LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Rumslig artificiell intelligens
Geospatial Artificial Intelligence

EXTQ60, 7,5 credits, A (Second Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED L
Date of Decision: 2023-04-20

General Information

Elective for: L5-gi
Language of instruction: The course will be given in English

Aim

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.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- 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

Competences and skills
For a passing grade the student must

- 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
For a passing grade the student must

- 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.

Contents

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.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
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. 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, 3, 4, 5. The final grade are decided through grade on the project assignment.

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.

Parts

Code: 0123. **Name:** Written Hand-ins and Exercises.
Credits: 1. **Grading scale:** UG. **Assessment:** Passed exercises and assignments. **Contents:** Compulsory practical exercises, seminars and written assignments.

Code: 0223. **Name:** Quizzes.
Credits: 1,5. **Grading scale:** UG. **Assessment:** Passed quizzes. **Contents:** Compulsory quizzes.

Code: 0323. **Name:** Project Work.
Credits: 5. **Grading scale:** TH. **Assessment:** Graded (TH) project assignment, which will also be deciding the course grade.

Admission

Admission requirements:

- EXTF80 Geographic Information Technology
- EDAA20 Programming and Databases

The number of participants is limited to: No
The course overlaps following course/s: NGEN27

Reading list

- Raschka, S. and Mirjalili, V.: Python Machine Learning, machine learning and deep learning with Python, Scikit-learn, and TensorFlow 2. Packt publishing, Birmingham, 2019, ISBN: 9781789958294. Available via Lund University Library.
- Pétrowski, A. and Ben-Hamida, S.: Evolutionary Algorithms, Volume 9. Wiley online library, 2017, ISBN: Print: 9781848218048, Online: 9781119136378.

Contact and other information

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Course homepage: https://www.nateko.lu.se/xxx - will be published here