The Hebrew University of Jerusalem

Syllabus

Machine learning in earth and environmental sciences - 70938

Last update 01-09-2022

HU Credits: 3

Degree/Cycle: 2nd degree (Master)

Responsible Department: Geology

Academic year: 0

Semester: 1st Semester

Teaching Languages: English and Hebrew

Campus: E. Safra

Course/Module Coordinator: Efrat Morin

Coordinator Email: efrat.morin@mail.huji.ac.il

Coordinator Office Hours: Tuesdays 15-16

Teaching Staff:
Prof Efrat Morin

Course/Module description:
The course will describe the fundamentals underlying machine learning and will present common methods of the field. The students will learn the theoretical aspects of these methods and apply them for problem solving in earth and environmental sciences. The course will include home assignments (in Python) and a final course project.

Course/Module aims:
- To explain the fundamentals of machine learning and the application for problem solving in earth and environmental sciences
- To teach a several common machine learning methods and algorithms with examples from earth and environmental sciences
- To impart practical capabilities in machine learning methodologies
- To impart self-learning and selection capabilities of machine learning methods for solving problems in earth and environmental sciences

Learning outcomes - On successful completion of this module, students should be able to:
- to define what is machine learning and explain how can it help in earth and environmental sciences problem solving
- to select an appropriate machine learning method for a given earth and environmental sciences problem
- to apply the methods presented in the course
- to self-learn machine learning methods that are based on principles taught in the course

Attendance requirements(%):
80% attendance is mandatory

Teaching arrangement and method of instruction: Frontal lectures, class tutoring, homework, self-learning, course project

Course/Module Content:
- Introduction
- Linear classification and regression models
- Supervised learning (concepts and theory)

- Tree-based models (classification and regression trees, random forests)
- Artificial neural networks and deep learning
- Convolutional neural networks
- Recurrence neural networks (including LSTM)
- Unsupervised learning (PCA and cluster analysis)

Required Reading:
None

Additional Reading Material:
Will be given during the course

Course/Module evaluation:
End of year written/oral examination 0 %
Presentation 0 %
Participation in Tutorials 0 %
Project work 0 %
Assignments 55 %
Reports 0 %
Research project 45 %
Quizzes 0 %
Other 0 %

Additional information:
Recordings would be available for the students after each meeting, conditioned on attendance.