

# GIS analyses with Free and Open-Source Software

## General Information

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Seminar im Wintersemester 2019/2020

Arbeitsgruppe Geoinformatik,  
Geographisches Institut



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# About me

Ph.D Student at the GIScience Research Group

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- B.Sc Umweltnaturwissenschaften in Freiburg, DE and Toronto, CA
- M. Sc Angewandte Geoinformatik in Trier, DE

## **Me & Free and Open-Source Software:**

- Developing QGIS Plugins & QGIS Toolbox for forestry applications
- Developing methods, processing chains and QGIS toolbox for wetland mapping at GeoVille (Innsbruck, Austria)
- Performing data analysis using Python, R and various FOSSGIS tools

# Who are you?

Please go to this website and fill in  
this survey. It's anonymous.

<https://pollev.com/christinalud976>

# Learning Goals

By the end of this course, you will be able to ...

- ... **explain** the concept of Free and Open Source Software (FOSS).
- ... **explain** the concept of reproducibility and replicability.
- ... **formulate** a research question and **find suitable open data, methods and FOSSGIS tools** to answer it.
- ... **implement** this spatial analysis as a **script based, automated workflow**.
- ... **discuss** the results, limitations and uncertainties of your spatial analysis.
- ... **use** git to track your progress and share your work.

# Prerequisites

Prerequisite is the course “Introduction to GIS”

## Required prior knowledge

- Basic concepts of GIS
  - Coordinate Reference Systems and transformations
  - Vector & raster data processing
- Basic knowledge of QGIS
  - Importing and exporting vector and raster data
  - Changing the style of layers
  - Working with the attribute table
  - Performing basic vector and raster analyses (e.g. clip, buffer, raster calculations, etc.)
  - Using QGIS Model builder
- Prepare using online resources e.g. this [QGIS Tutorial](#)

# Schedule

Date	Title	Assignments	Project
1	2019-10-23 Seminar: Introduction to FOSSGIS	Assignment 1	
2	2019-10-30 Seminar: Open Data + QGIS	Assignment 2	
3	2019-11-06 Tutorium		
4	2019-11-13 Seminar: Methods Research + GRASS GIS	Assignment 3	
5	2019-11-20 Tutorium		
6	2019-11-27 Seminar: GRASS GIS + Python	Assignment 4	project draft due
7	2019-12-04 Tutorium		
8	2019-12-11 Seminar : QGIS + Python	Assignment 5	
9	2019-12-18 Tutorium		
10	2020-01-08 Project		
11	2020-01-15 Project		
12	2020-01-22 Project		
13	2020-01-29 Project Presentations		
14	2019-02-05 Project Presentations		

# Schedule

## **Seminar** (Attendance is mandatory)

Time: Wednesday, 8:30 – 10:45

Place: PC Pool BST

## **Tutorium** (Attendance is optional)

Given by Pascal Wolf

Time: Wednesday, 9:15 – 10:45

Place: PC Pool BST

# How this Seminar fits in Your Studies

## ■ Bachelor

- Methoden in der Geographie III (MG 3): Geographische Informationssysteme: Blockseminar  
**4 ECTS**
- Angewandte Geoinformatik (AGI) – Übung  
**4 ECTS**

## ■ Master

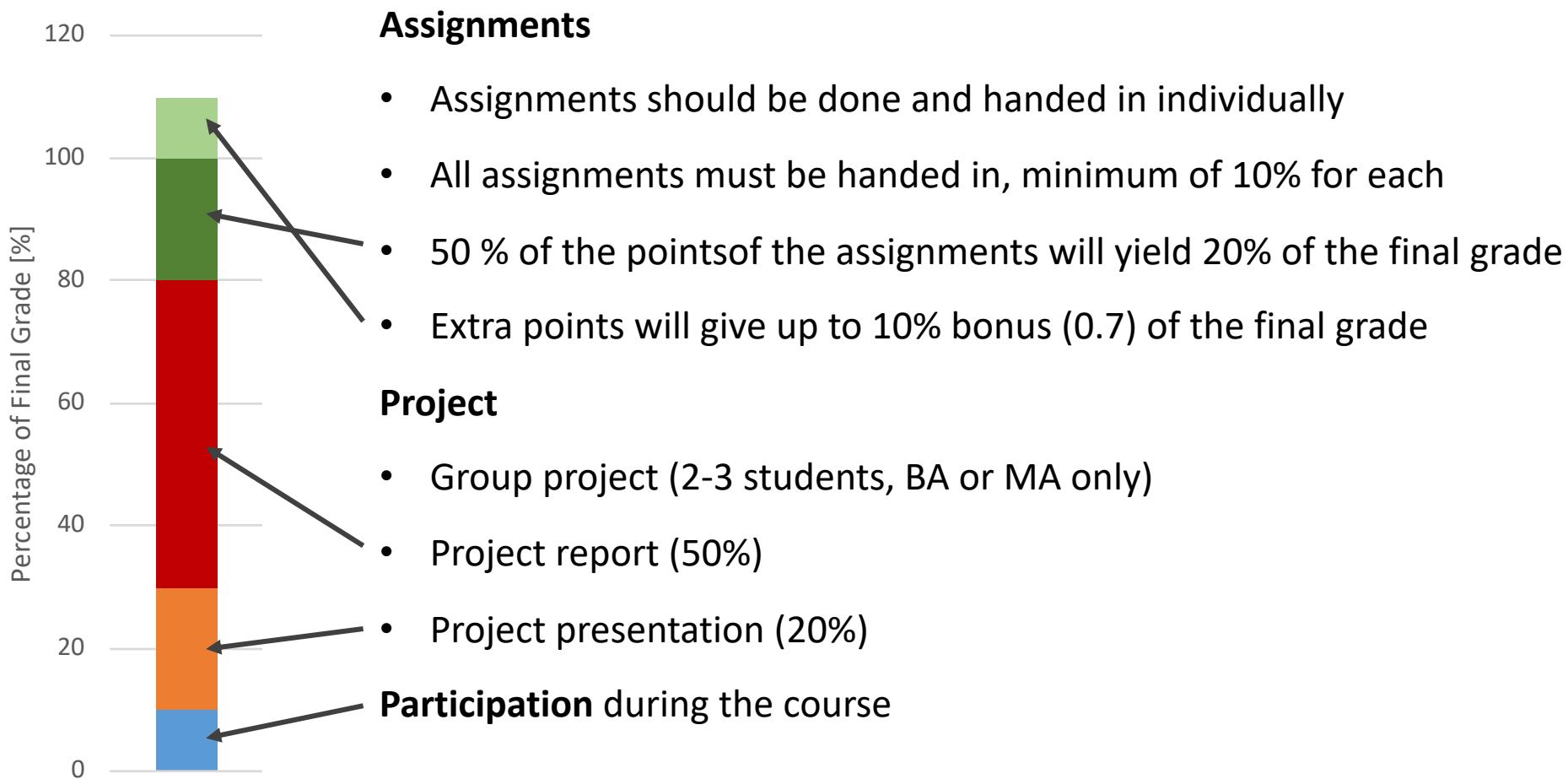
- Geographische Arbeitsmethoden (GM) – Übung  
**5 ECTS**
- Forschung Geoinformatik 1 (FG01) - Übung  
**5 ECTS**

Deregistration possible until next week (November, 6th) via email

# Examination mode

% of total points	Grade	Bedeutung	Meaning
>95	1.0	Sehr gut	Very good
>90-95	1.3	Sehr gut -	Very good -
>85-90	1.7	Gut +	Good +
>80-85	2.0	Gut	Good
>75-80	2.3	Gut -	Good -
>70-75	2.7	Befriedigend +	Satisfying +
>65-70	3.0	Befriedigend	Satisfying
>60-65	3.3	Befriedigend -	Satisfying -
>55-60	3.7	Ausreichend +	Sufficient +
>=50-55	4.0	Ausreichend	Sufficient
<50	5.0	Durchgefallen	Failed

# Examination Mode



# Introduction to the Project

Perform a **spatial analysis by implementing an automatized workflow** using different FOSSGIS tools.

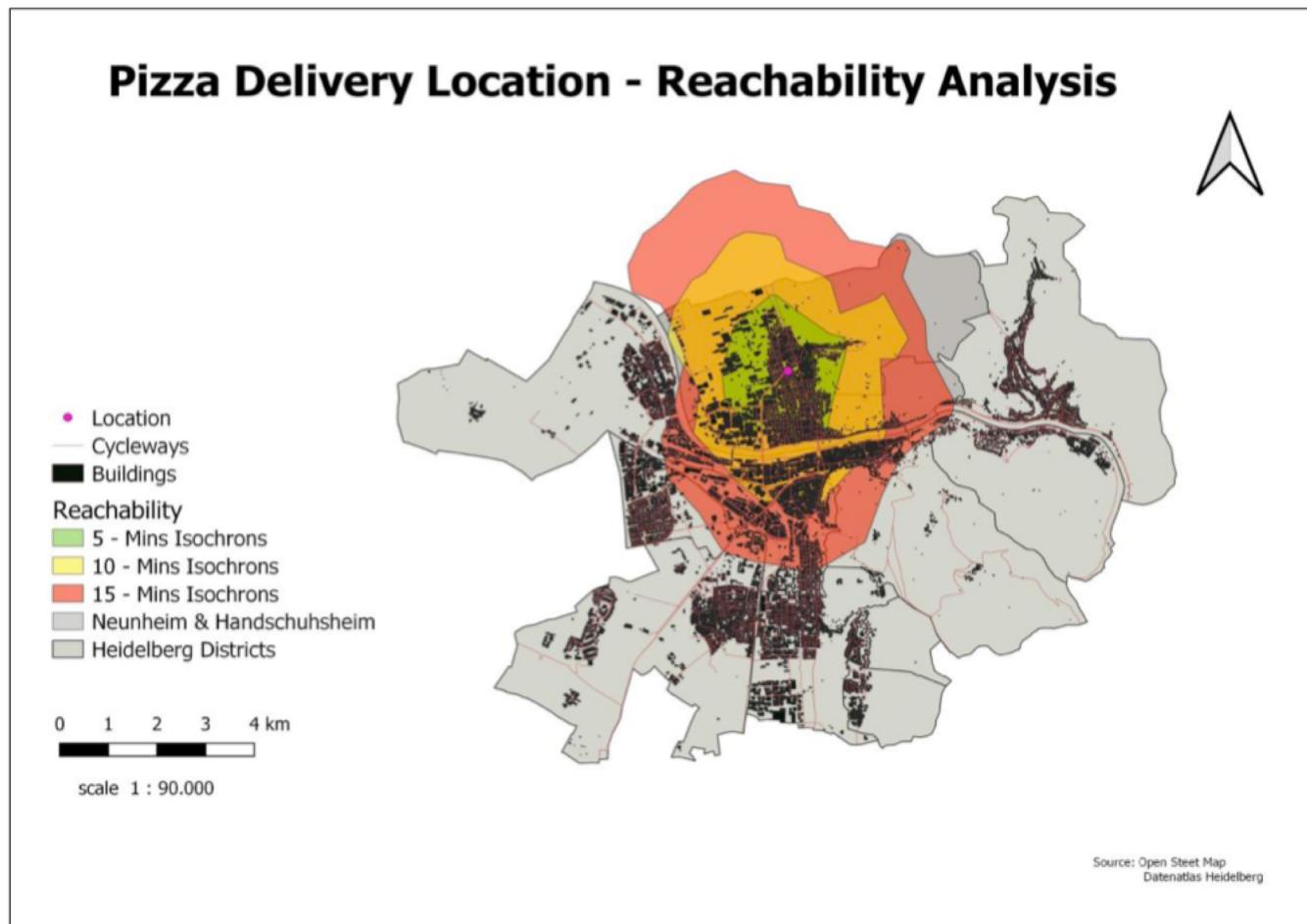
## Possible Topics:

- Risk analysis with different scenarios
- Accessibility analysis with different planning scenarios e.g. for urban green spaces, supermarkets, public schools, etc.
- Finding a good location for e.g. a pizza delivery (was done last year)
- Hydrological analysis, erosion analysis, etc.
- Combine the project with another course

You may implement your workflow also as part of a QGIS plugin/toolbox, GRASS GIS Add-on, webapp, ...

# Examples from FOSSGIS course WS 2018/19

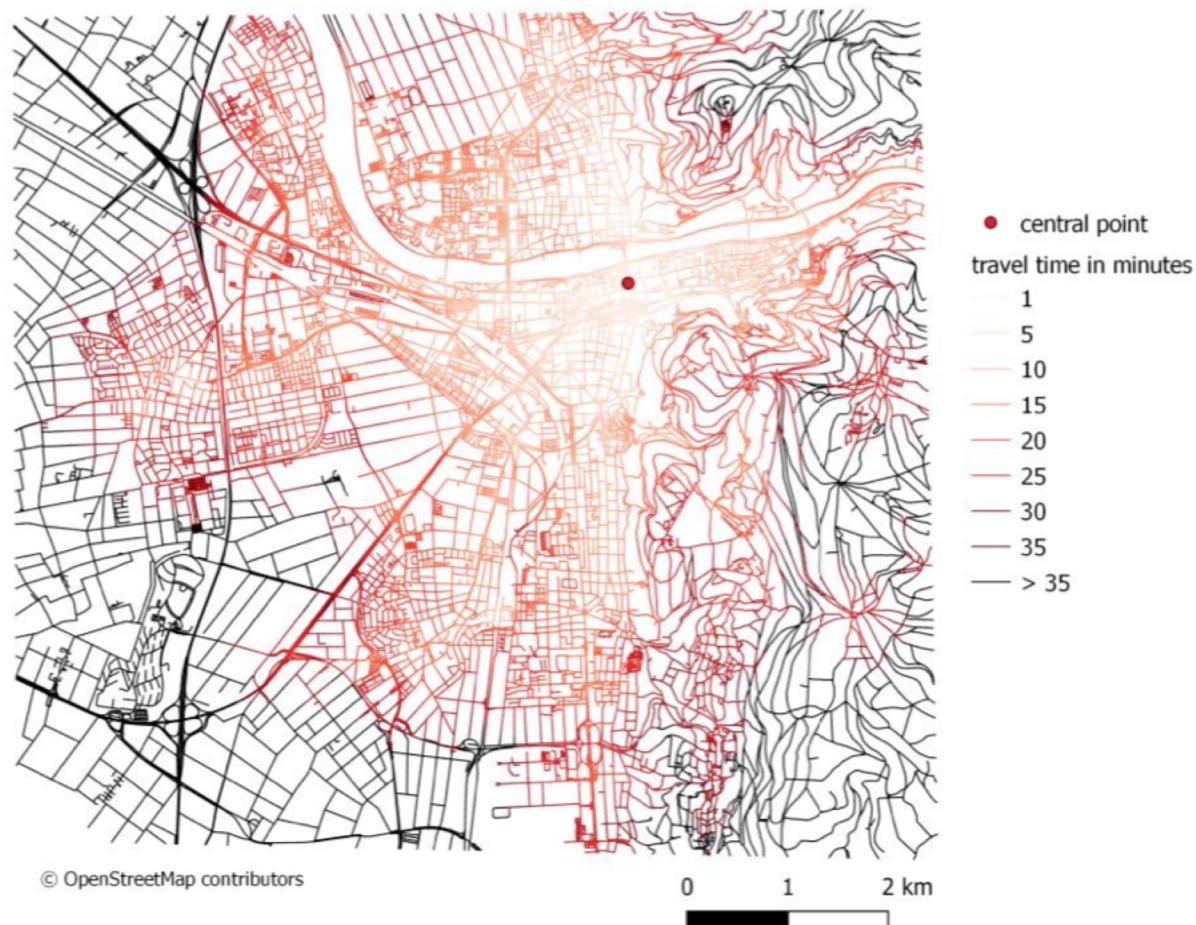
Find a suitable location for a pizza delivery (Berte & Ketterer)



# Examples from FOSSGIS course WS 2018/19

## Reachability analysis using public transport (Czizewski& Stier)

Streets of Heidelberg classified by travel time to center by public transport



# Examples from FOSSGIS course WS 2018/19

## WebApp to find best Kindergarten (Gassilloud & Wolf)

FOSSGIS Project - Mozilla Firefox

File Edit View History Bookmarks Tools Help

FOSSGIS Project × +

localhost/m/page.html

Most Visited Getting Started

### FOSSGIS Project

Find your favourite kindergarten!  
von Pascal Wolf & Matthias Gassilloud  
Wintersemester 2018/19

Minimum distance of nearby bus station (in meter)  
500

Minimum distance of nearby forest (in meter)  
1500

Minimum distance away from industrie (in meter)  
300

Minimum distance of nearby school (in meter)  
2000

Minimum distance of nearby train station (in meter)  
1800

Minimum distance of nearby tram station (in meter)  
1000

Process Request

• © OpenStreetMap contributors.

# Project: Formal Requirements

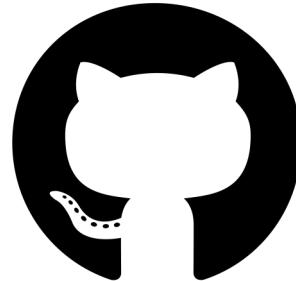
- **Project draft, presentation and report**
- Use structure of scientific research paper
  - 1. **Introduction:** Description of problem / question; Literature overview
  - 2. **Data and Methods:** Describe the data, methods and assumptions
  - 3. **Results:** Describe results
  - 4. **Discussion:** Discussion of results
- Provide your code / model in appendix and on GitHub:
  - Document your code so others understand what is happening
  - Results must be reproducible

# Course material

- Link will be provided
- Key for registration: **FOSSGIS2019**
- Only for handing in assignments

Most course material will be on

**GitHub**



# Literature

- Will be provided in the course of the seminar
- **Neteler M. & Mitasova H. (2008): *Open Source GIS: A GRASS GIS Approach*.** Springer Verlag.

<http://www.grassbook.org>

- **Web Sources**
  - [QGIS Dokumentation](#)
  - [GRASS GIS Wiki](#)
  - [Geographic Information Systems Stack Exchange](#)
  - [Stack Overflow](#)
  - more to come ...