Package 'PrevalenceMapping'

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Title Prevalence Mapping

Version 1.0

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Description The package performs Bayesian geostatistical spatial mapping of disease prevalence using prevalence survey data and environmental covariate raster files. Using an integrated nested Laplace approximation (INLA) framework, the outputs include mapped prevalence in the form of raster files, and measures of in-sample-fit and cross-validation.

Depends R (>= 3.3.0)

License CC0

LazyData true

Imports raster,
parallel,
data.table,
stats,
utils,
graphics

Suggests INLA

RoxygenNote 6.0.1

Byte-Compile yes

R topics documented:

`calculateVIFandRemoveVariables` *Calculate variance inflation factor (VIF) and remove variables with VIF > threshold value*

Description

The function checks for collinearity between variables and performs stepwise VIF selection. Source: https://beckmw.wordpress.com/2013/02/05/collinearity-and-stepwise-vif-selection/.

Usage

```
calculateVIFandRemoveVariables(response, raster_stack, thresh = 10,
  trace = T, ...)
```

Arguments

`response`	A data frame containing the response data including number of positive cases (n_positive), number of individuals examined (examined), and point locations (longitude and latitude).
`raster_stack`	A collection of RasterLayer objects with the same spatial extent and resolution (These are the environmental covariates).
`thresh`	The threshold value used for retaining variables, Default: 10.
`trace`	A logical argument indicating if text output is returned as the stepwise selection progresses, Default: T.
`...`	Additional arguments passed to 'lm'

Details

DETAILS

Value

OUTPUT_DESCRIPTION

Author(s)

Marcus W. Beck

Examples

```
## Not run:
if(interactive()){
 #EXAMPLE1
 }

## End(Not run)
```

`crossValidation` *Performs cross-validation*

Description

Performs cross-validation for a subset of data to assess predictive performance of the final model.

Usage

```
crossValidation(response, finalmodel, A_mat, spde, family = "binomial",
  raster_stack, int.strategy, n_reps = 100, pct_out)
```

Arguments

`response`	A data frame containing the response data including number of positive cases (n_positive), number of individuals examined (examined), and point locations (longitude and latitude).
`finalmodel`	An object returned from the function findModelWithSmallestDIC.
`A_mat`	An observation/prediction weight matrix returned from makeMeshSPDE.
`spde`	An inla.spde2 model object for a Matern model returned from makeMeshSPDE.
`family`	A string indicating the likelihood family, Default: 'binomial'.
`raster_stack`	A collection of RasterLayer objects with the same spatial extent and resolution.
`int.strategy`	Character. The integration strategy to use; one of 'auto', 'ccd', 'grid', 'eb' (empirical bayes), 'user' or 'user.std'.
`n_reps`	Number of replicates of subsets of data for cross-validation, Default: '100'.
`pct_out`	Percentage of data to be used as a test set.

Details

DETAILS

Value

OUTPUT_DESCRIPTION

Examples

```
## Not run:
if(interactive()){
 #EXAMPLE1
 }

## End(Not run)
```

`findModelWithSmallestDIC` *Find the best spatial model, i.e. the model with the smallest DIC*

Description

The function performs forward and backward elimination of variables in order to find the spatial model with a set of covariates that result in the smallest DIC.

Usage

```
findModelWithSmallestDIC(response, raster_stack, A_mat, spde,
  family = "binomial", save_output = TRUE)
```

Arguments

`response`	A data frame containing the response data including number of positive cases (n_positive), number of individuals examined (examined), and point locations (longitude and latitude).
`raster_stack`	A collection of RasterLayer objects with the same spatial extent and resolution.
`A_mat`	An observation/prediction weight matrix returned from makeMeshSPDE.
`spde`	An inla.spde2 model object for a Matern model returned from makeMeshSPDE.
`family`	A string indicating the likelihood family, Default: 'binomial'.
`save_output`	A logical argument indicating if output to be saved to a csv file, Default: TRUE.

Details

DETAILS

Value

OUTPUT_DESCRIPTION

Examples

```
## Not run:
if(interactive()){
 #EXAMPLE1
 }

## End(Not run)
```

`fitFinalModel` *Fit the final spatial model using a subset of data*

Description

Fit the final spatial model using a subset of data for the purpose of cross-validation.

Usage

```
fitFinalModel(response, val_DAT, finalmodel, A_mat, spde, family = "binomial",
  raster_stack, int.strategy)
```

Arguments

`response`	A data frame containing the response data including number of positive cases (n_positive), number of individuals examined (examined), and point locations (longitude and latitude).
`val_DAT`	Subset of data for cross-validation.
`finalmodel`	An object returned from the function findModelWithSmallestDIC.
`A_mat`	An observation/prediction weight matrix returned from makeMeshSPDE.
`spde`	An inla.spde2 model object for a Matern model returned from makeMeshSPDE.
`family`	A string indicating the likelihood family, Default: 'binomial'.
`raster_stack`	A collection of RasterLayer objects with the same spatial extent and resolution.
`int.strategy`	Character. The integration strategy to use; one of 'auto', 'ccd', 'grid', 'eb' (empirical bayes), 'user' or 'user.std'.

Details

DETAILS

Value

OUTPUT_DESCRIPTION

Examples

```
## Not run:
if(interactive()){
 #EXAMPLE1
 }

## End(Not run)
```

makeMeshSPDE *Make a mesh, build an spde model, and a projector matrix*

Description

Construct a nonconvex boundary for a set of points. Create a triangle mesh based on initial point locations, specified or automatic boundaries, and mesh quality parameters. Construct observation/prediction weight matrices for models. Create an inla.spde2 model object for a Matern model.

Usage

```
makeMeshSPDE(response, control = list(convex = NULL, concave = NULL, max_edge
  = NULL, cutoff = NULL), plot_mesh = FALSE)
```

Arguments

response	A data frame containing the response data including number of positive cases (n_positive), number of individuals examined (examined), and point locations (longitude and latitude).
control	Parameters controlling inla.nonconvex.hull and inla.mesh.2d, including convex, concave, max_edge, and cutoff.
plot_mesh	A logical argument indicating if mesh is to be plotted, Default: FALSE.

Value

OUTPUT_DESCRIPTION

Examples

```
## Not run:
if(interactive()){
 #EXAMPLE1
 }

## End(Not run)
```

predictionOnAGrid *Prediction of the response on a grid/raster*

Description

The function predicts the response on target locations where data are not observed using posterior distributions.

Usage

```
predictionOnAGrid(response, finalmodel, A_mat, spde, mesh,
  family = "binomial", raster_stack, nsamp, int.strategy,
  write_posterior = TRUE)
```

Arguments

response	A data frame containing the response data including number of positive cases (n_positive), number of individuals examined (examined), and point locations (longitude and latitude).
finalmodel	An object returned from the function findModelWithSmallestDIC.
A_mat	An observation/prediction weight matrix returned from makeMeshSPDE.
spde	An inla.spde2 model object for a Matern model returned from makeMeshSPDE,
mesh	A triangle mesh created based on initial point locations and returned from makeMeshSPDE.
family	A string indicating the likelihood family, Default: 'binomial'.
raster_stack	A collection of RasterLayer objects with the same spatial extent and resolution.
nsamp	Number of samples to draw from an approximated posterior of a fitted model. Make nsamp >= 100 in order to compute mean, sd, IQR, and 95% CI of posterior samples.
int.strategy	Character. The integration strategy to use; one of 'auto', 'ccd', 'grid', 'eb' (empirical bayes), 'user' or 'user.std'.
write_posterior	A logical argument indicating if posterior realizations are to be written into raster files, Default: TRUE.

Details

DETAILS

Value

OUTPUT_DESCRIPTION

Examples

```
## Not run:
if(interactive()){
 #EXAMPLE1
 }

## End(Not run)
```

Index