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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. 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 five modules, running over 18 course days, given in three blocks (August/September, January/February, May/June) 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 and ethics. 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*.

OBJECTIVES

Course competence is developed throughout five 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.
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).

SUITEABLE FOR MANAGEMENT ▶ wanting to know what data scientists are accomplishing in their fields

RELEVANT FOR DATA ANALYSTS ▶ who want to go beyond spread sheets 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.
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 TensorFlow.

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 AND ELECTIVES
This module comprises of:
• a moderated peer discussion group consolidating your professional or data science course experiences,
• a peer consultation on data science,
• a number of elective courses on various data science tools and methods, selected from the training portfolio.

ALL MODULES
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. The duration of modules 1 - 4 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 duration of module 5 is approximately 120 hours and qualifies for 4 ECTS points. Main tool and CAS language is Python.

TAILORED CAS
With the electives you can tailor the profile of your CAS. Choose from topics such as basic introduction to Linux, HPC, public and private cloud infrastructures, Python, R, GPU programming, Git, LaTeX etc. Electives are constantly added to the training programme and offered on demand.
KEY INFORMATION

DEGREE  ▶ CAS Applied Data Science (CAS ADS)

STRUCTURE  ▶ 5 thematic modules with performance assessments. Individual modules possible.

SCOPE  ▶ 12 ECTS - approximately 340 hours comprised of lectures, module projects, performance assessments.

DURATION  ▶ 1 year (2 years possible)


FORMAT  ▶ Min. 18 days of presence (126 hours attendance) during three blocks per year (Aug/Sep, Jan/Feb, May/Jun).

TARGET GROUP  ▶ Public/Private Sector and Researchers

CAPACITY  ▶ 24 Participants

LANGUAGE  ▶ English

LECTURERS  ▶ University of Bern and external experts

FEE  ▶ CHF 7,200.- (Employees & Students of the University of Bern apply for reduced fee).
SCHEDULES AND LOCATIONS

Module 1 Data acquisition & management  
19 - 21 Aug. 2020

Module 2 Statistical inference for data science  
25 - 28 Aug. & 18 Sept. 2020

Module 3 Data analysis & machine learning  
25 - 29 Jan.&11 - 12 Feb. 2021

Module 4 Ethics & best practices  
16-18 June & 2 July 2021

Module 5 Consolidations & Electives & Oral exam  
Aug/Sep, Jan/Feb, May/June

All locations are based within the University of Bern campus, reached easily by foot from Bern railway station, except Module 3, which takes place in the ski resort Mürren.

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

<table>
<thead>
<tr>
<th>Description</th>
<th>Fee</th>
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<tbody>
<tr>
<td>Regular CAS program</td>
<td>CHF 7,200.-</td>
</tr>
<tr>
<td>Employees &amp; Students of University of Bern</td>
<td>CHF 4,200.-</td>
</tr>
<tr>
<td>Students not supported by their institute</td>
<td>CHF 2,100.-</td>
</tr>
</tbody>
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Inclusive of all modules, performance assessments, certificates, materials & teaching platforms, coffee breaks, half pension hotel in Mürren (Module 3) and diploma apéro.
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 PD Dr. Sigve Haug 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, Insitute of Anatomy, University of Bern

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

Casimir von 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
Dr. Melanie Graf - University of Basel
PD Dr. Sigve Haug - University of Bern
Dr. Alexander Kashev - University of Bern
Dr. Kinga Sipos - University of Bern
M.Sc. Pablo Verges - DECTRIS Ltd.
Dr. Mykhailo Vladimirov - University of Bern
Dr. Guillaume Witz - University of Bern
Prof. Dr. Kai Brünnler - Berner Fachhochschule
Prof. Dr. Géraldine Conti - REDS - HEIG-VD and PAG