UNIVERSITÄT
BERN

CAS
Applied Data Science

Continuing Education in Extended Intelligence
2023/2024

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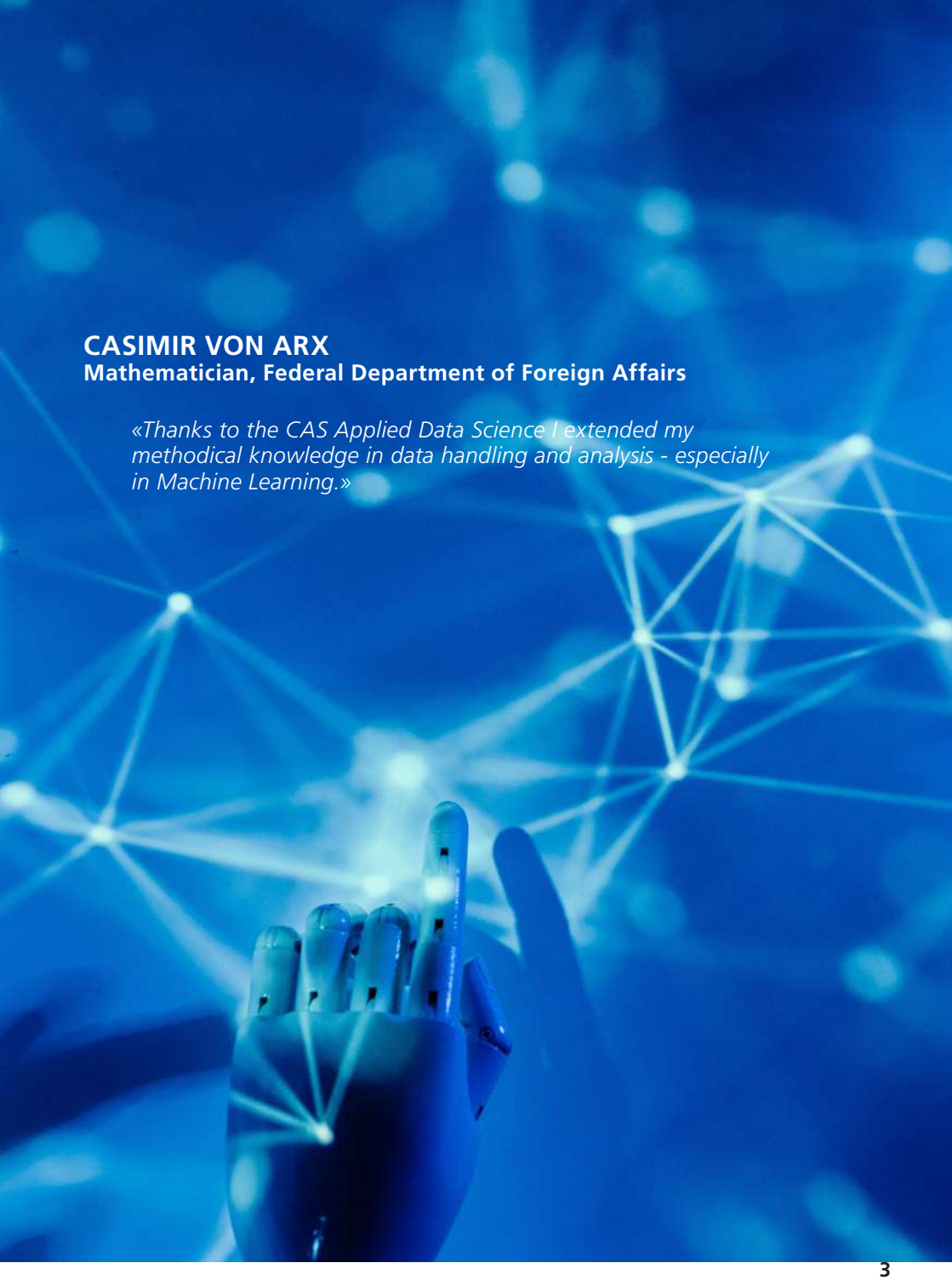
CAS
Applied Data Science

Introduction

With the explosion of data in science, economics, administration, medicine and many other fields, the importance and the demand for data science skills are increasing. It is the scientific methods and processes of extracting knowledge and insights from data. In light of this, the University of Bern offers a Certificate of Advanced Studies (CAS) program in Applied Data Science.

The program is organised into six modules, running over 21 course days from August to January and targets professionals and researchers in the private and public sector. The content covers a full cycle from data acquisition planning, description and visualisation of data, inference, machine learning, best practices ethics and deep learning. Our teaching methods are modern and peer oriented. The level assumes own experience and a higher education degree with some mathematical background. The program is applied in the sense of focusing on concepts and usage of common data science infrastructures and software tools, not on theoretical elaboration of the mathematics, statistics and informatics.



CASIMIR VON ARX
Mathematician, Federal Department of Foreign Affairs

«Thanks to the CAS Applied Data Science I extended my methodical knowledge in data handling and analysis - especially in Machine Learning.»

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 FOR APPLICATION ORIENTED PROFESSIONALS:
Make your own applications with your own data.

RELEVANT FOR DATA ANALYSTS:
Go beyond spread sheets towards large data sets and refine your skills.

APPLICABLE TO CONSULTANTS:
Know the possibilities offered by data science.

INTENDED FOR RESEARCHERS:
Take data science expert roles within your teams.

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

Be familiar with different data sources, data types, and be able to develop data management plans

Be able to describe, extract and present scientific knowledge from data by application of statistical methods

Be able to process data with machine learning tools and methods

Be familiar with best practices for data management, analytics and science

Be able to analyse and communicate data science challenges and use a wide range of data science tools and methods

Be able to perform deep learning for a wide range of tasks

CAS Applied Data Science
Summary

CAS Applied Data Science

Degree
Certificate of Advanced Studies in Applied Data Science ADS University of Bern (CAS ADS 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

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.

Further information
www.unibe.ch/continuing_education_programs/cas_in_applied_data_science

Modules

Module 1

Data Acquisition and management

In this module, you will learn to understand different data sources and types and how to design data management models and plans.

Module 2

Statistical inference for data science

In this module, you will become familiar with typical statistical concepts for describing and analysing data. You will learn how to draw scientific conclusions from statistical analysis results.

Module 3

Data analysis and machine learning

In this module, you will learn about standard analysis techniques and how to apply state-of-the-art machine learning with Python.

Module 4

Ethics and best practices

In this module, we reflect upon and apply best practices for data and code management, resource usage, quality assurance, open science, open access and fair principles. You will discuss the ethical questions in scientific computing and learn to use Version Control Software with Git.

Module 5

Peer Consulting and selected readings

This module comprises peer knowledge exchange groups, peer consultations and selected readings

Module 6

Deep Learning

In this module, you will learn performing deep learning with TensorFlow.

Final Project

CAS Thesis

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

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_in_applied_data_science

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. Partcipants 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	**Data acquisition and management**	2023-08-23 - 2023-08-25
Module 2	**Statistical inference for data science**	2023-08-29 - 2023-09-01
Module 3	**Data analysis and machine learning**	2023-09-25 - 2023-09-29
Module 4	**Ethics and best practices**	Weekly from 2023-10-20 until 2023-11-17
Module 5	**Peer Consulting and selected readings**	Weekly from 2023-11-24 until 2023-12-15
Module 6	**Deep Learning**	2024-01-15 - 2024-01-19

Further introductionary courses:

Algorithms and programming are important tools in data driven research. Python is a good scripting language widely used to make pipelines of tasks typical for large computations and analysis on large datasets. It suits the purpose of starting programming in it, as well.

For students who wish to refresh their Python programming knowledge or who are new to the Python programming language, we recommend attending the course

Introduction to Programming (Python)
on 2023-08-14.

CONTACT

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

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

Lecturers

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

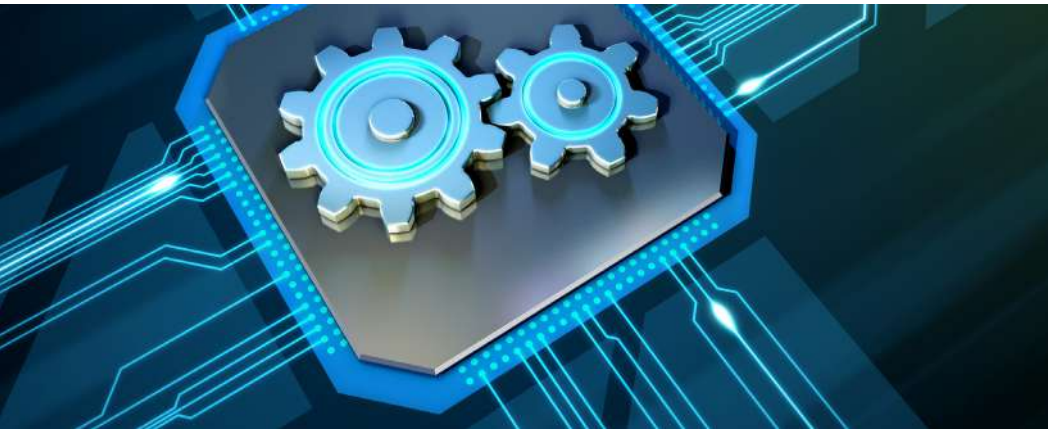
- Prof. Dr. Dr. Claus Beisbart
- Prof. Dr. Kai Brunnler
- Dr. Geraldine Schaller Conti
- PD Dr. Sigve Haug
- M. Sc. Ahmad Alhineidi
- Prof. Dr. Felix Wichmann
- Dr. Kinga Sipos
- M.Sc. Pablo Verges
- Dr. Mykhailo Vladymyrov
- Dr. Guillaume Witz

Program management

The Certificate of Advanced Studies (CAS) in Applied Data Science (ADS) 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 Applied Data Science (ADS) can be combined with the CAS Advanced Machine Learning (AML) 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 Applied Data Science (ADS) can be combined with the CAS Advanced Machine Learning (AML) 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

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www.math.unibe.ch