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# Inventory and Geomatics, Winter Semester 24/25

## Exercise 1

### General content of the exercise:

- Prepare your laptop (QGIS and R/RStudio)
- introduction\_to\_quarto.qmd (Introduction to Quarto)

Time required: approximately 1 hour (depending on internet and PC speed)

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Congratulations! You have the pleasure of spending the next semester with Teja Kattenborn, Thomas Purfürst, Thomas Seifert and Maximilian Fabi.

To work with all the geodata we will be using or generating, we need tools to assist us. In science (or in life in general), there are often many ways to achieve a goal - here are two approaches for our purposes:

### 1) QGIS:

QGIS (Quantum GIS): An open-source Geographic Information System (GIS) for editing, analyzing, and visualizing geographic data.

Platform: Available on Windows, Mac, and Linux.

Data formats: Supports a wide variety of raster and vector data formats, such as Shapefiles, GeoTIFFs, Geopackages, and many other GIS formats.

Functions:

- Create and edit maps
- Perform spatial analyses (e.g., buffer, overlays)
- Visualize 2D and 3D data
- Georeference images

Extensions/Plugins: A wide selection of plugins to extend functionality, e.g., for remote sensing, route calculation, and database management.

Integration: Can be connected with other GIS software and databases such as PostGIS.

Applications: Urban planning, environmental protection, geomarketing, cadastral management, science, remote sensing, etc.

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## **2) R:**

Programming language: R is an open-source programming language specifically designed for statistics, data analysis, and visualization. It is widely used in science.

Functions:

- Data manipulation, analysis, and visualization
- Perform statistical tests and models
- Support for machine learning and big data

Data formats: Can work with formats like CSV, Excel, databases, and many others. Popular packages (examples): ggplot2 (for visualizations), dplyr (for data manipulation), shiny (for web apps), tidyverse (a collection of useful packages).

## **3) RStudio:**

Integrated Development Environment (IDE): A user-friendly IDE for working with R.

Functions:

- Script editor with syntax highlighting and auto-completion
- Plot preview for visualizations
- Project and version control
- Integrated console for executing R commands directly

RMarkdown: Allows the creation of reports, presentations, and documentation with text, code, and outputs.

Shiny apps: Development and deployment of interactive web applications with R. R is often used in statistics, research, data analysis, and machine learning. RStudio makes working with R simpler and more organized.

## **To do for you:**

### **Install QGIS (LTR):**

To view and edit geodata, we need suitable software:

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## **QGIS:**

<https://www.qgis.org/en/site/forusers/download.html>

Install QGIS long-term-release (v. 3.34 LTR). Depending on your operating system, choose the appropriate version (in my case, MacOS). Use the 3.34 LTR (long-term release) so we all work on the same version, and more help is available in case of errors. Once installed, open it and change the system language to English.

## **RStudio and R installation:**

To use RStudio, R must first be installed on your computer. RStudio is just a graphical interface to work with R (IDE).

Here is a helpful website with a step-by-step guide. Just follow the instructions: <https://rstudio-education.github.io/hopr/starting.html>

### **Steps (more detailed in the guide above):**

#### **1. Install R (Latest stable)**

<https://rstudio-education.github.io/hopr/starting.html>

#### **2. Install RStudio:**

Now we need a “nice” graphical interface to work with R. You can download RStudio here: <https://posit.co/downloads/>

RStudio Desktop Free

The individual windows and elements can be customized to your preference, but more on that as the course progresses.

## **First exercise:**

Everything installed? Then you can start directly with the first (short) exercise in R

- **introduction\_to\_quarto.qmd**

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Simply open this file in RStudio and follow the script.

If it didnt work (for whatever reason), take a moment to relax and try again later. If it still doesnt work, ask your classmates or, if its really problematic, Teja or Max. Were here to help :)  
<https://posit.co/downloads/>