Geodata and algorithms in R

Intro

Jannes Muenchow

DAAD summer school

Contents of the tutorial

1. Spatial vector data

Contents of the tutorial

1. Spatial vector data
2. Spatial raster data

Contents of the tutorial

1. Spatial vector data
2. Spatial raster data
3. Bridges to GIS (tomorrow)

Some definitions

What is a GIS?

- A **G**eographic **I**nformation **S**ystem is a system for the analysis, manipulation and visualization of geographical data (Longley, Goodchild, Maguire, and Rhind, 2015).

What is a GIS?

- A **G**eographic **I**nformation **S**ystem is a system for the analysis, manipulation and visualization of geographical data (Longley, Goodchild, Maguire, and Rhind, 2015).
- Six components of a GIS: software, data, procedures, hardware, people, network


What is a GIS?

- A **G**eographic **I**nformation **S**ystem is a system for the analysis, manipulation and visualization of geographical data (Longley, Goodchild, Maguire, and Rhind, 2015).
- Six components of a GIS: software, data, procedures, hardware, people, network
- Typical GIS software packages: QGIS, SAGA-GIS, GRASS-GIS, ArcMap (commercial)

What is geocomputation?

- Geocomputation
- GIScience
- Geographic data science

What is geocomputation?

- Geocomputation
- GIScience
- Geographic data science

Graphical User Interface (GUI) GIS vs Geocomputation with R

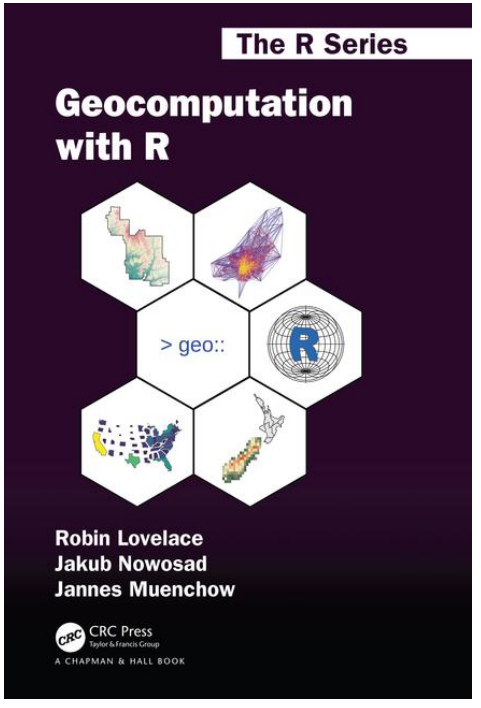
Attribute	**Desktop GIS (GUI)**	**R**
Home disciplines	Geography	Computing, Statistics
Software focus	Graphical User Interface	Command line
Reproducibility	Minimal	Maximal

Wanna learn more?

We are the authors of Geocomputation with R (Lovelace, Nowosad, and Muenchow, 2019).

Find here the online home of our book.

- Robin Lovelace - Geographer and Environmental Scientist focussing on sustainable transport planning; creator of **stplanr**.

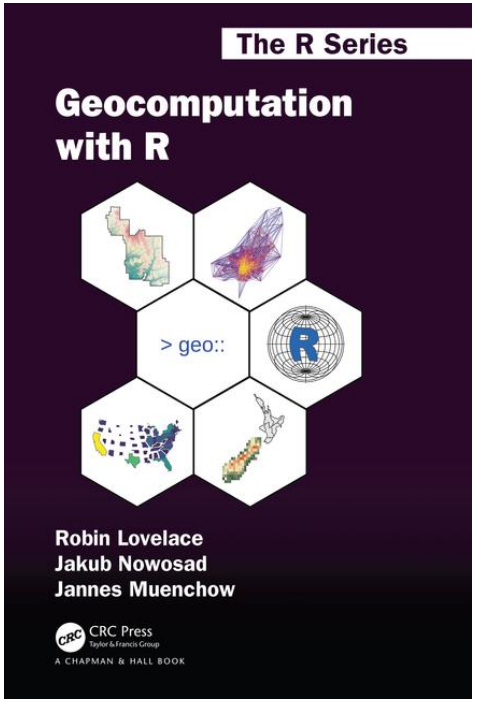


Wanna learn more?

We are the authors of Geocomputation with R (Lovelace, Nowosad, and Muenchow, 2019).

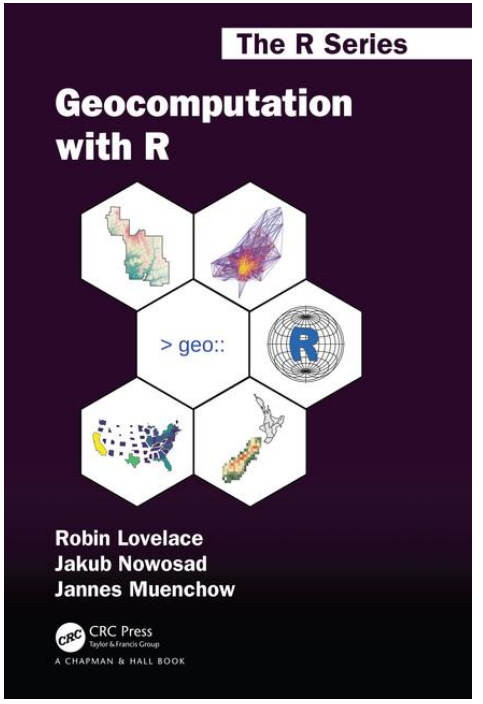
Find here the online home of our book.

- Robin Lovelace - Geographer and Environmental Scientist focussing on sustainable transport planning; creator of **stplanr**.
- Jakub Nowosad - Computational geographer with a focus on the analysis of large datasets to understand environmental processes; creator of the **sabre** package.



Wanna learn more?

We are the authors of Geocomputation with R (Lovelace, Nowosad, and Muenchow, 2019).



Find here the online home of our book.

- Robin Lovelace - Geographer and Environmental Scientist focussing on sustainable transport planning; creator of **stplanr**.
- Jakub Nowosad - Computational geographer with a focus on the analysis of large datasets to understand environmental processes; creator of the **sabre** package.
- Jannes Muenchow - GIScientist with a special focus on ecology, landsliding and geomarketing; creator of the **RQGIS(3)** package (Muenchow, Schratz, and Brenning, 2017).

Further reading: https://geocompr.robinlovelace.net/intro.html#what-is-geocomputation

Geographic data (models)

- Geographic data consists of **xy-coordinates** and corresponding **attributes** (this might include a time stamp, otherwise the data is static).

Geographic data (models)

- Geographic data consists of **xy-coordinates** and corresponding **attributes** (this might include a time stamp, otherwise the data is static).
- Usually we neglect the curvature of the Earth when visualizing geographic data.

Geographic data (models)

- Geographic data consists of **xy-coordinates** and corresponding **attributes** (this might include a time stamp, otherwise the data is static).
- Usually we neglect the curvature of the Earth when visualizing geographic data.
- Geographic data only represents a simplified representation of the world. So we decide what we display for which purpose.

Geographic data (models)

- Geographic data consists of **xy-coordinates** and corresponding **attributes** (this might include a time stamp, otherwise the data is static).
- Usually we neglect the curvature of the Earth when visualizing geographic data.
- Geographic data only represents a simplified representation of the world. So we decide what we display for which purpose.
- Geographic data can quickly become big.

Geographic data (models)

- Geographic data consists of **xy-coordinates** and corresponding **attributes** (this might include a time stamp, otherwise the data is static).
- Usually we neglect the curvature of the Earth when visualizing geographic data.
- Geographic data only represents a simplified representation of the world. So we decide what we display for which purpose.
- Geographic data can quickly become big.
- Two data models for representing digitally geographic data: **the vector** (Pebesma, 2018c) and **the raster** (Hijmans, 2019) data model.

References

Hijmans, Robert J. (2019). *Raster: Geographic Data Analysis and Modeling*. R package version 2.8-19. URL: https://CRAN.R-project.org/package=raster.

Longley, Paul, Michael Goodchild, David Maguire, et al. (2015). *Geographic Information Science & Systems*. Fourth edition. Hoboken, NJ: Wiley. 477 pp. ISBN: 978-1-118-67695-0.

Lovelace, Robin, Jakub Nowosad, and Jannes Muenchow (2019). *Geocomputation with R*. The R Series. CRC Press.

Muenchow, Jannes, Patrick Schratz, and Alexander Brenning (2017). "RQGIS: Integrating R with QGIS for Statistical Geocomputing". In: *The R Journal* 9.2, pp. 409-428.

Pebesma, Edzer (2018). "Simple Features for R: Standardized Support for Spatial Vector Data". In: *The R Journal* 10.1, pp. 439-446. URL: https://journal.r-project.org/archive/2018/RJ-2018-009/index.html.