Package 'siland'

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Type Package

Title Spatial Influence of Landscape

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Description Method to estimate the spatial influence scales of landscape variables on a response variable. The method is based on Chandler and Hepinstall-Cymerman (2016) Estimating the spatial scales of landscape effects on abundance, Landscape ecology, 31: 1383-1394, <doi:10.1007/s10980-016-0380-z>.

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Depends base, graphics, stats, lme4, sp, raster, rgdal

NeedsCompilation no

R topics documented:

siland-package *Spatial Influence of Landscape*

Description

Method to estimate the spatial influence scales of landscape variables on a response variable. The method is based on Chandler and Hepinstall-Cymerman (2016) Estimating the spatial scales of landscape effects on abundance, Landscape ecology, 31: 1383-1394, <doi:10.1007/s10980-016-0380-z>. This package allows for statistical inference about the scales at which landscape variables affect an ecological varibale. This ecological variable can be continous (mean of different measurements), an abundance (counting) or a proportion.\ The approach is based on the method proposed by Chandler et al., Estimating the spatial sacles of landscape effects on abundance, 2016, Landscape Ecology, 31, 1383-1394.

Details

The DESCRIPTION file:

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print.siland	print for an object of class siland
siland	Estimation of spatial influence of landscape
siland-package	Spatial Influence of Landscape
summary.siland	The function gives a detailed summary of an object of class siland

The principal function is the function siland(). Two functions for graphical displays are available: plotsiland() and plotcontri().

Author(s)

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`dataSiland` *A simulated data set that reprsents observations.*

Description

The data set has 5 columns, X, Y, conv, varloc and y. Columns X and Y represents the location for the observed data. Column locfac corresponds to an explanatory factor with two levels. Column locvar corresponds to a continuous explanatory variable. Column y corresponds to a conitnuous response variable simulated with a gaussian model.

Usage

```
data("dataSiland")
```

Format

A data frame with 80 simulated data and 5 variables.

`X` a numeric vector

`Y` a numeric vector

`locfac` a local factor with two levels

`locvar` a continuous local variable

`y` a numeric vector

Note

dataSiland$y have been simulated using the locfac variable and the landscape landSiland with a gaussian model. The locvar variable has not been used to simulate data y. To simulate the data, parameters have been fixed to the following values: Intercept=-5, locfac=3, L1 =50, L2=-50, SIF.L1=400, SIF.L2=200 and sigma=2. The spatial influence function was exponential.

Examples

```
data(dataSiland)
data(landSiland)
nrow(dataSiland)
#Plot for landscape variables
plot(landSiland[[1]],col=2,pch=".")
points(landSiland[[2]],col=3,pch=".")
#Locations of observations
points(dataSiland[,c("X","Y")])
```

landSiland *A list of simulated data sets that describes landscape.*

Description

Each component of the list is a dataframe that correponds to a landscape variable. For each data set, the columns X and Y indicate the locations of the different "pixels".

Usage

```
data("landSiland")
```

Format

The format is: List of 2 $ L1:'data.frame': 9513 obs. of 2 variables: ..$ X: num [1:9513] 0 43 86.1 129.1 172.2 ... ..$ Y: num [1:9513] 9535 9535 9535 9535 9535 ... $ L2:'data.frame': 3615 obs. of 2 variables: ..$ X: num [1:3615] 387 430 473 516 560 ... ..$ Y: num [1:3615] 9535 9535 9535 9535 9535 ...

Note

The landscape comes from the north of France. Two features of the landscape are considered and they are denoted L1 and L2.

Examples

```
data(landSiland)
names(landSiland)
#locations for the two landscape variables b1 and b2
plot(landSiland[[1]],col=2,pch=".")
points(landSiland[[2]],col=3,pch=".")
```

plotcontri *Plot contributions*

Description

Plot contributions for the different landscape variables

Usage

```
plotcontri(res, land, data, type = 0, numvar = NULL)
```

Arguments

res	a result form siland estimation
land	the landscape associated to the estimation res
data	the observations associated to the estimation res
type	type of plot, 1 or 2. For type equal to 0 (by default), a graphic for each local and landscape variable is displayed. For type equal to 1, the rate of landscape with local contribtions is displayed.
numvar	a number indicating the variable that has to be displayed. If NULL (by default), graphics are displayed following the argument type.

Note

A local model with only continuous variables can be currently considered. The function doesn't work if local model includes random effect(s) or categorical variables (factor). These cases are ongoing developements.

Examples

```
data(landSiland)
data(dataSiland)
res=siland(y~locvar,land=landSiland,data=dataSiland,sif="exponential",family=gaussian)

plotcontri(res,landSiland,dataSiland)

plotcontri(res,landSiland,dataSiland,type=1)
plotcontri(res,landSiland,dataSiland,numvar=2)
```

---

plotsiland *Plot results from siland function*

Description

Plot locations of observed data and locations of landscape variables. The location of black points corresponds to the locations of observed data, and the size is propotional to numeric values. The locations of different landscape variables are displayed with small points of different colours. Estimated mean distance of spatial influence for each landscape variable is indicated beside the graphic with a continuous line. Dashed line indicates the radius that gives 95 percent of the total influence of landscape variable.

Usage

```
plotsiland(res, land, data)
```

Arguments

res	a dataframe obtained from the function siland
land	a list with the location of the landscape variables. Each component of the list is a dataframe with two columns "X" and "Y" indicating the locations of each landscape variable.
data	a dataframe with the response variable and the local variables

Examples

```
data(dataSiland)
data(landSiland)
res=siland(loc.model=y~locfac,land=landSiland,data=dataSiland,sif="exponential",family="gaussian")
plotsiland(res,landSiland, dataSiland)
```

---

print.siland *print for an object of class siland*

Description

The function print an object of class siland. It gives the model used and the estimated parameters

Usage

```
## S3 method for class 'siland'
print(x,...)
```

Arguments

x	an object of class siland
...	the same arguments that the default print

---

siland *Estimation of spatial influence of landscape*

Description

siland is used to fit spatial influence of landscape.

Usage

```
siland(loc.model, land=NULL, data, initSIF = NULL, sif = "exponential",
family = "gaussian", test = FALSE)
```

Arguments

loc.model	a symbolic description (see lm() or glm()) of the response variable concerning local variables. Random effects are also allowed according to the syntax in package lme4 (see lmer() function in package lme4).
land	a list containing the location of the landscape variables. Each component of the list is a dataframe with two columns "X" and "Y" indicating the locations of pixels for a given landscape variable.
data	a dataframe containing the response variable and the local variables.
initSIF	a vector indicating the starting values for the estimation of the mean distance of the spatial influence functions. The length of initSIF has to be equal to the length of list land. By default, initialisation is equal to 100 for each landscape variable.
sif	the family of the spatial influence function. sif can be "exponential", "gaussian" or "uniform".
family	the distribution of response variable. family can be "gaussian", "poisson" or "binomial" and the associated link function are identity, log and logit respectively.
test	logical value. If TRUE, a ratio likelihood test is performed for each explanatory variable (local and spatial). By default, the value is FALSE since performing tests for all the variables can be heavy computing.

Value

siland returns an object of type list.

coefficients	vector of estimated coefficients
local	an object of class formula that indicates the local model used
landcontri	a dataframe of estimated contributions of each spatial variable (in column) to each observation (in row). The number of columns is equal to the length of list land
loglik	log-likelihood for the estimated parameters
loglik0	log-likelihood for the local model
fitted	fitted values
sif	the family of the spatial influence function
resoptim	an object of class optim or optimize giving informations about the optimization procedure see optim() or optimize() for further details.
AIC	akaike information criterion
AIC0	akaike information criterion for local model (no landscape variable)
nparam	number of parameters
pval0	p.value of the test of global effect of spatial variables. Obtained from the likelihood ratio test between the complete model and the local model.
pval	if test is TRUE, vector of p.values of the test of effect of each landscape variables
family	family distribution for the model

sd.error	standard error for gaussian family, NA in other case
model.Type	type of local model: GLM for generalised model, LMM for linear mixed model or GLMM for generalised linear mixed model
rand.StdDev	standard deviation of random effects for LMM or GLMM
nparam	number of model parameters

Author(s)

Carpentier, F. and Martin, O.

References

Chandler R. and Hepinstall-Cymerman J. (2016) Estimating the spatial scales of landscape effects on abundance. Landscape ecology, 31: 1383-1394.

Examples

```
data(dataSiland)
data(landSiland)
resE=siland(y~locvar,land=landSiland,data=dataSiland,sif="exponential",family=gaussian)
resE
resE$AIC
```

---

summary.siland *The function gives a detailed summary of an object of class siland*

Description

The function gives a detailed summary of an object of class siland. It aims to give results as the summary for an object of type glm or lm.

Usage

```
## S3 method for class 'siland'
summary(object,...)
```

Arguments

object	an object of type siland
...	Dots are not take into account in this version

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