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**UNIVERSITÄT
BERN**

CAS Advanced Machine Learning



Continuing Education in Extended Intelligence
2023/2024

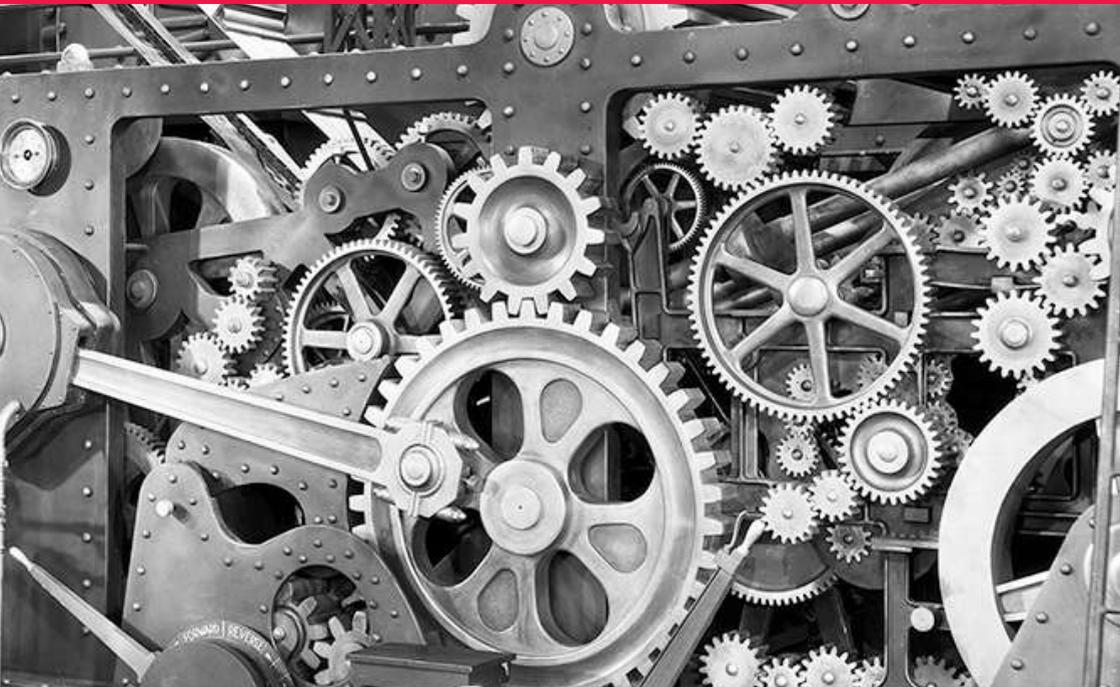


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CAS

Advanced Machine Learning



Introduction

In many disciplines, the amount of available data and the computing capacity are growing rapidly. This enables the application of machine learning methods on tasks previously being reserved for humans. Trained machines outperform homo sapiens in more and more cognitive tasks. As with other disruptive technology emergences, the resulting automation potential represents a huge benefit for the human society, but also comes with new challenges and risks. This CAS offers the opportunity to complement your data science competences with a formal deepening and broadening of knowledge and skills on machine learning and artificial intelligence. The format is designed to align with the participants main study and or professional activities. The teaching and learning approaches are team and discussion oriented and designed to develop practical competency.

The program is organised into six modules, running over 18 course days from August to January and targets professionals and researchers in the private and public sector. The content covers a review of machine learning methods, established applications, the research frontier and philosophical and ethical aspects. The difficulty is at a university master level and assumes own basic machine learning experience, programming skills and a higher education degree with some mathematical background. The program focuses on concepts and usage of common machine learning tools, not so much on theoretical elaboration of the mathematics, statistics and informatics.

ANONYMOUS

«I can better support customers in Machine Learning projects and have become more efficient in the implementation.»



Target Groups

Aimed at students and professionals from the public/private sector that hold a degree from a university or a university of applied sciences (e.g. BSc, MSc, PhD).

SUITABLE AND INTENDED FOR DATA ANALYSTS AND RESEARCHERS FROM EVERY FIELD:

Become experienced with data analysis, programming and basic machine learning. Learn more by doing - the program includes programming and project work from day one. Know, experience and exploit the possibilities offered by machine learning methods.

Standard data sets are provided, but participants are encouraged to bring or acquire their own. If you have any questions regarding whether this program could work for you, please do not hesitate to contact us.



Objectives

Course competence is developed throughout six modules and a CAS project work. On completion, the graduates will

Design, tune, train and measure performance of neural networks with advanced deep learning libraries

Understand the inner mechanisms of neural networks during training

Be familiar with active research in machine learning

Understand and communicate scientific publications on machine learning and artificial intelligence

Be familiar with the philosophy and ethics of extended and artificial intelligence

Be familiar with one or more applied machine learning domains, the main mathematical methods for data science and machine learning

CAS Advanced Machine Learning

Summary

CAS Advanced Machine Learning

Degree

Certificate of Advanced Studies in Advanced Machine Learning AML
University of Bern (CAS AML Unibe)

Scope

16 ECTS

Duration

2023-08 - 2024-07
(2 years is possible)

Start

2023-08

Admission

A degree from an university or an university of applied sciences

Cycle

Annual

Language

English

Further information

www.unibe.ch/continuing_education_programs/cas_advanced_machine_learning

Locations

All courses take place in walking distance from the Bern railway station. The exception is Module 3 which takes place on the mediterranean coast and Module 6, which takes place in the ski resort Mürren two train hours from Bern city.

All courses are additionally held online. Remote participation is possible (via Zoom).

Teaching methods

Our teaching methods are modern and peer oriented. The modules use online platforms with multimedia materials, tutorials and assessments to aid learning, along with classes for discussion, feedback and a chance to deepen knowledge. Main tool and language is Python.

Workload

The duration of all modules corresponds to approximately 20 classroom hours each and module work (expected effort is 30 hours), with each complete module qualifying for 2 ECTS points. The expected workload for the final CAS Project (4 ECTS) is 120 hours.





Modules

Module 1

Review of machine learning, practical methodology and applications

Review of basic principles, concepts, practical methodology and applications of machine learning.

Module 2

Deep networks

Study of established deep network applications commonly used in industry.

Module 3

Deep learning research

Study of new promising, but not yet widely established approaches with deep networks.

Module 4

Selected topics on machine learning

In this module, participants study selected publications on machine learning and artificial intelligence and present them to the others.



Module 5

Philosophy and Ethics of extended cognition and artificial intelligence

Artificial Intelligence as a scientific field dates back to the 1950s. This module concerns key philosophical and ethical questions and discussions triggered by the existence of intelligence outside the human brain.



Module 6

Elective module

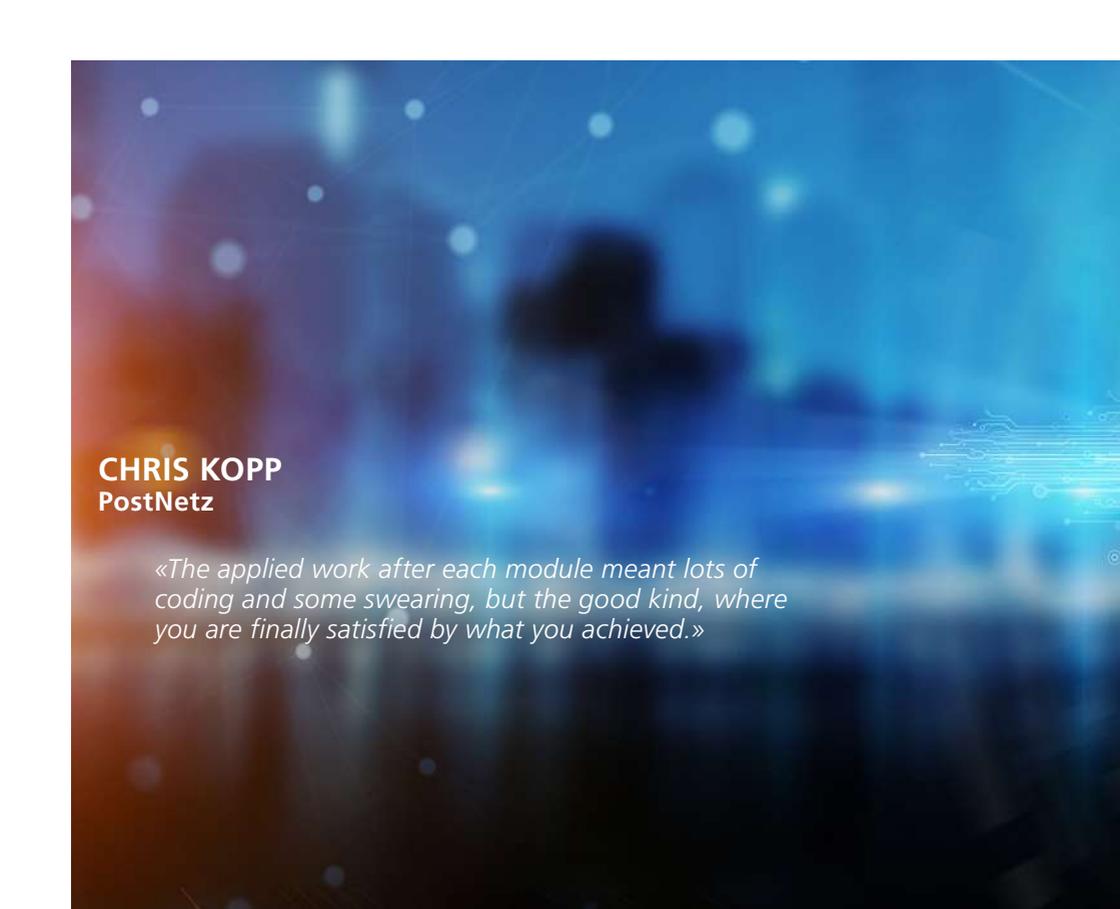
One 2 ECTS module on machine learning in an applied domain or mathematical methods for machine learning and data science. Elective modules might differ from year to year.

Final Project

CAS Thesis

Consolidate all gained knowledge in your final CAS Project. Team work and usage of own data are encouraged.





CHRIS KOPP
PostNetz

«The applied work after each module meant lots of coding and some swearing, but the good kind, where you are finally satisfied by what you achieved.»

Final Project

Participants define and perform a 4 ECTS project work, individually or in teams during the CAS. Support is provided by the CAS lecturers. Output is a report, computational notebooks and a presentation. The use of own data from profession or research is encouraged.



To check if registration is currently possible, visit



Cost

Regular CAS program: CHF 9600

Employees and students of University of Bern: CHF 5600

Inclusive of all modules, performance assessments, certificates, materials and teaching platforms, coffee breaks, full pension hotel (Module 3), full pension hotel in Mürren (Module 6) and diploma apero.

Participants must supply their own laptops.

Registration

Register via https://www.unibe.ch/continuing_education_programs/cas_advanced_machine_learning

Registration opens in November and a maximum of 20 registrations can be accepted each year. Registrations are processed in the order of arrival. The CAS can only be offered if there are sufficient registrations by the deadline.

Registered participants will receive an acceptance confirmation by email and will be invited to one of the next introduction events. Attendance to one introduction is mandatory. Participants can cancel their registrations before the deadline without any costs. After the deadline the regulations apply. Individual modules and electives can be attended before the registration.

Schedule

2023/2024

Module 1	Review of machine learning	2023-08-22 - 2023-08-25
Module 2	Deep Networks	2023-08-29 - 2023-09-01
Module 3	Deep Learning research	2023-10-02 - 2023-10-06
Module 4	Selected topics on machine learning	Weekly from 2023-10-20 until 2023-12-15
Module 5	Philosophy and Ethics of AI	Weekly from 2023-10-20 until 2023-12-15
Module 6	Elective Module	2024-01-22 - 2024-01-26

Further introductory courses:

There are already many handy packages for machine learning available. However, to benefit most from these, a good mathematical understanding of the background can make a big difference.

For students who wish to refresh their mathematical knowledge or who are new to machine learning mathematics, we recommend attending the course

Mathematical Methods for Data Science and Machine learning

2023-08-15 - 2023-08-18



CONTACT



PD Dr. Sigve Haug
Director of Studies
sigve.haug@unibe.ch



Claire Dove
Education and
Communication Manager
claire.dove@unibe.ch

Lecturers

Our lecturers are local or external experts. Currently, lecturers include

- Prof. Dr. Dr. Claus Beisbart
- Dr. Lorenzo Brigato
- Dr. Geraldine Schaller Conti
- PD Dr. Sigve Haug
- Prof. Dr. Felix Wichmann
- Dr. Kinga Sipos
- Dr. Mykhailo Vladymyrov
- Dr. Guillaume Witz

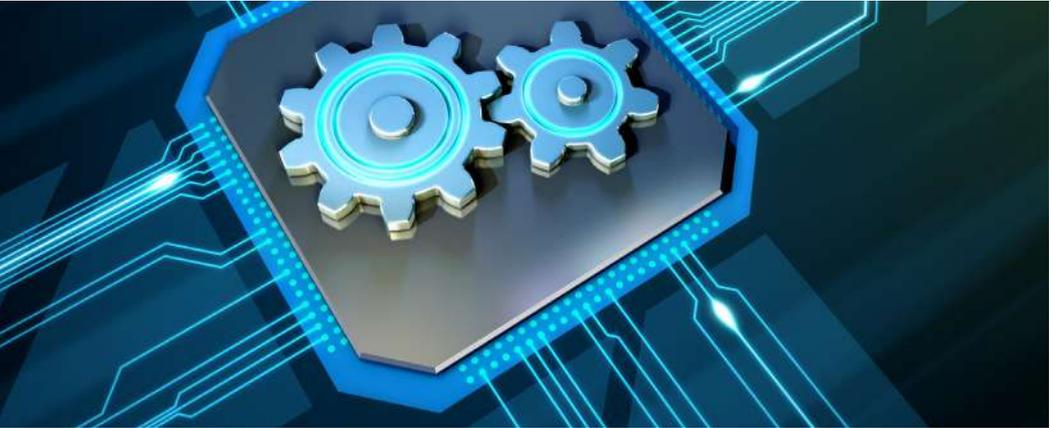
Program management

The Certificate of Advanced Studies (CAS) in Advanced Machine Learning (AML) is offered by the Mathematical Institute.

- Prof. Dr. Paolo Favaro
- Prof. Dr. Jan Draisma
- Prof. Dr. Tobias Hodel
- PD Dr. Sigve Haug (Director of Studies)
- Prof. Dr. Christiane Tretter (Chair)
- Prof. Dr. Thomas Wihler



Further Studies: Extended Intelligence



DAS Extended Intelligence

The CAS Advanced Machine Learning (AML) can be combined with the CAS Applied Data Science (ADS) or the CAS Natural Language Processing (NLP) into a Diploma of Advanced Studies in Extended Intelligence - the DAS XI.

The scope of the DAS XI comprises 38 ECTS:

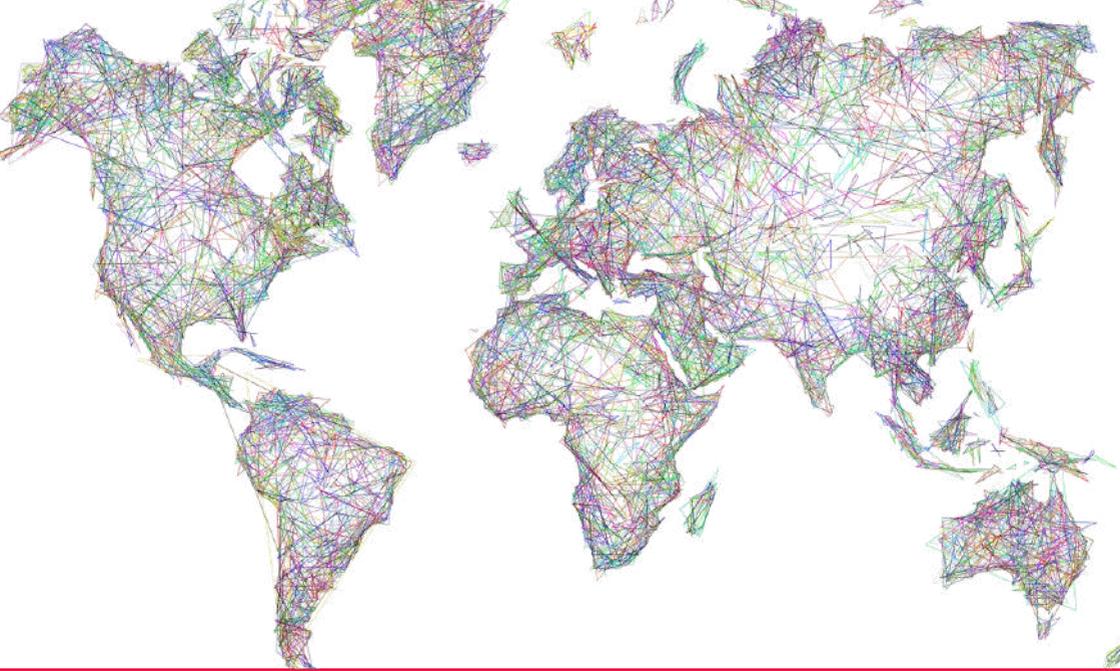
- 16 ECTS from CAS ADS/AML/NLP**
- 16 ECTS from CAS ADS/AML/NLP**
- 2 ECTS from DAS Module**
- 4 ECTS from DAS Thesis**

MAS Extended Intelligence

The CAS Advanced Machine Learning (AML) can be combined with the CAS Applied Data Science (ADS) and the CAS Natural Language Processing (NLP) into a Master of Advanced Studies in Extended Intelligence - the MAS XI.

The scope of the MAS XI comprises 62 ECTS:

- 16 ECTS from CAS ADS**
- 16 ECTS from CAS AML**
- 16 ECTS from CAS NLP**
- 2 ECTS from MAS Module**
- 12 ECTS from MAS Thesis**



University of Bern

Mathematical Institute

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Schweiz

www.math.unibe.ch