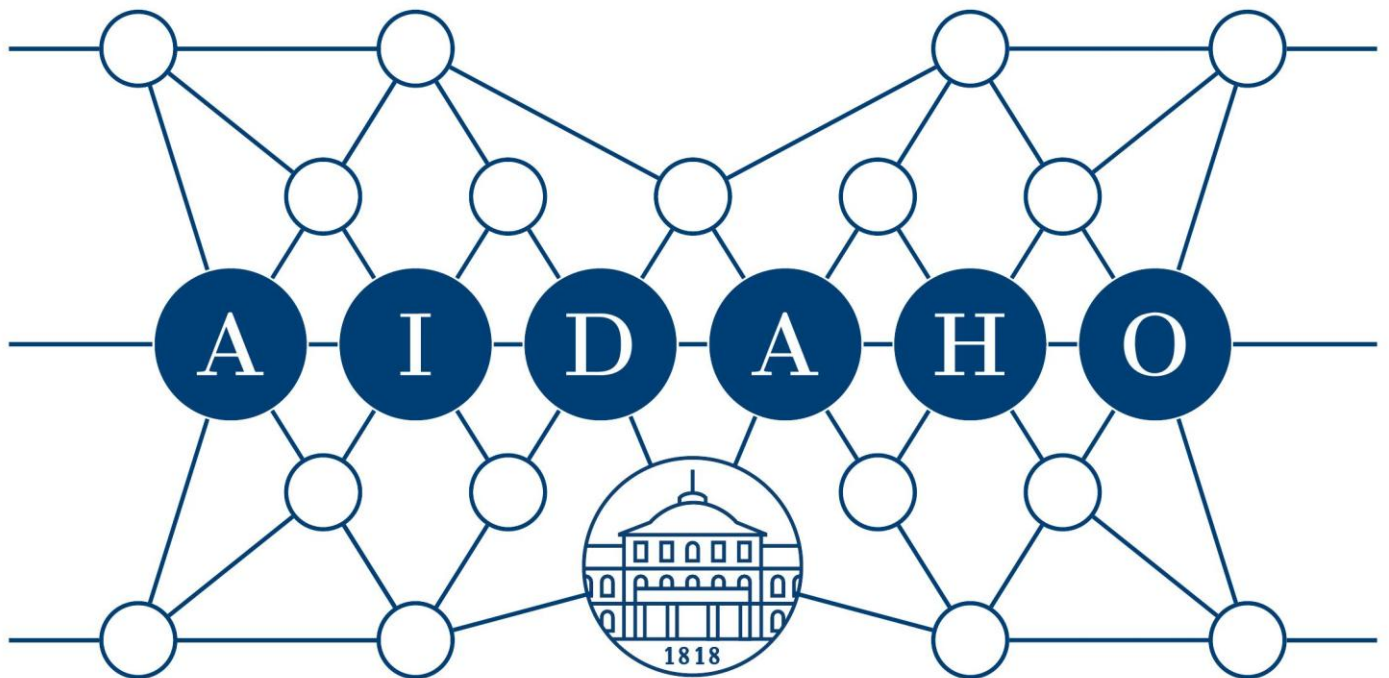




UNIVERSITÄT
HOHENHEIM

Curriculum



AI & DATA SCIENCE CERTIFICATE HOHENHEIM

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GLOSSARY

AI & Data Science Certificate Hohenheim	AIDAHO
AIDAHO-Credit Points	AIDAHO-CP / CP
Computer-based Examination	CE
Computational Science Hub	CSH
Compulsory	Comp.
Data Science	DS
Künstliche Intelligenz / Artificial Intelligence	KI / AI
Machine Learning	ML
Compulsory	P
Hour per Semester Week	SWS
Module-specific Examination	VSP
Elective	W
Semi-Elective	WP

Important

The information contained in this curriculum is potentially changing. Therefore, the information provided here is without guarantee. The document is kept up to date. Current version: as of 02.12.2024.

You can also find this curriculum on our [website](#). In the pdf version published there, you can activate the hyperlinks, which you can recognize in this print version by the underlining.

GENERAL INFORMATION

AIDAHO

The AI & Data Science Certificate Hohenheim (AIDAHO) is a project funded by the German Federal Ministry of Education and Research (BMBF) to expand teaching in the areas of Artificial Intelligence, Machine Learning and Data Science. As part of the certificate, all Hohenheim students are given the opportunity to broaden their subject-related knowledge in these areas while studying. For this purpose, we extend the existing course offerings by our AIDAHO coursework.

Computational Science Hub (CSH)

AIDAHO is a project of members of the Computational Science Hub (CSH). The CSH is an association of Hohenheim scientists with the goal of strengthening cross-faculty networking and bundling systems knowledge from the individual disciplines with methodological competencies in the areas of Artificial Intelligence (AI), Data Science, and Scientific Computing.

Prerequisites

AIDAHO is open to all registered students of the University of Hohenheim.¹ No specific prior knowledge is required. However, the program deals with advanced mathematics and statistics. We therefore strongly recommend that you have at least a keen interest in these topics.

Information Opportunities

Essential information about the contents, the structure and the examination procedures can be found on our [website](#). In addition, we offer advice by mail (aidaho@uni-hohenheim.de) and inform about news about the certificate via our [newsletter](#). You will also find a summary of the most important information about the certificate [here](#).

¹ The certificate is not intended for the following study programs: Study programs of information systems.

PROGRAM STRUCTURE

GENERAL

AIDAHO consists of a total of 30 AIDAHO-CP. One AIDAHO-CP corresponds to about 30 working hours. Furthermore, the program is divided into two areas: basic modules and specialization modules. The basic modules comprise 18 AIDAHO-CP and the specialization modules 12 AIDAHO-CP.

In the three basic modules, fundamental knowledge of Machine Learning and Data Science is taught. In addition, participants learn the programming languages Python, R and SQL which are relevant for the certificate. In the two specialization modules, participants focus on individual topics, learn advanced methods, or apply their acquired skills themselves.

Overview AIDAHO Structure

Basic Modules				
Module	Credits	Comp.	CP	Semester
Tools for AI & Data Science	CE	P	6	WT/ST
Introduction to Machine Learning with Python	CE	P	6	ST
Introduction to Data Science with R/RStudio	CE	P	6	ST
Specialization Modules*				
Module	Credits	Comp.	CP	Semester
Application Seminars	VSP	WP	6	WT/ST
Methodological In-Depth Lectures	VSP	WP	6	WT/ST

Explanations: CE = Computer-based Examination, VSP = Module-specific Examination, P = Compulsory, WP = Semi-Elective, ST = Summer Term, WT = Winter Term.

* At least one application seminar must be taken out of the specialization modules.

MODULES

General

An updated list of the full AIDAHO [course offerings](#) can be found on our website. Registration for the courses takes place via the F.I.T. platform of the University of Hohenheim (see section on [documentation via the F.I.T. platform](#)).

Basic Modules

The basic modules section includes three courses that must be completed for the AIDAHO certificate. All courses in the fundamentals section are taught in English.

- The module "Tools for AI & Data Science: Introduction to Python, R & SQL" serves as an introductory course for AIDAHO. Here, the necessary basics in programming with Python, R and SQL are taught. The module prepares participants to learn Machine Learning and Data Science methods. After an initial in-class introduction to the topics, students engage with three thematic modules focusing on programming languages through comprehensive digital self-study units. To pass, you must successfully complete a computer-based exam at the end of the semester.
- In "Introduction to Machine Learning with Python" the students deepen their programming knowledge in Python and learn basic Machine Learning concepts. For this purpose, they learn methods of unsupervised and supervised learning and gain first experience in working with neural networks. The participants will also learn about data processing, manipulation and visualization. The course is designed as an asynchronous online course with independent learning controls (quizzes) and exercises.
- In "Introduction to Data Science with R and RStudio", students expand their programming skills in R and learn how to work with large data sets. The course is designed as a lecture with exercises and offers an introduction to data management, scientific computing and data analysis. In data management, students will follow the path from data collection to data preparation and organization to descriptive presentation. Afterwards, concepts of high-performance computing will be covered, predictive statistical models will be applied, and simple text analysis methods will be introduced and deepened in exercises.

Specialization Modules

Within the specialization modules section, a variety of courses are offered that deepen, expand or use the skills and competences learned in the basic modules.

AIDAHO participants can choose two of these courses. **To be eligible for the certificate, at least one of them must be an application seminar.** The courses are held either in English or German, depending on the course specifics.

The courses cover topics from the following areas:

- **Artificial Intelligence:** Deep Learning, Explainable AI, Machine Learning, Computer Vision, ...
- **Data Science:** Big Data Handling, High Performance Computing, Data Visualization, Applied Computational Statistics, Econometrics, Biostatistics or Mathematics, Data Mining, Data Analytics, extensive applications of programming languages / software packages in combination with in-depth methodological content, ...

The courses in the specialization section generally exceed the learning objectives of the basic modules section (methodological in-depth lectures) or apply advanced methods from the above-mentioned sections in a specific project (application seminars).

The program furthermore features cooperation modules with industry partners, implemented as AIDAHO application seminars, which bridge academic learning with practical corporate insights.

The offerings in the specialization section may vary and can change at any time. A list of courses currently offered in the specialization section can be found on the AIDAHO [website](#).

Methodological In-Depth Lectures

Methodological in-depth lectures are characterized by the fact that they extend or deepen the range of methods acquired in the basic modules. This includes all courses that deal with methods of Artificial Intelligence, Machine Learning or advanced quantitative data analysis in their learning objectives. Courses that address ethical and legal issues related to AI, ML as well as data analysis methods or deal with intelligent methods of data preparation or data management can also be included in this specialization modules section.

Application Seminars

Participants in the AIDAHO program have to take at least one application seminar to further improve the methods learned. Within an application seminar, it is recommended that the following aspects are worked on independently as far as possible:

- Preparation of raw data
- Management and workflows for data analysis with Machine Learning and Data Science projects
- Computer-aided implementation of the analysis methodology
- Presentation of the results of an advanced analysis methodology

The categories above are meant as guidelines.

Passed project, seminar, or thesis work whose major component is empirical, quantitative data analysis, real-time data analysis, or Machine Learning / Artificial Intelligence may receive credit in the AIDAHO specialization area, if applicable (see section on recognition of course work).

Within the framework of cooperation modules, the participants can gain practical experience with the methods they have learned. The modules are designed as showcases into the vivid reality in companies and governmental institutions and are intended to provide insights into the framework conditions of practical, data-driven knowledge gain and its communication. Cooperation modules are therefore designed as a project work or hackathon. However, other forms of practical cooperation can also be found in the AIDAHO module manual.

STUDY ORGANIZATION AND EXAMINATIONS

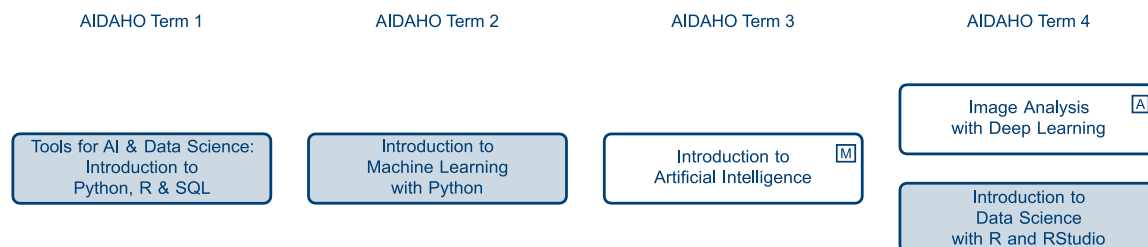
Overview

AIDAHO consists of a basic module and a specialization module section. A total of 5 courses must be completed and 30 AIDAHO-CPs must be earned. After completing the introductory course "Tools for AI & Data Science: Introduction to Python, R & SQL", participants take all other certificate modules in a self-selected order. Any number of AIDAHO modules can be taken in one semester. In general, we recommend devoting three to four semesters to the AIDAHO program.

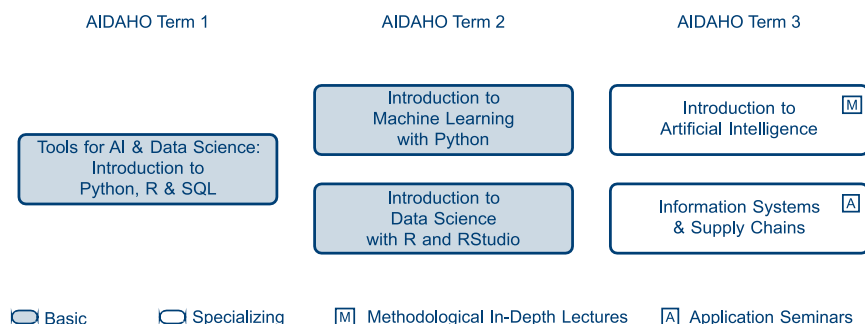
When planning individual studies, it should be considered that not all modules are offered in every semester. For example, the module "Introduction to Machine Learning with Python" is only offered in the summer semester.

The following figure visualizes two different ways how AIDAHO could be completed:

AIDAHO in 4 terms



AIDAHO in 3 terms



Credit Points

The AIDAHO program works with so-called AIDAHO-Credit Points. These reflect the hours spent on modules. One AIDAHO-CP corresponds to about 30 working hours.

Documentation through the F.I.T. platform

For the administration of the AIDAHO certificate, we use the [F.I.T. platform](#) of the University of Hohenheim. Students can login to the platform with their KIM access data and register for AIDAHO courses.

Documentation explaining the features of the F.I.T. platform can be found in the [FAQ](#) on our website.

Confirmation of Participation

Confirmation of participation for individual courses of the AIDAHO program can be created via the F.I.T. platform. To print out the confirmations, participants must first access the certificate overview and then download the desired proof of participation.

The Certificate

Once all the required modules have been completed, the AI & Data Science Certificate Hohenheim can be downloaded via the F.I.T. platform. The certificate consists of two documents. The first part of the certificate attests to the completion of the program. All completed AIDAHO courses are shown on the certificate. The second part of the certificate is a detailed performance summary, like a transcript of records. This document lists the completed courses, naming the date and the respective instructor, as well as any additional courses completed.

Data Storage

For the evaluation of the AIDAHO project, data about the participants will be stored. However, this requires consent at the beginning of the certificate. The data collected includes: Name, matriculation number, e-mail address as well as course participation and study achievements are collected via ILIAS and FIT.

Participants can additionally and voluntarily take part in the evaluation of the AIDAHO program. During the evaluation, information on demographic and social background may be requested for the purpose of evaluation and anonymized analysis. In addition, information on motivation as well as usage and performance data is collected for this purpose (after voluntary consent).

The data collected for the purpose of evaluation is stored in parts on the following platforms: F.I.T., Ilias, TDSS (Teachers' Diagnostic Support System) and servers of the University of Hohenheim. The data is anonymized for evaluation purposes only and used for scientific analysis. Anonymization is carried out by the head of evaluation (tobias.schrimpf@uni-hohenheim.de) or his deputy (johannes.bleher@uni-hohenheim.de). Requests for deletion of data are processed by the head of evaluation or his deputy.

Recognition of Course Work

To receive recognition for credits already accomplished for the AIDAHO certificate, a request for recognition must be submitted using the respective template. The form can be found on the AIDAHO [website](#). Once the completed form as well as the proof of successful completion of the course (transcript of records) has been emailed to aidaho@uni-hohenheim.de, the AIDAHO project staff will review whether the coursework is eligible to be recognized within the AIDAHO certificate. If so, the module will be entered accordingly on the F.I.T. platform. Further information on the form must be taken into account. Only correctly completed credit forms for courses with matching content are eligible for credit.

Project-, Seminar- or Final Theses

Project-, seminar-, or final theses are eligible in the AIDAHO specialization module with a (short) letter of recommendation from the supervising department head (to aidaho@uni-hohenheim.de) and an approval by a project staff member. For recognition, the instructions on the recognition form on our website should be followed.

Within the project-, seminar- or final thesis the following aspects should be worked on independently as far as possible:

- Preparation of raw data
- Management and workflows for data analysis with Machine Learning and Data Science projects
- Computer-aided implementation of the analysis methodology
- Presentation of the results of an advanced analysis methodology

The categories above are to be understood as guidelines. Further details on recognition can be found in the [crediting form](#) on our website.

CONTACT

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