

Spatial Information Systems (GIS)

Advanced basics of
geographic information systems



Exercise WiSe 2024/25

(Course notes for internal use only!)

1. Exercise

- (1) Organization (contact, dates, moodle, grading)
- (2) QGIS (installation, GUI, settings)
- (3) Exercise 1 (tasks and workflow)

Contact Information

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Consultation Hours: On request (Please send an email to confirm a time slot)

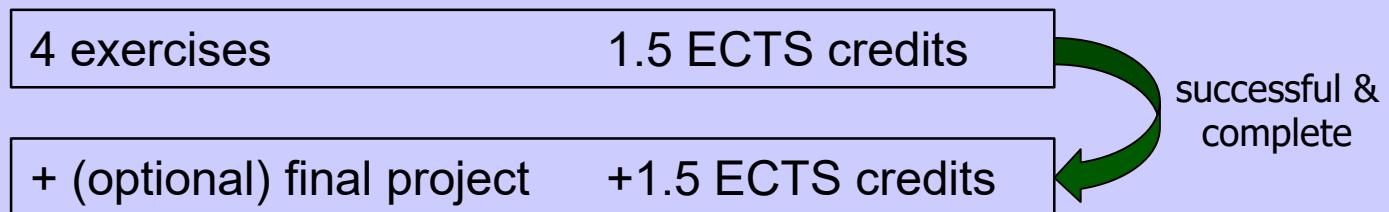


Language

- The official course language will be English (in German on demand).
- The course notes are available in both languages.
- Please tell me when I'm talking too fast or when I should repeat something in German for better understanding.
- You may at any time ask questions in German or English.
- You may turn in your exercises in German or English.

Exercise organization

- Exercises will take place biweekly on Friday, 1:30 pm
- Exercise slides will be provided
- Processings in groups of 5-6 students (grouping via moodle)
- Submissions preferably via moodle-upload
- Processings have to be in time and complete
- Time for processing: 2 weeks
- Please check the quality and the functionality of your work before you submit it. Discuss your work in your group!



dates

- | | |
|------------|--|
| 08.11.2024 | Exercise 1 |
| 1:30 pm | (Research and georeferencing) |
| 22.11.2024 | Exercise 2 |
| 1:30 pm | (Digitization and acquisition of attributes) |
| 06.12.2024 | Exercise 3 |
| 1:30 pm | (Use of free geo-data and geo-data analysis) |
| 20.12.2024 | Exercise 4 |
| 1:30 pm | (Transfer of a statistic into thematic maps) |
| 17.01.2025 | Final project (optional) |
| 1:30 pm | (Individual GIS topic) |

E-Learning platform moodle

The screenshot shows the Moodle course page for 'Raumbezogene Informationssysteme/ Spatial information systems (GIS) WiSe2024'. The page includes a sidebar with navigation links like General Information, Forum, Group selection, etc., and a right sidebar with sections for Kursteilnehmer/innen, Suche, and Aktuelle Termine.

Welcome
Welcome to the course "Raumbezogene Informationssysteme/ Spatial information systems (GIS)" in the winter semester 2024/2025. In the beginning we would like to give some general information.

Language:
The official course language will be English (in German on demand). The course notes are available in both languages. You may at any time ask questions in German or English. You may turn in your exercises in German or English.

Format of teaching:
Lectures and Exercises are planned as in-person teaching. All materials will be provided in digital form in this moodle course room. You can download these until the end of semester. The exercises and project work involve group work (3-6 students). Please get together in groups independently. Group selection starts Friday, October 18, 2024. Group no. 20 is reserved for students who solely want to participate in the final project. [Link to available groups](#) For good overview of course participants and to allocate your performances please take part in the [survey](#) for additional student information (just two questions).

Course interaction:
Additionally to the in-person meeting in the lecture hall you can also send us an e-mail. We will try to answer your questions as soon as possible. Information about general issues and course organization are given in the forum [News and announcements](#). For questions and discussion related to exercises please use the forum [Discussions and questions](#). In addition, groups can use a [digital chat room](#) for communication.

Further information:
In-person teaching channels provided. All provided in English or any kind of language.
We hope for a successful semester.
Volker Rodehorst, T

The course is managed using the open-source learning platform moodle. All documents and further information can be found in the moodle-course *Spatial information systems (GIS) WiSe2024*.

Enrolment key: **spatial24**

Moodle group selecting

Raumbezogene Informationssysteme/ Spatial information systems (GIS) WiSe2024

Raumbezogene Informationssysteme/ Spatial information systems (GIS) WiSe2024

General Information

The exercises and the final project are organized in groups of **max. 3 students 5-6 students**.

Forum

Please select one of the available groups!

Group selection

Group selection starts Friday, October 18, 2024. You will have the possibility to change your group until November **7 14**.

Survey for additional particulars

After November **7 14**, please write **me** an email, in case you want to participate in the exercises.

Available groups

You can change your choice until November **7 14**, 2024!

Course evaluation

Lecture notes and helpful documents

Exercise 1 - Research and georeferencing

Exercise 2 - Digitization and acquisition of attributes

Exercise 3 - Geo-data analysis and working with free geo-data

Exercise 4 - Transfer of a statistic into thematic maps

Final Project - Individual GIS



You can remove/change your choice until November 14, 2024!

Survey for additional particulars

Raumbezogene Informationssysteme/ Spatial information systems (GIS) WiSe2024

Raumbezogene Informationssysteme/ Spatial information systems (GIS) WiSe2024

General Information

Forum

Group selection

Survey for additional
particulars

Course evaluation

Lecture notes and helpful
documents

Exercise 1 - Research and

Survey to collect further student information (just two questions). It is necessary to allocate your performance.



Survey

Survey to collect further student information. It is necessary to allocate your performance.

Modus: Nicht anonym

1. Please fill in your matriculation number (Student-ID)! (50000 - 200000)

2. Please specify your study course (degree program)!

notwendig

Vorherige Seite Nächste Seite Abbrechen



Grading

You get no marks. The grading is just an indication of the quality of your work.

- failed → Rework is necessary
- just managed → Your work is accepted. You have made mistakes. It is advisable to eliminate them.
- well done → Your work is accepted. You have made just some little mistakes.
- great → Your work is accepted. Everything is alright.

precondition to get credits

permission for final project

Grading

The screenshot shows the 'Grader report' section of the Lernplattform. At the top, there are navigation links: 'Lernplattform Bauhaus-Universität Weimar', 'My Courses', 'Support', and a user profile for 'Thomas Gebhardt'. Below this, a dropdown menu is set to 'Grader report'. A search bar contains the text 'Grader report'. On the left, there are filters for 'Visible groups' (set to 'All participants') and dropdown menus for 'First name' (with letters A-Z) and 'Surname' (with letters A-Z). In the center, a large table displays student information and their performance across four assignments. The columns include 'First name / Surname', 'Email address', 'Phone', and four assignment columns labeled 'Online-assignment for exe...', each with a 'well done' rating. The table also includes an 'Overall average' row at the bottom. The interface has a clean, modern design with a light blue header and white background.

Good overview about the quality of your exercises and outstanding matters

Quantum GIS (www.qgis.org)

- is a freely Spatial Information System
- can be used for detection and processing of spatial data
- can be used for visualization of data
- supports vector and raster layers
- translated in many languages
- runs on different operating systems like Mac OS X, Linux, Unix and Windows

Installation QGIS (www.qgis.org)

The screenshot shows the official QGIS website. At the top, there is a navigation bar with links for "Project", "Community", "Resources", "Download" (which is highlighted in green), "Donate", and a gift icon. Below the navigation bar, a news item about the OSGeo Statement: EU Cyber Resilience Act is displayed. A search bar is also present. The main content area features a large map background. On the left, a button says "Free and Open Source". The central text reads "Spatial without Compromise" in large white font, followed by a subtitle "Spatial visualization and decision-making tools for everyone". A large green "Download" button is at the bottom left. To the right, the QGIS logo (a stylized green 'Q' with an orange and yellow block inside) is displayed. The bottom of the page has a footer with links for "Windows", "Mac", and "Linux".

Download for Windows

The screenshot shows the QGIS website's download page for Windows. The top navigation bar includes links for Project, Community, Resources, Download (highlighted with a green box), Donate, and a gift icon. A news banner at the top reads "News: OSGeo Statement: EU Cyber Resilience Act". The main content area features a large heading "Download QGIS for your platform" and a sub-section about binary packages. It mentions the current version is QGIS 3.40.0 'Bratislava' (released 2024-10-25) and the long-term builds offer QGIS 3.34.12 'Prizren'. The page notes QGIS availability on Windows, macOS, Linux, Android, and iOS. A prominent red arrow points from the "Long Term Version for Windows (3.34 LTR)" link to the "QGIS-OSGeo4W-3.34.12.msi (~1.3GB)" file link. Below this, a note states that the OSGeo4W installer is recommended for regular users or organization deployments, allowing multiple versions to be installed separately. A "OSGeo4W Network Installer" button is also present. A note at the bottom indicates 64-bit executables are provided since QGIS 3.20. The sidebar on the left lists Project, Community, Resources, Funding, Goodies, Download (selected), and Archive.

Download QGIS for your platform

This page provides binary packages (installers).

The current version is QGIS 3.40.0 'Bratislava' and was released on 2024-10-25.

The long-term builds currently offer QGIS 3.34.12 'Prizren'.

QGIS is available on Windows, macOS, Linux, Android and iOS.

[Long Term Version for Windows \(3.34 LTR\)](#)  [QGIS-OSGeo4W-3.34.12.msi \(~1.3GB\)](#)

The OSGeo4W installer is recommended for regular users or organization deployments. It allows to have several QGIS versions in one place, and to keep each component up-to-date individually without having to download the whole package.

[OSGeo4W Network Installer](#)

Since QGIS 3.20 we only ship 64-bit Windows executables.

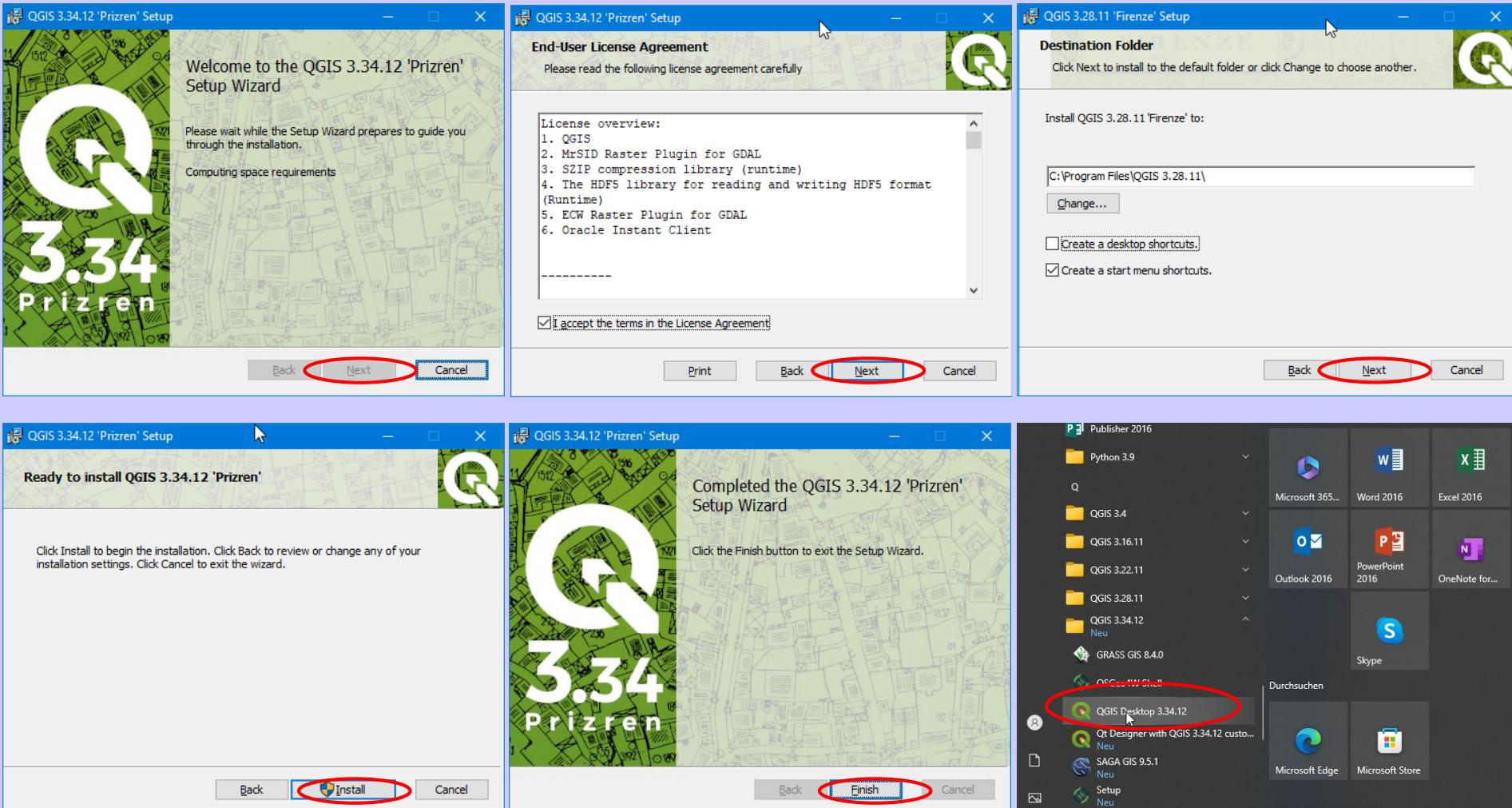
Other platforms

 [Linux](#) 

 [macOS](#) 

 [BSD](#) 

Windows Installation 3.34



Further downloads

The screenshot shows the QGIS website's download page. The top navigation bar includes links for Project, Community, Resources, Download (which is highlighted), and Donate. On the left, a sidebar menu lists Project, Community, Resources, Funding, Goodies, Download (highlighted), and Archive. The main content area is titled "Other platforms" and features a "Linux" section with a dropdown menu. Below it, text explains that GNU/Linux is a Free operating system built on the same principles as QGIS, and provides installers for many Linux distributions. A list of supported distros includes Debian/Ubuntu, Fedora, NixOS, openSUSE, Mandriva, Slackware, Arch Linux, Flatpak, and Spack. A link to "Linux Installation Instructions" is provided. Other sections shown include macOS, BSD, Mobile and tablet, Source Code, and Example Datasets.

Project

Community

Resources

Download

Donate

Archive

Other platforms

Linux

GNU/Linux is a Free operating system built on the same principles that QGIS is built on. We provide installers for many flavors of GNU/Linux binary packages (including rpm and deb packages). Please select your choice of distro below:

- Debian/Ubuntu
- Fedora
- NixOS
- openSUSE
- Mandriva
- Slackware
- Arch Linux
- Flatpak
- Spack

[Linux Installation Instructions](#)

macOS

BSD

Mobile and tablet

Source Code

Example Datasets

Helpful documents

<https://docs.qgis.org/3.34/en/docs>

QGIS Documentation



3.28

Search docs

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- QGIS Server Guide/Manual (QGIS 3.28)

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- Module: Creating and Exploring a Basic Map
- Module: Classifying Vector Data
- Module: Laying out the Maps
- Module: Creating Vector Data
- Module: Vector Analysis
- Module: Rasters
- Module: Completing the Analysis
- Module: Plugins
- Module: Online Resources
- Module: QGIS Server
- Module: GRASS
- Module: Assessment
- Module: Forestry Application

QGIS Documentation v: 3.28 ▾

QGIS Training Manual

QGIS Desktop User Guide/Manual (QGIS 3.28)

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19. Working with Vector Tiles

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25. GRASS GIS Integration

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QGIS User Guide

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6.1. Introducing OGIS

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- QGIS Server Guide/Manual (QGIS 3.28)
- Training Manual

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- 2. Introducing GIS
- 2.1. Overview
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- 2.4. Getting a GIS Application for your own com
- 2.5. GIS Data
- 2.6. What have we learned?
- 2.7. Now you try!
- 2.8. Something to think about
- 2.9. Further reading
- 2.10. What's next?

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- 3.2. Point features in detail
- 3.3. Polyline features in detail
- 3.4. Polygon features in detail
- 3.5. Vector data in layers
- 3.6. Editing vector data
- 3.7. Scale and vector data
- 3.8. Symbology
- 3.9. What can we do with vector data in a GIS?

FOR WRITERS

Documentation Guidelines

FOR DEVELOPERS

- PyQGIS Cookbook (QGIS 3.28)
- Developers Guide
- QGIS Documentation v: 3.28 ▾

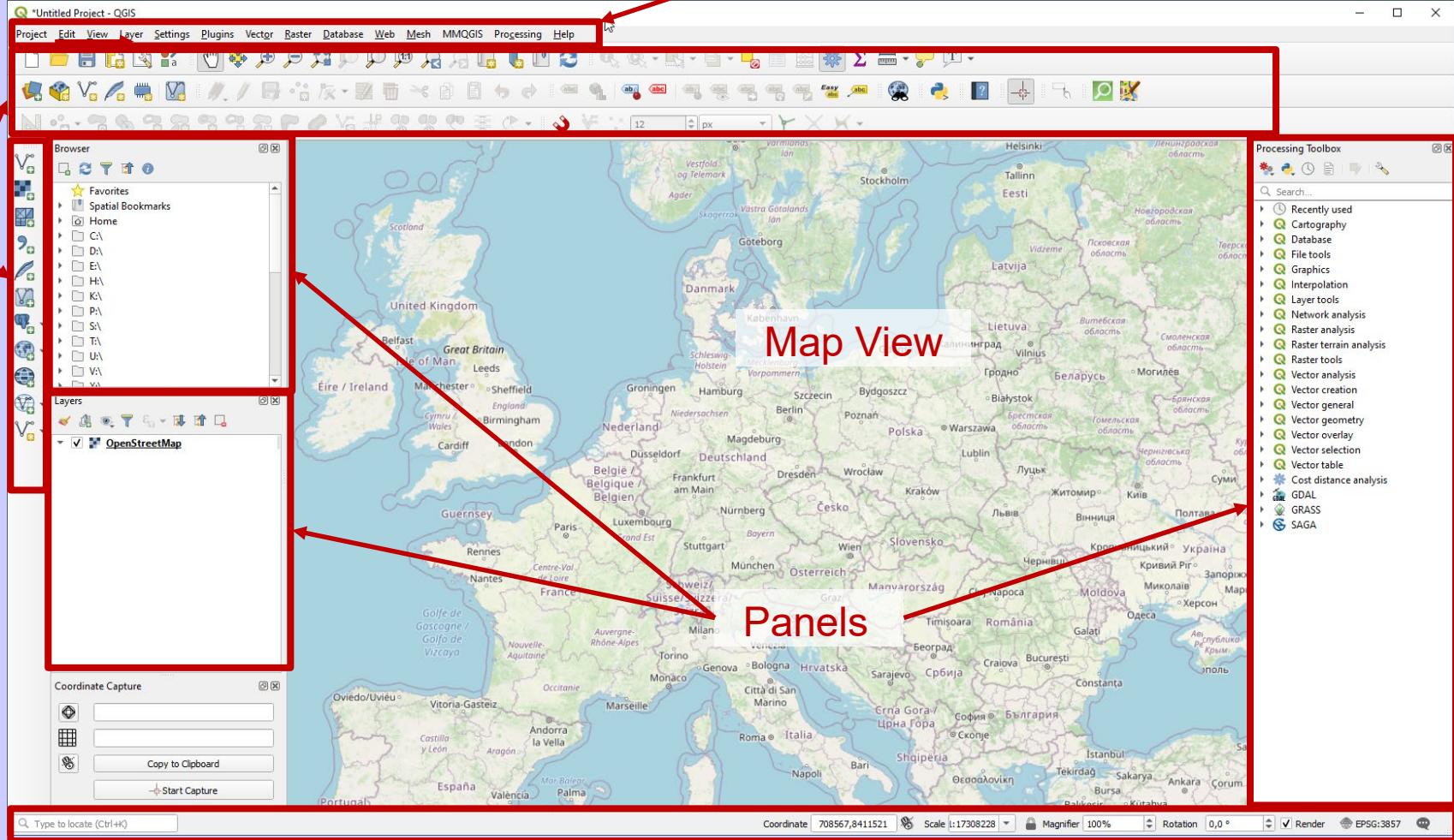
A Gentle Introduction to GIS

1. Preamble

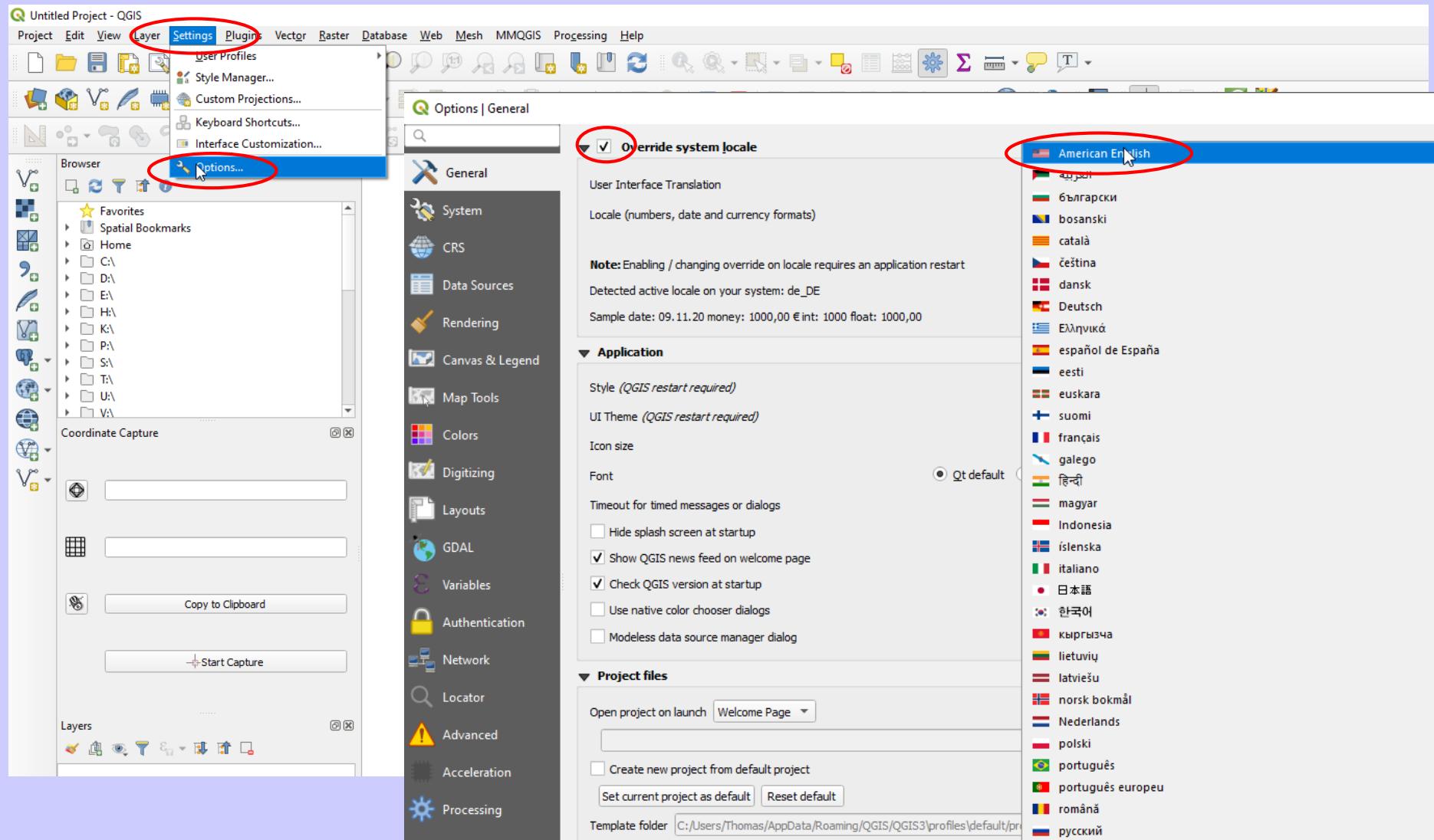
- ## A Gentle Introduction to GIS
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 - 3. Vector Data
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 - 3.7. Scale and vector data
 - 3.8. Symbology
 - 3.9. What can we do with vector data in a GIS?
 - 3.10. Common problems with vector data

User interface

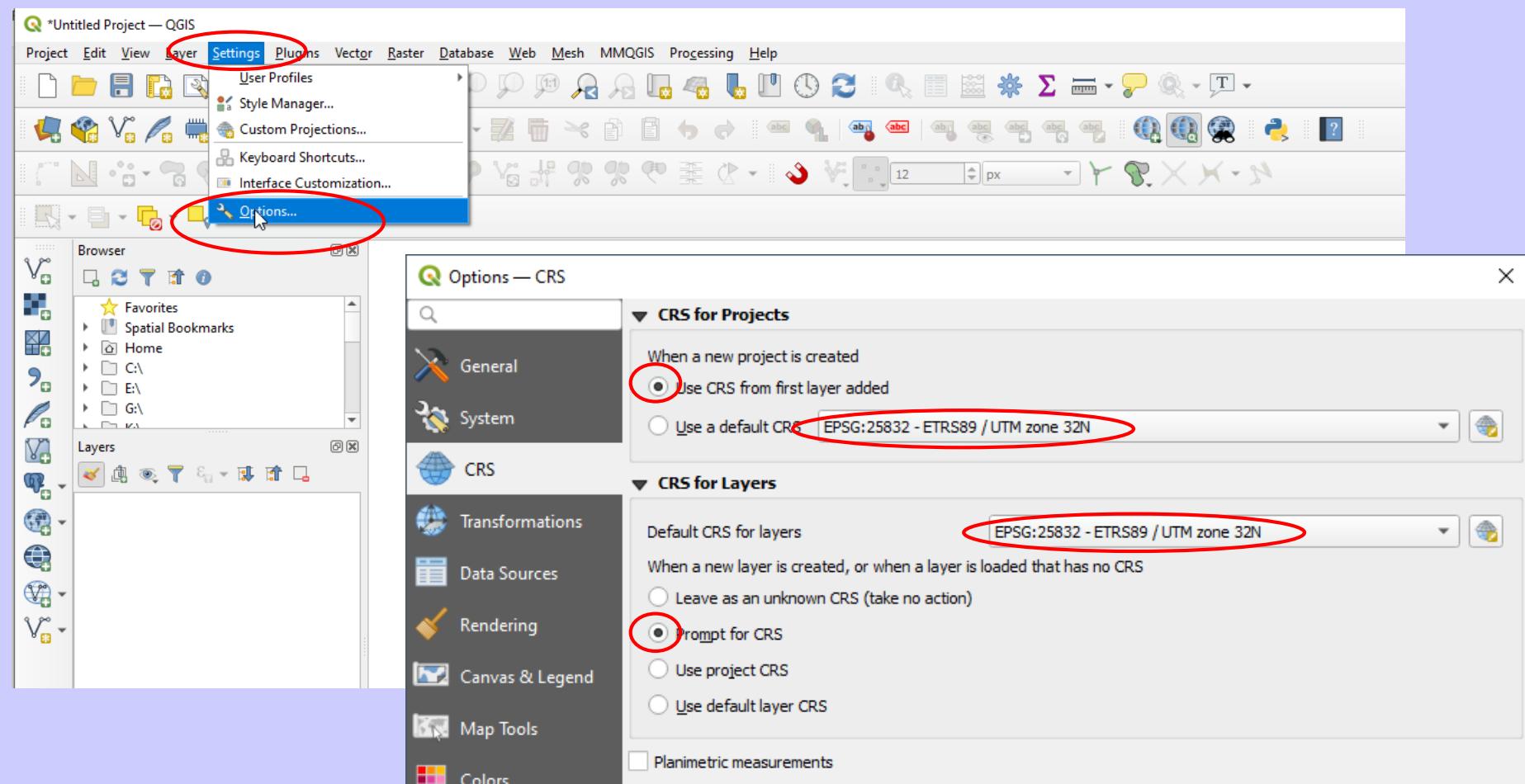
Menu Bar



Settings

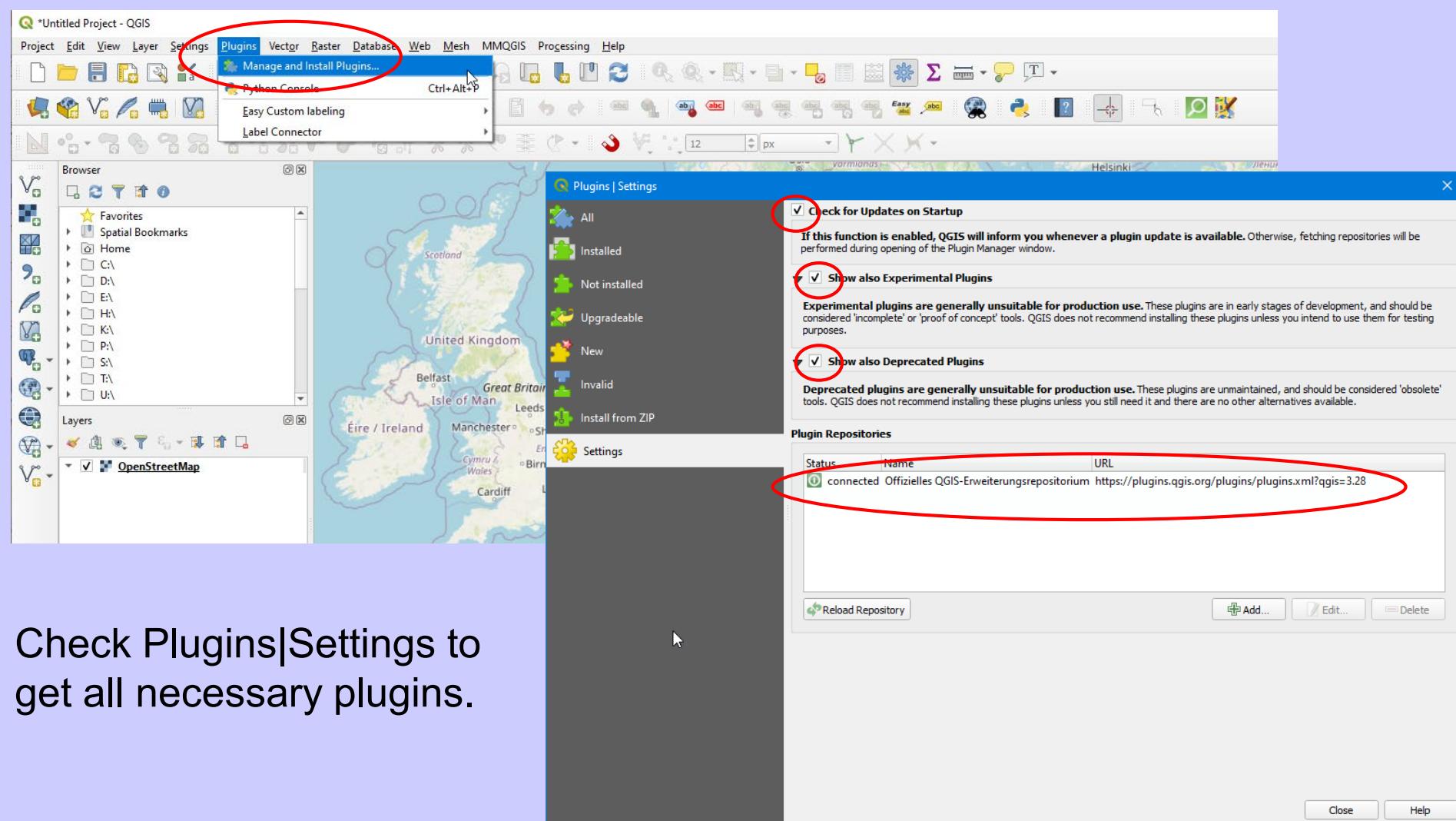


Settings



Check Settings|Options for default crs.
We will use EPSG 25832 / UTM zone 32N

Settings



Check Plugins|Settings to get all necessary plugins.

Tasks of exercise 1

1. Research via internet

Please research via internet for pages, where with (e. g. your) name a map or geo-information is linked. Try to find out what spatial reference hides behind?

Give a short report about your results (search name, webpage, linked geo-information, kind of metric).

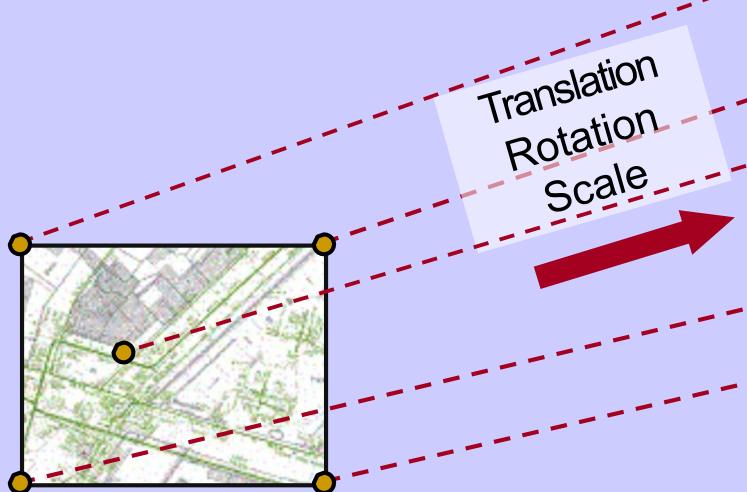
2. Georeferencing

To bring images and data together in a GIS, each record (data set) must be placed. With the help of a georeferencing task such information can be transformed into a specified coordinate system.

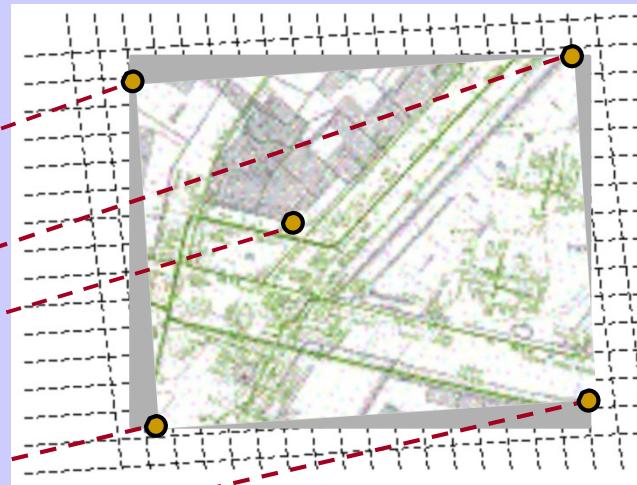
The basic approach to georeferencing a raster is to identify points on the raster for which you can accurately determine coordinates.

Georeferencing

1. Identify identical points
(Source and target points)
2. Transformation



Graphic file with **source points**
(in local image coordinates)



File with **target points**
(e.g. in National coordinate system)

workflow of exercise 1

2. Georeferencing

- a) Install QGIS and download archive *GeoRef2019.zip* from moodle.
- b) Import the topographic map *DTK_2019.tif* in QGIS.
- c) Open georeferencer tool (Layer → Georeferencer) and open an aerial image (File → Open_raster).
- d) Click at least four well distributed corresponding (identical) points between image and map.
- e) Settings:
 - type: *Helmert*,
 - target crs: *EPSG:25832*,
 - method: *Nearest neighbour*,
 - define a *output raster file* as well as a *pdf report* and
 - save the used points (GCP)
- f) Start georeferencing

workflow of exercise 1

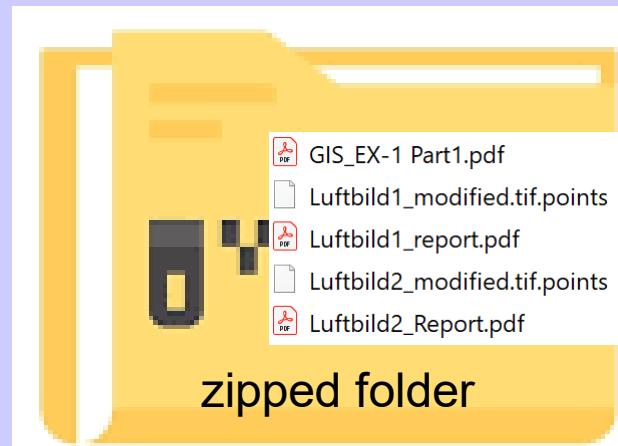
2. Georeferencing

- g) Improve your result by checking the position (image and map) of your points in georeferencer tool. If necessary move or delete points and repeat georeferencing.
- h) Import the corrected aerial image (output raster) in QGIS.
- i) Set the layer properties to partially transparent to check the result.
(Repeat georeferencing if there are deviations → go back to g))

workflow of exercise 1

2. Georeferencing

- j) Repeat georeferencing for the second aerial image in the same way and save your project.
- k) Please submit two point files and two PDF reports of your georeferencing – no images.



All work steps can also be consulted in the QGIS user manual.