

Geocomputation and Machine Learning for Environmental Applications, 7.5 hp

Academic programme:

The proposed course intends to provide students with the opportunity to develop crucial skills required for advanced spatial data processing. Throughout the course students will focus on developing fundamental and independent-learning skills in advanced data processing - a field that is continuously evolving with the availability of increasingly complex data and ongoing technological advancement. A diverse set of complementary and sometimes overlapping tools will be presented for an overview of the universe of open source softwares available for spatial data processing. We demonstrate their strengths, weaknesses and key features for various data processing objectives (ex.: modelling, data filtering, queries, GIS analyses, graphics or reporting) and data types. Specifically, we guide students in using these tools and software and assist them along the steep curve of learning, command-line programming. We focus our training on helping students to develop independent learning skills and to find online help, solutions and strategies, in order to fix bugs, and independently progress with complex data processing problems.

The Academic Programme is divided into 3 main areas of study:

Lectures: (30 min to 1 hour each) Students take part in a series of lectures introducing the basic functioning of tools, theoretical aspects or background information needed for a better understanding of concepts that are subsequently applied in data processing.

Tutorials: Students are guided during hands-on sessions where trainers perform data analyses on real case study datasets, allowing the former to replicate the procedures on their own laptops.

Exercises: In addition to tutorials and lectures, students are encouraged to embark on their respective projects of interest during exercise sessions. Specific tasks are set to help reinforce the newly learned data processing skills. Such exercise sessions equip students with the confidence and resources to become independent learners and to effectively address the demands of advanced spatial-data processing.

Exercises are designed to enhance participants' programming skills and mathematical modelling understanding within the context of GIS and Remote Sensing. The exercises and examples provided are cross-disciplinary in nature. They may cover forestry, landscape planning, predictive modelling and species distribution, mapping, nature conservation, computational social science and other spatially related fields of studies. Furthermore, these case studies can be viewed as template procedures and easily adapted to be applied to different thematic challenges across disciplines.

Learning objectives:

This course will enable students to further develop and enhance their spatio-temporal data processing skills. Most importantly, it will endow them with proficiency in a fully-functional open source operating system with all the requisite software tools. With continuous practice through the weeks, students will become familiar with command lines and cover numerous topics, including:

- Learning a large suite of existing tools and knowing which ones to employ for project-specific applications.
- Acquiring confidence in using several command line utilities for spatial data processing under the Linux operating system.
- Developing data processing skills; and understanding data types, data modelling and data processing techniques.
- Independent learning, critical thinking and efficient data processing.

Required course material:

Note-taking and Organization: Our previous experience suggests notes-taking and organising electronic data in order are helpful in gaining more out of the class. Your curiosity in searching new methods, commands and scripting procedures will be fundamental to your overall success. .

PC and data Storage: You need to have a laptop with **40 GB of free disk space and 8GB of RAM.**

Class materials: All the class materials will be presented from www.spatial-ecology.net site and in particular under the Jekyll documentation site <http://spatial-ecology.net/docs/build/html/index.html>. Additional materials for a deep immersion in GIS coding and RS applications can be found in <http://spatial-ecology.net/dokuwiki/doku.php>

Course requirements: Course participants are expected to have basic computer skills and a strong desire to learn GIS using open source tools. We assume participants to be interested in geographical data analyses and possessing prior knowledge in basic calculus and statistics.

The course is given by [Spatial Ecology](#)

Trainers:

- Giuseppe Amatulli, Ph.D. ([Yale University](#), USA, [Spatial ecology](#), UK)
- Longzhu Shen, Ph.D. ([Spatial ecology](#), UK)