



# GEOSPATIAL TRAINING AT UNIVERSITY OF HELSINKI

Department of Geosciences and Geography  
Digital Geography Lab



# GOESPATIAL TRAINING AT UH

- Our department has a rich history of providing high-quality training across various areas of geospatial sciences.
- In the Digital Geography Lab (DGL), we prioritize:
  - Open science and tools
  - Transparency and reproducibility, and
  - Justice in education and transfer of knowledge
- These is also reflected in our teachings and trainings



# **COURSES OFFERED IN PARTNERSHIP WITH LIH**

- **Geo-Python (Automating GIS Processes I)**
- **Automating GIS Processes (II)**
- **Cartographic Visualization in GIS**



# GEO-PYTHON

- This course teaches the basic concepts of programming and scientific data analysis using the Python programming language in a format that is easy to learn and understand.
- Level: intermediate
- Pre-requisites: No specific requirement
- Teaching period: 7 weeks in period 1 (Sep- Oct)
- Instructors: David Whipp, Kamyar Hasanzadeh
- Course materials always available for learning: [geo-python-site.readthedocs.io](https://geo-python-site.readthedocs.io)



# TOPICS

Week	Theme
1	Basic concepts of Python and computer programs
2	Diving into Python
3	Repeating tasks and making decisions
4	Creating and using functions
5	Data analysis Part I
6	Data analysis Part II + Dealing with errors
7	Data visualization



# LEARNING GOALS

- **Master Core Programming Concepts:** Understand the fundamental concepts of computers, programs, programming languages, and the use of variables along with data types.
- **Develop Proficiency in Python:** Gain practical skills in Python, including data type conversions, list manipulation, and the use of conditional statements and loops. Learn to define and utilize functions with parameters and return values, and document code with docstrings.
- **Utilize Development Tools:** Become proficient with essential development tools, including version control with Git and GitHub, and Jupyter notebooks for coding and documentation.
- **Engage with Python Modules and Data Analysis:** Explore Python modules, particularly pandas for data analysis, understanding their structure, functionality, and documentation. Learn to read, manipulate, and analyze tabular data within pandas DataFrames.
- **Implement Effective Debugging Strategies.**
- **Visualize Data:** Learn to use Matplotlib for data visualization, including plot formatting and customization, and saving plots for presentation.
- **Apply Practical Skills in Real-World Scenarios:** Combine all learned skills to manage, analyze, and visualize data, repeating analysis workflows for multiple datasets and efficiently solving programming challenges.



# COURSE STRUCTURE AND ENVIRONMENT

- **Weekly lectures**
- **Weekly exercises**
- **Final project**
  
- **Lectures and exercises are implemented in an interactive way**
  - We use CSC notebooks (Jupyter) and Binder



# AUTOMATING GIS PROCESSES

- This course introduces the geographic data analysis using the Python programming language through interactive lessons and hands-on exercises.
- Level: intermediate
- Pre-requisites: Python and Pandas (Geo-python)
- Teaching period: 6 weeks in period 2 (Nov- Dec)
- Instructors: Kamyar Hasanzadeh
- Course materials always available for learning: [autogis-site.readthedocs.io](https://autogis-site.readthedocs.io)





# TOPICS

week	theme
1	Shapely and geometry objects (points, lines and polygons)
2	Managing spatial data with GeoPandas (reading and writing data, projections, table joins)
3	Geocoding and spatial queries
4	Reclassifying data, overlay analysis
5	Visualisation: static and interactive maps
6	OpenStreetMap data (osmnx) and Network analysis (networkx)



# LEARNING GOALS

- **Python and GIS Integration:** Develop the ability to search for and understand the GIS packages available for Python, focusing on how to represent geometric objects with Shapely and create them based on coordinate values.
- **Spatial Data Manipulation:** Learn to read and write spatial data across common formats, perform simple analyses on spatial and non-spatial datasets, and manage coordinate reference systems.
- **Advanced Spatial Analysis:** Acquire the capability to perform geocoding, conduct Point-in-Polygon queries, join, etc.
- **Data Reclassification and Overlay Analysis:** Master reclassifying data based on various criteria, performing overlay analysis, aggregating data, merging geometric objects, and simplifying geometries to streamline spatial datasets.
- **Mapping and Visualization:** Learn to create both static and simple interactive map images, including adding background maps and sharing maps online, leveraging the power of Python for GIS visual storytelling.
- **OpenStreetMap and Routing:** Understand how to retrieve and save data from OpenStreetMap, extract street network properties and statistics, and implement simple route optimization using shortest-path algorithms.



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# CARTOGRAPHIC VISUALIZATION IN GIS

- **The course will familiarize the students to the art and science of cartographic visualization. The course covers the cartographic theories and teaches how to implement them in GIS.**
- Level: advanced
- Pre-requisites: Python, GeoPandas (AutoGIS, Geo-python), or QGIS
- Teaching period: 4 weeks May
- Instructors: Kamyar Hasanzadeh, Tatu Leppämäki, Tuuli Toivonen
- Course materials always available for learning: [cartogis.readthedocs.io](https://cartogis.readthedocs.io)



# TOPICS

Week	Lecture	Tutorial
1	Introduction, cartography as an art	Map making 101: working with colors
2	The digital turn and cartography	Non-cartographic visualization, Static maps
3	Cartographic Story Telling and Critical Theory	Visualizing big geospatial data
4	Map media, tools, and future directions	Interactive visualization, mapping time, other tools



# LEARNING GOALS

- **Understand Cartographic Evolution:** Grasp the development of cartography and apply modern design and color theory to create effective maps, viewing it as both an art and a science.
- **Embrace Technological Advances:** Learn how technology and big data have transformed cartography, including the importance of coordinate systems, map projections, and design aesthetics. Develop skills to produce and visualize data through various map types.
- **Narrate with Maps:** Master storytelling with geospatial data, employing critical cartography principles and visualizing large-scale data.
- **Create Interactive Maps:** Learn to design interactive maps, publish them online, and explore future trends in cartography, focusing on narrative techniques across diverse media.



# COURSE STRUCTURE AND ENVIRONMENT

- **Intensive course:**
  - **Weekly lectures**
  - **Weekly discussion sessions**
  - **Weekly exercises**
  - **Final project**
- **You can choose one of the two paths for map-making:**
  - **Using Python and open-source libraries**
  - **Using QGIS**
- **Lectures and exercises are implemented in an interactive way**
  - We use CSC notebooks (Jupyter) and Binder (for Python group)
  - Hands-on sessions for QGIS group



# GEOSPA TALKS

## SPACE, PLACE, ANALYSIS

 <https://geospa.org>



FIUGINET  
*Finnish University Network for Geoinformatics*





# GEOSPA TALKS

- GeoSPA is a series of talks revolving around anything geospatial. Focusing on Space, Place, and Analysis.
- GeoSPA talks operates under the [Fiuginet](#) network (Finnish University Network for Geoinformatics), supported by LIH
- Organized by University of Helsinki and Aalto University



## UPCOMING TALK:

- Presenter: Franz-Benjamin Mocnik, Paris Lodron University of Salzburg
- Topic: Place Representation and Place Communication – A Challenge for Geographical Information Science
- 21.5.2024 (more details to be announced)

**Abstract.** Places form an integral part of our everyday lives. We live them as a home, as a work place, and in many other ways. Place-making, that is, the process that generates places, regularly involves the representation and communication of places; places could otherwise not be socially constructed. The seminar talk addresses the diversity and heterogeneity of such place representations by means of corresponding examples, in order to then identify and analyse different types of place representations. Among these are the modes of ‘natural representation’ and ‘representation-as’. The latter is of particular interest as it establishes genres of place representations, such as the genre of touristic place representations. The talk will conclude with an outlook on the Corpus of Place Representations, which is currently under development and will enable further empirical studies of place representations.



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