

landscapemetrics: introducing a new R tool to characterise landscapes



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Background

Landscape metrics are used to characterize landscape patterns and link them to ecological processes. Until now, there is no comprehensive collection of landscape metrics available in R. `landscapemetrics` is the first R package that includes most of the commonly employed landscape metrics found in the ecological literature. This allows reproducible and transparent workflows within the same software environment, including pre-processing of data, calculation of landscape metrics, and further analysis or plotting of the results.

Overview

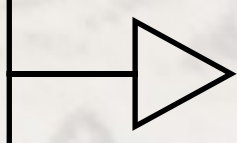
- Comprehensive collection of metrics
- Facilitates reproducibility and transparency
- “FRAGSTATS”-style metrics [1]
- “Tidy” data philosophy [2]
- Includes utility functions
- Based on the `raster` package [3]
- Open-source and cross-platform
- Easy to integrate into workflows

How to use `landscapemetrics`

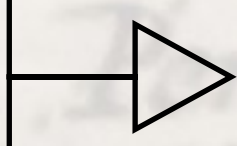
Install from CRAN



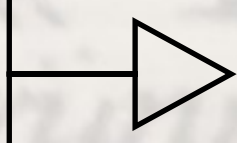
Import raster data



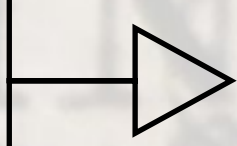
Calculate selected metrics



Calculate several metrics



Integrate into larger workflow



```
install.packages("landscapemetrics")
library(raster)
library(landscapemetrics)

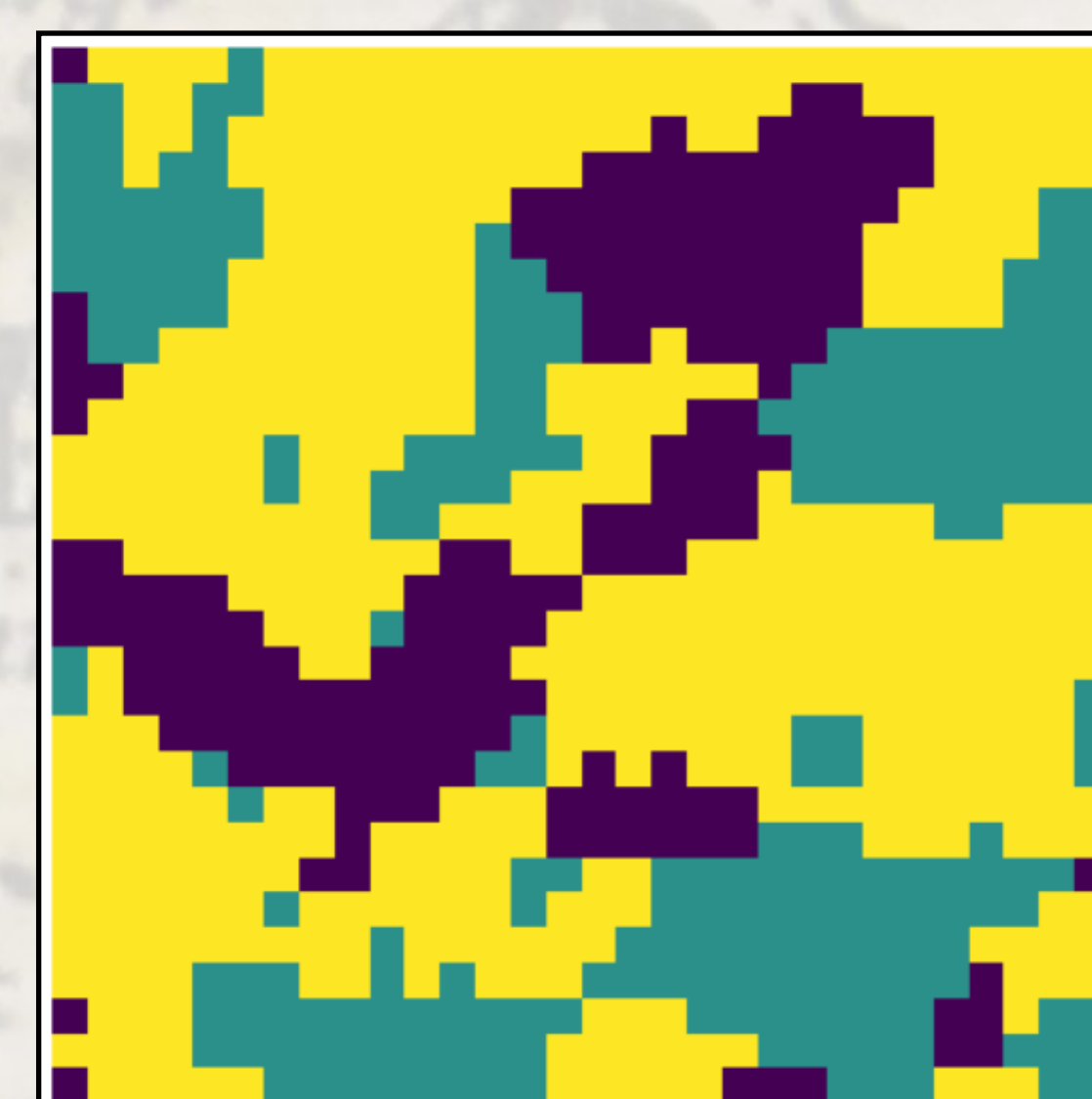
data <- raster("C:/User/land_cover.tif")

area_lsm <- lsm_p_area(data)
perim_lsm <- lsm_p_perim(data)

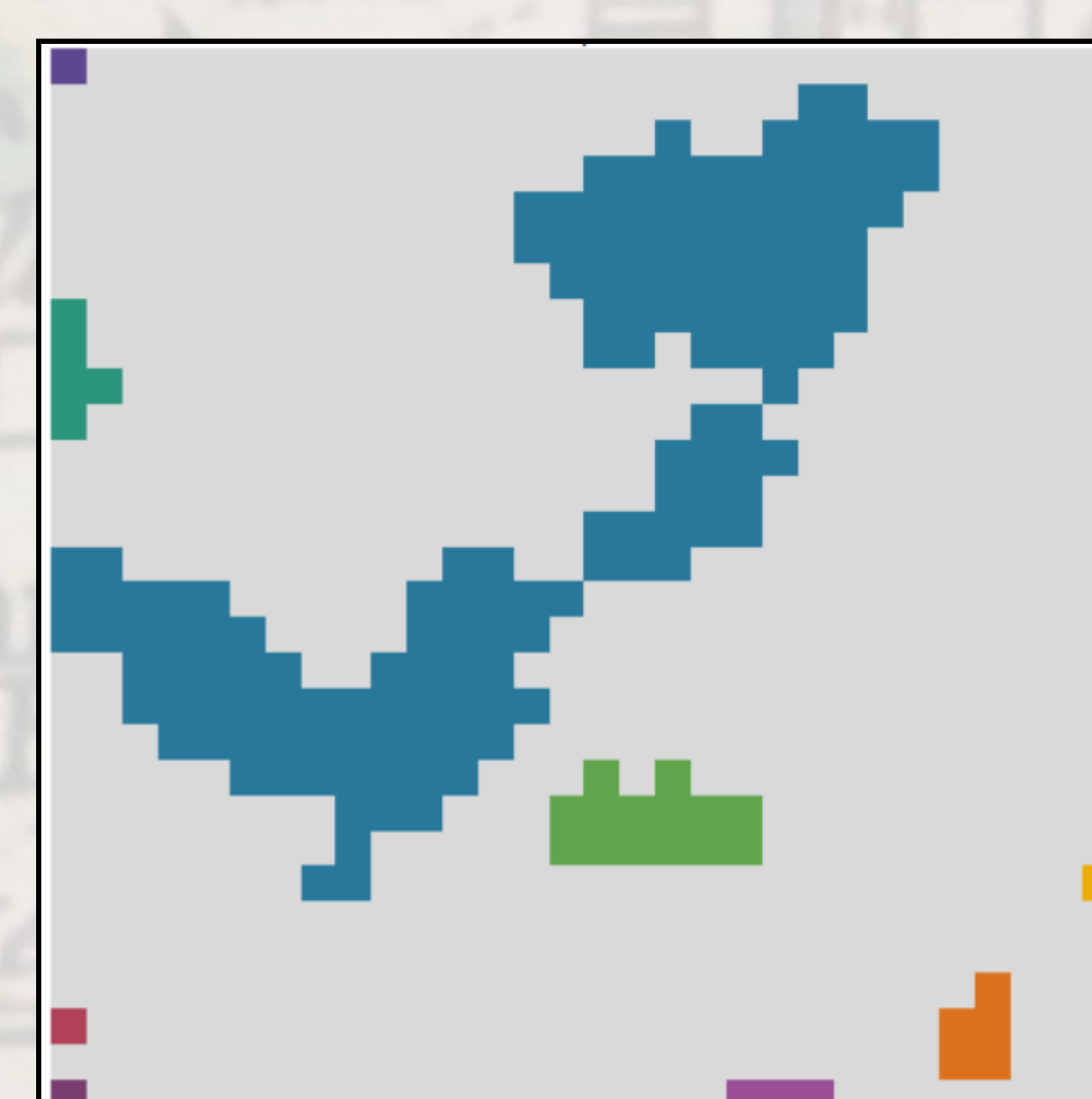
shape <- calculate_lsm(data, level="class",
                       type="shape metric")

subsample_patches <- lsm_p_enn(data) %>%
  filter(class == 2 & value > 2.5)
```

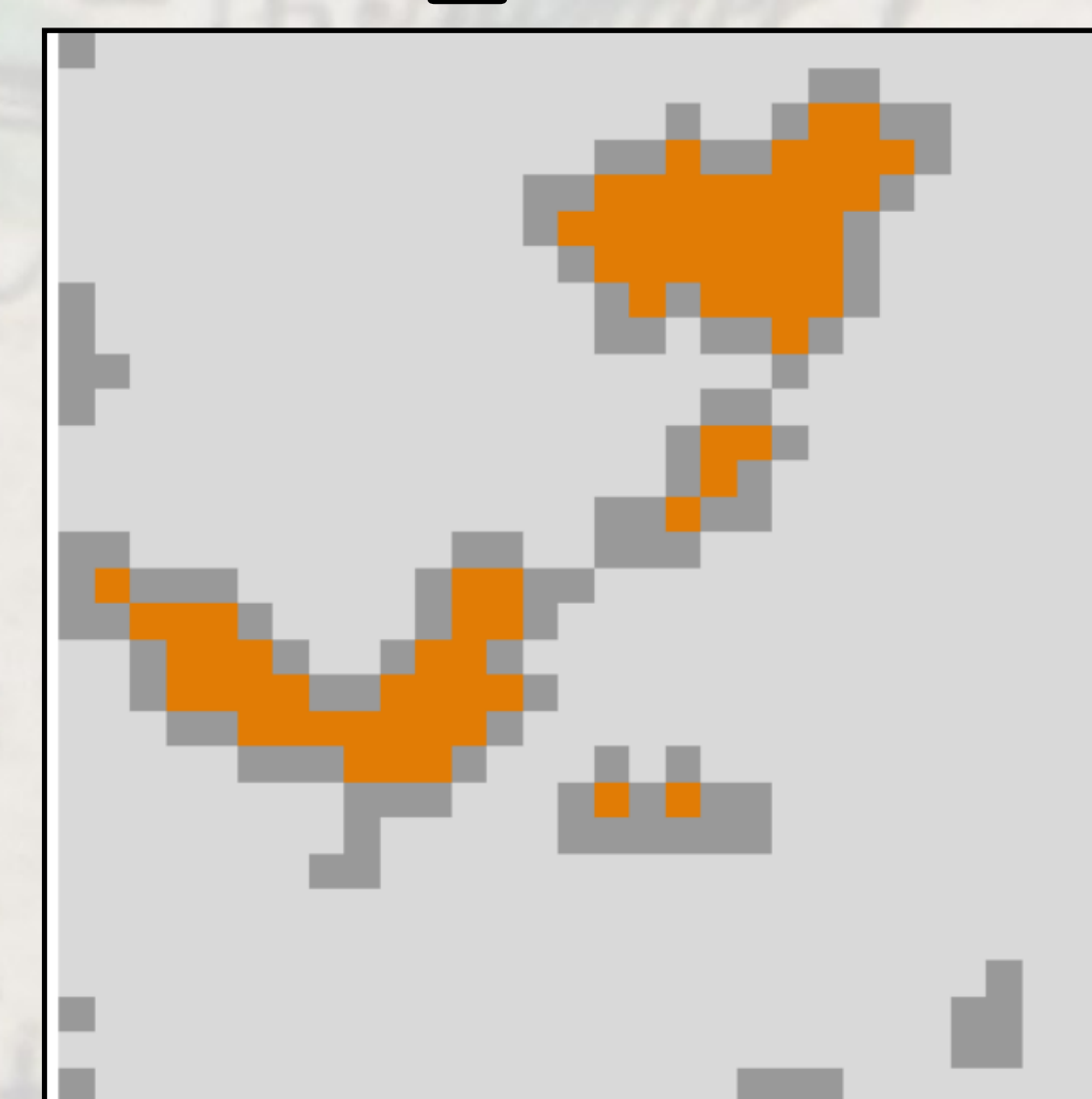
Exemplary landscape



`show_patches()`



`show_cores()`



Utility functions

Area of Application	Function name	Description
Visualization	<code>show_patches()</code>	Plot patches in the landscape
Visualization	<code>show_cores()</code>	Plot core areas in the landscape
Visualization	<code>show_lsm()</code>	Plot cells filled with corresponding patch metric values
Visualization	<code>show_correlation()</code>	Plot correlation between metrics
Sampling	<code>sample_lsm()</code>	Sample metrics in buffer around sample points
Sampling	<code>extract_lsm()</code>	Extract metrics of patches enclosing sample points
Sampling	<code>window_lsm()</code>	Moving window analysis
Building block	<code>get_adjacencies()</code>	Get class cell adjacencies
Building block	<code>get_boundaries()</code>	Get boundary cells of patches
Building block	<code>get_circumscribingcircle()</code>	Get diameter of smallest circumscribing circle around patches
Building block	<code>get_nearestneighbour()</code>	Get minimum Euclidean distance between classes
Building block	<code>get_patches()</code>	Connected components labeling
Various	<code>check_landscape()</code>	Check if input fulfils package requirements
Various	<code>list_lsm()</code>	List all available metrics
Various	<code>spatialize_lsm()</code>	Assign corresponding patch metric values to cells

More info?

Contribute? Bugs?



[1] McGarigal, K., Cushman, S. A., & Ene, E. (2012). FRAG-STATS v4: Spatial Pattern Analysis Program for Categorical and Continuous Maps. Computer software program produced by the authors at the University of Massachusetts, Amherst. Amherst: University of Massachusetts.

[2] Wickham, H. (2014). Tidy Data. *Journal of Statistical Software*, 59 (10), 1–23.

[3] Hijmans, R. J. 2019. `raster`: Geographic data analysis and modeling. R package version 2.9-5. <<https://cran.r-project.org/package=raster>>.

Acknowledgments

We thank K. With, L.J. Graham & J. Hollister for input on the R package structure and M. Strimas-Mackey, F. Privé & J. VanDerWal for code contribution.

M.H.K.H. was supported by the DFG Research Training Group 1644 "Scaling Problems in Statistics".

