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. Data science is a discipline consisting of applied mathematics, statistics, computer science, ethics and subject specific knowledge in application areas. 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 18 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.*

*For experienced data workers we also offer the CAS Advanced Machine Learning (https://www.math.unibe.ch/cas_aml).
OBJECTIVES

Course competence is developed throughout six modules. On completion the graduates will:

1. be familiar with different data sources, data types, and be able to develop data management plans;
2. be able to describe, extract and present scientific knowledge from data by application of statistical methods;
3. be able to process data with machine learning tools and methods;
4. be familiar with best practices for data management, analytics and science;
5. be able to analyse and communicate data science challenges and use a wide range of data science tools and methods;
6. be able to perform deep learning for a wide range of tasks.
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 MANAGEMENT** ▶ wanting to know what data scientists are accomplishing in their fields

**RELEVANT FOR DATA ANALYSTS** ▶ who want to go beyond spreadsheets towards large data sets and refine their skills

**APPLICABLE TO CONSULTANTS** ▶ with a desire to know the possibilities offered by data science

**INTENDED FOR RESEARCHERS** ▶ wanting to take data science expert roles within their 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.
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 the importance of statistical inference for data science and where to apply it, along with the understanding and application of the theoretical concepts. 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 learn about and be able to discuss the ethical questions in scientific computing, and learn to use Version Control Software with Git.

MODULE 5 ➤ CONSOLIDATIONS
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.

ALL MODULES
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 CAS Project is 120 hours. Main tool and language is Python.
KEY INFORMATION

DEGREE ➤ CAS Applied Data Science (CAS ADS)

STRUCTURE ➤ 6 thematic modules with performance assessments. CAS project work. Individual modules possible.

DEGREE ➤ CAS Applied Data Science (CAS ADS)

SCOPE ➤ 16 ECTS - approximately 480 hours comprised of lectures, module projects, performance assessments.


FORMAT ➤ 18 days of presence during blocks in August, September and January. Total workload 480 hours.

TARGET GROUP ➤ Public & Private Sector and Researchers.

LANGUAGE ➤ English

CAPACITY ➤ 24 participants

LECTURERS ➤ University of Bern and external experts.

FEE ➤ CHF 9'600.- (CHF 5'600 for employees of the University of Bern and enrolled students).
## SCHEDULES AND LOCATIONS

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<thead>
<tr>
<th>Module</th>
<th>Title</th>
<th>Dates</th>
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<tbody>
<tr>
<td>1</td>
<td>Data acquisition &amp; management</td>
<td>25. – 27. Aug. 2021</td>
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All courses are held online. The physical locations for voluntary, but recommended participation are based within the University of Bern campus, reached easily by foot from Bern railway station, except Module 3 and 6, which take place somewhere in the south and in the ski resort Murren.

Further information found via: www.cas-applied-datascience.unibe.ch
CAS PROGRAM FEES

<table>
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<tr>
<th>Regular CAS program</th>
<th>CHF 9'600.-</th>
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<tbody>
<tr>
<td>Employees &amp; Students of University of Bern</td>
<td>CHF 5'600.-</td>
</tr>
</tbody>
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Inclusive of all modules, performance assessments, certificates, materials & teaching platforms, coffee breaks, full board and stay in hotels for retreat Modules 3 & 6 and diploma apero.

Participants must supply their own laptops.

*If there are free places, modules can be attended individually. Prices are CHF 300.- per half day. Individual modules are accredited with certificates which are accumulated for the full CAS ADS.

REGISTRATION

Register via: www.cas-applied-datascience.unibe.ch

Registered participants will receive acceptance confirmation by email and will be invited to one of the next About the CAS Applied Data Science events. Attendance to one event 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. Please contact cas-ads@math.unibe.ch for further information.

Registration opens in November and a maximum of 24 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.

Deadline: end of May.
TESTIMONIALS

„With the CAS Applied Data Science I had a distinct advantage in applying for doctoral positions.“

Fluri Wieland, Institute of Anatomy, University of Bern

„I changed positions between starting and finishing the CAS and the knowledge will be very useful for my new job. Helping me to better understand the transition of industry.“

Anonymous, Corporate Sector

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

Casimir van Arx, Mathematician, Federal Department of Foreign Affairs

„Thanks to this CAS, I really got involved with Data Science. I received some great tools that helped to solve a lot of problems - and I’m hungry for more!“

Anonymous, University of Bern

PROGRAM MANAGEMENT

Prof. Dr. Jan Draisma
Prof. Dr. Paolo Favaro
PD Dr. Sigve Haug (program manager)
Prof. Dr. Christiane Tretter
Prof. Dr. Thomas Wihler (chair)

LECTURERS INCLUDE

Prof. Dr. Dr. Claus Beisbart – University of Bern
Prof. Dr. Kai Brunnler – Berner Fachhochschule
Dr. Geraldine Conti – PAG
PD Dr. Sigve Haug – University of Bern
Dr. Qiyang Hu – University of Bern
Dr. Kinga Sipos – University of Bern
M.Sc. Pablo Verges – DECTRIS Ltd.
Dr. Mykhailo Vladymyrov – University of Bern
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