Faculty of Science

NGEN27, Physical Geography: Geospatial Artificial Intelligence, 7.5 credits

Naturgeografi: Rumslig artificiell intelligens, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2022-02-14 to be valid from 2022-02-14, autumn semester 2023.

General Information

The course is an elective course at second cycle level for a Degree of Master of Science (120 credits) in GIS and remote sensing and for a Degree of Master of Science (120 credits) in physical geography and ecosystem science, all specialisations.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Geomatics	A1N, Second cycle, has only first-cycle course/s as entry requirements
Physical Geography and Ecosystem Science	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The overarching aim of the course is to introduce the student to new paradigms in data management with special focus on artificial intelligence (AI) and machine learning (ML) and their application in GIS and remote sensing.

Knowledge and understanding

On completion of the course, the student shall be able to:

- explain differences between knowledge-based and data-driven methods for spatial analysis
- account for how technologies based on artificial intelligence and machine learning methods can be relevant for applications in GIS and remote sensing.

Competence and skills
On completion of the course, the students shall be able to:

- independently use AI for so-called "spatial data mining and knowledge discovery", and thereby process large amounts of spatial data and explore and develop knowledge
- apply AI in spatial simulation and modelling
- apply AI and ML for classification of remote sensing data in the form of satellite images in relevant application fields as e.g. land use mapping.

Judgement and approach
On completion of the course, the students shall be able to:

- critically carry out a literature study reviewing the field of spatial artificial intelligence
- demonstrate a critical and judicious attitude to advanced methods for handling of spatial data in different processes and applications
- evaluate advantages and disadvantages with different AI and ML-methods and be able to relate these to one another at a conceptual level.

Course content

The course starts with a general introduction to the concept AI and its different components with a focus on GIS-applications. This is followed by modules with a focus on optimisation of data processing, machine learning and simulation techniques for applications in both GIS and remote sensing. Main focus for the course is technical knowledge and technical proficiencies that are aiming to that the student should be able to apply AI in different situations but aspects of ethics and public benefits are also treated in lectures during the course.

Course design

The teaching consists of lectures, practical exercises, seminars and a final project assignment that is carried out individually or in groups. Each lecture theme is highlighted with practical exercises that, based on key elements, expands and deepens the understanding of the theoretical material. Through the exercises, the student gets ability to apply AI on different spatial problems to develop solutions. Both exercises and seminars aim also to deepen the students' commitment in their own learning process. Participation in exercises, seminars, laboratory sessions and project work, as well as associated parts, is compulsory.

Assessment

Examination takes place in the form of written assignments, exercises, seminars (1 credit) and quizzes (1.5 credits) during the course and through a final project work (5 credits).

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.
To pass in the whole course passed results on all written assignments, exercises seminars, quizzes and project work and participation in all compulsory components. Written assignments, exercises, seminars are assessed according to the grading scale Fail, Pass, while the project assignment is assessed according to the grading scale Fail, Pass, Pass with distinction. The final grade are decided through grade on the project assignment.

Entry requirements

For admission to the course, 90 credits of scientific studies are required. Of these should at least 15 credits be in basic Geographic information science, equivalent to the NGEA11, geographic Information systems, basic course, 15 credits and 15 credits in Programming equivalent NGEN20, programming for applications in GIS and remote sensing, 15 credits. English 6/English B.

Further information

To fully appreciate the course, good experience in Python programming is recommended. Also knowledge if remote sensing facilitates for the student to assimilate the course material.

Subcourses in NGEN27, Physical Geography: Geospatial Artificial Intelligence

Applies from H23

2301 Written hand-ins and exercises, 1,0 hp
Grading scale: Fail, Pass
Written hand-ins, exercises and seminars

2302 Quizzes, 1,5 hp
Grading scale: Fail, Pass
Quizzes during the course

2303 Project work, 5,0 hp
Grading scale: Fail, Pass, Pass with distinction
Final project in the course