Spatial data analysis and simulation modelling (INFOMSDASM)

General information

Course ID

INFOMSDASM

Course type

Course

Credits

7.5 ECTS

Category / Level

Master

Instruction language

English

Offered by

Utrecht University - Faculty of Science - Graduate School of Natural Sciences - - - -

Aims

After completing this course the student can:

* Understand concepts and apply methods of geo-spatial data analysis and geodata models
* Understand concepts, design and apply models for field-based and agent-based simulation
* Understand spatial error models and apply them for error propagation and for data calibration
* Analyze existing studies applying spatial data analysis and simulation modeling
* Choose appropriate geo-analytic and simulation models for spatial analytical tasks

*Assessment*

* *Computer practicals* (successful participation and submission)
* *One short paper assignment* on a self-selected geo-analytical topic, handed in as preliminary and final version (mark is given for revised papers, using criteria for academic research papers)
* *Written open book exam* on theory (consisting of mandatory readings and lecture content)
* *Case study report* on a self-selected geo-analytical problem. Mark is given using criteria for academic research papers. The case study will be done in the last two weeks of the course.

Content

The first half of the course is an introduction to geo-spatial data analysis, the second half is an introduction to spatial simulation modeling. This includes the following content:

* Reference systems and transformations, geodata quality and online geodata sources
* Core concepts of spatial information, geodata types, and spatial databases
* Basic geospatial transformation methods, including spatial overlay, distance-based and network-based methods (using Python and QGIS)
* Field-based and agent-based simulation modeling (using Python and PCRaster)
* Stochastic modeling and uncertainty
* Spatial model calibration

*Course form*  
Each week there will be online lectures about theory/models/concepts and corresponding computer practicals that contain exercises to apply the theory to some practical examples of spatial analysis and simulation modeling. There will also be presentations of the short paper in the middle and of the case study towards the end of course.

*Literature*  
- Chrisman 2002: Exploring Geographic Information systems, 2nd edition  
- Burrough, McDonnell, Lloyd 2015: Principles of Geographical Information Systems, 3rd edition  
- Crooks, Malleson, Manley, Heppenstall 2019: Agent-based modelling and geographical information systems

*Prerequisites*  
Data wrangling and data analysis (INFOMDWR)