# Package 'exactextractr'

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**Title** Fast Extraction from Raster Datasets using Polygons

**Version** 0.1.1

**Description** Provides a replacement for the 'extract' function from the 'raster' package that is suitable for extracting raster values using 'sf' polygons.

**Depends** R (>= 3.4.0)

**License** Apache License (== 2.0)

**SystemRequirements** GEOS (>= 3.5.0)

**Imports** Rcpp (>= 0.12.12), methods, raster, sf,

**LinkingTo** Rcpp

**Suggests** testthat

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 6.1.1

**NeedsCompilation** yes

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**Repository** CRAN

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## R topics documented:

coverage_fraction *Compute the fraction of raster cells covered by a polygon*

## Description

Compute the fraction of raster cells covered by a polygon

## Usage

```
## S4 method for signature 'RasterLayer,sf'
coverage_fraction(x, y, crop = FALSE)

## S4 method for signature 'RasterLayer,sfc_MULTIPOLYGON'
coverage_fraction(x, y, crop)

## S4 method for signature 'RasterLayer,sfc_POLYGON'
coverage_fraction(x, y, crop)
```

## Arguments

| | |
|---|---|
| x | a (possibly empty) RasterLayer whose resolution and extent will be used for the generated RasterLayer. |
| y | a sf object with polygonal geometries |
| crop | if TRUE, each generated RasterLayer will be cropped to the extent of its associated feature. |

## Value

a list with a RasterLayer for each feature in y. Values of the raster represent the fraction of each cell in x that is covered by y.

## Examples

```
rast <- raster::raster(matrix(1:100, ncol=10), xmn=0, ymn=0, xmx=10, ymx=10)
poly <- sf::st_as_sfc('POLYGON ((2 2, 7 6, 4 9, 2 2))')

cov_frac <- coverage_fraction(rast, poly)[[1]]
```

exact_extract *Extract or summarize values from Raster* objects*

## Description

Extracts the values of cells in a RasterLayer that are covered by a simple feature collection containing polygonal geometries, as well as the fraction of each cell that is covered by the polygon. Returns either the result of a summary operation or function applied to the values and coverage fractions (if fun is specified), or a data frame containing the values and coverage fractions themselves (if fun is NULL.)

## Usage

```
## S4 method for signature 'Raster,sf'
exact_extract(x, y, fun = NULL, ...,
  include_xy = FALSE, progress = TRUE, max_cells_in_memory = 3e+07)

## S4 method for signature 'Raster,sfc_MULTIPOLYGON'
exact_extract(x, y, fun = NULL, ...,
  include_xy = FALSE, progress = TRUE, max_cells_in_memory = 3e+07)

## S4 method for signature 'Raster,sfc_POLYGON'
exact_extract(x, y, fun = NULL, ...,
  include_xy = FALSE, progress = TRUE, max_cells_in_memory = 3e+07)
```

## Arguments

| | |
|---|---|
| x | a RasterLayer |
| y | a sf object with polygonal geometries |
| fun | an optional function or character vector, as described below |
| ... | additional arguments to pass to fun |
| include_xy | if TRUE, augment the returned data frame with columns for cell center coordinates (x and y) or pass them to fun |
| progress | if TRUE, display a progress bar during processing |
| max_cells_in_memory | the maximum number of raster cells to load at a given time when using a named summary operation for fun (as opposed to a function defined using R code). If a polygon covers more than max_cells_in_memory raster cells, it will be processed in multiple chunks. |

## Details

The value of fun may be set to a string (or vector of strings) representing summary operations supported by the exactextract library. If a single summary operation is specified, exact_extract will return a vector with the result of the summary operation for each feature in the input. If multiple

summary operations are specified, exact_extract will return a data frame with the result of each summary operation for each feature.

The following summary operations are supported:

- min - the minimum defined value in any raster cell wholly or partially covered by the polygon
- max - the maximum defined value in any raster cell wholly or partially covered by the polygon
- count - the sum of fractions of raster cells with defined values covered by the polygon
- sum - the sum of defined raster cell values, multiplied by the fraction of the cell that is covered by the polygon
- mean - the mean cell value, weighted by the fraction of each cell that is covered by the polygon
- mode - the most common cell value, weighted by the fraction of each cell that is covered by the polygon. Where multiple values occupy the same maximum number of weighted cells, the largest value will be returned.
- majority - synonym for mode
- minority - the least common cell value, weighted by the fraction of each cell that is covered by the polygon. Where multiple values occupy the same minimum number of weighted cells, the smallest value will be returned.
- variety - the number of distinct values in cells that are wholly or partially covered by the polygon.

Alternatively, an R function may be provided as fun. The function will be called for each feature with with vectors of cell values and weights as arguments. exact_extract will then return a vector of the return values of fun.

If fun is not specified, exact_extract will return a list with one data frame for each feature in the input feature collection. The data frame will contain a column with values from each layer in the input 'Raster*', and a final column indicating the fraction of the cell that is covered by the polygon.

## Value

a vector or list of data frames, depending on the value of fun (see Details)

## Examples

```
rast <- raster::raster(matrix(1:100, ncol=10), xmn=0, ymn=0, xmx=10, ymx=10)
poly <- sf::st_as_sfc('POLYGON ((2 2, 7 6, 4 9, 2 2))')

exact_extract(rast, poly, 'mean')

# two summary operations, returns data frame
exact_extract(rast, poly, c('min', 'max'))

# custom summary function, returns vector
exact_extract(rast, poly, function(value, cov_frac) length(value[cov_frac > 0.9]))
```

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