- **beta**: coefficient vector (for the autologistic model) or matrix (for the automultinomial model)
- **gamma**: the value of the autocorrelation parameter
- **X**: the design matrix
- **A**: the (square symmetric) adjacency matrix encoding the neighborhood structure
- **burnIn**: the number of burnin samples to be used. Defaults to 300
- **nSamples**: the number of samples to draw
- **y**: optional starting configuration, in factor form. Defaults to NULL

Value
simulated samples

Examples

```
##########generating coefficient values and data
#adjacency matrix A
A=igraph::get.adjacency(igraph::make_lattice(c(40,40)))

#design matrix
X=cbind(rep(1,1600),matrix(rnorm(1600*4),ncol=4))

#correlation parameter
gamma=0.6

#2 response categories (1 column in coefficient matrix)
beta2=matrix(rnorm(5)*0.3,ncol=1)
#This example uses a short burnIn period. Use a longer burnIn in practice.
y2=drawSamples(beta2,gamma,X,A,burnIn=1,nSamples=1)

#3 response categories (2 columns in coefficient matrix)
beta3=matrix(rnorm(10)*0.3,ncol=2)
y3=drawSamples(beta3,gamma,X,A,burnIn=1,nSamples=1)
```

```
**Description**

Fits an autologistic model or automultinomial model. Takes as arguments a design matrix X, a response vector y (in factor form), and a square symmetric adjacency matrix encoding the neighborhood structure. When the number of levels of the response y is >2, the function fits a multicategory generalization of the autologistic model. For a full description of the models the package fits and a user guide, please see the vignette.

**Usage**

```r
MLE(X, y, A, ciLevel = 0.95, method = "asymptotic", burnIn = 300, nBoot = 500)
```

**Arguments**

- `X`: the n-by-p design matrix
- `y`: the response vector (required to be a factor)
- `A`: the square symmetric adjacency matrix A encoding the neighborhood structure
- `ciLevel`: the confidence level to be used for inference. Defaults to 0.95 for 95 percent intervals.
- `method`: "boot" for parametric bootstrap and "asymptotic" for asymptotic confidence intervals.
- `burnIn`: the number of burnin samples to use for the Gibbs sampler when method="boot"
- `nBoot`: the number of bootstrap samples to use when method="boot"

**Value**

a fitted auto-model MLE object

**Examples**

```r
# generating coefficient values and data
A<igraph::getNadjacency(igraph::make_lattice(c(15,15)) #adjacency matrix A
X<cbind(rep(1,16),matrix(rnorm(16*4),ncol=4)) #design matrix
gamma=0.6 #correlation parameter
beta=matrix(rnorm(5)*0.3,ncol=1) #covariate parameters
y=drawSamples(beta,gamma,X,A,burnIn=10,nSamples=1)

# fitting model
fit=MLE(X = X,y=factor(y),A = A,ciLevel = 0.99,method = "asymptotic")
```
**Description**

Prints out summary tables of fitted model objects from MPLE. Also returns knitr::kable() summary tables.

**Usage**

```r
MLE_summary(fit)
```

**Arguments**

- `fit` a fitted MPLE object

**Value**

Tables based on the model fit

**Examples**

```r
# generating model fit to summarize
# Adjacency matrix A
A = igraph::get.adjacency(igraph::make_lattice(c(40, 40)))
X = cbind(rep(1, 1600), matrix(rnorm(1600 * 4), ncol = 4))
gamma = 0.6
beta = matrix(rnorm(5) * 0.3, ncol = 1)
y = drawSamples(beta, gamma, X, A, burnIn = 10, nSamples = 1)
fit = MPLE(X = X, y = factor(y), A = A, ciLevel = 0.99, method = "asymptotic")

# summarizing model fit
MLE_summary(fit)
```
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