DEPARTMENT OF EARTH SCIENCES

NGEO316   AI for Earth and Environmental Sciences, 5 credits

AI för geovetenskap och miljövetenskap, 5 högskolepoäng

Third-cycle level / Forskarnivå

Confirmation

This syllabus was confirmed by the Department of Earth Sciences on 2021-09-21, and is valid from Autumn semester 2021.

Responsible Department
Department of Earth Sciences, Faculty of Science

Entry requirements

Admitted to third cycle education.

Learning outcomes

On successful completion of the course, the third-cycle student is expected to be able to:

Knowledge and understanding

- Understand the concept of Artificial Intelligence (AI) and identify tools and algorithms appropriate for different applications
- Gain insight into different application areas for AI and their different challenges
- Learn about Machine Learning and Deep Learning algorithms used in AI

Competence and skills

- Perform machine learning and deep learning algorithms
- Apply AI to one's own research project

Judgement and approach

- Evaluate potential error sources occuring when applying AI algorithms

Course content

Machine learning and deep learning are a part of the field of Artificial Intelligence (AI), and their use with "Big Data" applications has grown exponentially over the last decade. Machine learning approaches are often applied to develop better models or to determine important variables within models, and are used currently for studies of climate, biology, geography, genetics, and many other fields relevant in the Earth and Environmental Sciences.

This course aims to give an overview of the background and status of AI, with focus on machine learning in general (week 1) and deep learning in particular (week 2), for the Earth and Environmental sciences. Understanding some of the commonly applied algorithms and considerations that should be taken when applying these (e.g., training data characteristics) is a goal of this course, and also to apply them practically in exercises.

Lectures and reading for the course will provide the student with material which will increase understanding of when and how to apply machine learning algorithms. Guest lectures will highlight ongoing applications of AI at different organisations. Students will participate in peer-based discussion groups during the course and write a final report relating the (potential) use of AI in their own PhD research.

Types of instruction

The course is given as a 3 week course. Week 1 is teacher-led and includes lectures, guest lectures, computer exercises, reading, and literature seminars on Machine Learning. Week 2 has a similar format but will cover the topic Deep Learning. Finally, during a third week, the students will work themselves to prepare a written report.

Language of instruction
The course is given in English.

Grades

The grade Pass (G) or Fail (U) is given in this course.

Types of assessment

To pass the course, participation in the lectures, and active participation in seminar discussions and computer exercises is required. After the second week of the course, an individual assignment is completed, which must be approved.

Course evaluation

The course evaluation is carried out together with the Ph.D. students at the end of the course by individual, anonymous survey followed by an open discussion with the entire class.

Other information

This University of Gothenburg PhD course is part of the BECC ClimBEco series

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(https://www.cec.lu.se/education/postgraduate-studies/climbeco/phd-courses) together with Lund University. Requirements for travel will be limited to only necessary moments.

Precedence for taking part in the course will be given to Univ of Gothenburg and ClimBEco PhD students.

A maximum number of 25 students will be accepted.

Basic knowledge of Python is desired for the course. Students not having a Python background should learn basic Python before the course, through tutorials suggested by the course instructors.