Using CSC resources in Open GeoScience and teaching

Henrikki Tenkanen

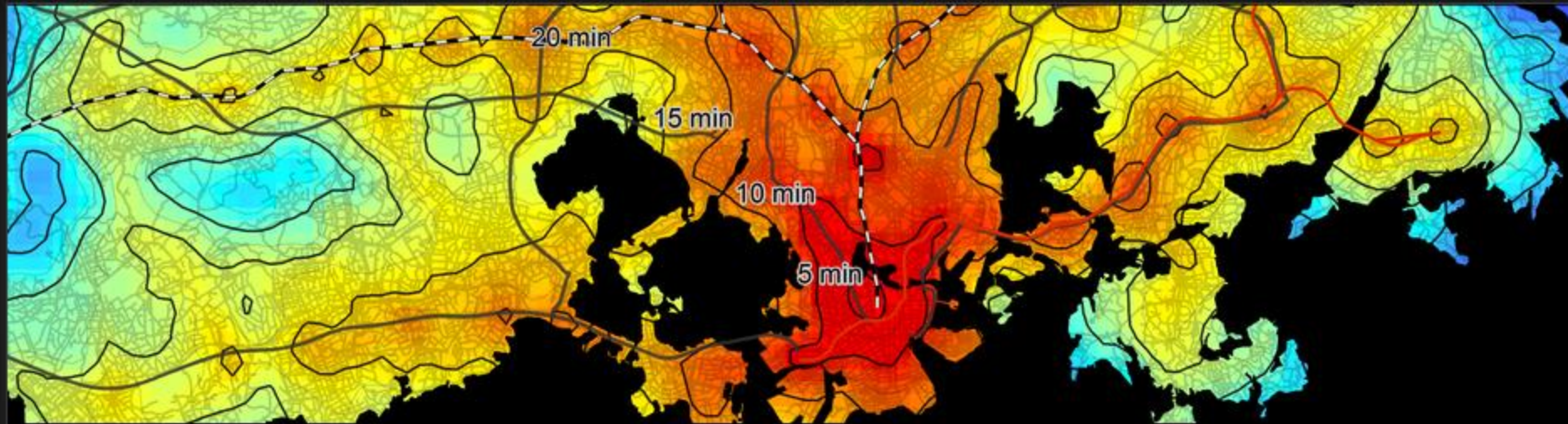**Department of Geosciences and Geography**
University of Helsinki, Finland

High-performance geocomputing 2016 workshop, Espoo, Finland

ACCESSIBILITY RESEARCH GROUP

Spatial analyses of accessibility and mobility using novel data sources

Home

Welcome to our project website!

Since the beginning of 2010 the Department of Geosciences and Geography at the University of Helsinki has had a research group dedicated to studying **spatial patterns of accessibility**. Lately, we have been increasingly interested also in **realised mobility of people**. More broadly, we are interested in development and application of quantitative spatial tools and novel data sources to support spatial planning.

RECENT ACTIVITIES

Travel Time Matrix: New version ready!

Big funding from the Kone Foundation!

Funding continues for MetropAccess!

Maria's thesis awarded as the best one of the year!

MetropAccess-Travel Time Matrix is being updated!

This organization | Search

Pull requests   Issues   Gist

Automating GIS processes

Automating GIS processes -course @ Department of Geosciences & Geography, University of Helsinki.

Automating GIS processes -course @ Department of Geosciences & Geography, University of Helsinki.

Automating GIS processes -course @ Department of Geosciences & Geography/Course-information

🔗 https://github.com/Automating-GIS-processes/Course-information

👥 People 16   📋 Teams 1   ⚙ Settings

📖 **Repositories**

New repository

Filters ▾   🔍 Find a repository...

★ 0   ⑂ 0

Exercise-2 Private

Exercise-2: Using pandas and geopandas to work with spatial data.

Updated 17 hours ago

★ 0   ⑂ 0

Lesson-2-Geo-DataFrames Private

Lesson 2: Data structures in Pandas and Geopandas
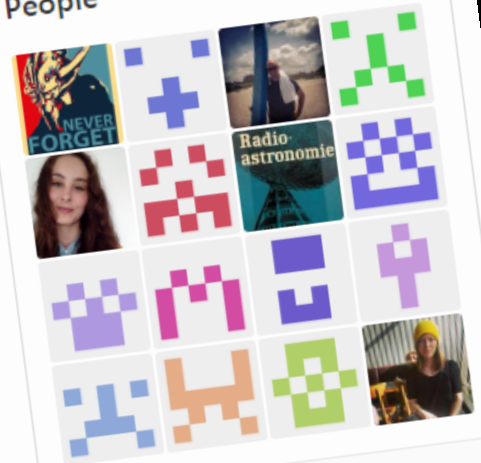
Updated 17 hours ago

★ 0   ⑂ 0

exercise-1-Robinlovelace Private

exercise-1-Robinlovelace created by GitHub Classroom

16 ⟩

People

Invite someone

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spatial

CSC Resources

Supporting open science …

Open tools

Tools

In MetropAccess research project we have developed tools for measuring accessibility by different travel modes: walk, bicycle, public transportation, car.

Read more about our tools from:

Private car: MetropAccess-Digiroad tool

cPouta resources with ArcGIS server

Public transport: MetropAccess-Reititin

Taito resources – Array jobs

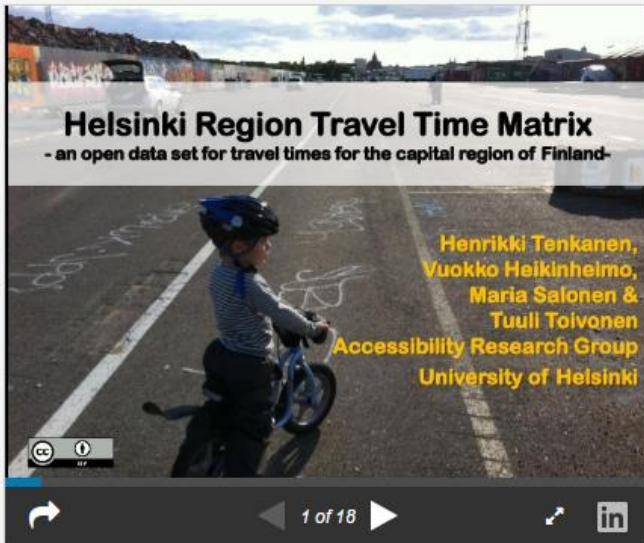You can alsofind more information about our tools on our Github-page!

www.helsinki.fi/science/accessibility/tools

Open data

Helsinki Region Travel Time Matrix

Helsinki Region Travel Time Matrix
- an open data set for travel times for the capital region of Finland-

Henrikki Tenkanen,
Vuokko Heikinheimo,
Maria Salonen &
Tuuli Toivonen
Accessibility Research Group
University of Helsinki

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Helsinki Region Travel CO2 Matrix

Helsinki Region Travel CO2 Matrix 2015 is a dataset that contains information on CO2 emissions of journeys made by public transportation (PT) and private car in the Capital Region of Helsinki. In addition, the dataset contains information on how many transfers were made during a PT journey and what is the average fuel consumption for a car journey. The CO2 emissions are calculated based on the distance traveled with different travel modes on an individual route multiplied with specific carbon emission factors. Carbon emission factors are based on the Helsinki Region Transport (HRT) carbon calculator. The same information is also displayed in the HRT Journey Planner. The travel information in the CO2 matrix is based on the Helsinki Region Travel Time Matrix 2015 dataset. The CO2 dataset is available for year 2015:

Muutoksia pääkaupunkiseudun saavutettavuuden
alueellisissa rakenteissa
2013-2015
- tarkasteluja matka-aikamatriisin perusteella -

Vuokko Heikinheimo,
Henrikki Tenkanen,
Maria Salonen &
Tuuli Toivonen
Accessibility Research Group
Helsingin yliopisto

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What is Helsinki Region Travel Time Matrix?

▸ **Travel time matrix:**

  ▸ Travel times and distances

  ▸ **Walking**, **PT** and **car**

  ▸ During **Rush-hour** and **midday**

  ▸ Between all 250 m statistical grid cells in Helsinki Region

▸ Data is available for:

  ▸ **April 2013**

  ▸ **September 2015**

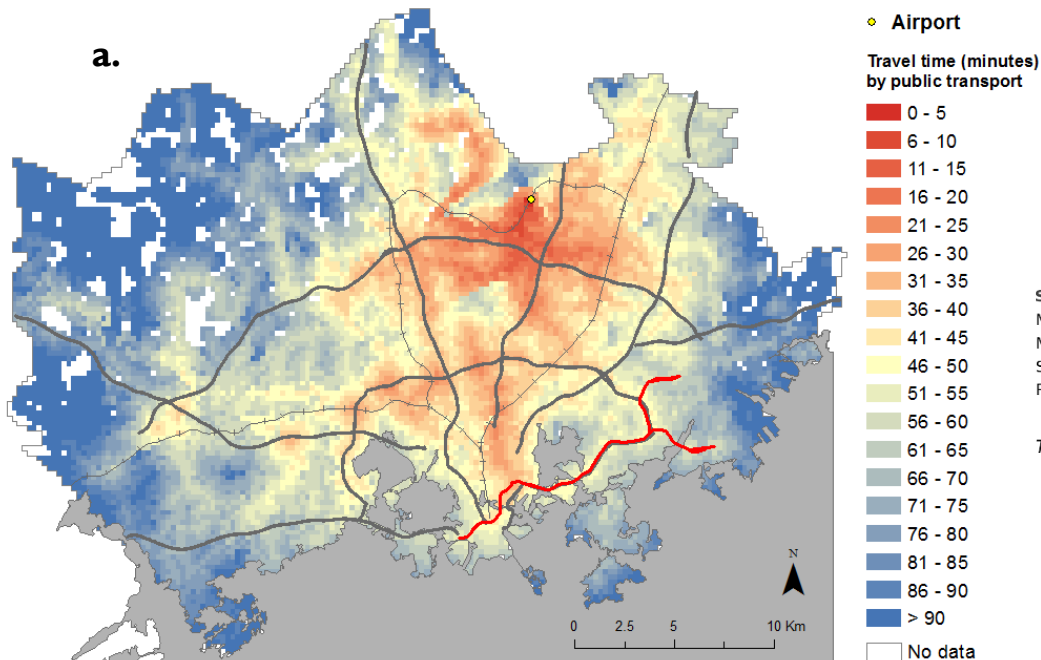# What is Helsinki Region Travel CO_2 Matrix?

- **Travel CO_2 Matrix:**
  - CO_2 emission estimates produced by PT and private car
  - The amount of needed PT transfers on a route(s)
  - Estimated fuel consumption of the trips made with car
  - During **Rush-hour** and **midday**
  - Between all 250 m statistical grid cells in Helsinki Region

  - Carbon emission factors and fuel consumption estimates are based on data from Helsinki Region Transport (HRT) and VTT
- Data is available for:
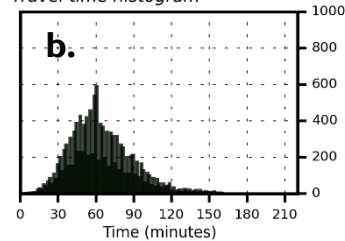 - **September 2015**

Travel times by PT…

Airport 2013

Airport

Travel time (minutes)
by public transport

- 0 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 30
- 31 - 35
- 36 - 40
- 41 - 45
- 46 - 50
- 51 - 55
- 56 - 60
- 61 - 65
- 66 - 70
- 71 - 75
- 76 - 80
- 81 - 85
- 86 - 90
- > 90
- No data
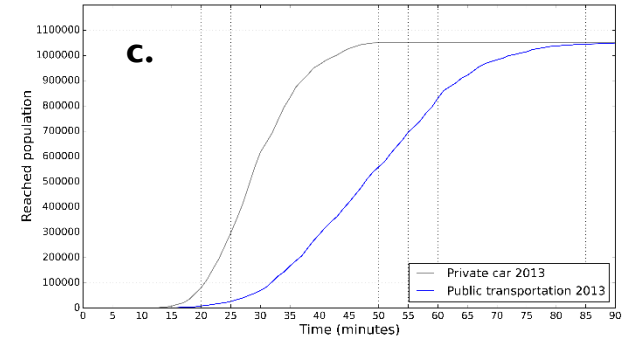
Summary:
Mean: 64 minutes
Median: 60 minutes
Std: 24 minutes
Range: 0-161 minutes

Travel time histogram

Transport lines: © City of Helsinki, Municipalities in the Helsinki Region and HSY (2015)
Travel times: © MetropAccess-project / Accessibility Research Group, University of Helsinki (2015). License: CC BY 4.0
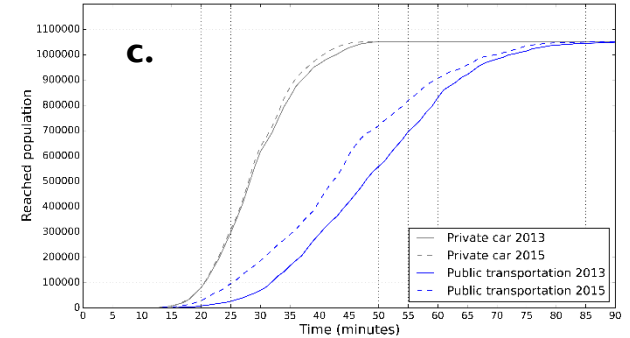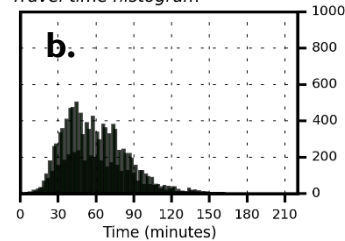
a. Travel time (minutes) to the destination using midday schedules.

b. Travel time histogram

c. Cumulative population that access the destination in time
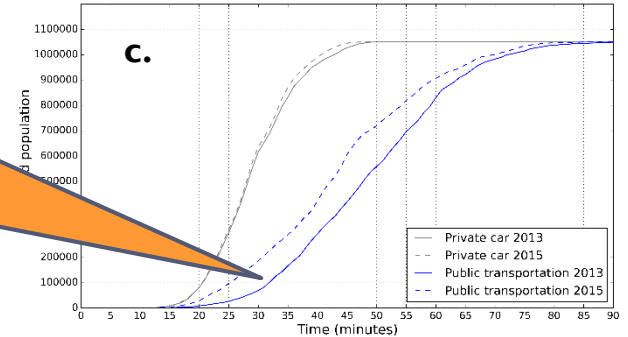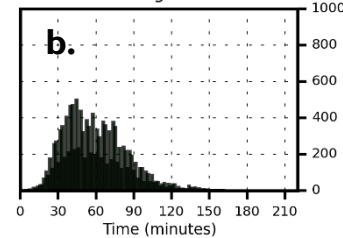
Travel times by PT…

Airport 2015

a.

Airport

**Travel time (minutes)
by public transport**

▮	0 - 5
▮	6 - 10
▮	11 - 15
▮	16 - 20
▮	21 - 25
▮	26 - 30
▮	31 - 35
▮	36 - 40
▮	41 - 45
▮	46 - 50
▮	51 - 55
▮	56 - 60
▮	61 - 65
▮	66 - 70
▮	71 - 75
▮	76 - 80
▮	81 - 85
▮	86 - 90
▮	> 90
▯	No data

Summary:
Mean: 59 minutes
Median: 56 minutes
Std: 24 minutes
Range: 0-162 minutes

Travel time histogram

b.

c.

Private car 2013
Private car 2015
Public transportation 2013
Public transportation 2015

a. Travel time (minutes) to the destination using midday schedules.

b. Travel time histogram

c. Cumulative population that access the destination in time

Travel times by PT...

Airport 201...

a.

> **Significant change!**
> In 2013 70 000 inhabitants reached the airport in 30 minutes while in 2015 the number is **186 000**! (+116 000)
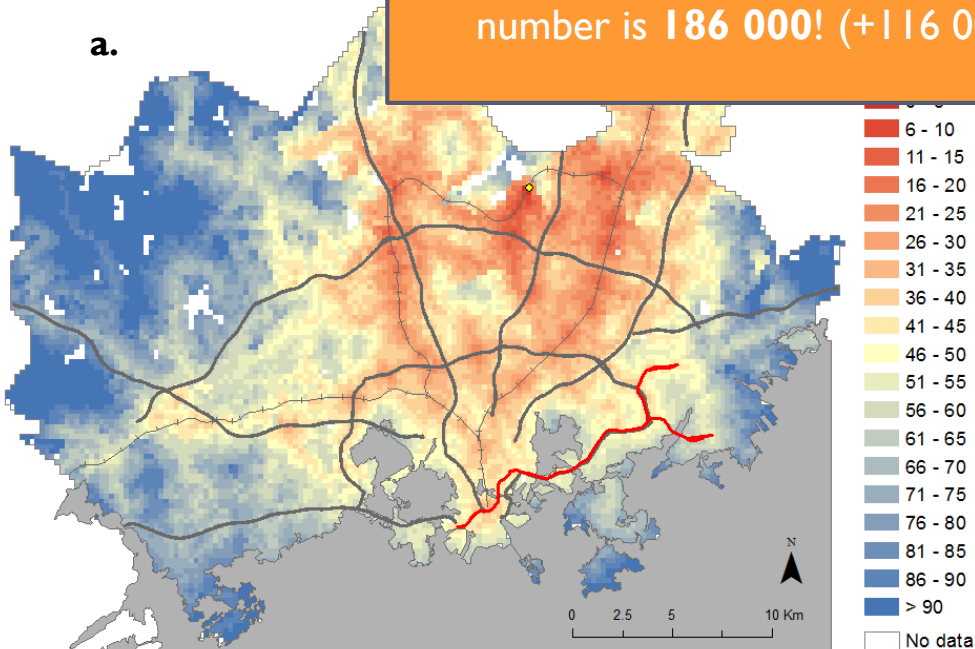
c.

Summary:
Mean: 59 minutes
Median: 56 minutes
Std: 24 minutes
Range: 0-162 minutes

Travel time histogram

b.

Transport lines: © City of Helsinki, Municipalities in the Helsinki Region and HSY (2015)
Travel times: © MetropAccess-project / Accessibility Research Group, University of Helsinki (2015). License: CC BY 4.0

Legend (minutes):
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 30
- 31 - 35
- 36 - 40
- 41 - 45
- 46 - 50
- 51 - 55
- 56 - 60
- 61 - 65
- 66 - 70
- 71 - 75
- 76 - 80
- 81 - 85
- 86 - 90
- > 90
- No data

a. Travel time (minutes) to the destination using midday schedules.

b. Travel time histogram

c. Cumulative population that access the destination in time

Private car 2013
Private car 2015
Public transportation 2013
Public transportation 2015

Why have we produced the matrices?

Connections between statistical grid cells in the Helsinki Metropolitan Area:

169 million

Individual calculations for each transport mode (3) at two different time levels requires a LOT of calculations:
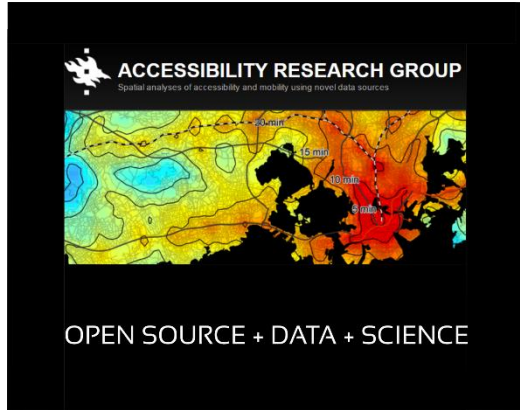
1.2 billion routings

It is not reasonable for different actors / stakeholders to repeat such a workload independently!
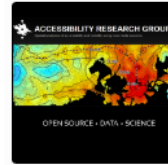
Calculations are done with CSC Finland resources

Open science / practice
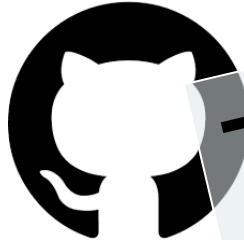
Tools are open source!

Open data!

Open science / practice

Helsinki Region Travel Time Matrix 2015

This repository demonstrates / documents how **Helsinki Region Travel Time Matrix 2015** is calculated. Dataset was produced by **Accessibility Research Group**, University of Helsinki.

Contents:

- What is Helsinki Region Travel Time Matrix 2015?
- Attributes of Helsinki Region Travel Time Matrix 2015
- How calculations were done?
  - Public Transport
  - Walking
  - Private car
- Licence
- How to cite this work?
- Codes
- Contribution / Contact

Helsinki Region Travel CO2 Matrix 2015

This repository demonstrates / documents how Helsinki Region Travel CO2 Matrix 2015 is calculated. Dataset was by Accessibility Research Group, University of Helsinki.

Contents:

- What is Helsinki Region Travel CO2 Matrix 2015?
- Attributes of Helsinki Region Travel CO2 Matrix 2015
- How calculations were done?
  - CO2 calculations
  - Fuel consumption calculations
- Licence
- How to cite this work?
- Codes
- Contribution / Contact

(You can read Finnish description from Metadata.)

The workflows about how the datasets were produced are well documented, automized and openly available!

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CSC Resources

Supporting open education …

Open education

Pouta Blueprints + GitHub is tightly integrated into our teaching:

Python for geo-people - Fall 2016

Course topics shortcut

Jump down to the list of course topics by week

Course meetings in Period I

- Mondays 8-10 *or* 10-12, A113-114, Physicum (5.9-17.10)
- *Work sessions on Thursdays 8-10, A111-112, Physicum (8.9-20.10)*

Instructors

- Henrikki Tenkanen
  - Office: A120, Physicum
  - Email: `firstname.lastname@helsinki.fi`
  - Phone: +358 50 4484436
- David Whipp
  - Office: D430, Exactum
  - Email: `firstname.lastname@helsinki.fi`
  - Phone: +358 2941 51617

Automating GIS processes - Fall 2016

Course meetings in Period II

- Mondays 9-12, A113-A114, Physicum (31.10 - 12.12)
- Work sessions on Thursdays 8-10, A111-112, Physicum (03.11 - 15.12)

Instructor

- Henrikki Tenkanen
  - Office: A120, Physicum
  - Email: `firstname.lastname@helsinki.fi`
  - Phone: +358 50 4484436

Course assistant

- Vuokko Heikinheimo
  - Office: A120, Physicum
  - Email: `firstname.lastname@helsinki.fi`
  - Phone: +358 2941 50760

Introduction to Quantitative Geology (Course 54070) - Fall 2016

Course meetings

Period I: 5.9-20.10 (Together with Automating GIS processes course)

- Mondays 8-10 *and* 10-12, A113-A114, Physicum
- *Work sessions on Thursdays 8-10, A111-112, Physicum*

Period II: 31.10-12.12

- Mondays 8-10 *and* 10-12, D211, Physicum
- *Work session dates/times to be determined*

Instructor

- David Whipp
- Office: D430, Exactum
- Email: `firstname.lastname@helsinki.fi`
- Phone: (0)2 941 51617

Course assistant

- Jorina Schütt
- Office: D422, Exactum
- Email: `firstname.lastname@helsinki.fi`
- Phone: (0)45 1865288

A problem and a requirement

- Learning to program is highly popular topic among students (excellent!)
  - ✓ More than 70 students enrolled
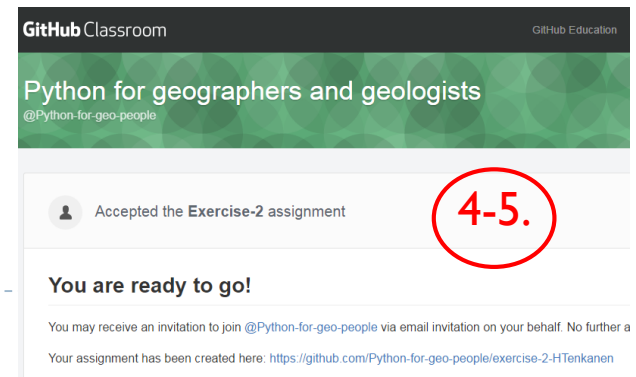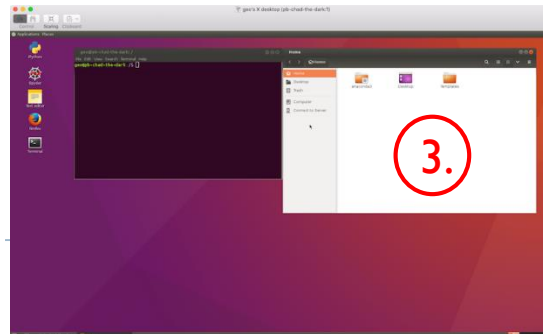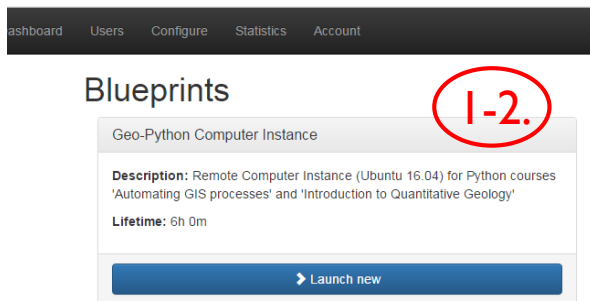 - ✓ Classroom capacity: 23 places

  ➔ We have a problem
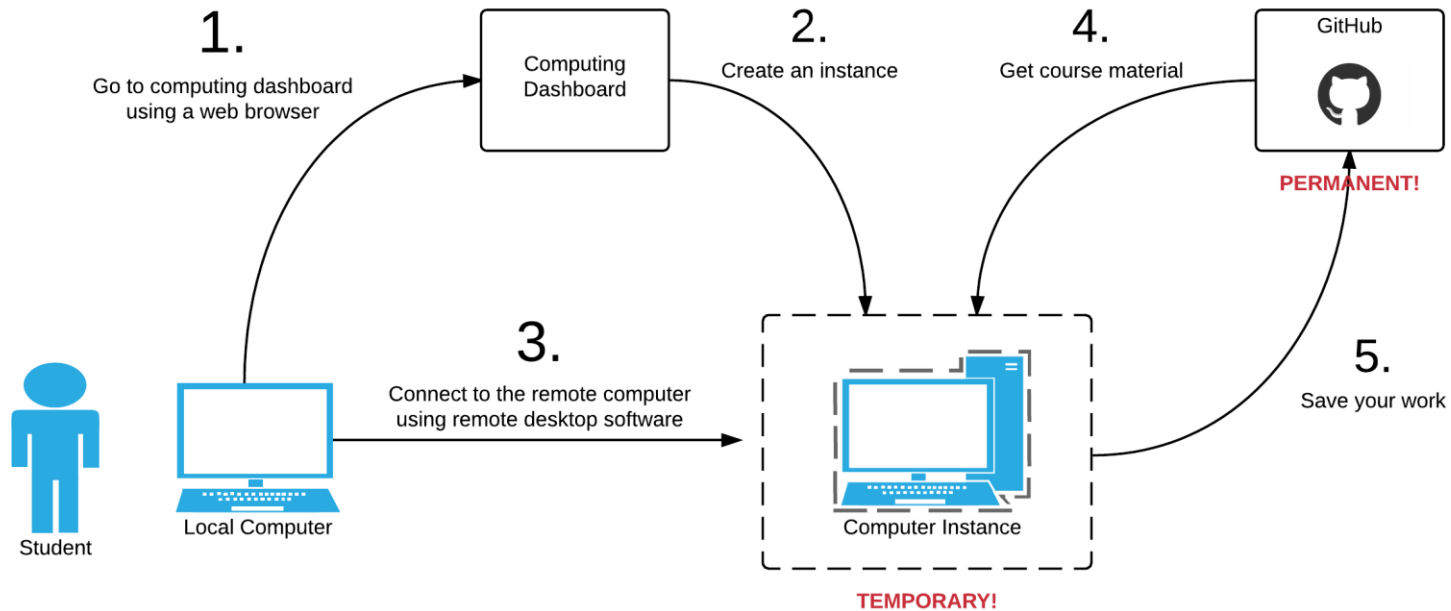
- Learning Version Control and how to use e.g. GitHub is an essential part of modern collaborative science / work

  ✓ These things are not taught anywhere

  ➔ A requirement that needs attention

Solution: Pouta BluePrints + GitHub Classroom

1. Go to computing dashboard using a web browser

Computing Dashboard

2. Create an instance

GitHub

PERMANENT!

4. Get course material

Student

Local Computer

3. Connect to the remote computer using remote desktop software

Computer Instance

TEMPORARY!

5. Save your work

1-2.

3.

4-5.

Open education

DEMO:
https://pb.geo.helsinki.fi

Thank you!

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Github: htenkanen
Email: henrikki.tenkanen@helsinki.fi