Package ‘landscapetools’

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Type Package
Title Landscape Utility Toolbox
Version 0.5.0
Description Provides utility functions for some of the less-glamorous tasks involved in landscape analysis. It includes functions to coerce raster data to the common tibble format and vice versa, it helps with flexible reclassification tasks of raster data and it provides a function to merge multiple raster. Furthermore, ‘landscapetools’ helps landscape scientists to visualize their data by providing optional themes and utility functions to plot single landscapes, rasterstacks, -bricks and lists of raster.

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Author Marco Sciaini [aut, cre] (https://orcid.org/0000-0002-3042-5435), Matthias Fritsch [aut], Maximillian H.K. Hesselbarth [aut] (https://orcid.org/0000-0003-1125-9918), Jakub Nowosad [aut] (https://orcid.org/0000-0002-1057-3721), Laura Graham [rev] (Laura reviewed the package for rOpenSci, see https://github.com/ropensci/onboarding/issues/188),
Jeffrey Hollister [rev] (Jeffrey reviewed the package for rOpenSci, see https://github.com/ropensci/onboarding/issues/188)

Maintainer Marco Sciaini <sciaini.marco@gmail.com>

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Description

landscapetools provides utility functions to work with landscape data (raster* Objects).

Author(s)

Maintainer: Marco Sciaini <sciaini.marco@gmail.com> (0000-0002-3042-5435)

Authors:

• Matthias Fritsch <matthias.fritsch@forst.uni-goettingen.de>
• Maximillian H.K. Hesselbarth <maximilian.hesselbarth@uni-goettingen.de> (0000-0003-1125-9918)
• Jakub Nowosad <nowosad.jakub@gmail.com> (0000-0002-1057-3721)

Other contributors:
classified_landscape

• Laura Graham (Laura reviewed the package for rOpenSci, see https://github.com/ropensci/onboarding/issues/188) [reviewer]
• Jeffrey Hollister (Jeffrey reviewed the package for rOpenSci, see https://github.com/ropensci/onboarding/issues/188) [reviewer]

See Also

Useful links:

• https://ropensci.github.io/landscapetools/
• Report bugs at https://github.com/ropensci/landscapetools/issues

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classified_landscape  Example map (factor).

Description

An example map to show landscapetools functionality generated with the nlm_random() algorithm with factorial values.

Usage

classified_landscape

Format

A raster layer object.

Source

Simulated neutral landscape models with R. https://github.com/ropensci/NLMR/

---

fractal_landscape  Example map (fractional brownian motion).

Description

An example map to show landscapetools functionality generated with the nlm_fbm() algorithm.

Usage

fractal_landscape

Format

A raster layer object.
Source

Simulated neutral landscape models with R. [https://github.com/ropensci/NLMR/](https://github.com/ropensci/NLMR/)

---

**gradient_landscape**

*Example map (planar gradient).*

Description

An example map to show landscapetools functionality generated with the nlm_planargradient() algorithm.

Usage

```r
gradient_landscape
```

Format

A raster layer object.

Source

Simulated neutral landscape models with R. [https://github.com/ropensci/NLMR/](https://github.com/ropensci/NLMR/)

---

**random_landscape**

*Example map (random).*

Description

An example map to show landscapetools functionality generated with the nlm_random() algorithm.

Usage

```r
random_landscape
```

Format

A raster layer object.

Source

Simulated neutral landscape models with R. [https://github.com/ropensci/NLMR/](https://github.com/ropensci/NLMR/)
show_landscape

Description

Plot a Raster* object with the NLMR default theme (as ggplot).

Usage

show_landscape(x, xlab, ylab, discrete, unique_scales, n_col, n_row, ...)

## S3 method for class 'RasterLayer'
show_landscape(x, xlab = "Easting", ylab = "Northing", discrete = FALSE, ...)

## S3 method for class 'list'
show_landscape(x, xlab = "Easting", ylab = "Northing",
               discrete = FALSE, unique_scales = FALSE, n_col = NULL,
               n_row = NULL, ...)

## S3 method for class 'RasterStack'
show_landscape(x, xlab = "Easting", ylab = "Northing",
               discrete = FALSE, unique_scales = FALSE, n_col = NULL,
               n_row = NULL, ...)

## S3 method for class 'RasterBrick'
show_landscape(x, xlab = "Easting", ylab = "Northing",
               discrete = FALSE, unique_scales = FALSE, n_col = NULL,
               n_row = NULL, ...)

Arguments

x     Raster* object
xlab  x axis label, default "Easting"
ylab  y axis label, default "Northing"
discrete If TRUE, the function plots a raster with a discrete legend.
unique_scales If TRUE and multiple raster are to be visualized, each facet can have a unique
               color scale for its fill
n_col  If multiple rasters are to be visualized, n_col controls the number of columns
        for the facet
n_row  If multiple rasters are to be visualized, n_row controls the number of rows for
        the facet
...    Arguments for theme_nlm
theme_nlm

Value

ggplot2 Object

Examples

## Not run:
x <- gradient_landscape

# classify
y <- util_classify(gradient_landscape,
    n = 3,
    level_names = c("Land Use 1", "Land Use 2", "Land Use 3"))

show_landscape(x)
show_landscape(y, discrete = TRUE)

show_landscape(list(gradient_landscape, random_landscape))
show_landscape(raster::stack(gradient_landscape, random_landscape))

show_landscape(list(gradient_landscape, y), unique_scales = TRUE)

## End(Not run)

---

theme_nlm

Description

Opinionated ggplot2 theme to visualize NLM raster.

Usage

theme_nlm(base_family = NA, base_size = 11.5,
    plot_title_family = base_family, plot_title_size = 18,
    plot_title_face = "bold", plot_title_margin = 10,
    subtitle_family = NA, subtitle_size = 13, subtitle_face = "plain",
    subtitle_margin = 15, strip_text_family = base_family,
    strip_text_size = 12, strip_text_face = "plain",
    strip.background = "grey80", caption_family = NA, caption_size = 9,
    caption_face = "plain", caption_margin = 10,
    axis_text_size = base_size, axis_title_family = base_family,
    axis_title_size = 9, axis_title_face = "plain",
    axis_title_just = "rt", plot_margin = ggplot2::unit(c(0, 0, 0, 0),
        "lines"), grid_col = "#cccccc", grid = TRUE, axis_col = "#cccccc",
    axis = FALSE, ticks = FALSE, legend_title = "Z",
    legend_labels = NULL, legend_text_size = 8, legend_title_size = 10,
theme_nlm

ratio = 1, viridis_scale = "D", ...)

theme_nlm_discrete(base_family = NA, base_size = 11.5,
plot_title_family = base_family, plot_title_size = 18,
plot_title_face = "bold", plot_title_margin = 10,
subtitle_family = NA, subtitle_size = 13, subtitle_face = "plain",
subtitle_margin = 15, strip_text_family = base_family,
strip_text_size = 12, strip_text_face = "plain",
strip.background = "grey80", caption_family = NA, caption_size = 9,
caption_face = "plain", caption_margin = 10,
axis_text_size = base_size, axis_title_family = base_family,
axis_title_size = 9, axis_title_face = "plain",
axis_title_just = "rt", plot_margin = ggplot2::unit(c(0, 0, 0, 0),
"lines"), grid_col = "#cccccc", grid = TRUE, axis_col = "#cccccc",
axis = FALSE, ticks = FALSE, legend_title = "Z",
legend_labels = NULL, legend_text_size = 8, legend_title_size = 10,
ratio = 1, viridis_scale = "D", ...)

theme_nlm_grey(base_family = NA, base_size = 11.5,
plot_title_family = base_family, plot_title_size = 18,
plot_title_face = "bold", plot_title_margin = 10,
subtitle_family = NA, subtitle_size = 13, subtitle_face = "plain",
subtitle_margin = 15, strip_text_family = base_family,
strip_text_size = 12, strip_text_face = "plain",
strip.background = "grey80", caption_family = NA, caption_size = 9,
caption_face = "plain", caption_margin = 10,
axis_text_size = base_size, axis_title_family = base_family,
axis_title_size = 9, axis_title_face = "plain",
axis_title_just = "rt", plot_margin = ggplot2::unit(c(0, 0, 0, 0),
"lines"), grid_col = "#cccccc", grid = TRUE, axis_col = "#cccccc",
axis = FALSE, ticks = FALSE, legend_title = "Z",
legend_labels = NULL, legend_text_size = 8, legend_title_size = 10,
ratio = 1, ...)

theme_nlm_grey_discrete(base_family = NA, base_size = 11.5,
plot_title_family = base_family, plot_title_size = 18,
plot_title_face = "bold", plot_title_margin = 10,
subtitle_family = NA, subtitle_size = 13, subtitle_face = "plain",
subtitle_margin = 15, strip_text_family = base_family,
strip_text_size = 12, strip_text_face = "plain",
strip.background = "grey80", caption_family = NA, caption_size = 9,
caption_face = "plain", caption_margin = 10,
axis_text_size = base_size, axis_title_family = base_family,
axis_title_size = 9, axis_title_face = "plain",
axis_title_just = "rt", plot_margin = ggplot2::unit(c(0, 0, 0, 0),
"lines"), grid_col = "#cccccc", grid = TRUE, axis_col = "#cccccc",
axis = FALSE, ticks = FALSE, legend_title = "Z",
legend_labels = NULL, legend_text_size = 8, legend_title_size = 10,
ratio = 1, ...)

theme_facetplot(base_family = NA, base_size = 11.5,
plot_title_family = base_family, plot_title_size = 18,
plot_title_face = "bold", plot_title_margin = 10,
subtitle_family = NA, subtitle_size = 13, subtitle_face = "plain",
subtitle_margin = 15, strip.background = "grey80",
caption_family = NA, caption_size = 9, caption_face = "plain",
caption_margin = 10, ratio = 1, viridis_scale = "D", ...)

theme_facetplot_discrete(base_family = NA, base_size = 11.5,
plot_title_family = base_family, plot_title_size = 18,
plot_title_face = "bold", plot_title_margin = 10,
subtitle_family = NA, subtitle_size = 13, subtitle_face = "plain",
subtitle_margin = 15, strip.background = "grey80",
caption_family = NA, caption_size = 9, caption_face = "plain",
caption_margin = 10, ratio = 1, viridis_scale = "D", ...)

**Arguments**

- **base_family**: base font family size
- **base_size**: base font size
- **plot_title_family**: plot title family
- **plot_title_size**: plot title size
- **plot_title_face**: plot title face
- **plot_title_margin**: plot title ggplot2::margin
- **subtitle_family**: plot subtitle family
- **subtitle_size**: plot subtitle size
- **subtitle_face**: plot subtitle face
- **subtitle_margin**: plot subtitle ggplot2::margin bottom (single numeric value)
- **strip_text_family**: facet facet label font family
- **strip_text_size**: facet label font family, face and size
- **strip_text_face**: facet facet label font face
- **strip.background**: strip background
- **caption_family**: plot caption family
caption_size  plot caption size  
caption_face  plot caption face  
caption_margin  plot caption ggplot2::margin  
axis_text_size  axis text size  
axis_title_family  axis title family  
axis_title_size  axis title size  
axis_title_face  axis title face  
axis_title_just  axis title justification  
plot_margin  plot ggplot2::margin (specify with ‘ggplot2::margin”)  
grid_col  grid color  
grid  grid TRUE/FALSE  
axis_col  axis color  
axis  axis TRUE/FALSE  
ticks  ticks TRUE/FALSE  
legend_title  Title of the legend (default "Z")  
legend_labels  Labels for the legend ticks, if used with show_landscape they are automatically derived.  
legend_text_size  legend text size, default 8  
legend_title_size  legend text size, default 10  
ratio  ratio for tiles (default 1, if your raster is not a square the ratio should be raster::nrow(x)  
/ raster::ncol(x))  
viridis_scale  Five options are available: "viridis - magma" (= "A"), "viridis - inferno" (= "B"),  
"viridis - plasma" (= "C"), "viridis - viridis" (= "D", the default option), "viridis  
-cividis" (= "E")  
...  optional arguments to ggplot2::theme

Details

A focused theme to visualize raster data that sets a lot of defaults for the ggplot2::theme.

The functions are setup in such a way that you can customize your own one by just wrapping the call and changing the parameters. The theme itself is heavily influenced by hrbrmstr and his package hrbrthemes (https://github.com/hrbrmstr/hrbrthemes/).
util_as_integer

Description
Coerces raster values to integers

Usage
util_as_integer(x)

## S3 method for class 'RasterLayer'
util_as_integer(x)

Arguments
x:
raster

Details
Coerces raster values to integers, which is sometimes needed if you want further methods that rely on integer values.

Value
RasterLayer

Examples
# Mode 1
util_as_integer(fractal_landscape)

util_binarize

Binarize continuous raster values

Description
Classify continuous raster values into binary map cells based upon given break(s).

Usage
util_binarize(x, breaks)

## S3 method for class 'RasterLayer'
util_binarize(x, breaks)
Arguments

- **x**: Raster* object
- **breaks**: Vector with one or more break percentages

Details

Breaks are considered to be habitat percentages \((p)\). If more than one percentage is given multiple layers are written in the same brick.

Value

RasterLayer / RasterBrick

Examples

```r
breaks <- c(0.3, 0.5)
binary_maps <- util_binarize(gradient_landscape, breaks)
```

Description

Classify continuous landscapes into landscapes with discrete classes

Usage

```r
util_classify(x, n, weighting, level_names, real_land, mask_val)
```

## S3 method for class 'RasterLayer'
```r
util_classify(x, n = NULL, weighting = NULL,
              level_names = NULL, real_land = NULL, mask_val = NULL)
```

Arguments

- **x**: raster
- **n**: Number of classes
- **weighting**: Vector of numeric values that are considered to be habitat percentages (see details)
- **level_names**: Vector of names for the factor levels.
- **real_land**: Raster with real landscape (see details)
- **mask_val**: Value to mask (refers to real_land)
Details

Mode 1: Calculate the optimum breakpoints using Jenks natural breaks optimization, the number of classes is determined with \( n \). The Jenks optimization seeks to minimize the variance within categories, while maximizing the variance between categories.

Mode 2: The number of elements in the weighting vector determines the number of classes in the resulting matrix. The classes start with the value 1. If non-numerical levels are required, the user can specify a vector to turn the numerical factors into other data types, for example into character strings (i.e. class labels). If the numerical vector of weightings does not sum up to 1, the sum of the weightings is divided by the number of elements in the weightings vector and this is then used for the classification.

Mode 3: For a given 'real' landscape the number of classes and the weightings are extracted and used to classify the given landscape (any given weighting parameter is overwritten in this case!). If an optional mask value is given the corresponding class from the 'real' landscape is cut from the landscape beforehand.

Value

RasterLayer

Examples

# Mode 1
util_classify(fractal_landscape,
  n = 3,
  level_names = c("Land Use 1", "Land Use 2", "Land Use 3"))

# Mode 2
util_classify(fractal_landscape,
  weighting = c(0.5, 0.25, 0.25),
  level_names = c("Land Use 1", "Land Use 2", "Land Use 3"))

# Mode 3
real_land <- util_classify(gradient_landscape,
  n = 3,
  level_names = c("Land Use 1", "Land Use 2", "Land Use 3"))
fractal_landscape_real <- util_classify(fractal_landscape, real_land = real_land)
fractal_landscape_mask <- util_classify(fractal_landscape, real_land = real_land, mask_val = 1)

## Not run:
landscapes <- list(
  '1 nlm' = fractal_landscape,
  '2 real' = real_land,
  '3 result' = fractal_landscape_real,
  '4 result with mask' = fractal_landscape_mask
)
show_landscape(landscapes, unique_scales = TRUE, nrow = 1)

## End(Not run)
util_merge

Description

Merge a primary raster with other rasters weighted by scaling factors.

Usage

util_merge(primary_nlm, secondary_nlm, scalingfactor = 1, rescale)

## S3 method for class 'RasterLayer'
util_merge(primary_nlm, secondary_nlm,
  scalingfactor = 1, rescale = TRUE)

Arguments

- **primary_nlm**: Primary Raster* object
- **secondary_nlm**: A list or stack of Raster* objects that are merged with the primary Raster* object
- **scalingfactor**: Weight for the secondary Raster* objects
- **rescale**: If TRUE (default), the values are rescaled between 0-1.

Value

Rectangular matrix with values ranging from 0-1

Examples

```r
x <- util_merge(gradient_landscape, random_landscape)
show_landscape(x)
```
util_raster2tibble  Converts raster data into tibble

Description

Writes spatial raster values into tibble and adds coordinates.

Usage

util_raster2tibble(x)

Arguments

x  Raster* object

Details

You will lose any resolution, extent or reference system. The output is raw tiles.

Value

a tibble

Examples

maptib <- util_raster2tibble(fractal_landscape)
## Not run:
library(ggplot2)
ggplot(maptib, aes(x,y)) +
  coord_fixed() +
  geom_raster(aes(fill = z))
## End(Not run)

util_rescale  util_rescale

Description

Linearly rescale element values in a raster to a range between 0 and 1.

Usage

util_rescale(x)

util_rescale(x)
util_tibble2raster

Arguments

x  

Raster* object

Details

Rasters generated by nlm_ functions are scaled between 0 and 1 as default, this option can be set to FALSE if needed.

Value

Raster* object with values ranging from 0-1

Examples

unscaled_landscape <- gradient_landscape + fractal_landscape
util_rescale(unscaled_landscape)

util_tibble2raster  

Converts tibble data into a raster

Description

Writes spatial tibble values into a raster.

Usage

util_tibble2raster(x)

Arguments

x  

a tibble

Details

Writes tiles with coordinates from a tibble into a raster. Resolution is set to 1 and the extent will be c(0, max(x), 0, max(y)).

You can directly convert back the result from `util_raster2tibble()` without problems. If you have altered the coordinates or otherwise played with the data, be careful while using this function.

Value

Raster* object
Examples

```r
tib <- util_raster2tibble(random_landscape)
tb <- util_tibble2raster(tib)
all.equal(random_landscape, tib)
```

---

**Description**

Export raster objects as ESRI ascii files.

**Usage**

```r
util_writeESRI(x, filepath)
```

```r
## S3 method for class 'RasterLayer'
util_writeESRI(x, filepath)
```

**Arguments**

- `x` : Raster* object
- `filepath` : path where to write the raster to file

**Details**

`raster::writeRaster` or `SDMTools::write.asc` both export files that are recognised by most GIS software, nevertheless they both have UNIX linebreaks. Some proprietary software (like SPIP for example) require an exact 1:1 replica of the output of ESRI’s ArcMap, which as a Windows software has no carriage returns at the end of each line. `util_writeESRI` should therefore only be used if you need this, otherwise `raster::writeRaster` is the better fit for exporting raster data in R.

**Examples**

```r
## Not run:
util_writeESRI(gradient_landscape, "gradient_landscape.asc")
## End(Not run)
```
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