Package: timescapes (via r-universe)

November 14, 2026

Title Quantifying Temporal Structure Across Landscapes

Version 0.1.0

Description Calculates interpretable mathematical summaries of binary conditions observed through time, based on metrics presented in Wan, Ho Yi (2025) <doi:10.1007/s10980-025-02252-4>. Metrics can be calculated for a single binary vector or independently for every cell in a raster time series.

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Encoding UTF-8

Roxygen list(markdown = TRUE)

Imports terra

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

VignetteBuilder knitr

Config/testthat/edition 3

Config/roxygen2/version 8.1.1

URL https://github.com/LoganHysen/timescapes

BugReports https://github.com/LoganHysen/timescapes/issues

Config/pak/sysreqs libgdal-dev gdal-bin libgeos-dev libproj-dev libsqlite3-dev

Repository https://loganhysen.r-universe.dev

Date/Publication 2026-10-29 19:54:14 UTC

RemoteUrl https://github.com/loganhysen/timescapes

RemoteRef HEAD

RemoteSha 0418ca33f19a11a19a4949dcc2ccd0854cb1d5ee

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ts_list_metrics *List available binary timescape metrics*

Description

List available binary timescape metrics

Usage

```
ts_list_metrics()
```

Value

A character vector of exact metric names accepted by `ts_metric()` and `ts_raster_metric()`.

Examples

```
ts_list_metrics()
```

ts_metric *Calculate a binary timescape metric*

Description

Calculates one named metric for a numeric vector in which `1` means that a condition is present and `0` means that it is absent. Metric names must match `ts_list_metrics()` exactly. If `x` contains any missing value, the result is `NA_real_`.

Usage

```
ts_metric(x, metric, ...)
```

Arguments

`x`	A non-empty numeric vector containing only `0`, `1`, or `NA`.
`metric`	One exact metric name returned by `ts_list_metrics()`.
`...`	Named metric-specific arguments. `core_time_index` and `n_core_periods` accept `min_core_period`, a positive whole number of time steps. If omitted, 15 is used with a warning once per call. `gap_mean` and `gap_max` accept `include_boundary_gaps` (default `TRUE`); set it to `FALSE` to count only absence runs between presence periods.

Value

One numeric value.

Metrics

Let n be the number of time steps, let an occupied period be a maximal run of ones, and let a gap be any maximal run of zeros, including leading and trailing runs by default. With `include_boundary_gaps = FALSE`, only gaps between presence periods count. No qualifying gaps (including an all-zero series with boundary gaps excluded) returns 0.

- `total_time`: sum of the series; range 0 to n.
- `n_periods`: number of occupied periods; range 0 to `ceiling(n / 2)`.
- `gap_mean`: arithmetic mean of gap lengths, or 0 when no gaps occur.
- `gap_max`: maximum gap length, or 0 when no gaps occur.
- `duration_sd`: sample standard deviation of occupied-period lengths, or 0 when fewer than two occupied periods occur.
- `edge_density`: number of changes between adjacent time steps divided by `n - 1`; returns 0 for a one-step series.
- `autocorr`: Pearson correlation between steps 1 through `n - 1` and steps 2 through n; returns NA when the correlation is undefined.
- `aggregation`: proportion of adjacent time-step pairs that are equal; returns 0 for a one-step series.
- `core_time_index`: proportion of occupied time in presence runs whose full length is at least `min_core_period`; returns 0 when no presence occurs.
- `n_core_periods`: number of such qualifying presence runs.

Time steps are unitless ordered observations; their duration is user-defined.

References

Wan, H. Y. (2025). It's about time: Temporal fragmentation and metrics for habitat change. Landscape Ecology, 40, 226. doi:10.1007/s10980025022524

Examples

```
x <- c(1, 1, 0, 0, 1, 1, 1, 0)
ts_metric(x, "n_periods")
ts_metric(x, "gap_mean")
ts_metric(x, "core_time_index", min_core_period = 3)
```

`ts_raster_metric` *Calculate a binary timescape metric for each raster cell*

Description

Applies one named timescape metric independently to every cell of a `terra::SpatRaster`, treating its layers as ordered time steps. Raster cells must contain only `0`, `1`, or NA through time. A cell containing any NA receives an NA result.

Usage

```
ts_raster_metric(r, metric, ...)
```

Arguments

`r`	A `terra::SpatRaster` whose layers are ordered time steps.
`metric`	One exact metric name returned by `ts_list_metrics()`.
`...`	Named metric-specific arguments passed to `ts_metric()`, including `include_boundary_gaps = TRUE` for gap metrics and a positive whole number `min_core_period` for core metrics. Omitting `min_core_period` uses 15 time steps and warns once per raster call, rather than once per cell.

Value

A one-layer `terra::SpatRaster` containing the selected metric.

Examples

```
r <- terra::rast(nrows = 2, ncols = 2, nlyrs = 4)
terra::values(r) <- matrix(
  c(
    1, 1, 0, 1,
    0, 0, 0, 0,
    1, 0, 1, 0,
    1, 1, 1, 1
  ),
  nrow = terra::ncell(r),
  byrow = TRUE
)
ts_raster_metric(r, "n_periods")
```

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