Package 'dissever'

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Type Package

Title Spatial Downscaling using the Dissever Algorithm

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Description Spatial downscaling of coarse grid mapping to fine grid mapping using predictive covariates and a model fitted using the 'caret' package. The original dissever algorithm was published by Malone et al. (2012) <doi:10.1016/j.cageo.2011.08.021>, and extended by Roudier et al. (2017) <doi:10.1016/j.compag.2017.08.021>.

URL https://github.com/pierreroudier/dissever

BugReports https://github.com/pierreroudier/dissever/issues

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LazyData TRUE

Imports methods, caret, sp, raster, plyr, dplyr, foreach, boot, magrittr, viridis

Suggests knitr, rmarkdown, randomForest, Cubist, gam, stats

Collate 'dissever-package.R' 'dissever.R'

VignetteBuilder knitr

RoxygenNote 6.0.1

NeedsCompilation no

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`dissever-package` *dissever*

Description

Dissever: algorithm for spatial downscaling

Details

Algorithm described in: [DOI: 10.1016/j.cageo.2011.08.021]

Author(s)

Brendan Malone (brendan.malone@sydney.edu.au);

`dissever` *Spatial downscaling*

Description

Performs spatial downscaling of coarse grid mapping to fine grid mapping using predictive covariates and a model fitted using the caret package.

Usage

```
## S4 method for signature 'RasterLayer,RasterLayer'
dissever(coarse, fine, method = "rf",
  p = 0.5, nmax = NULL, thresh = 0.01, min_iter = 5, max_iter = 20,
  boot = NULL, level = 0.9, tune_length = 3,
  tune_grid = .create_tune_grid(model = method, tune_length = tune_length),
  train_control_init = .default_control_init,
  train_control_iter = .default_control_iter, verbose = FALSE)
```

Arguments

coarse	object of class "RasterLayer", the coarse-resolution layer that needs to be downscaled
fine	object of class "RasterStack", the fine-resolution stack of predictive covariates
method	a string specifying which classification or regression model to use (via the caret package). Possible values are found using names(caret::getModelInfo()).
p	numeric, proportion of the fine map that is sampled for fitting the dissever model (between 0 and 1, defaults to 0.5)
nmax	numeric maximum number of pixels selected for fitting the dissever model. It will override the number of pixels chosen by the p option if that number is over the value passed to nmax.
thresh	numeric, dissever iterations will proceed until the RMSE of the dissever model reaches this value, or until the maximum number of iterations is met (defaults to 0.01)
min_iter	numeric, minimum number of iterations (defaults to 5)
max_iter	numeric, maximum number of iterations (defaults to 20)
boot	numeric, if not NULL (default), the number of bootstrap replicates used to derive the confidence intervals.
level	If this is a numeric value, it is used to derive confidence intervals using quantiles. If it is a function, it is used to derive the uncertainty using this function.
tune_length	numeric, the number of parameters to test to find the optimal parametrisation of the caret model (defaults to 3)
tune_grid	a data frame with possible tuning values
train_control_init	Control parameters for finding the optimal parameters of the caret model (see trainControl)
train_control_iter	Control parameters for fitting the caret model during the iteration phase (see trainControl)
verbose	controls the verbosity of the output (TRUE or FALSE)

Author(s)

Brendan Malone, Pierre Roudier

References

Malone, B.P, McBratney, A.B., Minasny, B., Wheeler, I., (2011) A general method for downscaling earth resource information. Computers & Geosciences, 41: 119-125. http://dx.doi.org/10.1016/j.cageo.2011.08.021

Examples

```
# Load the Edgeroi dataset (see ?edgeroi)
data(edgeroi)

# Plot the Edgeroi dataset (using the raster package)
library(raster)
plot(edgeroi$carbon) # coarse resolution layer
plot(edgeroi$predictors) # fine resolution predictors

# Run dissever using a simple linear model.

# In this instance we are subsampling heavily (p = 0.05) to keep
# run time short
res_lm <- dissever(
  coarse = edgeroi$carbon,
  fine = edgeroi$predictors,
  method = "lm",
  min_iter = 5, max_iter = 10,
  p = 0.05
)

# A lot more models are available through caret:
## Not run:
subset(caret::modelLookup(), forReg == TRUE, select = 'model')

## End(Not run)

# Plot dissever results
plot(res_lm, type = 'map', main = "Dissever using GAM")
plot(res_lm, type = 'perf', main = "Dissever using GAM")
```

---

edgeroi *Subset of the 1-km resolution soil carbon map and selected subset of environmental covariates for the Edgeroi District, NSW*

Description

Subset of the Australian 1-km resolution soil carbon map, along woth selected environmental covariates, for a small area of the Edgeroi district in NSW, Australia.

Usage

```
data(edgeroi)
```

Format

The edgeroi dataset is a list with two elements:

`carbon` a 7 row, 10 column `RasterLayer` of soil carbon stocks for a small area in the Edgeroi district NSW, Australia. The grid has a pixel resolution of 1 x 1 km. It contains the predicted soil carbon stock for the 0-30cm depth

`predictors` an 87 row, 117 column, 5 layer `RasterStack` of selected environmental covariates from a small area in the Edgeroi district NSW, Australia. The grids have a pixel resolution of 90m x 90m. It contains the following layers:

`Doserate` numeric; gamma radiometric data

`Elevation` numeric; topographic variable of bare earth ground elevation. Derived from digital elevation model

`Panchromat` numeric; panchromatic band of the Landsat 7 satelite

`Slope` numeric; Slope gradient of the land surface. Derived from digital elevation model

`TWI` numeric; topographic wetness index. Secondary derivative of the digital elevation model

Details

The Edgeroi District, NSW is an intensive cropping area upon the fertile alluvial Namoi River plain. The District has been the subject of many soil invetigations, namely McGarry et al. (1989) whom describe an extensive soil data set collected from the area. More recently, digital soil mapping studies of the area have been conducted, for example, Malone et al. (2009). The 1km mapping of soil carbon stock was performed using digital soil mapping methods McBratney et al. (2003) using the soil data from McGarry et al. (1989) and available environmental covariates.

Note

The raw spatial data that contributed to the creation of `edgeGrids` were sourced from publically accessable repositories hosted by various Australian Government and international agencies including CSIRO (for the DEM), Geosciences Australia (for the radiometric data) and NASA (for the Landsat 7 ETM+ data). The projection for the `RasterStack` is WGS 84 Zone 55.

References

- McGarry, D., Ward, W.T., McBratney, A.B. (1989) Soil Studies in the Lower Namoi Valley: Methods and Data. The Edgeroi Data Set. (2 vols) (CSIRO Division of Soils: Adelaide).
- McBratney, A.B., Mendonca Santos, M.L., Minasny, B. (2003) On Digtial Soil mapping. Geoderma 117: 3-52.
- Malone, B.P., McBratney, A.B., Minasny, B. (2009) Mapping continuous depth functions of soil carbon storage and available water capacity. Geoderma 154, 138-152.

@examples data(edgeroi) summary(edgeroi$carbon) summary(edgeroi$predictors)

generate_ci *Confidence intervals using bootstraping*

Description

Generates confidence intervals of a dissever output using bootstraping

Usage

```
## S4 method for signature 'list,RasterStack'
generate_ci(object, covariates, level = 0.9,
  n = 50L)
```

Arguments

object	object of class dissever, output from the dissever function
covariates	object of class "RasterStack", the fine-resolution stack of predictive covariates used to generate the dissever output
level	If this is a numeric value, it is used to derive confidence intervals using quantiles. If it is a function, it is used to derive the uncertainty using this function.
n	the number of bootstrap replicates used to derive the confidence intervals

Author(s)

Pierre Roudier

Examples

```
# Load the Edgeroi dataset (see ?edgeroi)
data(edgeroi)

# Create a dissever output
diss <- dissever(
  coarse = edgeroi$carbon,
  fine = edgeroi$predictors,
  method = "lm",
  min_iter = 5, max_iter = 10,
  p = 0.05
)

# Generate the confidence intervals
## Not run:
ci <- generate_ci(diss, edgeroi$predictors, n = 5)

plot(ci)

## End(Not run)
```

plot.dissever *Plots a dissever result*

Description

Plots a dissever result. Two modes are possible to visualise either the resulting map or the convergence of the disseveration.

Usage

```
## S3 method for class 'dissever'
plot(x, type = "map", ...)
```

Arguments

x	object of class dissever, output from the dissever function
type	character, type of visualisation to produce. Options are "map", to produce a map of the dissevered coarse map, or "perf", to show the convergence of the RMSE during the disseveration procedure.
...	Additional arguments passed to plot

Author(s)

Pierre Roudier

Examples

```
# See ?dissever
```

print.dissever *Prints the performance of the dissever procedure*

Description

Prints the performance of the model used to do the dissever procedure.

Usage

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

Arguments

x	object of class dissever, output from the dissever function
...	Additional arguments passed to print

Author(s)

Pierre Roudier

`summary.dissever` *Prints summary of the model used in the dissever procedure*

Description

Prints summary of the model used in the dissever procedure.

Usage

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

Arguments

`object`	object of class `dissever`, output from the `dissever` function
`...`	Additional arguments passed to summary

Author(s)

Pierre Roudier

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