Package 'supercells'

October 14, 2022

Title Superpixels of Spatial Data

Version 0.9.1

Description Creates superpixels based on input spatial data.
This package works on spatial data with one variable (e.g., continuous raster), many variables (e.g., RGB rasters), and spatial patterns (e.g., areas in categorical rasters).
It is based on the SLIC algorithm (Achanta et al. (2012) <doi:10.1109/TPAMI.2012.120>), and readapts it to work with arbitrary dissimilarity measures.

License GPL (>= 3)

Encoding UTF-8

Imports sf, terra (>= 1.4-21), philentropy (>= 0.6.0), future.apply

RoxygenNote 7.2.0

LinkingTo cpp11

SystemRequirements C++11

URL https://jakubnowosad.com/supercells/

BugReports https://github.com/Nowosad/supercells/issues

Suggests knitr, covr, testthat (>= 3.0.0), rmarkdown, stars

Config/testthat/edition 3

NeedsCompilation yes

Author Jakub Nowosad [aut, cre] (<https://orcid.org/0000-0002-1057-3721>),
Pascal Mettes [ctb] (Author of the initial C++ implementation of the
SLIC Superpixel algorithm for image data),
Charles Jekel [ctb] (Author of underlying C++ code for dtw)

Maintainer Jakub Nowosad <nowosad.jakub@gmail.com>

Repository CRAN

Date/Publication 2022-06-04 18:00:02 UTC

R topics documented:

`supercells` *Creates supercells*

Description

Creates supercells based on single- or multi-band spatial raster data. It uses a modified version of the SLIC Superpixel algorithm by Achanta et al. (2012), allowing specification of a distance function.

Usage

```
supercells(
  x,
  k,
  compactness,
  dist_fun = "euclidean",
  avg_fun = "mean",
  clean = TRUE,
  iter = 10,
  transform = NULL,
  step,
  minarea,
  chunks = FALSE,
  future = FALSE,
  verbose = 0
)
```

Arguments

`x`	An object of class SpatRaster (terra) or class stars (stars)
`k`	The number of supercells desired by the user (the output number can be slightly different!). You can use either `k` or `step`. It is also possible to provide a set of points (an `sf` object) as `k` together with the `step` value to create custom cluster centers.
`compactness`	A compactness value. Larger values cause clusters to be more compact/even (square). A compactness value depends on the range of input cell values and selected distance measure.
`dist_fun`	A distance function. Currently implemented distance functions are `"euclidean"`, `"jsd"`, `"dtw"` (dynamic time warping), name of any distance function from the `philentropy` package (see `philentropy::getDistMethods()`; "log2" is used in this case), or any user defined function accepting two vectors and returning one value. Default: `"euclidean"`
`avg_fun`	An averaging function - how the values of the supercells' centers are calculated? It accepts any fitting R function (e.g., `base::mean()` or `stats::median()`) or one of internally implemented `"mean"` and `"median"`. Default: `"mean"`

clean	Should connectivity of the supercells be enforced?
iter	The number of iterations performed to create the output.
transform	Transformation to be performed on the input. Currently implemented is "to_LAB" allowing to convert RGB raster to a raster in the LAB color space. By default, no transformation is performed. (This argument is experimental and may be removed in the future).
step	The distance (number of cells) between initial supercells' centers. You can use either k or step.
minarea	Specifies the minimal size of a supercell (in cells). Only works when clean = TRUE. By default, when clean = TRUE, average area (A) is calculated based on the total number of cells divided by a number of supercells Next, the minimal size of a supercell equals to A/(2^2) (A is being right shifted)
chunks	Should the input (x) be split into chunks before deriving supercells? Either FALSE (default), TRUE (only large input objects are split), or a numeric value (representing the side length of the chunk in the number of cells).
future	Should the future package be used for parallelization of the calculations? Default: FALSE. If TRUE, you also need to specify future::plan().
verbose	An integer specifying the level of text messages printed during calculations. 0 means no messages (default), 1 provides basic messages (e.g., calculation stage).

Value

An sf object with several columns: (1) supercells - an id of each supercell, (2) y and x coordinates, (3) one or more columns with average values of given variables in each supercell

References

Achanta, R., Shaji, A., Smith, K., Lucchi, A., Fua, P., & Süsstrunk, S. (2012). SLIC Superpixels Compared to State-of-the-Art Superpixel Methods. IEEE Transactions on Pattern Analysis and Machine Intelligence, 34(11), 2274–2282. https://doi.org/10.1109/tpami.2012.120

Nowosad, J. Motif: an open-source R tool for pattern-based spatial analysis. Landscape Ecol (2021). https://doi.org/10.1007/s10980-020-01135-0

Examples

```
library(supercells)
library(terra)
library(sf)
# One variable

vol = rast(system.file("raster/volcano.tif", package = "supercells"))
vol_slic1 = supercells(vol, k = 50, compactness = 1)
plot(vol)
plot(st_geometry(vol_slic1), add = TRUE, lwd = 0.2)

# RGB variables
# ortho = rast(system.file("raster/ortho.tif", package = "supercells"))
# ortho_slic1 = supercells(ortho, k = 1000, compactness = 10, transform = "to_LAB")
```

```
# plot(ortho)
# plot(st_geometry(ortho_slic1), add = TRUE)
#
# ### RGB variables - colored output
#
# rgb_to_hex = function(x){
#   apply(t(x), 2, function(x) rgb(x[1], x[2], x[3], maxColorValue = 255))
# }
# avg_colors = rgb_to_hex(st_drop_geometry(ortho_slic1[4:6]))
#
# plot(ortho)
# plot(st_geometry(ortho_slic1), add = TRUE, col = avg_colors)
```

Index