HSLU Lucerne University of Applied Sciences and Arts

Master of Science in Applied Data Science and Artificial Intelligence

Module Descriptions

Digital and AI Ethics

Module description valid from 01.09.2026

General Module Information

Module number	W.MSCDAI_AIE03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Gordon Millar (gordon.millar@hslu.ch)
Teaching language	English

Record

Record	Ultimately, data-based systems should contribute to the common good. At the same time, handling data ethically can be a source of competitive advantage. Data-based systems can, however, endanger human values such as freedom, privacy, security, trust, dignity, and public welfare. Algorithm-based systems may, additionally, be a danger to personal wellbeing and to society as we currently know it. It is therefore essential to systematically and rationally analyse the ethical aspects of data and algorithm-based systems, to assess the claims and rights of stakeholders, to evaluate design variants, and then to optimise them. This module provides the theoretical and practical knowledge to enable you to do this. The students analyse and evaluate data-based and algorithmic systems from an ethical perspective. They know which values are particularly endangered and/or can be promoted by data and algorithm-based systems (autonomy, privacy, fairness, safety, etc.)

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	Knowledge: Students are familiar with the approaches and concepts of data ethics, algorithm/AI ethics and Corporate Digital Responsibility (CDR). They know the criteria and are familiar with the tools for assessing ethical conflicts in connection with data and algorithm-based systems. Problem-solving and critical thinking: Students can evaluate and suggest improvements to different design variants according to human-centred and ethical criteria. Methodological and communication skills: Students can apply a rational and structured approach to analysing and solving ethical conflicts between the claims of different stakeholders in a data/algorithm-based context. Students can conduct a stakeholder dialogue to identify the interests, rights and claims involved with respect to data/algorithm-based systems. Personal and interpersonal skills: Students are able to reflect on their own ethical values in the context of data generation and processing, the use of algorithms and the development of resultant products and services. Students can assess the contribution of data/algorithm-based systems to the common good.
Learning content and structure	Topic 1: Digital society and ethics 1. digitization of all areas of life 2. general and digital ethics – schools of thought 3. relevant values: freedom, privacy, security, health, sustainability, property, trust, dignity, public welfare, etc. 4. bias 5. technology assessment Topic 2: Data ethics 1. principles, guidelines and requirements 2. Code of Ethics for Data-Based Value Creation 3. harm avoidance, justice, autonomy 4. control, transparency, accountability 5. privacy: definition, function 6. fine-tuning and maintenance of models Topic 3: Algorithm/AI Ethics 1. algorithm ethics – AI ethics 2. value-based design 3. ethical stakeholder analysis and dialogue 4. autonomy and automated decisions 5. trustworthy AI, non-discrimination and fairness 6. EU: Artificial Intelligence Act 7. Foundation Models and hidden ideologies 8. Threshold setting 9. AI Revolution in Society, including the influence of science fiction Topic 4: Corporate Digital Responsibility (CDR) 1. from CSR to CDR 2. dimensions of responsibility 3. CDR management - an integrated model 4. transparency v. performance 5. ethics as a competitive advantage 6. Big tech, monopolies, government and liberty 7. technology for the Sustainable Development Goals

	8. ethical dilemmas in the professional context 9. bias in data visualisation
Teaching and learning methods	Classroom: Dialogue-oriented teaching Coaching: Exercises for deepening understanding and the application of this understanding to case studies Self-study: Exercises for deepening understanding and the application of this understanding to case studies
Literature, teaching materials, resources	
Material(s)	Data Innovation Alliance (ed.). (2020). Code of Ethics for Data-Based Value Creation. https://data-innovation.org/data-ethics/ European Parliament. (2023). Artificial intelligence Act. Briefing. Floridi, L., Cowls, J., & Beltrametti, M. (2018). AI4People—An Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations. Minds and Machines, 28(4), 689–707. Frischherz, B., & Millar, G. (2022). Corporate Digital Responsibility (CDR). Eine neue Herausforderung für Unternehmen. Management Und Qualität MQ, 5–6, 9–11. Frischherz, B., & Millar, G. (2024). Digital Ethics. A Teaching Handbook. Globethics. https://globethics.net/publications/digital-ethics Swiss Informatics Society SI: https://swissinformatics.org/en Stanford Encyclopedia of Philosophy: https://plato.stanford.edu/ TA-SWISS – Foundation for Technology Assessment: www.ta-swiss.ch Anthropic, AI, and the US Department of War, https://web.stanford.edu/class/cs182/handouts/06PolicyMemo.pdf?utm_source=chatgpt.com
Learning objectives acc. the competency model	Graduates critically evaluate the impact of their solutions. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations. Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates present research-based solutions through functionally appropriate forms of communication.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 80%
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	oral examination/assessment
Format	case study

Time	end of semester/block week
Location	on-site/in-person
In group	Yes
Scope	15.00 Minute(s)
Contribution to final grade	100 %
Electronic	no
Comments	open book English (German by request – coherent choice)

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26.08.2026

Module code: W.MSCDAI_AIE03

Version: 1.0

NoSQL Lab with Python & MongoDB

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_BDL03_1.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Oliver Staubli (oliver.staubli@hslu.ch)
Teaching language	English

Record

Record	The module is a direct continuation of the preceding modules and consolidates knowledge gained so far about using Python and databases. Participants will complete various lab exercises to learn which use cases can be solved more efficiently with a conventional relational database or with a NoSQL database like MongoDB. Python is generally used as programming language, with some JavaScript exceptions for command line operations. More Details: https://wiki.revolytics.com/nosql/ Students are able to use the Python programming language to access relational databases, insert and extract data for conducting data analysis. Students can experience firsthand the differences between relational databases and NoSQL DB in lab exercises. Students will practice what they have learned in a personal project conducting an in-depth data analysis on their own MongoDB cluster in

	the cloud. The module focuses on data manipulation in databases (SQL DBs and NoSQL DBs) in connection with the Python programming language. Generative AI is used to build data aggregation pipelines in MongoDB.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_CIP02 **and** W.MSCIDS_DBM02

Module content

Learning objectives	Based on the modules 'Data Collection, Integration and Preprocessing' (CIP) and 'Database Management for Data Scientists', students are able to explain and complete basic CRUD tasks for SQL and NoSQL databases. Students are able to analyze lab tasks and decide which use cases can be solved effectively with which approach. They are able to explain their choice (relational / NoSQL / other) and apply their gained knowledge to other projects. Students are able to decide whether to apply relational or NoSQL methods for managing use cases with large data sets. They will solve some cases by using both methods to clearly understand the difference (i.e. learning by doing). Students are able to ask questions and share their solutions overcoming technical issues while installing the various course software tools. The ILIAS forum is used for FAQ and sharing solutions. Students are able to collaborate with others in completing various laboratory exercises, whereby they will learn to address possible differences of opinions objectively. Students are able to come up with ideas for in-depth data analysis and the needed data, therefore fostering their creativity.
Learning content and structure	Topic 1: Python Database Programming 1. Introduction to SQLite3, MySQL and PostgreSQL in combination with Python 2. Saving and retrieving data with Python in relational databases 3. CRUD-SQL operations from Python scripts Topic 2: NoSQL 1. What is NoSQL? 2. NoSQL vs. Big Data? 3. Difference between SQL and NoSQL Topic 3: MongoDB 1. Introduction to MongoDB 2. Database Design for Document-Databases 3. Introduction to MongoDB Atlas (Cloud DBaaS) 4. Query MongoDB using Python (PyMongo) 5. Building data aggregation pipelines with Generative AI
Teaching and learning methods	Online: During the class, selected code examples are created or reviewed.

	Exercises enable you to deepen the learned content. Coaching: Hands on exercises on personal device (BYOD – Bring Your Own Device) Self-study: Students will need to complete some of the lab exercises individually between the lessons to ensure continuity in content the next time the class meets. For selected topics references to literature and videos will be provided. Other: Assessment 1 consists of an interactive online course "PyMongo Course" introducing MongoDB with Python. Assessment 2 consists of a personal project using open data and conducting analysis in MongoDB with Python.
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 80%
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	programming
Time	during the semester/block week
In group	No
Contribution to final grade	20 %
Electronic	no
Comments	Completing the interactive online "PyMongo Course" in accordance with the lecturer's instructions
Examination/assessment 2	
Type	practical examination/assessment
Format	project assignment
Time	during the semester/block week

Contribution to final grade	80 %
Electronic	no
Comments	Submission of a personal project applying MongoDB and Python knowledge in an in-depth data analysis

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_BDL03_1

Version: 1.0

Big Data in the Cloud

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_BDL03_2.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Block week	yes
Delivery / execution	Spring semester Autumn semester
Regularity of classes	block teaching
Module coordinator(s)	Dimitrios Marinos (dimitrios.marinos@hslu.ch)
Teaching language	English

Record

Record	The module is a direct continuation of the preceding modules and consolidates knowledge gained so far about using Python and databases. It includes various lab tasks to enhance the understanding, usage and also configuration of the Azure Data infrastructure. End to End usage from database to the actual application will allow the students to experience every touchpoint of the big data chain. Finally, the business part will enhance the value proposition allowing the participants to create a full project offering including the Delivery, Lifecycle and SLA perspective. The module is offered as a block week. For the completion of the course is not advised to use Generative AI solutions (e.g. ChatGPT). The exam is based on a team individual delivery with hands on development as well as a specific constructed documtation. For the planning, execution and orchestration of the course no Generative AI tool has been use (e.g. ChatGPT). The module focuses on creating awareness and hands-on knowledge on a real big data infrastructure environment while providing a holistic view on big data

	projects from offering to delivery stages. Students learn how to use current big data tools such as the entire Azure Data Factory chain, SQL, Python and Dashboarding (power BI or Tableau).

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	Students can configure, leverage, and interact with a given data lake structure and perform actions of data clearance and manipulation. Students will be introduced to the Azure environment and become familiar with the big data infrastructure elements while being able to configure and interact with some of them. Students will be able to interact with the big data lake given by the tutors using Python and finally project the data story on a dashboarding tool e.g. Power BI or Tableau. Students can determine which of the big data architecture is adequate for the requirements of a HSLU given project scope, deploy it and write a full offering package with pricing, lifecycle, and SLA coverage. Students will practice how to use the Azure and SQL for large data volume along with interactions using Python. Students will learn how to structure big data projects, deploy, price, and roll them out. Each team will have to present their big data project. Students will work together to complete a series of lab exercises. Presentation skills, negotiation attitude, technical judgement.
Learning content and structure	Topic 1: Big Data in Business 1. Understand the customer's (or our) big data requirements 2. Be able to compile offerings on big data projects based on market needs Topic 2: Data Handling 1. Use of cloud databased structures for big data repositories 2. Work hands on data lakes 3. Manipulate and clear the big data content and present a data map architecture Topic 3: Cloud Colverage 1. Leverage Azure for use with big data requirements 2. Learn the data factory and databricks principles 3. Configurate and setup full big data instance Topic 4: Data handling 1. Write Python to access and work on real data 2. Present them valuably on power BI or Tableau dashboard 3. Create a full deployment concept and offering from pricing to SLAs.
Teaching and learning methods	Classroom or Online: The lectures focus closely on the principles of Topics 1, 2, 3 and 4.

	Students will complete various lab exercises during class, discuss and develop solutions for some of them in small groups. Coaching: Will be given during the lab and exercises. Self-study: The lecturers will guide the students throughout the entire Big Data journey step by step. Students will need to study a documentation and install available online software in advance. Other: During the lab the students will work on real case exercises.
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	project assignment
Time	during the semester/block week
Contribution to final grade	100 %
Electronic	no

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_BDL03_2

Version: 1.0

Projekt-based Learning

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_BYD12.26
Type of module	C–Core Module
Module level	I-Intermediate level
ECTS credits	12
Module category	learning module (LM)
Workload	
Contact hours, in hrs	0.00
Supervised self-study, in hrs	0.00
Unsupervised self-study, in hrs	360.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	none
Module coordinator(s)	Patricia Feubli (patricia.feubli@hslu.ch)
Teaching language	English

Record

Record	The BYDO module is a practice-integrated, project-based learning format in which students work in interdisciplinary teams on real-world challenges from business or society. The project work takes place within structured learning boxes and is supported by academic and methodological coaching. The module aims at applying scientific methods and developing subject-specific, methodological, and transferable competencies.

Placement in the course of studies

Degree programme	Master of Science in Applied Information and Data Science

Module content

Learning content and structure	The learning contents of the BYDO module focus on addressing real-world, practice-oriented challenges provided by companies or public institutions. Students apply scientifically grounded methods as well as project management and innovation approaches, while strengthening their subject-specific and methodological competencies. In addition,

	transferable skills such as teamwork, communication, self-organization, and reflective learning are systematically developed.
Teaching and learning methods	The BYDO module is based on project-based and practice-integrated learning in cooperation with external project partners. Core teaching and learning methods include independent project work in interdisciplinary teams, research-based and problem-based learning, as well as continuous reflection on the learning process. Learning activities are supported through academic and methodological supervision in the form of coaching, mentoring, and feedback formats.

Assessed assignment

Grading scale	HSLU.bestanden-nicht bestanden

Created: 26/08/2026

Module code: W.MSCDAI_BYD12

Version: 1.0

Data Collection, Integration and Preprocessing

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_CIP02.26
Type of module	C–Core Module
Module level	I-Intermediate level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Andreas Melillo (andreas.melillo@hslu.ch) Ramón Christen (ramon.christen@hslu.ch)
Teaching language	English

Record

Record	The quality and integrity of data are essential in almost all contexts of data science. In this module, students will learn how to collect data from various sources and consolidate it for analytical purposes. The module includes guidance on using specific Python components, applying theories related to data preparation, and managing an effective data science process. Students can collect structured and unstructured data from various sources, properly integrate it into a self-designed process and present their findings appropriately. Concepts and methodologies presented in class are applied in a data science group project. The use of GPT or AI-Bots for learning purposes is actively encouraged. This module allows students to apply and extend the basic Python knowledge from the 'Python for Data Science' course in a self-designed project.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_PDS01 **and** W.MSCIDS_CSC01

Module content

Learning objectives	Based on the preceding courses "Python for Data Science" and "Computer Science Concepts for Data Scientists", students will design their own, real-world inspired process including standard data science tasks such as data collection, pre-processing, enrichment and presentation. Thereby, students will strengthen and extend their Python programming skills. Students develop their own research questions and answer them appropriately. Being able to carry out a feasibility study, derive a project plan and adjust the procedure, if necessary, is a crucial goal of the module. Students can collect large data volumes themselves, prepare and inspect the data properly, interpret and present the results adequately. Students are able to process data with state-of-the-art methods out of the Python toolbox. Students collaborate using git. Students learn how to properly document and visualize the results of their own data projects. Students learn to work in teams in a realistic scenario facing the situation of diverse backgrounds and varying levels of pre-knowledge and skills.
Learning content and structure	Topic 1: Data Acquisition 1. BeautifulSoup, Selenium, Request, API packages 2. Static and dynamic web-scraping 3. API introduction Topic 2: Cleansing and Pre-processing 1. Numpy, Pandas 2. Get to know python packages for adequate data cleaning and pre-processing Topic 3: From Storage to Webapps 1. Storage + File Formats 2. FastAPI 3. Streamlit + Dash Topic 4: Code + Visualization 1. Git Introduction 2. Scientific Visualisation
Teaching and learning methods	Classroom or online: Each topic is briefly introduced theoretically and complemented with specific examples and exercises in the first four weeks. Self-study: The self-study component comprises exercises that allow students to deepen their understanding of the topics discussed in class. Additionally, throughout the project time (second three weeks), students develop their skills according to the needs of their projects. Other:

	Project work: Students conduct a typical data science project comprising all the topics covered in the first four weeks. GPT / AI-Bots: The use of GPT/AI bots to support the comprehension of learning content for the project is permitted.
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: Weeks 1 - 4: Mandatory Weeks 5 - 7: Self-organized group work, option for group-wise lecturer support
Grading scale	HSLU.bestanden-nicht bestanden
Examination/assessment 1	
Type	practical examination/assessment
Format	project assignment
Time	during the semester/block week
Contribution to final grade	100 %
Electronic	no
Comments	Comprises "CIP Project": • Feasibility study • Final documentation/presentation • Github project

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_CIP02

Version: 1.0

Computer Science Concepts for Data Scientists

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_CSC01.26
Type of module	C–Core Module
Module level	I-Intermediate level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	40.00
Supervised self-study, in hrs	50.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Martin Zimmermann (martin.zimmermann@hslu.ch) Halldór Janetzko (halldor.janetzko@hslu.ch)
Teaching language	English

Record

Record	Information systems – including big data and all associated tasks – can never be anything other than hardware and software, both of which we encounter in virtually all aspects of modern life. Nevertheless, there are basic principles that play a key role in the design of these two components. This module examines these principles using examples (e.g. carrying out own analyses or manipulations with selected methods and IT tools). The topics and contents are carefully selected with a view to developing them further in the subsequent modules. Understand, describe and evaluate computer systems and networks in terms of their components and function; classify and describe application architectures; explain the properties of algorithms and be able to specify algorithms; understand and be able to apply the basic concepts of data processing and information visualization by using current tools and operating systems.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	Understand the basic structure of computer systems, the essential components and the tasks and functions of operating systems; describe how networks are designed and function by using the internet as an example, and to apply some general concepts; understand the principles of virtualization and cloud computing; classify and describe application architectures; explain the properties of algorithms and the most important data structures; understand and be able to apply the basic concepts of modern programming languages; understand and create simple data models; be able to apply data processing based on filters and pipes. Be able to examine a given computer system in terms of its components and performance data; compare various cloud systems; formulate simple algorithms and programs; integrate algorithms into a program; make the right choice for a given problem involving a rough application architecture (e.g. web application, native applications); create filters and pipes for data processing tasks; use appropriate visual variables and apply design principles for information visualization problems. Be able to independently find the necessary information for a given problem in the above-mentioned areas; be able to use Generative AI tools, e.g. for coding assistance, coding-related queries, step-by-step explanations, or explanations for solving data science problems. Exchange feedback with peers. Function effectively in the group. Study the topics independently. Monitor one's own motivation levels and get suitable support as needed; manage deadlines and schedules and be able to submit project work on time.
Learning content and structure	Topic 1: Computer systems and networks 1. Components and interfaces of computer systems 2. Tasks and architecture of operating systems 3. Design of networks (TCP/IP Model), several protocols 4. Virtualization 5. Cloud computing 6. Case studies: Developing a network (simulation) with switches and routers, Linux as virtual machine Topic 2: Algorithms and programming language concepts 1. General principles of software development 2. Classes of applications: Web applications, native applications, 3. From the problem to the program: Algorithms 4. Basic concepts of programming languages 5. Complexity of algorithms 6. Case study: Visual programming languages Topic 3: Data processing and information visualization

	1. Big data challenges: 5 Vs 2. Focus volume: Principles for working with big data 3. Shell introduction: SSH, Bash, folder, editors, Man-pages 4. Data processing (shell): pipe, cut, sort, join, grep, wc, etc. 5. Visualization concepts and techniques in Tableau 6. Case Study: Log file analysis
Teaching and learning methods	Classroom: Introduction to the module's design and the semester Discussion about self-study (e.g. flipped classroom) Presentation and discussion of the exercises Introduction to the project Coaching: Guided study of the literature Group exercises Group projects Self-study: Individual exam preparation Generative AI: Integration of Generative AI (GenAI) tools in various student learning activities, e.g.; Coding Assistance, i.e. coding-related queries, providing; Guidance on syntax (e.g. filter & pipes pattern in Linux); Explanations of computer science concepts, e.g., step-by-step explanations for solving data science problems; Writing assistance, e.g., improve writing skills by getting suggestions on grammar, style, and structure
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	individual examination
Time	end of semester/block week
Location	on-site/in-person
In group	No

Scope	60.00 Minute(s)
Contribution to final grade	67 %
Electronic	no
Comments	Closed book Aids: Two-page A4 document
Examination/assessment 2	
Type	practical examination/assessment
Format	project assignment
Time	during the semester/block week
Location	remote
In group	Optional
Scope	10.00 Minute(s)
Contribution to final grade	33 %
Electronic	no
Comments	All legitimate aids are permitted.

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_CSC01

Version: 1.0

Computational Language Technologies

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_CTA03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	weekly
Module coordinator(s)	Diego Antognini (diego.antognini@hslu.ch) Guang Lu (guang.lu@hslu.ch)
Teaching language	English

Record

Record	A large part of business information is only available as unstructured text data. This represents a challenge for computational processing. The analysis of text data has triggered the development of specialized methods at the intersection of Linguistics, Computer Science, and Machine Learning. These are commonly referred to as Natural Language Processing (NLP). NLP powers - among many other applications - information extraction from text, sentiment analysis, automatic text summarization, machine translation, speech recognition, text classification, and virtual assistants. This module introduces the main building blocks of a text understanding pipeline. It focuses on techniques applicable in a business context. In the first part of the course, we will learn how to access and analyze textual resources, discover interesting patterns, extract relevant information from text data. In the second, we will be focusing on deep learning in NLP and scratch the surface of recent advances in foundation models. Finally, a small introduction to large language models (GenAI) will be taught. Students will gain a foundational understanding in NLP methods and strategies. They will also learn to identify the strengths and weaknesses of the various technologies and frameworks.

	Students can build the main components of a Natural Language Processing pipeline and can apply the learned methods in various use cases. They are capable of presenting and visualizing analyses and findings in an informative and structured manner. Speech-to-text and text-to-speech will not be covered in this course. The assignment(s) will require students to use out-of-the-box Generative AI as part of their modeling. Generative AI will be used to highlight current problems and challenges of text generation. Synthetic datasets and examples will be generated using Generative AI.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_MPM02 **and** W.MSCIDS_CIP02

Module content

Learning objectives	Students can build the main components of a Natural Language Processing pipeline and can apply the learned methods in various use cases. They are capable of presenting and visualizing analyses and findings in an informative and structured manner. Founded knowledge in the areas: - Pre-processing - Full-text search - Bag-of-words model - Document classification - Word embeddings - Language models - Keyword extraction - Semantic analysis - Information extraction - Basics of neural networks and deep learning for NLP - Named entity recognition - Text summarization Studens can translate business use-cases into a NLP problem, and they can trade-off the different options for implementation. Understanding of each of the NLP steps from framing to implementing and evaluating.
Learning content and structure	Topic 1: Introduction to Natural Language Processing Pipeline & Linguistic Concepts The main NLP methods and common NLP tasks will be introduced. Benefits and challenges of NLP are discussed. We are going to refresh fundamental linguistic concepts and introduce an analytics pipeline to gain information from text. We will practice how to preprocess text in Python. Topic 2: Text Processing & Exploratory Text Analysis Focus of this block is on data discovery. We will learn how to scrape semi-structured data from Wikipedia. Exploratory text analysis is introduced, including summary statistics and data discovery. Text visualization skills will be refreshed/learned. Specific text analysis tasks will be discussed with code including named entity recognition, keywords

	extraction, sentiment analysis, and topic modelling. Topic 3: Representation learning Focus of the session is to obtain the ability to transform text into computer readable representations. We will learn about discrete and distributed vector representations and practice the transformation techniques. We will also train our very own, domain specific word embeddings. Topic 4: Similarity & Classification, Introduction to Deep Learning in NLP (NN + CNN) This session focusing on the understanding of core similarity/distance measures and their applicability. We will apply the learned techniques to build our first Text classification models. Evaluation of these models will be also a center of this session. We will also start introducing basic concepts of Deep Learning for NLP. Basics concepts of Deep Learning for NLP will be introduced with a focus on standard neural networks and convolutional neural networks. PyTorch, convolutions, and sentiment analysis using CNN will be practiced. Topic 5: Deep Learning in NLP (RNN + attention meachnism) Topic 6: Deep Learning in NLP (transformers and large language models) Topic 7: Deep Learning in NLP (large language models and advanced concepts)
Teaching and learning methods	Theory and practice
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	individual examination
Time	during the semester/block week
Contribution to final grade	75 %
Electronic	no
Examination/assessment 2	
Type	practical examination/assessment

Format	individual examination
Time	during the semester/block week
Location	remote
Contribution to final grade	25 %
Electronic	no

Created: 26/08/2026

Module code: W.MSCDAI_CTA03

Version: 1.0

Computer Vision

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_CVI03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	weekly
Module coordinator(s)	Aygul Zagidullina (aygul.zagidullina@hslu.ch) Safouane El Ghazouali (safouane.elghazouali@hslu.ch) Umberto Michelucci (umberto.michelucci@hslu.ch) Dimitris Mousadakos (dimitris.mousadakos@hslu.ch)
Teaching language	English

Record

Record	Computer vision has become ubiquitous in society, and there are numerous applied examples in fields such as image search, medicine, drones, apps, video surveillance and self-driving vehicles. The underlying principles for these uses are complex image recognition processes, such as image classification, localization and the detection of objects in images. In recent years, neural networks ("deep learning") have fundamentally changed the performance of image recognition systems. Students will learn how to implement, train, debug and optimize their own neural networks for image classification purposes and many more. Students are introduced to the newest methods and applications in the field of computer vision. They will be able to explain the problems relating to image recognition and algorithms (e.g. backpropagation) and to apply the technical steps for training and fine-tuning the networks. Students are able to explain and compare a range of deep learning

	methods for solving problems relating to image-based object classification. They are able to explain the underlying algorithms and technologies of these methods, select suitable options for a given data set, and explain their choice. Furthermore, they have the necessary practical experience in solving exemplary problem tasks of varying complexity, are able to explain the possibilities and limitations of the methods used, and can apply them to new image data sets. Students are able to deepen their understanding of the underlying technologies independently, follow developments in new research methods, and apply what they have learned.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_DPL03
Further entry requirements	The students should be have some basic to intermediate python programming skills. Skills that are useful but not mandatory (they will be covered if necessary during the course) are: the use of github and jupyter notebook. It is expected that the students have already studied deep learning and how to train basic neural networks.

Module content

Learning objectives	Students are able to explain the essential characteristics and peculiarities of image data. They are able to display image data, store it in different formats, and process and extract specific attributes from it. They can explain the most important machine learning issues and are familiar with the solution methods of machine learning that rely on neural networks. They are able to explain the theoretical principles of these methods in order to justify a particular type of use in an applied field. Students are able to independently assess whether a simple problem can be solved, select suitable steps and methods for doing so, and apply these steps and methods to the data. Students are able to explain the specific requirements, conditions and limits that apply to the methods used. They are able to summarize the historical development up to the latest state of research of the discipline and can anticipate the appropriate development steps accordingly. Students are able to reflect on and evaluate their own knowledge against the current level of expertise on technology. Students are able to explain the foundations, potential and limitations of Generative AI models. They are able to critically assess the correctness of the results provided by Generative AI models.

	Students are familiar with cutting-edge tools and can apply them accurately and efficiently to solve specific problems. Students are able to integrate Generative AI tools in the process of writing and implementing code. Students are able to present the analysis of image data correctly, coherently and vividly to expert and lay audiences.
Learning content and structure	Topic 1 — Motivation, history, and image fundamentals * Typical computer vision tasks and applications * Image representation and processing with NumPy/OpenCV * Images as NumPy arrays * Grayscale operations, filtering, morphology * Image quality improvement (denoising, smoothing, super-resolution concepts) * Color spaces and conversions * Compression basics and artifacts * Data-centric practice: datasets, annotation formats, augmentation, train/val/test splits, reproducibility Topic 2 — Core vision tasks and evaluation * Semantic segmentation, object localization/classification, instance segmentation * Performance metrics: F1-score, Dice, IoU, AP, mAP * Error analysis and practical model selection Topic 3 — Modern architectures for recognition, detection, and segmentation * CNN backbones and transfer learning * Vision Transformers and hybrid architectures * Detection paradigms * Two-stage detectors (R-CNN family) * One-stage detectors (YOLO/RetinaNet family) * Transformer-based detectors (DETR-style) * Segmentation paradigms * U-Net and HRNet * Transformer-based segmentation * Promptable segmentation and interactive workflows (SAM-style concepts) Topic 4 — Generative and multimodal vision * Variational Autoencoders (VAEs) * Generative Adversarial Networks (GANs) * Diffusion-based generative models (concepts and applications) * Neural style transfer and DeepDream * Vision–language models: contrastive pretraining (CLIP-style), captioning, grounding, and multimodal assistants Topic 5 — Application and project work * Lab: object detection and classification on videos recorded by IoT devices * Course project: implementation and evaluation of a state-of-the-art computer vision task with final presentation
Teaching and learning methods	Classroom: Short lectures on the theory, followed by applied examples (prepared programming examples to be supplemented) individually or in groups.
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically

	oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication.

Assessed assignment

Admission requirements, end-of-module exam	Partial Attendance is mandatory. To pass the course at least 80% of presence is mandatory. Lectures will be recorded. WARNING: the lecture are not optimised for the recording, and thus using only the recording will offer a less optimal learning environment.
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	oral examination/assessment
Format	project assignment
Time	end of semester/block week
Scope	30.00 Minute(s)
Contribution to final grade	100 %
Electronic	yes
Comments	Presentation of project work

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_CVI03

Version: 1.0

Scientific Writing and Presentation Skills – Input and Coaching

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_CW03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	42.00
Supervised self-study, in hrs	48.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Martin Gutmann (martin.gutmann@hslu.ch)
Teaching language	English

Record

Record	This module is designed to support students during their Preliminary Thesis writing and to build their scientific and professional communication skills. The module provides input on oral and written communication skills and coaching, including in the context of the student's thesis project. As such, this module focuses on what it takes to communicate particular knowledge comprehensibly and convincingly to a professional audience in English. The module structure is as follows: - Two inputs on professional presentation - Two inputs on scientific writing - Coaching sessions on professional presentation (group or individual) - Coaching sessions on scientific writing (group or individual) The input and coaching sessions on scientific writing will be offered in English AND German (when enough students register). The presentation input is offered in English only. Students can choose the language (English or German) of their

	Preliminary Master's Thesis and presentation.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Further entry requirements	Enrollment in the Preliminary Master's Thesis Please note that because this module relates directly to and assesses students on the Preliminary Master's Thesis, it is not possible to participate in this module without simultaneously writing the Preliminary Master's Thesis. If a student in the module receives permission from the IDS program management to postpone the submission of their Preliminary Thesis, the assessment for this module will also be postponed until the following semester.

Module content

Learning objectives	Students understand the basic forms of scientific writing. Students understand the APA citation standards. Students are able to systematically plan, structure, write and edit scientific texts. Students are able to communicate scientific content by using a range of written and oral formats. Students are able to analyze, define and meet the expectations of the audience of their professional presentations. Students are able to design and visualize culturally appropriate presentation content. Students are able to hold a well-structured and convincing professional presentation. Students are able to identify the main aspects of a task involving the communication of scientific content in a formal scientific context (writing) and business context (presentation). Students are able to apply the important tools, including generative AI, for researching, preparing and presenting scientific content. Students are able to consider Anglo-American expectations when designing convincing presentations. Students understand the appropriate language and cultural conventions for communicating scientific content in written and spoken form. Students understand that stakeholder needs and culture-based expectations must be defined and met. Students are able to reflect on the presentation style specific to their culture.
Learning content and structure	Topic 1: Style Style characteristics of scientific writing in English and German (depending on student's language choice) Success factors in preparing an international, professional presentation

	in English Topic 2: Planning Planning, structuring, editing, and revising scientific texts, as well as language norms and conventions in scientific writing Structure, elements, visualization and choreography of scientific presentations in international settings Topic 3: Success factors Understanding the success factors in situations where effective spoken language counts Topic 4: Spoken communication Forms of spoken communication: Presentation (defense of the Master's Thesis, contribution at a conference, business meetings, etc.) Topic 5: Anglo-American conventions Applying Anglo-American conventions as encountered in a range of scientific settings
Teaching and learning methods	Classroom: Four initial input sessions followed by training and coaching Coaching: Coaching for the two assessments Self-study: Studying the literature, planning, writing, designing presentations including appropriate visualizations
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.bestanden-nicht bestanden
Examination/assessment 1	
Type	written examination/assessment
Format	documentation
Time	during the semester/block week
In group	No
Contribution to final grade	50 %
Electronic	no

Comments	Preliminary study for the Master's Thesis (scientific writing)
Examination/assessment 2	
Type	oral examination/assessment
Format	presentation
Time	during the semester/block week
Scope	8.00 Minute(s)
Contribution to final grade	50 %
Electronic	no
Comments	Recorded Presentation (narrated Power Point) of component of preliminary Master’s Thesis (due in week 14 of semester)

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_CW03

Version: 1.0

Database Management for Data Scientists

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DBM02.26
Type of module	C–Core Module
Module level	I-Intermediate level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Luis Terán (luis.teran@hslu.ch)
Teaching language	English

Record

Record	The field of data science continues to gain popularity as ever-increasing volumes of detailed and valuable data are being generated for analyses. These structured data collections are called databases. Database management systems (DBMS) simplify working with large data quantities by providing tools for structuring, storing, manipulating and retrieving data in packages. These can be linked to analytical tools for processing large data collections that exceed the capacity of the main memory. In this module, students gain comprehensive knowledge of how to use relational databases and SQL. Enable data scientists to use appropriate tools with which to manage (structure, load, manipulate, query, analyze, secure, visualize) large data collections in database systems. The module group fully ensures coordination between data integration and DBMS.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_CSC01 **and** W.MSCIDS_PDS01

Module content

Learning objectives	Plan a database application for decision support and value creation from data. Install and operate an SQL database server. Define a database structure in SQL based on a database model derived from data sources. Load data into a database server efficiently, and transform the data according to the target structure. Perform a data analysis (descriptive statistics) with SQL Queries. Optimize the runtime of SQL Queries by analyzing the optimizer's execution plan using materialized views, indexes, and subsampling. Visualize the result of SQL queries in an interactive dashboard to support decisions. Solve a technical problem in a group. Achieve a project goal during the semester. Research independently the information necessary for solving a self-chosen problem by integrating database systems and data analysis in decision making. Present a project status to an audience. Exchange feedback with peers. Write a project report. Work together effectively in the team. Be able to work on topics on one's own and gauge and further develop the ability to learn independently. Submit results on time and further develop the ability to manage workloads and deadlines independently as needed.
Learning content and structure	Topic 1: Database Management 1. The concept of DBMS 2. The advantage of using DBMS for big data 3. How to create value from big data 4. How to plan a database application for decision support 5. Installing and operating an SQL database server 6. Introduction to the project Topic 2: Database Modeling 1. The entity-relationship model 2. The relational model 3. Normal forms 4. SQL DDL (CREATE TABLE …)

	Topic 3: Database Integration 1. SQL DML (INSERT, UPDATE, DELETE) 2. Comparing ETL and ELT 3. Loading large volumes of data efficiently (LOAD) 4. Data Transformation with SQL (INSERT INTO … SELECT…) Topic 4: Database Analysis 1. SQL DQL (SELECT … FROM … WHERE) 2. Views (CREATE VIEW … AS SELECT …) 3. Joining Tables (JOIN … ON) 4. Aggregating data (COUNT, SUM, AVG, MIN, MAX) 5. Subqueries (WHERE … IN (SELECT …)) 6. Grouping statistics (GROUP BY) 7. Ordering results (ORDER BY) 8. Limiting results (LIMIT) 9. Generating SQL queries with Copilot Topic 5: Database Optimization 1. Analyzing the execution plan (EXPLAIN SELECT …) 2. Materialized Views (CREATE TABLE … AS SELECT …) 3. Indexes (CREATE INDEX …) Topic 6: Database Visualization 1. Setting up and running a Metabase BI dashboard 2. Connecting the BI-Tool to the database server 3. Getting data to the dashboard using an SQL query 4. Configuring a visualization 5. Interpreting the result for decision support
Teaching and learning methods	Classroom: Organizational questions Summary of video lectures and book reading Interaction in the format of the teaching conversation Student presentations of exercises Student presentations of project status Feedback and advice Questions and answers Coaching: Team exercises on all course contents (1 per session) 1 Semester project over all sessions Project report Self-study: Watching Video Lectures Reading the Book “SQL & NoSQL Databases” Other: Team work on the semester-project
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult

	individual, societal, and international business team situations.

Agenda

Data Management	
	Plan a database application for decision support and value creation from data.
Database Modelling	
	Define a database structure in SQL based on a database model derived from data sources.
Database Integration	
	Install and operate an SQL database server. Load data into a database server efficiently, and transform the data according to the target structure.
Project Coaching	
	Project work & coaching session. During this session, all teams are expected to present ther current project status to the lecturer individually to receive feedback.
Database Analytics	
	Perform a data analysis (descriptive statistics) with SQL Queries.
Database Performance	
	Optimize the runtime of SQL Queries by analyzing the optimizer's execution plan using materialized views, and indexes.
Database Visualization	
	Visualize the result of SQL queries in an interactive dashboard to support decisions.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	project assignment
Time	during the semester/block week
In group	No
Contribution to final grade	49 %
Electronic	no
Comments	Project work with a SQL DB: Max. 40 pages, The report must satisfy all 6 criteria communicated at the beginning of the course.
Examination/assessment 2	

Type	written examination/assessment
Format	individual examination
Time	end of semester/block week
Scope	60.00 Minute(s)
Contribution to final grade	51 %
Electronic	no
Comments	closed book

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DBM02

Version: 1.0

Design of Data Experiments

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DDE01.26
Type of module	C–Core Module
Module level	I-Intermediate level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	weekly
Module coordinator(s)	Lukas Schmid (lukas.schmid.02@hslu.ch)
Teaching language	English

Record

Record	In this course, students will acquire core competencies in data analysis. In the first part, the course introduces scientific methods, relationships between variables, sampling strategies, and threats to internal validity. In the second part, students will learn about different types of experiments and methods, as well as how to conduct and analyze data from experimental designs. The lectures are accompanied by tutorials in which students solve practical exercises.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	Students are able to apply the design of experiments to their own quantitative research projects. Students have an accurate sense of the possibilities and limitations of the design of experiments and are able to select

	methods appropriate for the problem and apply them in a solution-oriented manner. Students understand the methods of the design of experiments at the desired level. Students are able to conduct basic type of ANOVA, multi-factorial designs, randomization inference, power calculations, and randomization to treatment groups using the software R. Students are able to correctly apply the specific language of the design of experiments in reports, etc. Students are able to reflect on their skills in the design of experiments in the context of communication and interaction. Students are able to vary the form and content of their communication based on the situation with team members, customers, etc. Students reflect on their skills when using the design of experiments.
Learning content and structure	Topic 1: Introduction to scientific methods and the relationship between variables: Introduction to scientific methods, difference between qualitative and quantitative research, causal graphs, types of variables and relationship between variables, data types Topic 2: Sampling: Anecdotal evidence, idea of sampling, estimator and estimate, sampling techniques, internal and external validity Topic 3: Threats to internal validity: Confounders, reverse causality, misspecification of functional form, placebo effect, non-compliance, attrition, spillover effects, Hawthorne effect, John Henry effect Topic 4: Introduction to experiments: Experimental versus observational research, types of experiments, potential outcome framework, Stable Unit Treatment Value Assumption Topic 5: Analyzing experiments with two treatments: Manipulation, causal estimands, characteristics of experiments, randomization, correlation vs. causal effects, balance tests, treatment effect estimation, classical statistical inference, relationship statistical tests and confidence interval Topic 6: Analyzing experiments with more than two treatments: Analysis of Variance, Bonferroni Correction, factorial designs, conjoint experiments Topic 7: Implementation of an experiment: Design of the study, power calculation, ethics application and pre-registration, treatment randomization types, stratified experiments General Topic: Generative AI This is a compulsory module. Therefore Generative AI (GenAI) may not be used in the final exam. Accordingly, the learning content is independent of the use of GenAI. However, selected examples of the use of GenAI will be shown and commented on in the lectures and exercises.
Teaching and learning methods	Classroom: Form: Presentation of lecture notes The content of the lecture notes is question-developing using examples. The lecture notes are stored electronically.

	Coaching and Tutorials: Form: Tutorial Students solve applied problems and; Students work through applied problems and questions in exercises. The students are accompanied by the lecturers and assistants coaching the students. Students are expected to use the suggested solutions to evaluate their own solutions and learn from the differences and, if necessary, mistakes. Self-study: Independent self-study
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	individual examination
Time	end of semester/block week
In group	No
Scope	60.00 Minute(s)
Contribution to final grade	100 %
Electronic	no
Comments	The exam period specified in the notification is 90 minutes because it includes time for the preparatory work and submission.

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DDE01

Version: 1.0

Customer Data Analytics

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DE_CRA01.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	weekly
Module coordinator(s)	Dominik Georgi (dominik.georgi@hslu.ch) Ingo Gächter (ingo.gaechter@hslu.ch)
Teaching language	English

Record

Record	The "Domain Experience: Customer Analytics" module familiarizes students with applied data science in the context of customer data analysis and new opportunities with generative AI (Artificial Intelligence). Many companies collect a broad range of customer data (e.g. transaction data, personal data, behavioral data) for the purpose of analyzing customer relationships and business opportunities. The module initially provides an overview of the possibilities of customer analytics. Students have the opportunity to work on real-life analyses as part of a group project, where they are given a clearly defined problem, work with customer data, and receive the support they need in conducting the analysis. The lecturers of Lucerne School of Business and data science experts from the applied fields support the project.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	Students are able to conduct big-data analyses to contribute substantially to how customer experiences and relationships are managed. Experimenting with data science- and AI models to forecast and visualize business results. Students are able to carry out quantitative analyses based on given data from real markets in order to arrive at specific conclusions for an operational purpose. They are able to employ the help of Generative AI Models for ideation and implementation (e.g. code generation). Students are able to evaluate whether a certain question can be addressed by using the given data and possibly adjust the question and/or alter the data's structure with a view to applying data science methods or AI models to best serve the purpose at hand. Students are familiar with a range of methods and AI used in customer analytics. Students are able to visualize data and explain the results of their analyses comprehensibly and plausibly. Students are able to work with others independently to complete a project based on what they have learned. Students are aware of their limitations and know when they have reached a dead end, and they are able to use strategies to discover new approaches (new AI opportunities, contacts with experts, internet forums, creativity techniques, etc.).
Learning content and structure	Principles: Understand the relevance of data science and AI for managing customer experiences and customer relationships. Overview: Overview of the role of data and AI in the field of customer analytics: CRM data, customer data, transaction data, customer touchpoint data, social media data, web analytics data, public and open source data. Analysis framework: Approaches to customer analytics issues, basic analysis framework with drivers as independent variables and customer behavior as dependent variable. Use cases: Use cases involving customer analytics: (1) Customer experience management and new opportunities with AI: Customer journey, (2) customer relationship management: Customer acquisition, customer loyalty (e.g. churn prognosis), customer development (e.g. cross-selling potential analysis, next-product-to-buy analyses). Specific uses : Use of customer analytics in a specific use case (case work in groups). Presentation: Presentation of group projects.
Teaching and learning methods	Discussion-based lessons with current examples and applications (Classroom), Coaching lessons with lecturers / practice partners (Coaching), Presentation of the group work (Coaching), Familiarization with the methodology (Self-Study), Working together as a group on a case, possibly with external partners from an applied field (Other)
Literature, teaching materials, resources	

Database	data
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	oral examination/assessment
Format	presentation
Time	during the semester/block week
In group	Yes
Scope	30.00 Minute(s)
Contribution to final grade	100 %
Electronic	no
Comments	German or English (free of choice)

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DE_CRA01

Version: 1.0

Data Analytics for Energy Systems and IoT

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DE_DAE01.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	weekly
Module coordinator(s)	Philipp Schütz (philipp.schuetz@hslu.ch)
Teaching language	English

Record

Record	In the near future, energy systems will have to cope with numerous challenges (e.g. grid stabilization against power peaks of solar energy and electromobility, increasing grid maintenance costs, etc.). In addition, more and more data on consumer and user behavior is becoming available. This module focuses on sample applications that make it possible to develop new business models to ensure a reliable, cost-effective and environmentally friendly energy supply in the future. Students analyse different panel and time series data of energy systems and IoT devices. For this purpose, they will develop models for classifying, monitoring and predicting the behavior of such systems at a given time.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	Students understand the main terms used in the context of energy systems and IoT technologies and are aware of the current problems. Students understand different methods for modeling target values based on metadata and panel data, anomaly/state detection, and for modeling of time-dependent signals. Students are able to compare different methods with regard to their suitability for solving an existing problem. Students may use generative AI technology for inspiration on solutions, code generation and to increase the quality of their deliverables (presentation, documentation) Students are able to identify appropriate methods for solving a new analytical problem and to apply them and evaluate the results. Students are able to apply the presented methods to new data and interpret the results of the statistical package they used. Students are able to jointly identify and apply different methods to solve a problem and evaluate the results of their fellow students. Students are able to evaluate the results of externally analyzed data in terms of their plausibility and choice of methods. Students are able to independently research additional forecasting methods for a given task and learn to use them of their own accord.
Learning content and structure	Topic 1: The principles of energy systems and use in Switzerland 1. Energy requirements of Switzerland 2. Overview of supply infrastructure and grids 3. Structure of the national electricity grid 4. Challenges of load balancing Topic 2: Collecting energy system data 1. Different data sources and monitoring procedures 2. Case example on collecting online data Topic 3: Remote diagnosis of bulk consumers / smart maintenance 1. Monitoring the condition of heating systems by using heat pumps as an example 2. Anomaly detection for bulk consumers Topic 4: Estimating residential energy demand 1. Linear regression models for panel data 2. Sensitivity analysis for system and environmental properties 3. Modeling of various consumer types Topic 5: Load forecasting 1. Time series models (autoregression, moving average, ARMA, ARIMA) 2. (deep) neuronal network models to predict the consumption time series Topic 6: Internet of things 1. Data acquisition with IoT devices 2. Analysis of IoT data in practice
Teaching and learning methods	Classroom: Discussion-based lessons Coaching: Exercises to further explore and apply the theory by means of problem-

	based learning Self-study: Exercises to further explore and apply the theory by means of an own case study
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	oral examination/assessment
Format	presentation
Time	during the semester/block week
In group	Yes
Scope	10.00 Minute(s)
Contribution to final grade	10 %
Electronic	no
Comments	
Examination/assessment 2	
Type	written examination/assessment
Format	individual examination
Time	end of semester/block week
In group	No
Scope	60.00 Minute(s)
Contribution to final grade	90 %
Electronic	no

Created: 26/08/2026

Module code: W.MSCDAI_DE_DAE01

Version: 1.0

Fraud Detection

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DE_FRD01.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Peter E. Fischer (peter.e.fischer@hslu.ch)
Teaching language	English

Record

Record	MODULE CONCEPT The progress in digitalization and more persistent threats (e. g. cybercrime) contribute to increasing fraud with simpler technical effort, but more difficult to identify and mitigate. To protect the value of data analyses, it is vital to fight fraud with appropriate strategies, tools, solutions and processes at high quality. In this module, the students will be inducted to the requirements and technologies needed for successful detection of and protection against fraud (e.g. in the financial industry like insurances and banks). The learning blocks consist of introductory lectures leading teams of students to in-depth understanding that is shared within and across the teams. A lab exercise will provide hands-on experience, so students are prepared to implement their knowledge in practice. OVERALL OBJECTIVES - Digest fraud detection methodologies

	incl. information security and risk management. - Gain practical experience in analyzing data related to fraud detection and setup appropriate strategies, systems and procedures. - Understand the importance of awareness in information security, risk management and dealing with fraud. - Get to know basic IT forensics. VIDEO INTRODUCTION https://frd.pefis.info/

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Further entry requirements	Preferably first or second semester. -> Delivers high potential for interesting Master Theses! Interested? -> Contact peter.e.fischer@hslu.ch

Module content

Learning objectives	PROFESSIONAL SKILLS - Broad knowledge about requirements, strategies, tools, solutions, implementation of protection against fraud - Insight in related topics like information security, risk management, basic forensics, incident response and knowledge management PROBLEM-SOLVING AND CRITICAL THINKING - Analytical thinking - Problem recognition, structuring and solving - Decision-making processes METHOD SKILLS - Fraud Detection Strategies - Digital Analytics - Value Propositions - System Design - Design Thinking, Prototyping, Testing and Re-Engineering - Effective use of GenAI COMMUNICATION SKILLS - Written and oral interaction, active listening - "Language" of the industry - Professional documentation, presentations, and defense INTERPERSONAL SKILLS - Teamwork - Reflections and finding of compromises - Working under sub-optimal conditions (e.g. online) - Negotiations and decision making

	PERSONAL SKILLS - Self-esteem - Analytical and synthetical thinking - Structured reasoning and processing - Dedication, effectivity, and efficiency
Learning content and structure	Topic 1: Introduction Definitions, requirements, basics, security, vulnerabilities, threats, risks, motivation Topic 2: Strategies Basics, fraud detection techniques, artificial intelligence, machine learning Topic 3: Tools Security operations, protection & counter defeat, Incident Response & IT Forensics processes Topic 4: Solutions Successful platforms, products, suppliers, evaluation options, service providers Topic 5: Lab Exercise Hands-on fraud detection, analysis with a simple Fraud Detection engine, guided by expert Topic 6: Guest Lecture Challenges, approaches and experiences in detection from an expert in the field Topic 7: Presentations Students' term papers (either in week 7 of the semester, as mid-term or in the exam period, depending on public holidays etc.)
Teaching and learning methods	Classroom: Dialog oriented lectures and (group) discussions Coaching: Team work to elaborate depth into topics, creation of content for term papers (formatted as wikis) Self-study: Generic and topic-specific deepening with publicly available literature Design Thinking for MSc Thesis, personal reflection
Literature, teaching materials, resources	
Video	https://frd.pefis.info/ In this lecturer testimonial, Prof. Dr. Peter E. Fischer presents the Fraud Detection Domain Experience module, addressing one of today's most pressing challenges: combating fraud in sectors such as banking and insurance. Students learn advanced strategies, tools, and processes to detect and prevent fraud, gaining hands-on experience in AI, IT

	forensics, and risk management. The module also develops critical skills like analytical thinking, professional communication, and innovative problem solving – preparing graduates to protect valuable data assets and create impactful solutions.\
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: > 80%
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	project/seminar paper
Time	during the semester/block week
Location	remote
In group	Yes
Scope	40000.00 Characters
Contribution to final grade	80 %
Electronic	no
Comments	In teams of about four, students draft a term paper in the format of an online wiki to digest lectures' content and a deep dive about a personal topic.
Evaluation criteria	CONTENT (40%) - All relevant aspects of Fraud Detection are covered - The findings are correct and comprehensible and reflect the state of the art - Information is critically assessed, structured and weighted - The objectives are reached and critically reflected - A personal reflexion summarizes the lessons learned METHODOLOGY (20%)

	- A good methodology and approach has been chosen and applied - The approach is critically reflected - The sources are relevant and cited correctly QUALITY AND FORM (20%) - Error-free scientific language and style - High-quality format, graphics, tables etc. - Correct terminology - Adequate structure with guides like, table of content, abbreviations, references etc.
Examination/assessment 2	
Type	oral examination/assessment
Format	presentation
Time	during the semester/block week
Location	on-site/in-person
In group	Yes
Scope	5.00 Minute(s)
Contribution to final grade	20 %
Electronic	no
Comments	At the end of the module, the teams present their personal deep dives in five-minute (per team member) pitches in a team presentation. Questions from the audience and the professor challenge the defenses and give opportunities to demonstrate achieved competences.
Evaluation criteria	PRESENTATION (20%) - Focus on explaining approach, structure and main specific findings - Good english language, presentation, body language, eye contact, stimulance. - Defence clarifies open issues and demonstrates competence.

Comments

Comments	The implementation modalities may be adjusted by announcing the conditions for the module examinations (all details published in the Fraud Detection Ilias section).

Created: 26/08/2026

Module code: W.MSCDAI_DE_FRD01

Version: 1.0

Geospatial Data Analysis for Smart Communities

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DE_GD01.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	weekly
Module coordinator(s)	Timo Ohnmacht (timo.ohnmacht@hslu.ch)
Teaching language	English

Record

Record	In the course of globally advancing digitalization, more and more extensive data worlds are being created that pertain to particular locations. This includes, for example, information relating to municipal boundaries, postcodes, hectares, or point data (coordinates) as used in a wide range of spatial, mobility and societal contexts. But how can space be captured in data in the first place? What is the point of visualizing the differences between urban and rural populations in the form of thematic maps? And what is the benefit of analyzing the patterns of mobile phone movements? Such questions play a particularly important role in smart cities and smart communities, which include more than a merely urban context. The geospatial Data Analysis for Smart Communities module introduces students to the principles and variety of spatial data used in Switzerland. Its aim is to enable students to use spatial data in order to create simple, personal cartographic representations in connection with mobility as well as spatial and societal aspects. Students will use their own maps to evaluate the differences and dynamics in georeferenced data and to formulate and evaluate the goals and potentials of smart communities. Generative AI tools offer various possibilities to generate geographic

	data. AI commands can be used to generate data, e.g. sending a prompt (user input), such as: "Can you generate a comma-delimited table of latitude, longitude, and city name for 10 greatest cities in Switzerland?" AI will return Data that can be further processed and validated with QGIS or Tableau. Results and data sources that are generated with AI must be highlighted in the term paper. Students have an overview of the type and variety of spatial data available in Switzerland and of the applications used for processing such data. They are able to use the data to make statements about spatial or social trends.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	They are able to prepare simple spatial data and convert it into simple thematic maps by relying on various background maps to make the new version (e.g. alpine relief, lakes, rivers, borders) more attractive visually. They are able to interpret the data in the context of smart communities. They are able to link all of the various types of georeferencing data (Swiss national coordinates, WGS-84 etc.). They understand visualization of data as a means of communication and can evaluate its success. They are able to complete a project based on what they have learned and without external help. They are able to gauge the opportunities, risks and problems of the results while working in groups. Students have an overview of the type and variety of spatial data available in Switzerland and of the applications used for processing such data. They are able to use the data to make statements about spatial or social trends.
Learning content and structure	Topic 1: Principles of the topic Significance and potential of data and its implications for smart communities. The topic aims to further build awareness of smart communities and their effect on society, politics and the environment. Topic 2: Principles of georeferencing Participants will use databases and statistics to learn about different types of underlying data and to examine the possibilities derived from the use of such material. Topic 3: Simulations Participants will use a range of models (FaLC, Senozon, 3D model of the city of Lucerne) to develop simulations for practical purposes and to define specific areas of application. Topic 4: Movement patterns

	The topic examines the general conditions, possibilities and limits of the technology based on the example of mobile phone location signals. Topic 5: Examples of spatial data used for political purposes The topic highlights the role of data in understanding and planning mobility concepts, developing and accessing particular locations, designing transport infrastructure, and completing regional development projects. Topic 6: Data preparation Cartographic representations with QGis and data preparation with R: An introduction to the instruments used in the supervised term paper.
Teaching and learning methods	Classroom: Discussion-based lessons with current examples and applications Coaching: Preparations for the lessons and solving case examples or other tasks Self-study: Written group work
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	project/seminar paper
Time	during the semester/block week
Scope	2.00 Page(s)
Contribution to final grade	30 %
Electronic	no
Comments	concept for the term paper in German or English (free of choice)
Examination/assessment 2	
Type	written examination/assessment
Format	project/seminar paper

Time	during the semester/block week
In group	Yes
Scope	10.00 Page(s)
Contribution to final grade	70 %
Electronic	no
Comments	supervised term paper in groups of up to four in German or English (free of choice)

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DE_GD01

Version: 1.0

Data Science in Health Care

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DE_HEA01.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Philip Hochuli (philip.hochuli@hslu.ch)
Teaching language	English

Record

Record	Why health care? There are both economic and non-economic reasons why we should all be interested in health care. From an economic perspective, Switzerland's health care expenditures per person have grown by 2.5% on average each year since 1996 [1], making health insurance less and less affordable to individuals. Also, in an international comparison, Switzerland ranks second in the OECD's list of per capita health expenditures [2]. From a non-economic perspective, we have important health issues to solve such as antibiotic resistances, adverse drug reactions due to inappropriate medication, or chronic diseases. For example, over 50% of all adults suffer from at least one chronic disease, and over 20% of them suffer from at least two [3]. Why data science in health care? Data science can play a decisive role in improving both the efficiency and quality of health care systems. In particular, data science can play a decisive role in fighting diseases such as cancer, improving digitization of services (e.g. "digital doctors"), developing effective prevention policies, and even in improving fraud detection. Therefore, there are many reasons why you should be excited to become a data scientist in health care! By working as a data scientist in health care, you can have a huge impact on people's lives and on the system's efficiency.

	References: [1] BFS - Ausgaben für das Gesundheitswesen https://www.bfs.admin.ch/bfs/de/home/statistiken/querschnittsthemen/wohlfahrtsmessung/alle-indikatoren/gesellschaft/gesundheitsausgaben.html (accessed Nov 26, 2022) [2] OECD. 2019. Health Spending. Available at https://data.oecd.org/healthres/health-spending.htm (accessed June 6, 2021) [3] Boersma, Peter. "Prevalence of Multiple Chronic Conditions Among US Adults, 2018." Preventing Chronic Disease17 (2020). https://doi.org/10.5888/pcd17.200130.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_SA01

Module content

Learning objectives	Understand major topics in data science in health care. Be familiar with different sources of data from health care. Be able to prepare a data set for analysis. Be able to select and apply analytical methods for extracting information from data. Students should be able to break down an analytical question into manageable parts and analyze them iteratively to answer the original, more complex question. They should also be able to identify the strengths and weaknesses of their own work. Students should be able to present their work to an attentive audience. They should be able to communicate the purpose of their work, the approach, the main results of the analyses, and the conclusions. Students should be able to solve a complex data science question collaboratively as a group.
Learning content and structure	Topic 1: Data Science in Health Care 1. Role and importance of data science in health care 2. Different applications of data science to health care Topic 2: Working with Data 1. Introduction to various data sources from health care. 2. Understand how to handle missing data points. 3. Process and cleanse data independently by means of structured procedures and supported decisions. 4. Document and justify the selected procedure. 5. Understand that data preparation is a critical step in the data science pipeline and that careful preparation is the basis for meaningful analyses. Topic 3: Generative AI (GenAI) The module offers excellent opportunities to use generative AI to make your own work more effective: 1. Use GenAI to improve your preliminary study, e.g. to obtain hints regarding its readability.

	2. Use GenAI to improve your presentation. 3. Use GenAI to optimize your code, e.g. to comment it and/or discover weaknesses. Topic 4: Presentation 1. Summary and presentation of the results 2. Evaluate the implications and formulating recommendations
Teaching and learning methods	Classroom: Dicussion-based lessons Coaching: Project-work to further explore and apply the theory by means of an own case study Self-study: Project-work to further explore and apply the theory by means of an own case study
Literature, teaching materials, resources	
Material(s)	Learning materials including links to sources will be provided as part of the lecture.
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 80%
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	research project
Time	during the semester/block week
Location	remote
In group	Yes
Scope	2.00 Page(s)
Contribution to final grade	30 %
Electronic	yes
Comments	Preliminary study for your main project (in groups of 2 - 4).

	As in the case of your Master's Thesis, this module also requires you to submit a preliminary study for your data project. The study should describe (among other things) the objectives of your work and the planned procedures. Detailed requirements will be given during the lecture.
Examination/assessment 2	
Type	oral examination/assessment
Format	presentation
Time	during the semester/block week
In group	Yes
Scope	15.00 Minute(s)
Contribution to final grade	70 %
Electronic	no
Comments	Data science project based on a data set from the health care sector. Grading will be based on a presentation of your project. Detailed requirements will be given during the lecture.

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DE_HEA01

Version: 1.0

Data-Driven Supply Chain Management (SCM) and Logistics

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DE_LOG01.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	weekly
Module coordinator(s)	Uta Jüttner (uta.juettner@hslu.ch)
Teaching language	English

Record

Record	In this module, students will learn about the role of information research and data science for global supply networks and logistics. They will recognize how the increase of real-time information flows from raw material supplier to the final consumer enables data analyses which support strategic and perational decision making within and across organisations. After an initial introduction to the topic of Supply Chain Management and Logistics, students will work on real-life data sets brought into the classroom by the two practitioner lecturers from Kühne + Nagel as well as Bossard. They will be given clearly defined problems, work with the companies' logistics and supply chain data and receive the support they need in conducting the analysis and presenting their proposed solutions. Students generate managerial insight concerning the design of more sustainable, resilient and efficient supply chain and logistics processes by analysing small and large data sets.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_SA01 **and** W.MSCIDS_PDS01

Module content

Learning objectives	They are able to carry out quantitative analyses of given data as a basis for improving the supply network design and processes. Students identify the required input parameters, assess the influence of the parameters and/or optimize the parameterization in order to solve supply chain process-related business issues. They are familiar with selected, use case- and hence problem-specific methods used in SCM and logistics. They visualize the key insights from their data analyses and derive and synthesise the most important implications for decision making. They recognize and acknowledge the positive and/or negative stress that the work with practitioners on real business challenges may impose on group dynamics and integrate mitigating measures.
Learning content and structure	Topic 1: Motivation and history Students acknowledge that the way companies in supply chains go to market and the very way supply chains compete is being transformed through digitisation of information. Topic 2: Core concepts and methods 1. Introduction to supply chain management and logistics 2. Supply network resilience 3. Network modelling 4. Smart logistics service design Topic 3: Advanced topics Data analysis methods to support the core topics above (supply network resilience, network modelling, smart logistics service design). Topic 4: Application Three use cases: Two real life from Kühne + Nagel and Bossard and one from a telecom industry
Teaching and learning methods	Classroom: Discussion-based lessons with classic concepts as well as topical subjects and real company issues Coaching: Coaching with University and Practitioner lecturers Self-study: Background reading concerning the domain and its characteristics as well as the core concepts covered in the classroom Background reading on the companies and use cases covered in the module
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically

	oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 80%
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	presentation
Time	during the semester/block week
Location	on-site/in-person
In group	Yes
Scope	35.00 Minute(s)
Contribution to final grade	40 %
Electronic	no
Comments	Within the framework of the group project, two out of the following three topics covered in the module must be analysed and reflected upon with the help of the group assignment: - Inventory Management and Optimisation - Smart Logistic Service Optimisation - Network Modeling All groups will work on two out of the three selected topics and submit a PPfile with comments in the notes section for both projects. ☐ Form of the presentation of your interim results: 15 to 20 minutes plus moderation of Q&A and discussion of 5 to 10 minutes. The number of slides will be determined by the time available.
Evaluation criteria	Oral presentation of the interim findings (2*20% to the overall module mark): ☐ Content weighting, time management of the presentation 10% ☐ Logical structure, contextualization of the business problem 25% ☐ Clarity of the presentation concerning the justification of the data analysis undertaken and the interim results 30% ☐ Clear identification of limitations to date, plan on the next steps and how they are organised within the group, expected results 25% ☐ Communication and interaction appropriate to the audience present 10%

Examination/assessment 2	
Type	practical examination/assessment
Format	project assignment
Time	end of semester/block week
Location	remote
In group	Yes
Scope	1.00 Page(s)
Contribution to final grade	60 %
Electronic	no
Comments	☐ Form of the presentation of your interim results: 15 to 20 minutes plus moderation of Q&A and discussion of 5 to 10 minutes. The number of slides will be determined by the time available. ☐ Form of the written group work: PPT file with comments in the notes section, possibly with separate files from the data analysis and/or in the appendix. Important: the sources (e.g., websites for secondary sources and/or literature sources) must be identified on the respective slide with the actual citation and in an aggregate from on the last slide in the form of a reference list. Please note that the number of slides submitted for each group project should not exceed 20 (excluding appendices).
Evaluation criteria	Written documentation (2*30% to the overall module mark): ☐ Contextualisation: Problem well positioned in the context of the literature and the company 15% ☐ Data Analysis: Methods and data analyses well justified, implemented and explained 25% ☐ Results and Recommendations: Line of argumentation and coherence of the results 35% ☐ Structure: Completeness and balance of the parts of any DA process model, flow of evidence and distinction between theory, results and own interpretations 10% ☐ Writing and overall visual presentation: Reader friendly and correct writing, referencing, uniformity of figures, tables, lists, headings etc.) 15%

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DE_LOG01

Version: 1.0

Natural Experiments Using R

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DE_NER01.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Block week	yes
Delivery / execution	Spring semester Autumn semester
Regularity of classes	block teaching
Module coordinator(s)	Lukas Schmid (lukas.schmid.02@hslu.ch)
Teaching language	English

Record

Record	The aim of this course is to understand, interpret, and evaluate natural experiments using R. Natural experiments have become an important tool to estimate causal effects in business, economics, political science, and sociology. Scholars have used natural experiments to analyze questions ranging from the impact of Yelp ratings on restaurant revenues, the effect of education on wages, and the relationship between anti-smoking laws and cigarette consumption. Each session first introduces a research design for natural experiments. In a second part, students will apply their knowledge in R tutorials. In the third part, students will work on a project with the goal of understanding and critizing a current research article. Generative AI can be used to solve the tutorials but not for the assignment. Students can understand, interpret, and evaluate natural experiments.

	They will learn how to model, analyze and visualize natural experiments.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_RB01

Module content

Learning objectives	Understand the most important empirical designs that use natural experiments. Understand the differences and similarities between experiments and natural experiments. Find studies on natural experiments. Students are able to critically assess natural experiments. They should also be able to identify the strengths and weaknesses of their own work. Students can use generative AI to solve their problems. Students are able to estimate empirical models on natural experiments. Students can perform robustness tests. Students are able to present their work convincingly. They are able to communicate the purpose, approaches and main results of their work, as well as the conclusions they have drawn. Students should be self-critical about their work and accurately identify its weaknesses.
Learning content and structure	Topic 1: Experiments and Natural Experiments 1. Explain the caveats of ordinary least squares regression 2. Explain the selection problem 3. Explain the advantages of natural experiments 4. Know the difference between experiments and natural experiments Topic 2: Matching 1. Describe the key assumption of matching. 2. Estimate a matching model 3. Interpret a matching estimate 4. Criticize the assumptions of matching Topic 3: Instrumental Variables 1. Describe the key assumption of the instrumental variable design 2. Estimate an instrumental variable design model 3. Interpret an instrumental variable regression 4. Criticize the assumptions of an instrumental variable design Topic 4: Difference-in-Differences 1. Describe the key assumption of the difference-in-differences design 2. Estimate a difference-in-differences model

	3. Interpret a difference-in-differences regression 4. Criticize the assumptions of a difference-in-differences design Topic 5: Regression Discontinuity Design 1. Describe the key assumption of the regression discontinuity design 2. Estimate a regression discontinuity model 3. Interpret an difference-in-differences regression 4. Criticize the assumptions of an regression discontinuity design
Teaching and learning methods	Classroom: Discussion-based lessons Coaching: Further study and specific applications of the research designs. Self-study: Reading about the topic.
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 100%
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	oral examination/assessment
Format	presentation
Time	end of semester/block week
In group	No
Contribution to final grade	100 %
Electronic	yes

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DE_NER01

Version: 1.0

Open Government Data with Tableau

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DE_ODS01.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	23.00
Supervised self-study, in hrs	67.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Andreas Hüsser (andreas.huesser@hslu.ch)
Teaching language	English

Record

Record	Open data infrastructures play an important role and rely on a range of sources, including communities of volunteers as well as companies and public institutions. This module focuses on how to access and visualize this type of data and thus contribute to the further development of the open data infrastructure in a specific industry. Not only are technical aspects and the advantages and disadvantages of Open Government Data discussed, but they are also visually processed using Tableau to generate insights that would not be apparent from the data itself. You will learn how to link Open Government Data with Spatial Data and present it in a meaningful way, including interactive dashboards. Students are able to visualize and develop parts of an open data infrastructure with Tableau Desktop and to extract additional value from data. While doing so, they will learn about the benefits of open data and how to structure and develop it further. Students will also learn how to prepare the data using Tableau Prep to put it into a form that is readable by Tableau and usable for analysis. Students will be taught the fundamentals of Tableau, including how to create interactive dashboards and how to create interactive maps based on open geospatial data (OpenStreetMap).

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	A solid working knowledge of Tableau Prep and Tableau Desktop. Evaluation of the possibilities and limitations of open data based on a solution that students design themselves. Data visualization by using open data and geospatial data, with a view to putting it to practical use with the software Tableau Desktop.
Learning content and structure	Topic 1: Introduction to the topic Open data, shared data, my data, data space, data commons, linked data. Students will receive a comprehensive overview of the topic as well as the advantages and disadvantages of Open Data for civil society, government agencies and public services, as well as businesses. Topic 2: Data preparation Students learn about the problems of Open Data. Often, these are extensive and messy data sets with missing values that first have to be prepared and put into a usable form for analysis using Tableau Prep. In the process, students will learn how to pivot rows and columns, how to link different data sources to each other with joins, and how to aggregate the data. Topic 3: Visualizing data In this part, students learn the fundamentals of Tableau. This includes innovative visualizations and dashboards, the use of calculated fields, table calculations, sets and parameters for interactivity, as well as the use of level of detail expressions and the use of OpenStreetMap with geospatial data from the Swiss Federal Office of Statistics. Topic 4: Insights from practice Guest lecture by Martin Soutschek from OutdoorActive. Martin Soutschek will give an insight into how Open Data can be profitably used in practice and how Open Data can be integrated into a business model. This will be illustrated using a wide variety of use cases.
Teaching and learning methods	Classroom (on-site): Lessons on-site in class, including presentations and Tableau Desktop and Tableau Prep lessons and on-site coachings for group and individual works. Online: Lessons online via Zoom on Tableau Desktop and Tableau Prep.
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates know the strengths and weaknesses, and the effects of their

	own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	project assignment
Time	during the semester/block week
In group	Yes
Contribution to final grade	50 %
Electronic	no
Comments	Students visualize open data relating to an applied field (e.g., education, labor and acquisition, science, energy, finance, geography, commerce, agriculture and forestry, energy, health, etc.) in Tableau Desktop (Data Story).
Examination/assessment 2	
Type	practical examination/assessment
Format	project assignment
Time	during the semester/block week
In group	No
Contribution to final grade	50 %
Electronic	no
Comments	Students work individually on visualizing open data they can chose from (interactive dashboard).

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DE_ODS01

Version: 1.0

Sports Data Analytics

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DE_SDA01.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Block week	yes
Delivery / execution	Spring semester Autumn semester
Regularity of classes	block teaching
Module coordinator(s)	Martin Rumo (martin.rumo@hslu.ch)
Teaching language	English

Record

Record	80% of all International Sports Federation are in Switzerland including the International Olympic Committee in the olympic capital Lausanne. The economic importance of sports data is increasing, and thesports analytics market is growing very rapidly. While the sports markets are also very diverse and include broadcasting, fan engagement, performance diagnostics, scouting and betting, in this course we focus on describing sports performance for athlete selection and development. Students will learn the principles underlying Sports Data Analytics: Data, Analytics and Visualisation. Students will also apply the principles in a small project with practical relevance. Project are suggested by a Swiss sports organisation. The course will also focus on the process of analytics translation and will apply it while working with a decision maker from the Swiss sports

	ecosystem. Students gain an overview of the sports analytics market and can evaluate its products. They will learn how to model, analyze and visualize performance in sports.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	Understand the most common measurement technologies and data collection methods. Select and apply analytical methods for extracting information from data sets to answer performance related questions. Learn to visualise Information with D3 (Data-driven Documents) Students are able build performance related indicators using available sports data. They should also be able to identify the strengths and weaknesses of their indicators. Students are able to set up meaningful visualisations that express performance in numbers. They are also able to consider the nature of the competition when using statistics. Students are able to present their work convincingly. They are able to communicate the purpose, approaches and main results of their work, as well as the conclusions they have drawn. Students should be self-critical about their work and accurately identify its weaknesses.
Learning content and structure	Topic 1: Phenomena Sport 1. Understand the phenomena Sport 2. Understand the skill vs. luck ratio in Sport 3. Understand the general use of data in Sport Topic 2: Methodological Approaches 1. Know different measurement technologies 2. Understand how data is organized, analyzed and presented Topic 3: Areas of Applications Getting familiar with the following areas of applications: o Analytics o Profiling / Scouting o Athlete Development o Content Generation Topic 4: Sports Data Analytics as a Business Understanding value chains in the Sports industry

Teaching and learning methods	Classroom: Discussion-based lessons Coaching: Further study and application of the theories when completing different practical tasks Self-study: Reading about the topic
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 100%
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	documentation
Time	during the semester/block week
In group	Yes
Contribution to final grade	100 %
Electronic	no
Comments	Students have to hand in a observable notebooks containing the elements of an interactive dashboard application. It is recommended to form groups in which the tasks are solved and the notebooks discussed. Discussion points and outcomes are to be documented and are evaluated as well.

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DE_SDA01

Version: 1.0

Sustainability Analytics

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DE_SUA01.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Block week	yes
Delivery / execution	Autumn semester Spring semester
Regularity of classes	block teaching
Module coordinator(s)	Salomon Billeter (salomon.billeter@hslu.ch)
Teaching language	English

Record

Record	To ensure long-term viability of businesses, societies, and humanity, it has become imperative to incorporate ecological, societal, and economical long-term consequences into business decisions, product design, and public policies and to report on them. Also, it is important to make our infrastructures, societies, and businesses resilient against large-scale sudden and gradual impacts of changes such as climate change. Sustainable, balanced products, strategies, investments, and reports require state-of-the-art analytics and models which master the long-term nature of the challenges and the interconnectedness of almost all relevant domains of our life. Moreover, the largely unprecedented nature of sustainability problems impose additional challenges to data analytics. In this module, we - get an overview of the challenges, scientific domains, approaches, and methods; - know the diversity of relevant applications; - connect relevant data and domains using appropriate methods;

	- access the rich scientific, modeling, and analytics tool kits to help solve the problems; and - integrate communities, data, and methods; gaining hands-on experience while solving a real-life challenge in the area of climate change or an area of the team's own choice. The students are able to employ analytics to help solving sustainability-related problems including climate change and thereby support the transition to more sustainable and resilient products, businesses, and societies. The block week is carried out as onsite coworking sessions with coaching. A classroom setting will be used for input sessions and may also be used for selected topics emerging from the coworking sessions during the block week.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	The students are able to employ analytics to help solving sustainability-related problems including climate change and thereby support the transition to more sustainable and resilient products, businesses, and societies. They get an overview of the challenges, scientific domains, approaches, and methods. They know the diversity of relevant applications and corresponding methodologies. They know how to acquire the relevant domain knowledge. They solve a real-life challenge in the area of climate change or an area of the students' own choice, gaining hands-on experience. They gain an overview of the applicability of scientific and analytics methods to help solve their challenge. They connect relevant data and domains using appropriate analytics methods. They know and connect a wide tool kit of methods ranging from data integration via time-series analysis and lifecycle analysis to integrated assessment modeling and dynamic simulation. They communicate the results of their challenge in an engaging and compelling way. They are able to engage with stakeholders with different objectives, to elicit and incorporate their views, and to link them to quantitative trade-offs.
Learning content and structure	Topic 1 (15%): Sustainability Examples will illustrate each aspect of sustainability. Sustainability background: 1. From "Limits of Growth" to UN Sustainable Development Goals 2. Climate change, climate mitigation and adaptation, planetary boundaries

	3. ESG reporting and regulatory landscape Employment of analytics in sustainability: 1. Decision support (analytics, simulation, integrated assessment), planning 2. Reporting, life cycle cost-benefit analysis 3. Product innovation 4. Systems innovation Topic 2 (50%): Challenge A challenge is selected in the area of climate change in Switzerland (or another area of the participants' choice) and solved in small groups as a common thread throughout the module. A data set will be provided as a starting point for data integration, and a method will be provided as a starting point for the analytics. The work in the challenges is prepared before and carried out during the block week. The challenge will encompass a system overview, data integration, analytics, and modeling, stakeholder engagement, and communication of results. Topic 3 (25%): Analytics methods The tool kit is outlined to establish an overview. As a preparation of the block week, the elements employed in the challenges are provided more in-depth. The tool kit contains: 1. Techniques for sourcing and integration of data especially relevant for sustainability 2. Analytics tool kit from regression and time-series analysis via data sourcing with choice experiments to elaborate models such as system dynamics, agent-based models, and integrated assessment models which are however only outlined and introduced 3. A brief overview of the relevant domains is provided, ranging from natural sciences (climate, biodiversity, planetary boundaries) to the humanities (focus on economic considerations) Topic 4 (10%): Stakeholder engagement Tool kit for use in the stakeholder engagement part of the challengs is outlined: System maps, theories of change, and other tools.
Teaching and learning methods	Classroom: The following topics are briefly outlined and illustrated in a classroom setting: - Topic 1 "Sustainability" - Topic 3 "Analytics methods" The classes alternate with coaching and self-study. The topics and form are communicated ahead of time. The classroom training will provide the techniques needed to solve the challenge, and it will provide an overview of the area. On request, dedicated session will illustrate chosen topics more in-depth. Coaching: Coaching and professional support is provided for all topics during the entire block week and in dedicated session before and after. The choice of topics is driven by the students. Self-study: Self-study and team work is required for all topics and focuses on - Topic 2 "Challenge" as a common thread Other:

	The block week will be used to conclude the challenge and will focus on - Topic 2 "Challenge" - Topic 4 "Stakeholder engagement"
Literature, teaching materials, resources	
Material(s)	The course materials will be shared in a class notebook (a Miro board), containing * Lecture material and background material * Lecture notes * References and links to data and other materials * Collaboration materials The class notebook will be compiled before, during, and after the course. Ilias will refer to it. Ilias will contain additional materials such as documents and example scripts in R and Python.
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance required during the first module day, the challenge selection day, and the block week.
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	oral examination/assessment
Format	presentation
Time	during the semester/block week
In group	Yes
Scope	15.00 Minute(s)
Contribution to final grade	40 %
Electronic	no
Comments	Presentation of the results of the challenge
Evaluation criteria	Will be communicated in the course material and discussed during the

	course.
Examination/assessment 2	
Type	written examination/assessment
Format	documentation
Time	end of semester/block week
In group	Yes
Contribution to final grade	60 %
Electronic	no
Comments	Summary report with documented data analysis, introduction, system context, analysis findings, and conclusions. The summary report can consist of an annotated, commented, and extended Jupyter Notebook or R Markdown.
Evaluation criteria	Will be communicated in the course material and discussed during the course.

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DE_SUA01

Version: 1.0

Time Series in Finance

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DE_TSA01.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Thomas Ankenbrand (thomas.ankenbrand@hslu.ch) Denis Bieri (denis.bieri@hslu.ch)
Teaching language	English

Record

Record	Financial markets are social systems with unique characteristics. Accordingly, they have certain time series that cannot be replicated and often exist only in limited form. Nevertheless, there is strong demand for analyses and models in the applied field. In this module, students do practical work and discover how data scientists apply concepts from this dynamic field and deliver meaningful results. Students analyze and model time series of financial markets.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	Students understand the characteristics of financial market time series, which reflect not only the characteristics of such markets as a social system but also the operational conditions of market players.

	Students are able to apply appropriate methods adequately and pragmatically. Students get to know a number of basic time series models and know when and how to apply them. Students are able to explain the economic, methodological and applied aspects of their analyses and models. Students are able to discuss the opportunities, risks and limitations of time series analysis in financial markets.
Learning content and structure	Topic 1: Principles of financial markets 1. Financial markets as social systems 2. Market mechanisms and infrastructure 3. Overview of the fields of application 4. Consequences for time series analyses Topic 2: Applied fields 1. Risk management 2. Portfolio management (Markowitz, CAPM) 3. Forecasting models 4. Crypto assets 5. High frequency trading 6. Macroeconomic time series 7. Behavioral finance 8. Generative AI in finance Topic 3: Applied methods 1. Setting up the environment for analyzing/modeling time series models 2. Data preparation 3. Data decomposition 4. Descriptive statistics (distribution functions, central moments, stationarity, correlations) 5. Estimation techniques (ordinary least square, maximum likelihood) 6. Time series models (linear regression, autoregression, moving average, ARIMA, GARCH, VAR) Topic 4: Application Pitch and discussion of solutions
Teaching and learning methods	Classroom: Discussion-based lessons Coaching: Own case study to further explore and apply the theories learned Self-study: Own case study to further explore and apply the theories learned
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult

	individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 80%
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	oral examination/assessment
Format	presentation
Time	during the semester/block week
In group	Yes
Scope	5.00 Minute(s)
Contribution to final grade	50 %
Electronic	no
Comments	Presentation of a case study
Examination/assessment 2	
Type	written examination/assessment
Format	assessed assignment
Time	during the semester/block week
Scope	5.00 Page(s)
Contribution to final grade	50 %
Electronic	no
Comments	Written paper on the case study

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DE_TSA01

Version: 1.0

DevOps - Git, Docker & Software Engineering in Python

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DEV02.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Oliver Staubli (oliver.staubli@hslu.ch)
Teaching language	English

Record

Record	If you want to build better software faster, DevOps is the answer: DevOps practices enable software development (dev) and operations (ops) teams to accelerate delivery through automation, collaboration, fast feedback, and iterative improvement. In this module, students learn to code and collaborate in teams while building complex software projects (games). Students will learn to use different software programming paradigms and get firsthand experience with tools like Git, Docker, Scrum-Boards and Python IDEs. Finally, students will deploy their projects to the cloud. More Details: https://wiki.revolytics.com/devops/

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	

Group A	W.MSCIDS_PDS01

Module content

Learning objectives	Students know the basics Git commands and how to collaborate remotely through GitHub. Students can deploy code through CI/CD pipelines to the cloud. Students can work with virtual environments like Docker to test and ship their code/models. Students know how to collaborate in Scrum teams and know the basics like Backlog, Standups, Sprint, etc. Students can break down complex requirements and build software as a team in time (and budget). Students can apply the presented programming paradigms and Scrum methodology in their team-assignment. Students can commit code with adequate change documentation for other team members to understand. Students are able to self-organize in order to solve complex software engineering problems, select among different approaches, carry them out and evaluate the results together in groups. Get in touch with more complex problems and learn how to fit into a team of software developers.
Learning content and structure	Topic 1: DevOps Tools 1. Git & GitHub: Learn how to collaborate on code. 2. Docker: Learn how to containerize and deploy your applications. 3. GitHub Actions: Learn to set up a CI/CD pipeline to deploy your applications automatically. 4. Jira: Organise and track project tasks and progress using Jira's agile project management features. Topic 2: Software Development 1. Python-Scripts: Learn to work with Python scripts instead of Notebooks. 2. Programming Paradigms: Learn how to structure your code (OOP). 3. Unit Testing: Learn how to test your code. 4. Typing: Learn how to add types to your code. 5. Debugging: Learn how to debug your code efficiently. 6. Documentation: Learn how to document and comment your code. Topic 3: DevOps Practices 1. Scrum: Learn how to manage projects in an Agile way. Experience what it means to work in sprints and what is done during sprint planning, review, refinement and retrospective. 2. CI/CD (Continuous Integration/Continuous Deployment): Learn how to automate a deployment pipeline. 3. Code Review: Learn how to review other code. 4. Microservices: Learn how to create your own service with FastAPI Topic 4: Exercises (Games) 1. Game Server Concept: Learn how a frontend and backend of a server works. 2. Multiplayer Games: Learn how to implement complex boardgame

	rules (Hangman, Battleship, UNO, Brändi Dog).
Teaching and learning methods	Classroom: Interactive lessons (active learning) Coaching: Exercises and student team projects Self-study: External module Wiki Other: Benchmark validation of students progress on team projects
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 80%
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	project assignment
Time	during the semester/block week
In group	Yes
Contribution to final grade	100 %
Electronic	no
Comments	Team project: Implement Hangman, Battleship and UNO or Brändi-Dog game

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DEV02

Version: 1.0

DevOps and Large Language Models

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DLM03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Claudiu-Cristian Musat (claudiu.musat@hslu.ch) Diego Antognini (diego.antognini@hslu.ch) Vincent Coriou (vincent.coriou@hslu.ch)
Teaching language	English

Record

Record	This advanced course on DevOps and LLMs is designed for students who have completed either coursework in DevOps or Generative Artificial Intelligence. The course provides a deep dive into the interplay between DevOps and Large Language Models (LLMs). Through a combination of lectures, hands-on projects, and guest speakers, students will gain a thorough understanding of how coding and DevOps change due to LLMs and also which DevOps methods are applicable for LLMs in production. The promise of LLM-aided development has many wondering if studying computer science makes sense anymore. We focus on how coding and DevOps change due to LLMs, how to thrive in this new reality and also which DevOps methods are applicable for LLMs in production. Understand the integration of Large Language Models (LLMs) into the complete software development lifecycle, from coding assistance to deployment and oerations. Be proficient in leveraging LLMs for enhanced development productivity, automated DevOps processes, and building agentic systems. Develop practical skills in LLMOps, agent-based architectures, and the unique challenges of operating AI-powered

	development tools. Gain hands-on experience in building full-stack applications with LLM assistance while understanding the limitations, costs, and operational considerations of LLM-aided development.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_GEN02 **and** W.MSCIDS_DEV02

Module content

Learning objectives	Students will apply LLM technologies to real-world software development and operations scenarios, enabling them to bridge the gap between traditional DevOps practices and AI-enhanced development workflows. Students will develop proficiency in using LLM-powered coding assistants like Cursor and Copilot, while gaining advanced skills in prompt engineering for development tasks. Through hands-on experience building full development agents and implementing LLMOps practices, they will learn to manage the operational complexity of AI-powered systems, preparing them to lead the transformation of software development processes in modern organizations. This course will sharpen students' problem-solving and critical thinking abilities by immersing them in the practical challenges of LLM-aided development. Students will learn to critically evaluate when and how to integrate LLMs into development workflows, distinguishing between hype and genuine productivity gains. By working on projects ranging from simple code generation to complex agentic systems, they will enhance their capacity to assess trade-offs between automation and control, while developing strategies for debugging, monitoring, and maintaining AI-powered development systems. Students are familiar with cutting-edge LLM integration methods including specialized coding models (StarCoder), agentic development frameworks, Infrastructure-as-Code generation, automated testing and documentation, and can apply them accurately and efficiently to solve specific software development and operations challenges. They will master both LLMs for DevOps (using AI to enhance traditional operations) and LLMOps (operating AI systems themselves), including monitoring, version control, and cost management. Students can clearly communicate their solution strategies for LLM-integrated development processes, articulate the benefits and limitations of AI-powered development tools, and effectively present complex agentic system architectures. They will be able to explain technical decisions around LLM selection, deployment strategies, and operational trade-offs to both technical and non-technical stakeholders. Critical and respectful discussions in groups about the transformative impact of LLMs on software development, collaborative evaluation of AI-generated code quality, and constructive peer review of LLM-assisted development projects. Students will engage in thoughtful debates about the future of programming, ethical considerations in AI-powered development, and the balance between human expertise and automated assistance.
Learning content and structure	Topic 1: LLMs as Coding Assistants Topic 2: LLMs as App and Experience Builders

	Topic 3: LLMs for DevOps Topic 4: LLMOps - DevOps for LLMs Topic 5: AgentOPS - Code as Agents Topic 6: RAG for Coding - Building Organizational Copilots
Teaching and learning methods	Lots of colabs. Lots of slides. Most of them LLM-generated. We'll have fun.
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	project assignment
Time	during the semester/block week
Contribution to final grade	75 %
Electronic	no
Examination/assessment 2	
Type	written examination/assessment
Format	individual examination
Time	during the semester/block week
Contribution to final grade	25 %
Electronic	no

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DLM03

Version: 1.0

Deep Learning

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DPL03.26
Type of module	C–Core Module
Module level	I-Intermediate level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	weekly
Module coordinator(s)	Mirko Birbaumer (mirko.birbaumer@hslu.ch) Marc Bravin (marc.bravin@hslu.ch) Pascal Jund (pascal.jund@hslu.ch)
Teaching language	English

Record

Record	Computer Vision and Natural Language Processing have become ubiquitous in society, and there are numerous applications in fields such as image search, drones, self-driving vehicles, speech recognition, bots, machine translation and summarization of text. The underlying principles for many of these applications are neural networks ("deep learning") which have fundamentally changed the performance of computer vision systems and computational language technologies. Students are introduced to the fundamentals of neural networks. They learn how to implement, train, debug and optimize neural networks for various tasks in computer vision and language modeling. Students are able to explain and compare a range of deep learning methods for solving problems related to computer vision and computational language technologies. They are able to explain the underlying algorithms and technologies of these methods, select suitable models for a given data set, and explain their choice. Furthermore, they have the necessary practical experience in solving

	exemplary problem tasks of varying complexity, are able to explain the possibilities and limitations of the methods used, and can apply them to new data sets. Students are able to deepen their understanding of the underlying technologies independently, follow developments in new research areas, and apply what they have learned.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_MPM02 **and** W.MSCIDS_MPM03

Module content

Learning objectives	Students are able to explain the theoretical principles of the most relevant deep learning methods and how they can be applied to image and text data sets. They are able to explain different validation methods and metrics in order to compare different models with respect to their performance, uncertainty and limitations. Students are able to independently assess whether a problem in computer vision or computational text technologies can be solved by means of a deep learning method, select suitable deep learning methods, and apply these methods to the data. Students are able to explain the specific requirements, conditions and limitations of the methods used. They are able to summarize the historical development up to the latest state of research of the discipline. Students are able to reflect and evaluate their own knowledge with respect to the state-of-the-art expertise of these technologies. Students are able to explain the foundation, potential and limitation of Generative AI models. They are able to critically assess the correctness of the results provided by Generative AI models. Students are familiar with cutting-edge tools and can apply them accurately and efficiently to solve specific problems. Students are able to integrate Generative AI tools in the process of writing and implementing code. Students are able to present the analysis of image and text data correctly, coherently and vividly to expert and lay audiences. Critical and respectful discussions in groups.
Learning content and structure	Topic 1: Motivation and history 1. History of Neural Networks 2. Classical Image Classification Methods 2.1 Overview of data-driven image classification algorithms 2.2 K-nearest neighbor classifier implemented with NumPy 2.3 Validation of classification methods (training/validation/test split, cross-validation) 2.4 Linear classification algorithms (SVM) 2.5 Optimization (stochastic gradient descent) for various loss functions

	Topic 2: Core concepts and methods 1. Training and Optimizing Fully Connected Neural Networks 1.1 Historical overview and neurobiological motivation of neural networks 1.2 Fully connected neural networks 1.3 Activation functions 1.4 Backpropagation 1.5 Dropout and Batch Normalization 1.6 Neural networks with Tensorflow and Keras 2. Convolutional Neural Networks (CNN) 2.1 Convolutional layers and max pooling 2.2 CNN architectures (AlexNet, VGG, ResNet, etc.) 2.3 CNNs with Tensorflow and Keras 2.4 Transfer learning 3. Recurrent Neural Networks (RNN) 3.1 Language Models and RNNs 3.2 Long short-term memory networks (LSTM) 3.3 Gated recurrent units (GRU) Topic 3: Advanced topics 1. Transformers 1.1 Attention and self-attention 1.2 Pretrained Transformer Language Models Topic 4: Application 1. Image classification and visual explanation of deep learning models (Grad-CAM, Layer-wise Relevance Propagation) 2. Text classification and text generation 3. Image captioning
Teaching and learning methods	Classroom: Short lectures on the theoretical concepts, followed by hands-on examples (prepared programming examples to be adapted to specific tasks) individually or in groups. Subsequent reflection through clicker tasks / quizzes, as well group as plenary discussions. Coaching: Exercises for each topic Self-study: Extensive lecture notes with code examples
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	individual examination
Time	end of semester/block week
In group	No
Scope	120.00 Minute(s)
Contribution to final grade	100 %
Electronic	yes
Comments	Personal summary of 20 A4 pages (equivalent to 10 double-sided sheets)

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DPL03

Version: 1.0

Data Quality

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DQU02.26
Type of module	C–Core Module
Module level	I-Intermediate level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	27.00
Supervised self-study, in hrs	63.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Simon Broda (simon.broda@hslu.ch)
Teaching language	English

Record

Record	The module provides students with insights and applied knowledge of the theoretical principles and application related to data quality in the context of data science. Students are able to recognize the importance of data quality as it relates to data preparation and to projects in the context of data science. In addition, they will have an overview of how instruments of data quality are conceptualized and of their possibilities and limitations. They will also be able to select and apply basic methods of the concepts and application of data quality in line with the nature of a particular problem. Finally, students are able to apply and evaluate the selected software, tools and techniques.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_DDE01

Module content

Learning objectives	Students recognize the importance of data quality in the context of academic and applied research. Students are able to select, apply, and evaluate the software,tools, and techniques of data quality to their own work. Students have an accurate sense of the possibilities and limitations of concepts and techniques of data quality and are able to select methods appropriate for typical problems and apply them in a solution-oriented manner. Students understand the methods of data quality at the desired level. Students are able to correctly apply the specific language of concepts and techniques of data quality in reports, etc. Students are able to reflect on their skills, concepts, and techniques of data quality in the context of communication and interaction. Students are able to vary the form and content of their communication based on the situation with team members, customers, etc.
Learning content and structure	1. Introduction to data quality principles 2. Basic properties of data quality 3. Data quality dimensions 4. Detecting data quality problems / Improvement of data quality 5. Application of machine learning methods / Model-driven development 6 Data quality in the context of large data quantities ("Big Data") and social media Generative AI This is a required module; therefore Generative AI (GenAI) may not be used in the final exam. The content is independent of the use of GenAI. However, selected examples of the use of GenAI will be shown and commented on in the lectures and exercises.
Teaching and learning methods	Lecture, tutorials, coaching. Each class will be split between theoretical input and a tutorial session during which students work on exercises. One of the exercises will need to be submitted and receive a passing grade to take the exam (see below).
Literature, teaching materials, resources	
Script	Data Quality
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication.

Assessed assignment

Admission requirements, end-of-module exam	Students are required to submit their own solution to one of the exercises 02 to 10. The solution must have been graded as "Pass" in order to take the final exam.
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	individual examination
Time	end of semester/block week
In group	No
Scope	60.00 Minute(s)
Contribution to final grade	100 %
Electronic	no

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DQU02

Version: 1.0

Data Visualization and Narration

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DVN03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Samuel Frei (samuel.frei@hslu.ch)
Teaching language	English

Record

Record	The module enabled students to understand how and where data visualization and storytelling techniques could be applied effectively to improve data communication for different audiences. They gained experience with design methods and narrative strategies that strengthened their ability to make complex data more accessible and comprehensible. Students also learned to immerse themselves in the art and science of data visualization, recognizing the balance between data, computer sciences, visual design, and human cognition. They explored the process of creating and refining charts and graphical representations, following a structured roadmap that connected their analytical work with its effective visual communication. In doing so, they understood how visual elements and narrative structures can be combined to engage an audience within a specific user scenario. Furthermore, students practiced developing a data visualization story tailored to a defined target group and user context. Through iterative experimentation and design refinement, they produced a coherent data visualization story that was assessed both individually and as part of a

	group synthesis. Finally, students were required to master the core skills without the use of GenAI tools, while being permitted to incorporate GenAI during the iterative development of their individual assignment, provided that its use was clearly declared and documented.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	Understand data visualization as a form of communication that must be user-oriented. Understand the design process for developing data visualization for a specific audience (target group) within a specific context (user scenario). Understand the various approaches and applications of data visualization (e.g. for data exploration, communication, decision making, or learning). Be able to develop visualization concepts that optimally serve a given purpose and the needs of target groups. Become literate in evaluating the impact of data visualizations and data storytelling. Be able to evaluate visualizations in terms of their user-friendliness and usefulness in specific audience scenarios. Apply methods of storytelling with data to build tension and dramaturgy to captivate your audience. Gain knowledge on how to make your data visualisations conspicuous, well-structured, narratively captivating and intuitively understandable. Applying human-centered design methods to better answer data visualization project requirements. Support and expand one's own communication skills for different audience situations (project presentation, client meetings, idea generation etc.). Be able to communicate data and information in a user-centred manner within an organization or to customers. Be able to defend one’s own work during a discussion, and offer supportive and thoughtful arguments and criticism to others. Be able to identify different audiences and contexts and adapt data visualizations accordingly. Be able to cooperate with and across various domains and disciplines. Be able to improve one's own cooperation within a team.

	Be able to self-reflect and evaluate criticism. Gain empathy to understand end-users, stakeholders and beneficiaries of a data visualization project. Be able to defend one's own work during a discussion. Be able to evaluate stakeholders' requirements and integrate them into projects and processes.
Learning content and structure	Topic 1: Visual Perception, Cognition and Principles of Visual Design Human visual perception and information processing and the consequences for audience-oriented communication. Data visualization grounded in principles of visual perception & cognition and human-centred-Design that are combined for communicating to a specific target group (audience). Topic 2: Data Visualisations Fundamentals The basic steps for effective data visualisations and communication. Topic 3: Data as Narrative Modes of storytelling with data and narrative fundamentals. How to structure a story to build tension and dramaturgy with data. Topic 4: Data Storytelling & Interaction Interactive visualisations to explore complex data sets and as a means to stage data in layers to make meaningful stories out of information. Topic 5: Data Physicalisation Data Physicalisation as a creative and playful approach for evaluating, communicating, visualising and contextualising data in a physical spatial context. Topic 6: Design Concept and Audience Context A closer look at the human-centred design process: How to fit visual ideas to our target group's needs & motivations and adapting it to the scenario-context in which your data visualisation will be presented.
Teaching and learning methods	Classroom: The theoretical input during the lectures is deepened by means of short practical exercises and reflection upon the various outcomes of those activities. Self-study: Independent self-study based on the lecture scripts and additional sources provided. The Students will work on an individual data visualization project that will give them the possibility to apply all the learned skills. Coaching: Group coaching sessions
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication.

	Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 80%
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	presentation
Time	during the semester/block week
Location	remote
In group	No
Scope	20.00 Minute(s)
Contribution to final grade	90 %
Electronic	no
Comments	Development and realisation of a narrative data visualisation based on a topic for a specific target group in a specific context (user-scenario). This main part of the assignment is done individually and delivered as a pre-recorded screencast presentation (e.g. as recorded PP presentation with spoken audio track, or an integrated video recording of your interactive data visualisation in MP4 format).
Evaluation criteria	1. Completeness & Design Coherence Includes all required components in the pre-recorded presentation: title, introduction, design process (research, inspirations, draft iterations), final visualisation with arguments, conclusion, and references. Demonstrates coherent design: clear layout, appropriate typography, consistent visual elements, and thoughtful selection of images. 2. Design Process - The design process is clearly explained, purposeful, and well-structured. - Provides three diverse draft iterations in different media formats, each with positive and negative arguments. - Includes additional research on the needs of the target group. 3. Final Data Visualisation Story - The final solution is well-developed, visually comprehensible, and convincing. - The narrative is coherent, with a clear structure that guides the viewer. - The visualisation is suitable for the intended target group and user scenario. 4. Novelty & Originality The approach demonstrates innovation or originality in relation to the communication goal and the needs of the target group.

Examination/assessment 2	
Type	oral examination/assessment
Format	presentation
Time	during the semester/block week
Location	on-site/in-person
In group	Yes
Scope	15.00 Minute(s)
Contribution to final grade	10 %
Electronic	no
Comments	Group presentation of selected data visualization stories (from the group members)
Evaluation criteria	1. Completeness of the group presentation 2. Visual quality of the presentation, design coherence, appropriateness of the chosen images and visual. 3. Persuasiveness and clarity of the team's reasoning in selecting the most appropriate individual data visualization

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DVN03

Version: 1.0

Data Warehouse and Data Lake Systems

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_DWL03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	6
Module category	learning module (LM)
Workload	
Contact hours, in hrs	60.00
Supervised self-study, in hrs	120.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	weekly
Module coordinator(s)	Luis Terán (luis.teran@hslu.ch) José Mancera (jose.mancera@hslu.ch)
Teaching language	English

Record

Record	A data warehouse (DW or DWH) or enterprise data warehouse (EDW) describes a system for data integration, historicization, analysis, and reporting. It is a core component of the business intelligence process, serving as a central repository to unite data from diverse sources to create analytical reports for workers within the company. The data stored in a data warehouse originates from operational systems such as production, marketing, or sales and may pass through a functional data store. Data cleansing may be required for additional operations to ensure data quality before being used in the DW for reporting. The DWH concept, established thirty years ago, is commonplace in today's industry and, therefore, an essential concept for data scientists, as they might have to analyze DWH data in their future careers. The inclusion of generative AI methodologies is also welcomed as a support mechanism, particularly for creating simulations or predicting trends based on historical data.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_DBM02
Further entry requirements	Pre-requisite: • Database Management for Data Scientists (Course) • Programming languages: Python, SQL The use of generative AI tools to generate code is accepted as support to design or improve the efficiency of your Python code or SQL queries.

Module content

Learning objectives	Explain the concepts of data warehouse and data lake systems with their characteristics and advantages. Demonstrate how data warehouse and data lake can be observed in the context of case studies. Data integration in data warehouse and data lake systems Schema integration in data warehouse and data lake Systems Data analysis and visualization using data warehouse and data lake systems Analize and resolve practical problems by using data warehouse or data lake systems. Research independently the information necessary for solving a self-chosen problem using a data warehouse or data lake system in decision-making. The use of Generative AI tools to support the design of your approach is generally accepted. Exchange feedback with peers Function effectively in the group Be able to work on practical topics on one's own and gauge and further develop the ability to learn independently Submit results on time and further develop the ability to manage workloads and deadlines independently as needed
Learning content and structure	Session 1: (On-site) Course details: • Projects descriptions • Course administration • AWS Intro Services • Group creation Responsible lecturers: Luis Terán and Anja Shevchyk (Amazon) Session 2: (Online) Data Lake Intro: • Evolution of Data Warehouses w.r.t. Big Data • Motivation and Definition of Data Lake Systems • Business Requirements for the Data Lake • Data Analysis in the Data Lake

	• Schema on Read Responsible lecturer: Luis Terán Session 3: (Online) Data Ingestion: • Data Pipelines (ETL, NLP, ML) • ETL Pipelines • Amazon Lamda Functions • REST APIs Responsible lecturer: José Mancera Session 4: (Online / On-site) Data Storage: • Apache Airflow (Data Pipelines) • AWS Storage Services (S3) • Relational Database Services (RDS) Responsible lecturer: José Mancera Session 5: (Online) AWS services: • AWS Modern Data architecture for analytics Responsible lecturers: José Mancera and Anja Shevchyk (Amazon) Session 6: (Online) Flipped classroom Responsible lecturer: Jhonny Pincay Session 7: (On-site) • Midterm presentations (all groups will present on this session) Responsible lecturer: Luis Terán and Jhonny Pincay Session 8: (On-site) Data Transformation • Data Quality • Production Data Pipelines Responsible lecturer: José Mancera Session 9: (Online) Data Warehouse Systems I: • Evolution of Decision Support Systems • The Data Warehouse Environment • The Data Warehouse and Design • Granularity in the Data Warehouse Responsible lecturer: Luis Terán Session 10: (Online) Data Visualization: • Define data visualisation • History of data visualization • Why data visualization is important • Hands-on data visualization (QuickSight) Responsible lecturer: Luis Terán Session 11: (On-site) Flipped classroom Responsible lecturer: Jhonny Pincay Session 12 No class - Holiday Session 13: (Online)

	Flipped classroom Responsible lecturer: Jhonny Pincay Session 14: (On-site / Online) Final Presentations
Teaching and learning methods	Classroom: Introduction to the module's design and the semester Lectures on the various topics as an introduction Students present the status of their project and discuss them in groups Coaching: Guided project work, feedback by teachers Periodic presentation of projects advance by groups during flip classrooms Final project presentation Self-study: Individual project work The basic concepts of DW and DL are introduced theoretically and practically. Then, based on this, during the semester, the students will work on specific projects in the area of DW or DWL.
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	oral examination/assessment
Format	project assignment
Time	end of semester/block week
Location	on-site/in-person
In group	Yes
Scope	30.00 Page(s)
Contribution to final grade	100 %
Electronic	no

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_DWL03

Version: 1.0

Modern Data Engineering

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_ETL03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	weekly
Module coordinator(s)	Christian Dollfus (christian.dollfus@hslu.ch) Pavlin Nedyalkov Mavrodiev (pavlinnedyalkov.mavrodiev@hslu.ch)
Teaching language	English

Record

Record	The students receive an in-depth introduction to data engineering processes, as they are frequently used in industry today and which are important for data scientists, since the preparation of data is still a major part of a data scientist's work. The module gives an overview of the current trends in Data Engineering as well as over-arching data architectures, implemented with modern storage technologies, like NoSQL DB's, object storage and cloud solutions. In a first part a general overview is given. Then there is a Lab which consist of implementing an ELT-Proccess with the tool Apache HOP as well as a realtime stream process using Apache Kafka. Everything takes place on an Azure Cloud environment. Usage of Generative AI in the module: In the theory part of Data Engineering we show the new possibilities in theory and compare to RPA and ETL/ELT-Tools. In the exams its possible to use though we don't see a real advantage in our context. Students learn how to independently implement full automatic Data Engineering Streams/Pipelines with a state-of-the-art tool as well as anmoverview on Big Data concepts and how to use Cloud Computing.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_DBM02 **and** W.MSCIDS_CIP02 **and** W.MSCIDS_DWL03

Module content

Learning objectives	Students are able to have a practical knowledge of all major parts of modern Data Engineering: from the Cloud, to Data Lake and Big Data Infrastructure as well as traditional and mixed architectures used today in the industry. They have a technical knowledge to build data pipelines on their own and have an overview of all the relevant elements. Students are able to put known requirements and tasks in Data Engineering into practice. They can advise both sides, IT and business during the conception phase and implementation with the needed knowledge in Data Engineering. Today this is one of the most needed knowledge in the industry. Students are able to enlarge the knowledge of data collecting, reading, storing, shaping, harmonizing and preparing for further machine learning in a modern way. They can implement data quality issues in data pipelines. Further, a realtime data process is implemented in practice. Students are able to formulate potential problems and requirements within industry projects to the different stakeholders. Students can bridge the gap between the business representatives in companies and IT/DWH specialists. They are able to understand both sides concerning the management and engineering of the data to prepare for further analysis or systems.
Learning content and structure	Topic 1: Introduction and Motivation In this part we intend to get an overall overview of the elements of Data Engineering and some historical background Topic 2: Foundations and Storage Technologies of Data Engineering: Big Data Principles, DataLakes and Cloud Computing This part will introduce the storage technologies based on so called "NoSQL" technologies and give an overview of cloud computing and common cloud providers Topic 3: Introduction into ELT: Overview of data processes – Pipelines and Workflows This is the entry part in the world of the construction of data pipelines using a standard ETL-Tool Topic 4: Integration of Real time Streaming and Data Science Tools: Real time ELT Architectures In this part we look for the implementation of Data Science algorithms into data pipelines and perform real time architectures Topic 5: Integration of ELT into production and an overview to bild more complicated and larger solutions In a productive environment, software development tools are used also for data engineering solutions

	Topic 6: Enhancement of the overall Process – Data Scraping, Robotic Process Automation. Trends and the Future The last part focuses on additive important tasks in Data Engineering and especially data sourcing, there is a link to new RPA- tools becoming more and more important in industry
Teaching and learning methods	Classroom: The learning contents will be taught and distributed over the class. During the on-class study students are expected to develop by themselves implementing data pipelines on the cloud. Coaching: During the lessons we leave room for practical implementation as this topic is more an engineering one that needs not much theoretical knowledge. The aim is to begin with the final task and develop an integrated data engineering solution in the cloud. Self-study: Independent development on the cloud is possible on an individual basis Other: The final task can be engineered in teams of 2 (max 3) persons.
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance is expected since the module is carried out compactly in one block week. Everyone builds their own data pipelines step by step under guidance as well as a full realtime datastream unsing the Apache Tools HOP and KAFKA.
Grading scale	HSLU.bestanden-nicht bestanden
Examination/assessment 1	
Type	practical examination/assessment
Format	project assignment
Time	during the semester/block week
Scope	30.00 Hour(s)
Contribution to final grade	100 %
Electronic	no
Comments	Final project (task) in ELT using Apache HOP and final project (task) in realtime streaming using Apache KAFKA

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_ETL03

Version: 1.0

Generative AI

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_GEN02.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Marcel Blattner (marcel.blattner@hslu.ch)
Teaching language	English

Record

Record	This module provides a comprehensive exploration of Generative Artificial Intelligence. It guides students through the fundamentals of Generative AI, its historical evolution, and practical applications. Starting with no-coding tools and gradually transitioning to Python-based implementations, the course will enable students to design and implement generative AI applications. Understanding of the foundational concepts and history of generative AI. Mastering design and implementation of generative AI applications using no-coding frameworks and native Python libraries. The mental mindset to critically analyze and optimize generative AI systems. Understanding and applying ethical considerations in the development of generative AI. Phase I Definition and Scope of Generative AI, historical evolution and milestones Phase II

	Building blocks of Generative AI Understanding basic principles of Neural Networks Overview of Major Generative Models, e.g., GANs, VAEs, Autorgegressive Models Phase III Exploring tools like Dall-E and GPT Case studies and application Scenarios Hands-on sessions with no coding platforms Phase IV Deep dive and replace no-coding building blocks with Python native libraries (core functionalities will be provided) Phase V Advanced Topics in Generative AI. Fine-tuning and optimization of models Creative applications, e.g., art, music, and beyond Phase VI Ethical considerations and future directions. Where do we go from here? Metaview Flow (along all phases) Designing and Implementing a Generative AI application. Learn how to transition from concept to concrete solutions.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_PDS01

Module content

Learning objectives	Ability to apply gained knowledge of generative AI in practical scenarios, bridging the gap between theoretical concepts and real-world applications. Skills in evaluating generative AI systems, identifying areas for improvement, and optimizing models for better performance and efficiency in real-world applications. Understanding ethical challenges. Students will develop the ability to evaluate whether Generative AI approach is appropriate for a given problem, choose the most suitable generative methods, and apply these methods. They will gain a deep understanding of the specific requirements, conditions, and limitations associated with various Generative AI techniques. Additionally, students can recount the historical evolution and current state-of-the-art in generative AI research. Students can critically reflect upon and assess their knowledge and skills about the latest advancements and expert practices in Generative AI. This critical thinking and problem-solving skill set ensures that students are adept at applying generative AI in practical scenarios and capable of innovating and advancing the field. Students are familiar with cutting-edge methods and can apply them

	accurately and efficiently to solve specific problems. Students can clearly communicate their solution strategies for Generative AI based methods. Critical and respectful discussions in groups.
Learning content and structure	Topic 1: Motivation and history 1. Definition and scope 2. Historical evolution and milestones Topic 2: Buildung blocks of Generative AI 1. Understanding the basics of neural networks 2. Key concepts: generative vs. discriminative Models 3. Overview of major Generative Models (e.g., GANs, VAEs, Autoregressive Models) Topic 3: Generative AI in practice (No-Coding tools) 1. Exploring tools like DALL-E, GPT, etc. 2. Case studies and application scenarios 3. Hands-on sessions with No-Coding platforms Topic 4: Python for Generative AI 1. Setting up the Python Environment 2. Introduction to libraries and frameworks 3. Building simple Generative Models in Python (building blocks will be provided) Topic 5: Advanced topics in Generative AI 1. Fine-Tuning and optimization of models 2. Generative AI in natural language processing 3. Creative applications: art, music, and beyond Topic 6: Ethical considerations and future directions 1. Ethical implications of Generative AI 2. Future trends and research directions Flow (all topics) Designing and Implementing a Generative AI application. Learn how to transition from concept to concrete solutions.
Teaching and learning methods	Classroom: Short lectures on the theoretical concepts, followed by hands-on examples (prepared programming examples to be adapted to specific tasks) individually or in groups. Subsequent reflection through clicker tasks quizzes, as well group as plenary discussions Coaching: Exercises for each topic Self-study: Projects on real-world cases
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally

	appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 80%
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	oral examination/assessment
Format	presentation
Time	during the semester/block week
Scope	40.00 Minute(s)
Contribution to final grade	100 %
Electronic	no

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_GEN02

Version: 1.0

Advanced Generative AI

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_GEN03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	weekly
Module coordinator(s)	Diego Antognini (diego.antognini@hslu.ch) Marcel Blattner (marcel.blattner@hslu.ch) Guang Lu (guang.lu@hslu.ch) Claudiu-Cristian Musat (claudiu.musat@hslu.ch)
Teaching language	English

Record

Record	This advanced course on Generative AI is designed for students who have completed either coursework in Computational Language Technologies or Generative Artificial Intelligence. The course provides a deep dive into Large Language Models (LLMs) focusing on both the theoretical underpinnings and practical applications. Through a combination of lectures, hands-on projects, and guest speakers, students will gain a thorough understanding of how to effectively interact with, fine-tune, and deploy generative AI models in real□world scenarios. Understand the technical foundations of LLMs and their application in various domains. Be proficient in selecting, fine-tuning, and deploying LLMs for specific tasks. Develop advanced skills in prompt engineering and multimodal AI interactions.

	Gain practical experience in managing the costs and resources associated with LLM deployment. Be prepared to tackle real-world challenges involving generative AI, with a strong emphasis on ethical considerations.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_GEN02 **or** W.MSCIDS_CTA03

Module content

Learning objectives	Students will apply their knowledge of generative AI to practical scenarios, enabling them to bridge the gap between theoretical concepts and real-world applications. Students will develop proficiency optimizing LLMs for enhanced performance and efficiency, while also gaining advanced skills in prompt engineering. Through hands-on experience, they will learn to manage the costs and resources associated with LLM deployment, preparing them to address the complex challenges of generative AI in diverse domains. This course will sharpen students' problem-solving and critical thinking abilities by immersing them in the practical challenges of generative AI. Students will learn to dissect and analyze the technical foundations of LLMs, identifying key areas for optimization and improvement. By working on real-world applications, they will enhance their capacity to critically assess and refine AI systems for specific tasks, balancing performance with resource constraints. Students are familiar with cutting-edge methods and can apply them accurately and efficiently to solve specific problems. Students can clearly communicate their solution strategies for Generative AI based methods. Critical and respectful discussions in groups.
Learning content and structure	Topic 1: Introduction & building blocks Introduction and building blocks: Transformers, attention mechanisms, E/ED/D architecture, tokenization. 1. Scale. 2. Tool of choice – Transformers. 3. Tokenization. 4. What is an LLM? What type? (focus on text). 5. Applications of LLMs. 6. Future directions. Topic 2: The LLM you need The LLM you need. Separating use cases and use of LLMs in practice. Zero shot, few-shot, retrieval-augmented generation (RAG), fine-tuning. Commercial availability and limitations, from closed to open-source. 1. What can an LLM do? The good, the bad and the ugly. 2. Choosing the best approach: zero shot, RAG or fine-tuning. 3. Commercial availability.

	Topic 3: Interacting Interacting with LLMs. Prompting techniques. Multimodal LLM interactions. 1. Prompting and iterating on prompting. 2. Multimodal LLM interactions. Topic 4: Training LLMs Training LLMs. High level overview of LLM training - from pre-training to supervised fine-tuning, RLHF and the more modern DPO. State of the art LLMs. From GPT2 to Llama3. 1. Pretraining. 2. Supervised Fine-Tuning / Post-Training. 3. [Optional] Domain adaptation . 4. From RLHF to DPO. 5. SOTA LLMs. Topic 5: LLMs on a budget LLMs on a budget. From LoRA to LoRA+, DoRA to PEFT - Parameter Efficient Fine-Tuning (adapters, prompt-tuning, LoRA, etc). Server-side versus on-device and the cost of serving 1. PEFT. 2. Cost of serving. 3. Moving on-device Topic 6: Practical course 1. Building your own LLM. 2. Fine-tuning on a given dataset for a specific task. 3. Building an AI tutor using LLMs and RAG. Topic 7: Multimodal LLM (Optional, depending on the availability of a 7th course) Multimodal LLMs and how they differ from text-only ones. VLMs, audio tokenization.
Teaching and learning methods	Theory and practice
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	project assignment

Time	during the semester/block week
Contribution to final grade	75 %
Electronic	no
Comments	Course Project
Examination/assessment 2	
Type	written examination/assessment
Format	individual examination
Time	during the semester/block week
Location	remote
Contribution to final grade	25 %
Electronic	no
Comments	Take-home test (online)

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_GEN03

Version: 1.0

Data Strategy and Governance

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_GOV03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	40.00
Supervised self-study, in hrs	50.00
Unsupervised self-study, in hrs	0.00
Block week	yes
Delivery / execution	Autumn semester Spring semester
Regularity of classes	block teaching
Module coordinator(s)	Dimitrios Marinos (dimitrios.marinos@hslu.ch)
Teaching language	English

Record

Record	Learning on the base of Data strategy and be able to degive a Cloud based data Governance concept that is finally implemented in Azure Cloud. To Learn how to define and executre a Data driven strategy with a clear IT-Governance objective. Students will understand the business and IT impackt of missing compliance, standards and also bad Data Governacne on a Cloud/IT solution.Finally the students will get an introduction in the Azure cloud and have the chance to work directly on the Azure portal while setting Data and Service policies for governance purposes. Get knowledge and additional an additional accredidated certification that will support your further career development. For the completion of the course is not adviced to use Generative AI solutions (e.g. ChatGPT). The exam is mainly based on a development on the SC-900 of Microsoft and therefore is AI cannot be used for the accomplishment of the certificate. For the planning, execution and

	orchestration of the course no Generative AI tool has been use (e.g. ChatGPT).

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_DBM02
Further entry requirements	At least one of the following modules: • Data-Driven Business Models • Management of Digital Enterprise • Data Warehouse and Data Lake Systems • Modern Data Engineering • NoSQL Lab with Python & MongoDB

Module content

Learning objectives	Data Strategy and strategy frameworks IT Governance and Policies Solving the IT and Business continuity problem while protecting intellectual property. How to create safe organisations and also build a policy strategy hands on in the cloud. Going through Data model strategy concepts and what needs to be considered for a successful journey. Use Strategy frameworks to guide IT to deliver value. Develop hands on strategies and data policies to reflect the strategy. Presenting the results of a Strategy and Governance assessment. Showing implemented policies on the Azure Tenant as a team and explain governance strategies. Working with a team on exercises and projects during the course.
Learning content and structure	Topic 1: Motivation and history Learning how to define and apply a Data strategy. How to get wisdom out of you organisation and use it as business advantage. Topic 2: Core concepts and methods 1. Data maping 2. Cloud Governance 3. Data Ruirements engineering Topic 3: Advanced topics Governance and policy development in a cloud environmen Topic 4: Application Direct development in the Cloud and introduction to Azure
Teaching and learning methods	Classroom: A mix of Online and Physical presentation during the week. The first 3 days are physical and the last 2 online. Coaching: 1 hour per team for consultation during the modul in order to clarify specific questions.

	Self-study: Self-Study, Hands on at the Azure Cloud and presentations. Going through the material for the SC-900 Certificaiton Other: Presentation (theory) Case studies Hand-on exercises per team
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 100%
Grading scale	HSLU.bestanden-nicht bestanden
Examination/assessment 1	
Type	practical examination/assessment
Format	individual examination
Time	during the semester/block week
In group	No
Contribution to final grade	100 %
Electronic	no
Comments	Microsoft Certification of SC□900 within the next 60Days. It will be online from the Microsoft Portal. Get the Microsoft Security, Compliance, and Identity Fundamentals certification: https://learn.microsoft.com/en-us/credentials/certifications/security-compliance-and-identity-fundamentals/?practice-assessment-type=certification

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_GOV03

Version: 1.0

Global School of Empirical Research Methods

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_GSERM01.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	4
Module category	learning module (LM)
Workload	
Contact hours, in hrs	0.00
Supervised self-study, in hrs	0.00
Unsupervised self-study, in hrs	120.00
Block week	yes
Delivery / execution	Spring semester Autumn semester
Regularity of classes	block teaching
Module coordinator(s)	Andreas Brandenberg (andreas.brandenberg@hslu.ch)
Teaching language	English

Record

Record	The GSERM Global School in Empirical Research Methods is a high-calibre integrated generic programme on methodology launched by the University of St. Gallen. We welcome Master, PhD students, Post-Docs and also practitioners from all kinds of study fields and industries collecting data and analysing in different methods of statistics. You enhance your skills in block seminars taught by world-class faculty amongst an international crowd of participants. At different locations in Europe we offer courses in quantitative and qualitative statistics. Courses are offered from basic up to advanced level. Accommodation is offered and can be booked at an additional cost. Find out more: https://www.gserm.ch/stgallen/ Find all current courses on: https://www.gserm.ch/stgallen/courses/

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning content and structure	Find all current courses on https://www.gserm.ch/stgallen/courses/
Teaching and learning methods	Find all current courses on https://www.gserm.ch/stgallen/courses/

Assessed assignment

Grading scale	HSLU.bestanden-nicht bestanden

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_GSERM01

Version: 1.0

Human Centered Design

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_HCD02.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Block week	yes
Delivery / execution	Spring semester Autumn semester
Regularity of classes	block teaching
Module coordinator(s)	Peter Horvath (peter.horvath@hslu.ch)
Teaching language	English

Record

Record	Data scientists are one of the hottest things on the market, making logical decisions, calculations and presentations based on data. So why should you, as an aspiring data scientist think in a human-centered way? Because every data point is either created, interpreted, or acted upon by humans. And as much as we would like our world to be logical – it is not. You will spend time learning about the design mindset, design thinking, and related methodologies in an engaging, and (dare I say) fun way. This will enable you to place people at the center of data acquisition, data processing, data analysis and application of data. The aim is to ensure that the work of data scientists serves both human-level and organizational needs, and that people do not get lost in the data. An AI agent will play a role in the course as well. In the Human Centered Design module, you will learn how to adopt a human-centered approach to your existing activities and processes, as well as how to select and use appropriate design methods and tools.

	The module builds upon the Data Ideation module but is completely self-contained. The involvement of end-users (i.e. actual people) constitutes an essential part of Human Centered Design. To this end, students will plan, conduct and moderate workshops and evaluate the results, in addition to doing research, conducting analyses and documenting findings. You will participate in various co-creative activities during classes, with a special attention on qualitative research, ideation, planning, as well as physical and virtual workshops. You will work on a hands-on workshop project as part of a team. But wait, there's more! What you learn will be put into practice during the course in your most important project: your life! Obviously artificial intelligence cannot be circumvented in human-centered design either. To this end we will explore during each main stage of the curriculum how AI can be your friend – or your foe.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	Understand the design process on a macro level, and use its tools on a micro level, including a conscious approach to AI. Identify and visualize the range of external and internal stakeholder groups, and be able to gauge and evaluate their requirements. Define a project from a user perspective by selecting and applying human-centered research and design methods. Question initial project assumptions. Compare the results of quantitative data analysis with the needs of user groups and internal stakeholders. Applying human-centered design methods to better answer project questions, and define further project questions. Know when and how to use AI in the design process. Understand the structured approach to the human-centered design process, its phases and the corresponding methods. Apply and adapt methods to various projects. Define a project-specific design process, plan and execute human-centered design methods. Be able to define, explain and revise the steps in the project; and reflect upon, categorize and evaluate the results. Be able to directly engage with end-users in user research, and be the voice of the customer within projects, or the organization. Be able to defend your own work during a discussion, and offer

	supportive and thoughtful arguments and criticism to others. Be able to visualize and present results by taking into account the target group's expectations. Be able to cooperate with and across various domains. Compare the insights gained through qualitative data analysis with the needs of stakeholders as evaluated by means of human-centered design methods. Improved cooperation with other teams; Learn how to include end-users in projects. Use collaborative aspects of the project, e.g. planning, implementing (moderating) and following-up on workshops with user groups and internal stakeholders. Be able to self-reflect, critically reflect of your own position and role, and evaluate the critique of others. Gain empathy to understand end-users, stakeholders and beneficiaries of a project. Coordinate and evaluate various stakeholder positions and attitudes. Design your own career.
Learning content and structure	Understand the relevance of human-centered design for data science. Understand the mindset, concepts, processes and methods of human-centered design, along with its trends and criticism. Understand the tools of the design process in detail, select and apply the right methods to specific phases of a project.
Teaching and learning methods	Classroom: Interactive, engaging, co-creative. During our time together we will try to place emphasis on discussion, dialogue, and critique. Coaching: Plan and execute workshops with user groups independently for student projects. Self-study: To prepare for classroom interaction, familiarize yourself with the core material using original content provided for the course, and content from academia and practitioners. Other: Blended learning, co-creation, classroom engagement
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 80%
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	portfolio
Time	during the semester/block week
Scope	2000.00 Characters
Contribution to final grade	30 %
Electronic	no
Comments	Plan your career using an iterative, human-centered design process, in multiple steps.
Examination/assessment 2	
Type	written examination/assessment
Format	documentation
Time	end of semester/block week
In group	Yes
Contribution to final grade	70 %
Electronic	no
Comments	Documentation on planning, conducting and evaluating a workshop. You and your group will plan a workshop on a topic of selected in class. You will determine the process, select the methods, conduct the workshop, evaluate the results, and present this as a report.

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_HCD02

Version: 1.0

Hands-on Visualisation for Data Science

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_HVD03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Block week	yes
Delivery / execution	Autumn semester Spring semester
Regularity of classes	block teaching
Module coordinator(s)	Luis Terán (luis.teran@hslu.ch) José Mancera (jose.mancera@hslu.ch)
Teaching language	English

Record

Record	Data visualization is a powerful tool for exploring, understanding and communicating quantitative information patterns. It demands three quite different skills: substantive knowledge, statistical skill, and artistic sense. This course is intended to introduce participants to crucial data acquisition, design principles, and visualization techniques for data exploration and presentation. This course emphasizes the practical aspects of data visualization using different datasets and contexts within a cloud environment. This course will introduce the main concepts of visual analytics hands-on using visualization tools (i.e., Tableau). The students will design their use cases, and at the end of this course, they are expected to be able to create dashboards to answer the business questions for use cases. Generative AI to inspire dashboard design is welcome and will also be used during the lecture. This module is appropriate for students that want to boost their visualization skills based on best industry practices and use cases.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	Fundamentals of data visualization and design. Data visualization selection based on the goal of the analysis. Identify the limitations and biases in data that affect the recommendations. Building on your ghost deck. Final presentation with final recommendations and an executive summary. Identify the different data story types and how to find and use them to tell interesting data stories. Create a "ghost deck" — a skeleton deck commonly used by management consultants to identify a client's needs. Understand different techniques and strategies to deal with data. Visualization tool selection strategy based on data sources. Clearly articulate and communicate a problem statement for a data project. Clearly articulate the "so what" of your analysis. Function effectively in the group. Exchange feedback with peers. Be able to work on practical topics on one's own and gauge and further develop the ability to learn independently. Submit results on time and further develop the ability to manage workloads and deadlines independently as needed.
Learning content and structure	Session 1 - Luis Terán: 1. Intro to Data Visualization 1.1 Project descriptions 1.2 Group creation 1.3 Data Visualization Fundamentals 2. Design Principles 2.1 Exploratory Vs Explanatory 2.2 Chart junk 2.3 Design integrity 2.4 Using color 2.5 Good visual Session 2 - Luis Terán: 1. Creating Visualizations in Tableau: 1.1 What is Tableau 1.2 Connecting to data

	1.3 Combining data 1.4 Worksheets 1.5 Aggregations and hierarchies 1.6 Marks and filters Session 3 - Luis Terán and José Mancera: 1. Project 1. Build Data Visualization 2. Planning phase: 2.1 Audience attributes 2.2 Dashboards 2.3 Pulling data from priorities 2.4 Statement of work Session 4 - José Mancera: 1. Design phase: 1.1 Graphicacy 1.2 Chart choice 1.3 Visual hierarchy 1.4 Wireframing 1.5 Layouts 2. Dashboards in Production 2.1 Color 2.2 Interactivity 2.3 Annotations Session 5 - José Mancera 1. Industry dashboard designs 1.1 Industry use-cases 2. Work on Mini-Projects
Teaching and learning methods	Classroom: Introduction to the module's design and the semester Lectures on the various topics as an introduction Students present the status of their project and discuss them in groups Coaching: Guided project work, use cases and mini projects Self-study: Students will work on individual data projects that will give them the possibility to apply all the learned skills Other: Generative AI tools are welcome to boost inspiration and trends in dashboard design
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	project assignment
Time	during the semester/block week
Contribution to final grade	100 %
Electronic	no
Comments	Mini - Projects will be conducted during the semester and evaluated individually at the end of the block week by the lecturers.

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_HVD03

Version: 1.0

IBM WatsonX Gen AI Challenge

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_IBM01.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	6
Module category	learning module (LM)
Workload	
Contact hours, in hrs	0.00
Supervised self-study, in hrs	0.00
Unsupervised self-study, in hrs	180.00
Delivery / execution	Spring semester
Regularity of classes	weekly
Module coordinator(s)	Andreas Brandenberg (andreas.brandenberg@hslu.ch)
Teaching language	English

Record

Record	In this course, students will learn how to use generative AI to solve real-world business problems. The course project involves group work, where each group of 4 to 5 members will select a real use case from a list provided by various companies. They will then prepare and present a solution for their chosen use case. Students will gain practical experience with business-ready generative AI tools and cloud services through this project. They will explore and experiment with potential solutions and integrate them into a system to solve the problems posed by their use case. Registration: https://ibm.biz/Bdat5T Students will gain an understanding of generative AI applications in business, learning to identify and analyze specific use cases where generative AI can enhance business processes and decision-making – they will form groups apply their gained knowledge to a real world use case by a real client. The course will provide in-depth knowledge about different generative AI models, functionalities, and the contexts in which they are most

	effective. The course will cover the role and management of knowledge databases in generative AI, focusing on how these databases are constructed, maintained, and leveraged to improve AI performance and accuracy. Students will create prototype style solutions for their dedicated use case on the basis of the acquired knowledge of the course. The AI services are provided by IBM. Finally the students present their work to the clients.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	Students will learn to conduct a requirements elicitation phase, design, and develop prototype solutions using generative AI cloud services, focusing on real-world business applications. Emphasis on developing robust data models essential for effective operation of generative AI systems, and training these models using business-specific data for accurate output generation. Students will acquire skills in constructing and deploying generative AI prototypes, pilots, or proofs-of-concept, along with possibility of integrating these solutions with backend services, APIs, and other digital channels in a client environment. Through hands-on projects, students will solve real client use cases, applying their skills in generative AI to address specific business challenges and objectives. Special focus on mastering prompt engineering to guide generative AI systems towards desired business outcomes, and analyzing requirements to ensure solutions are aligned with business needs.
Learning content and structure	Topic 1: Motivation and Project 1. Enterprise AI Design Thinking 2. From classical ML to generative AI 3. Gen AI use cases 4. Conversational Design and Engineering Process 5. Use Case Ideation and/or Requirements Gathering 6. Conversational and User Experience (UX) 7. Integration of Conversational Channels 8. Introduction into Watsonx Topic 2: Core concepts and methods 1. Fundamental concepts of generative language models 2. Provision of service instances in IBM Cloud account 3. Introduction to Watson AI Services 4. Hands-on session to familiarize with cloud services 5. Prompt Engineering 6. Hyperparameter Tuning 7. Chatbots and Artificial Dialog Topic 3: Advanced topics 1. Knowledge Databases

	2. Pipelines 3. API integration 4. Web Services 5. User Interfaces
Teaching and learning methods	Classroom (online): Presentation of core concepts and best practices through lectures and interactive discussion. Coaching: Guided hands-on exercises for Cloud Services. How to use them and to integrate them. Exchange with Professors and IBM responsibles. Self-study: Group project work and reading background material
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 20% attendance requirement (introduction days and final presentation)
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	documentation
Time	end of semester/block week
Electronic	no
Examination/assessment 2	
Type	oral examination/assessment
Format	presentation
Time	end of semester/block week
Electronic	no
Examination/assessment 3	
Type	written examination/assessment
Format	documentation
Time	end of semester/block week

Electronic	no

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_IBM01

Version: 1.0

Legal Issues of Big Data

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_LBD03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	weekly
Module coordinator(s)	Reto Fanger (reto.fanger@hslu.ch)
Teaching language	English

Record

Record	Data systems can endanger human values such as privacy, security, independence, trust, transparency, etc. It is therefore essential to systematically analyse legal aspects of data systems from a data protection and fundamental rights perspective, to assess the claims and rights of stakeholders, to evaluate design variants and to optimise them. Generative AI (GenAI) infers as machine-based system, for explicit or implicit objectives, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions tha can influence physical or virtual environments. It is therefore essential to systematically analyse regulatory approaches and notable regulatory initiatives for GenAI, as the regulatory landscape worldwide will continue to evolve rapidly. This module provides the theoretical and practical knowledge for this. The students analyse data systems from a data protection and fundamental rights perspective. The students analyse regulatory approaches and notable regulatory

	initiatives for GenAI. The students describe and evaluate illegal or conforming design variants and behavior.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	The students know legal aspects which are affected by data systems. Students are familiar with the basic principles of data protection laws in Switzerland and the EU. Students know Big Data-specific approaches and concepts of data protection. The students know regulatory approaches and notable regulatory initiatives for GenAI. The students evaluate different design variants under data protection and fundamental rights aspects. The students evaluate different design variants under regulatory approaches and regulatory initiatives for GenAI. Students use a structured approach to identify, analyse and decide on data protection and fundamental rights conflicts between claims of different stakeholders. Students use a structured approach to identify, analyse and decide under regulatory approaches and regulatory initiatives for GenAI. Students conduct stakeholder dialogue to identify their interests, claims and rights. The students assess the contribution of a data system or a GenAI system to the common good. Students are aware of the importance of privacy and the fundamental right to informational self-determination in the context of big data analysis. Students are aware of the importance of legal approaches on GenAI.
Learning content and structure	Topic 1: General Data Protection requirements 1. Legal Basis (consent, overriding personal or public interest) 2. Purpose-related 3. Proportionality, Data Economy (Data Minimization) 4. Transparency Topic 2: Data Protection Rights of data subjects 1. Right to Information 2. Right of Rectification 3. Right to Block 4. Right of Deletion/Forgetting 5. Right to Data Portability

	Topic 3: Big Data-specific Data Protection aspects 1. Anonymisation/Pseudonymisation 2. Profiling and Privacy Impact Assessment 3. Data Portability 4. Privacy by Design and Privacy by Default Topic 4: Fundamental Rights aspects of Big Data 1. Violation of the Freedom of Information 2. Restriction of the Freedom of Personality and Movement Topic 5: Legal Aspects of GenAI Regulatory approaches and regulatory initiatives for GenAI
Teaching and learning methods	Classroom & Online, Coaching, Workshop, Discussion, Self-Study
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 80%
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	individual examination
Time	end of semester/block week
Location	on-site/in-person
In group	No
Scope	60.00 Minute(s)
Contribution to final grade	100 %
Electronic	yes
Comments	open book & open net

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_LBD03

Version: 1.0

Linear Algebra 1

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_LIA01.26
Type of module	C–Core Module
Module level	I-Intermediate level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	21.00
Supervised self-study, in hrs	69.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	weekly
Module coordinator(s)	Peter Büchel (peter.buechel@hslu.ch) Peter Scheiblechner (peter.scheiblechner@hslu.ch)
Teaching language	English

Record

Record	Friend suggestion, recommendation mechanisms, search result ranking, face recognition - what is common? Linear algebra is at their heart. Data are naturally stored in matrices, and linear algebra is the science of processing them and understanding and visualizing the structures they constitute. A solid foundation of linear algebra will help you to understand any algorithm operating with matrices, such as principal component analysis (PCA), support vector machines (SVM), neural networks (NN) or latent semantic analysis (LSA). In this course, you will learn the basic theory of linear algebra and see its working in data science using Python. Linear Algebra 1 covers the basic notions of vectors and matrices, Linear Algebra 2 the more advanced topics of linear mappings and matrix decompositions such as SVD. Students understand the algebra and geometry of vectors, matrices, and linear equation systems, and are able to operate with them manually and with a computer. - Generative AI will be included in the lectures as an aid to solve linear algebra problems.

	- The power and limits of generative AI will be explored and demonstrated. - The chances and risks of the use of generative AI will be discussed.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	Students - are proficient in the algebra and geometry of vectors; - are proficient in matrix algebra incl. inversion and determinants; - are able to set up and solve a linear system of equations. Students - understand how information can be represented and processed using matrices; - are able to recognize, understand, and visualize linear structures in high dimensional spaces. Students - are able to handle abstract notions and apply them to concrete situations; - are able to apply linear algebra methods using the language Python. Students are able to describe the ideas of data representations and algorithms appropriately and to communicate their results effectively. Students - are able to work collaboratively in teams; - are open to and able to offer constructive criticism.
Learning content and structure	Topic 1: Vector geometry Vectors in two and three dimensions Topic 2: Linear Equations Theory of general linear equation systems, Gaussian elimination Topic 3: Matrix algebra Matrices and their operations, inverse matrix, determinants
Teaching and learning methods	Classroom: Discussion-based lessons with examples Presentation Self-study: Exercises
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult

	individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	individual examination
Time	during the semester/block week
Location	remote
In group	No
Contribution to final grade	30 %
Electronic	yes
Comments	Questions concerning the exercises
Examination/assessment 2	
Type	written examination/assessment
Format	individual examination
Time	end of semester/block week
Location	on-site/in-person
In group	No
Scope	60.00 Minute(s)
Contribution to final grade	70 %
Electronic	no
Comments	Permitted material: own summary, lecture notes, exercises, books, numerical pocket calculator

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_LIA01

Version: 1.0

Linear Algebra 2

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_LIA02.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	21.00
Supervised self-study, in hrs	69.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Peter Büchel (peter.buechel@hslu.ch) Peter Scheiblechner (peter.scheiblechner@hslu.ch)
Teaching language	English

Record

Record	Friend suggestion, recommendation mechanisms, search result ranking, face recognition - what is common? Linear algebra is at their heart. Data are naturally stored in matrices, and linear algebra is the science of processing them and understanding and visualizing the structures they constitute. A solid foundation of linear algebra will help you to understand any algorithm operating with matrices, such as principal component analysis (PCA), support vector machines (SVM), neural networks (NN) or latent semantic analysis (LSA). In this course, you will learn more theory of linear algebra and see its working in data science using Python. Linear Algebra 2 covers the more advanced topics of linear mappings and matrix decompositions such as SVD. Students understand the algebra and geometry of vectors, matrices, linear maps, and linear equation systems, and are able to operate with them manually and with a computer.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Entry requirements (modules)	
Group A	W.MSCIDS_LIA01

Module content

Learning objectives	Students - are familiar with the concepts of vector subspaces, bases, dimension, and their applications to linear maps and matrices. - understand the geometry of inner products and orthonormality. - are able to perform eigenvalue and singular value decomposition. Students - understand how information can be represented and processed using matrices. - are able to recognize, understand, and visualize linear structures in high dimensional spaces. Students - are able to handle abstract notions and apply them to concrete situations. - are able to apply linear algebra methods using the language Python. Students are able to describe the ideas of data representations and algorithms appropriately and to communicate their results effectively. Students - are able to work collaboratively in teams. - are open to and able to offer constructive criticism.
Learning content and structure	Topic 1: Euclidean vector space 1. subspace 2. span 3. linear independence 4. basis 5. dimension 6. coordinates 7. scalar products 8. norms 9. orthonormality Topic 2: Linear maps 1. Basics 2. Matrix of a linear map Topic 3: Matrix decompositions 1. Eigenvalues and -vectors 2. diagonalization 3. singular value decomposition
Teaching and learning methods	Classroom: Discussion-based lessons with examples Presentation Self-study: Exercises
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically

	oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	assessed assignment
Time	during the semester/block week
Location	remote
In group	No
Contribution to final grade	30 %
Electronic	yes
Comments	Questions concerning the exercises during the semester (weekly)
Examination/assessment 2	
Type	written examination/assessment
Format	individual examination
Time	end of semester/block week
Location	on-site/in-person
In group	No
Scope	60.00 Minute(s)
Contribution to final grade	70 %
Electronic	no
Comments	Permitted material: own summary, lecture notes, exercises, books, numerical pocket calculator

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_LIA02

Version: 1.0

Master Thesis - internes Projekt

Modulbeschreibung gültig ab 01/09/2026

Allgemeine Modulinformationen

Modulnummer	W.MSCDAI_MAP04.26
Modultyp	C–Core Module
Modulniveau	I-Intermediate level
ECTS-Credits	3
Modulart	Projektmodul (PM)
Arbeitsaufwand	
Kontaktunterricht in h	0.00
Begleitetes Selbststudium in h	0.00
Individuelles Selbststudium in h	90.00
Semester	Frühlingssemester Herbstsemester
Unterrichtsintervall	ohne Unterricht
Modulverantwortliche/r	Patricia Feubli (patricia.feubli@hslu.ch)
Unterrichtssprache	Deutsch und Englisch

Record

Record	Der Modulbeschrieb ist nur für interne Zwecke bestimmt.

Einbettung im Studienverlauf

Studiengang / Verwendung	Master of Science in Applied Data Science and Artificial Intelligence

Modulinhalt

Lerninhalte und Aufbau	Der Modulbeschrieb ist nur für interne Zwecke bestimmt.
Lehr- und Lernformen	Der Modulbeschrieb ist nur für interne Zwecke bestimmt.

Leistungsnachweis

Notenskala	HSLU.Halbe Noten

Bemerkungen

Bemerkungen	Der Modulbeschrieb ist nur für interne Zwecke bestimmt.

Erstellt am: 26/08/2026

Modulstamm: W.MSCDAI_MAP04

Version: 1.0

Master's Thesis - internal project

Module description valid from 01.09.2026

General Module Information

Module number	W.MSCDAI_MAP04.26
Type of module	C–Core Module
Module level	I-Intermediate level
ECTS credits	3
Module category	project module (PM)
Workload	
Contact hours, in hrs	0.00
Supervised self-study, in hrs	0.00
Unsupervised self-study, in hrs	90.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	none
Module coordinator(s)	Patricia Feubli (patricia.feubli@hslu.ch)
Teaching language	German and English

Record

Record	This module description is intended for internal use only.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning content and structure	This module description is intended for internal use only.
Teaching and learning methods	This module description is intended for internal use only.

Assessed assignment

Grading scale	HSLU.Halbe Noten

Comments

Comments	This module description is intended for internal use only.

Created: 26.08.2026

Module code: W.MSCDAI_MAP04

Version: 1.0

Master's Thesis

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_MAT04.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	21
Module category	project module (PM)
Workload	
Contact hours, in hrs	0.00
Supervised self-study, in hrs	0.00
Unsupervised self-study, in hrs	630.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	none
Module coordinator(s)	Andreas Brandenberg (andreas.brandenberg@hslu.ch)
Teaching language	English

Record

Record	Through the master's thesis project, students are required to demonstrate their ability to independently address a scientifically rigorous problem drawn from research or professional practice within a prescribed timeframe, employing appropriate research methodologies in a methodologically sound, subject-appropriate, and solution-oriented manner. The problem must be situated within its broader scholarly context, and the current state of scientific knowledge, as well as scientific methods appropriate to the problem, must be applied. Furthermore, students must demonstrate their ability to present the relevant written components of the master's thesis project in a linguistically precise, formally correct, and clearly comprehensible manner. In addition, the master's thesis must be defended within the framework of a critical academic discourse.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	

Group A	W.MSCIDS_PRE03

Module content

Learning content and structure	Through the master's thesis project, students are required to demonstrate their ability to independently address a scientifically rigorous problem drawn from research or professional practice within a prescribed timeframe, employing appropriate research methodologies in a methodologically sound, subject-appropriate, and solution-oriented manner. The problem must be situated within its broader scholarly context, and the current state of scientific knowledge, as well as scientific methods appropriate to the problem, must be applied. Furthermore, students must demonstrate their ability to present the relevant written components of the master's thesis project in a linguistically precise, formally correct, and clearly comprehensible manner. In addition, the master's thesis must be defended within the framework of a critical academic discourse.
Teaching and learning methods	Independent scientific research project (Master's thesis) under individual academic supervision.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	master's thesis
Time	during the semester/block week
Location	remote
In group	No
Contribution to final grade	50 %
Electronic	no
Examination/assessment 2	
Type	oral examination/assessment
Format	presentation
Time	during the semester/block week
Location	on-site/in-person
In group	No
Contribution to final grade	50 %
Electronic	no

Comments

Comments	For all master's thesis projects with start before 1 February 2026, the following weighting of assessments apply:

	Written master's thesis: 80% Oral defense: 20%

Created: 26/08/2026

Module code: W.MSCDAI_MAT04

Version: 1.0

Applied Machine Learning and Predictive Modelling 1

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_MPM02.26
Type of module	C–Core Module
Module level	I-Intermediate level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	32.00
Supervised self-study, in hrs	58.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Nisia Trisconi (nisia.trisconi@hslu.ch) Matteo Simone Tanadini (matteo.tanadini@hslu.ch) Daniel Meister (daniel.meister@hslu.ch)
Teaching language	English

Record

Record	Machine learning is a collective term for various tools that can be used to discern relationships from existing data and to predict results. In this connection, a distinction is made between supervised learning and unsupervised learning. Supervised learning is based on statistical models for predicting or estimating a result by means of one or more input variables. This method lends itself to solving problems in areas such as economics, medicine, astrophysics and politics. Unsupervised learning, on the other hand, does not produce any examples of "correct" or "expected" outcomes, although relationships and connections can be identified from such data. The module focuses on methods of supervised learning and illustrates them with applied examples taken from real-life situations for the purpose of making predictions. Students learn the basic techniques, tools and approaches relating to machine learning while under the supervision of an expert. They will work on examples from the applied fields, whereby they can practice the methods and gain first experiences in making forecasts. Students are able to select suitable methods for a particular problem, apply them

	to real-life sample data, and evaluate the results. In this module, students learn to apply supervised learning in practice.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_SA01
Further entry requirements	Students that decide to take the R Bootcamp module (W.MSCIDS_RB01) are encouraged to do so before taking this module.

Module content

Learning objectives	Students know the basic procedures of supervised learning (regression, classification, support vector machines, resampling, model selection and regularization). They are able to evaluate whether the methods are suitable for solving problems as found in practice. Students are able to identify appropriate methods for solving a new analytical problem and to apply them and evaluate the results. Students practice interacting with generative AI to: - learn for which tasks it can be useful - learn prompt formulation - gain critical insights into the validity of the answers provided by these tools. Students are able to apply the presented methods to new data and interpret the results of the software package they used. Students are able to communicate appropriately their approach when selecting methods and doing the analysis, and they can present their results to a particular audience effectively. Students are able to develop problem-solving strategies for machine learning problems in a team, select and conduct various analyses, and evaluate the results jointly.
Learning content and structure	Topic 1: Linear Regression Application of single regression and multiple linear regression (based on the linear regression in Module 05.01) Topic 2: Generalised Linear Models GLMs will be introduced with a focus on classification and modelling of count data Topic 3: Extensions to Linear Regression and to Generalised Linear Models Modelling non-linear effect via polynomials and Generalised Additive Models Topic 4: Support Vector Machines Support Vector Machines Topic 5: Neural Networks Neural Networks Topic 6: Approximate Bayesian 1. Maximal Margin Classifier 2. Support Vector Classifiers

	3. Support vector machines Topic 7: Model Validation Fundamental concepts of model validation are introduced
Teaching and learning methods	Classroom: Discussion-based lessons with examples Presentation Coaching: Exercises completed with a coach and independently Other: Student projects with real-life tasks
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	individual examination
Time	end of semester/block week
Location	on-site/in-person
In group	No
Scope	60.00 Minute(s)
Contribution to final grade	60 %
Electronic	no
Comments	closed book, own summary allowed
Examination/assessment 2	
Type	practical examination/assessment
Format	project assignment
Time	during the semester/block week
Location	remote

In group	Yes
Contribution to final grade	40 %
Electronic	yes

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_MPM02

Version: 1.0

Applied Machine Learning and Predictive Modelling 2

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_MPM03.26
Type of module	C–Core Module
Module level	I-Intermediate level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Oliver Staubli (oliver.staubli@hslu.ch) Keith Lawless (keith.lawless@hslu.ch)
Teaching language	English

Record

Record	Machine learning has the goal to learn from data and predict future results. A distinction is made between supervised learning and unsupervised learning. Supervised learning is based on models algorithms for understanding and predicting the relationship between a response (=label) variable and a set of predictor variables. These methods have applications in areas such as economics, medicine, astrophysics and politics. Unsupervised learning, on the other hand, does distinguish between a response variable and predictor variables but rather tries to find patterns and structur in a collection of variables. I.e., relationships and structures can be derived from the data. The module focuses on modern methods of both supervised and unsupervised learning and illustrates these methods with example applications based on real problems for prediction. In this module, students learn to understand the principles of modern machine learning and apply advanced supervised and unsupervised learning in practice. Students learn the basic techniques, tools and architectures of modern machine learning with. In application examples, students can practice

	the procedures and gain experience in the application of methods such as random forest, boosting, clustering, multidimensional scaling, and principal component analysis. Students can select suitable methods for practical questions, process them on real example data and evaluate the results obtained. More details: https://wiki.revolytics.com/ml2/

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_MPM02

Module content

Learning objectives	Students - know the basic procedures of machine learning methods (principal component analysis, dimension reduction, multidimensional scaling, clustering, classification methods, trees, random forest, boosting and others.) - can assess the suitability of the learned methods to solve a practical problem. Students can identify adequate methods to solve problems, apply them and evaluate the results. Students may use ChatGPT to solve exercises. Students can apply the presented methods to new data and interpret the results of the software package used. Students can describe their approach to choose a given method as well as the results of their analysis with an adapted language that takes into account the recipient audience. Students are able to design strategies to solve machine learning problems, select among different analysis methods, carry them out and evaluate the results together in groups.
Learning content and structure	Topic 1: Classification 1. Logistic regression 2. Evaluating and comparing classifiers Topic 2: Trees and ensemble methods 1. Regression and classification trees 2. Random forest 3. Boosting Topic 3: Dimensionality reduction Principal Component Analysis (PCA) Topic 4: Multi-dimensional Scaling (MDS) 1. Classical MDS 2. Non-metric MDS 3. t-Distributed Stochastic Neighbor Embedding (t-SNE) Topic 5: Clustering 1. K-means 2. Partitioning around medoids (PAM) 3. Hierarchical clustering

	4. DBSCAN
Teaching and learning methods	Classroom: Interactive lessons (active-learning) Coaching: Exercises or student projects with real data analysis Self-study: Module Wiki
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	individual examination
Time	end of semester/block week
In group	No
Scope	75.00 Minute(s)
Contribution to final grade	100 %
Electronic	no
Comments	Closed book, four handwritten or printed A4 pages (both sides) permitted. Please bring a basic/offline calculator (no phones allowed).

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_MPM03

Version: 1.0

Master's Thesis Project

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_MT04.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	24
Module category	project module (PM)
Workload	
Contact hours, in hrs	0.00
Supervised self-study, in hrs	0.00
Unsupervised self-study, in hrs	720.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	none
Module coordinator(s)	Andreas Brandenberg (andreas.brandenberg@hslu.ch)
Teaching language	English

Record

Record	Through the master's thesis project, students are required to demonstrate their ability to independently address a scientifically rigorous problem drawn from research or professional practice within a prescribed timeframe, employing appropriate research methodologies in a methodologically sound, subject-appropriate, and solution-oriented manner. The problem must be situated within its broader scholarly context, and the current state of scientific knowledge, as well as scientific methods appropriate to the problem, must be applied. Furthermore, students must demonstrate their ability to present the relevant written components of the master's thesis project in a linguistically precise, formally correct, and clearly comprehensible manner. In addition, the master's thesis must be defended within the framework of a critical academic discourse

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	

Group A	W.MSCIDS_PMT03

Module content

Learning content and structure	Through the master's thesis project, students are required to demonstrate their ability to independently address a scientifically rigorous problem drawn from research or professional practice within a prescribed timeframe, employing appropriate research methodologies in a methodologically sound, subject-appropriate, and solution-oriented manner. The problem must be situated within its broader scholarly context, and the current state of scientific knowledge, as well as scientific methods appropriate to the problem, must be applied. Furthermore, students must demonstrate their ability to present the relevant written components of the master's thesis project in a linguistically precise, formally correct, and clearly comprehensible manner. In addition, the master's thesis must be defended within the framework of a critical academic discourse
Teaching and learning methods	Independent scientific research project (Master's thesis) under individual academic supervision.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	master's thesis
Time	during the semester/block week
Location	remote
In group	No
Contribution to final grade	50 %
Electronic	no
Examination/assessment 2	
Type	oral examination/assessment
Format	presentation
Time	end of semester/block week
Location	on-site/in-person
In group	No
Contribution to final grade	50 %
Electronic	no

Comments

Comments	For all master's thesis projects with start before 1 February 2026, the following weighting of assessments apply:

	Written master's thesis: 80% Oral defense: 20%

Created: 26/08/2026

Module code: W.MSCDAI_MT04

Version: 1.0

Master's Thesis Project

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_MTH04.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	15
Module category	project module (PM)
Workload	
Contact hours, in hrs	0.00
Supervised self-study, in hrs	0.00
Unsupervised self-study, in hrs	450.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	none
Module coordinator(s)	Andreas Brandenberg (andreas.brandenberg@hslu.ch)
Teaching language	English

Record

Record	Through the master's thesis project, students are required to demonstrate their ability to independently address a scientifically rigorous problem drawn from research or professional practice within a prescribed timeframe, employing appropriate research methodologies in a methodologically sound, subject-appropriate, and solution-oriented manner. The problem must be situated within its broader scholarly context, and the current state of scientific knowledge, as well as scientific methods appropriate to the problem, must be applied. Furthermore, students must demonstrate their ability to present the relevant written components of the master's thesis project in a linguistically precise, formally correct, and clearly comprehensible manner. In addition, the master's thesis must be defended within the framework of a critical academic discourse.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	

Group A	W.MSCIDS_PRS03 **and** W.MSCIDS_BYD12

Module content

Learning content and structure	Through the master's thesis project, students are required to demonstrate their ability to independently address a scientifically rigorous problem drawn from research or professional practice within a prescribed timeframe, employing appropriate research methodologies in a methodologically sound, subject-appropriate, and solution-oriented manner. The problem must be situated within its broader scholarly context, and the current state of scientific knowledge, as well as scientific methods appropriate to the problem, must be applied. Furthermore, students must demonstrate their ability to present the relevant written components of the master's thesis project in a linguistically precise, formally correct, and clearly comprehensible manner. In addition, the master's thesis must be defended within the framework of a critical academic discourse.
Teaching and learning methods	Independent scientific research project (Master's thesis) under individual academic supervision.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	master's thesis
Time	during the semester/block week
Location	remote
In group	No
Contribution to final grade	50 %
Electronic	no
Examination/assessment 2	
Type	oral examination/assessment
Format	presentation
Time	end of semester/block week
Location	on-site/in-person
In group	No
Contribution to final grade	50 %
Electronic	no

Comments

Comments	For all master's thesis projects with start before 1 February 2026, the following weighting of assessments apply:

	Written master's thesis: 80% Oral defense: 20%

Created: 26/08/2026

Module code: W.MSCDAI_MTH04

Version: 1.0

Collaborative Innovation Networks

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_NET02.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	6
Module category	learning module (LM)
Workload	
Contact hours, in hrs	0.00
Supervised self-study, in hrs	0.00
Unsupervised self-study, in hrs	180.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	none
Module coordinator(s)	Andreas Brandenberg (andreas.brandenberg@hslu.ch)
Teaching language	English

Record

Record	In this seminar we use a sophisticated multi-sensor system designed to measure and visualize both social and individual energy patterns in distributed teams while simultaneously conducting comparative analysis of collaboration quality across different work environments. The project is developed through distributed student teams from Germany, Switzerland, Italy, Poland, and Finland. The project combines cutting-edge biometric monitoring with environmental context analysis to understand how physical and remote work settings impact team dynamics, individual performance, and collective productivity. In the seminar we utilize smartwatches and smartphones equipped with heart rate monitors, accelerometers, microphones, and GPS capabilities to create comprehensive profiles of team interaction patterns. By integrating weather APIs and environmental context data, the platform provides unprecedented insights into the factors that influence collaborative work quality in modern hybrid work environments. The development and initial testing occur within the international graduate student teams organized as Collaborative Innovation Networks

	(COINs), spanning Germany, Switzerland, Italy, Poland, and Finland, providing authentic distributed collaboration scenarios for both system development and validation.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_MPM02 **and** W.MSCIDS_CIP02

Module content

Learning content and structure	The course consists of 3 parts 1. An introductory course on Human Dynamics/Social Network Analysis/machine learning based on the draft book manuscript "Happimetrics" 2. The main part consist of project work in teams, coming from different universities, doing a large scale project. At the end of the project work, teams will deliver a final presentation to the class, and hand in a final paper. Student teams will work independently on their own, they will give a biweekly status update in a two-hour meeting to the other teams. Check out the conference Website COINonCOINs which presents the latest research of our team: http://www.coinsconference.org. About 20% of previous seminar participants submitted their work at this conference, which is published in research journals and conference proceedings.
Teaching and learning methods	Classroom: Discussion-based lessons, presentations by teacher (20%) and students (80%) Coaching and teamwork: Select project and work in a team with 2 to 5 members to apply the methods learned in the (virtual) classroom Self-study: After dividing the work among team members, work independently on completing the assigned tasks, supported by instructor and team members.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 90% (in virtual status meetings)
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	oral examination/assessment
Format	presentation
Time	during the semester/block week
In group	Yes

Scope	5.00 Minute(s)
Contribution to final grade	20 %
Electronic	no
Examination/assessment 2	
Type	oral examination/assessment
Format	presentation
Time	during the semester/block week
In group	Yes
Scope	5.00 Minute(s)
Contribution to final grade	80 %
Electronic	no

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_NET02

Version: 1.0

Python for Data Science

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_PDS01.26
Type of module	C–Core Module
Module level	I-Intermediate level
ECTS credits	6
Module category	learning module (LM)
Workload	
Contact hours, in hrs	60.00
Supervised self-study, in hrs	120.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	weekly
Module coordinator(s)	Ramón Christen (ramon.christen@hslu.ch) Andreas Melillo (andreas.melillo@hslu.ch)
Teaching language	English

Record

Record	Students learn the Python programming language from scratch beginning with variables, data types and fundamental control structures. Weekly lectures that are closely aligned with the course book and e-learning material support students in the autodidactic learning process. Thereby, lectures focus on basic programming aspects, Python specific features and concepts supporting data science tasks. Beginners and experienced students both will profit from a wide range of examples and exercises on different levels. Students learn a new programming language with weekly theory inputs and level adequate exercises and autodidactic in parallel. By the end of this course, participants will be able to solve standard programming tasks for data science applications by using Python. Obtained competences from this course allow students to participate consecutive modules in the master program that have Python as prerequisite. In addition to the plain programming language Python, this course also discusses modern project structures and introduces the concept of remote software development which emerges to the standard in data

	science projects. The use of GPT or AI-Bots for learning purposes is actively encouraged. Yet, the final exam explicitly excludes the use of generative AI and any other AI-Bots. This basic Python module allows participation with different backgrounds and with little or no programming knowledge. Students will get a solid know-how in programming and be able to apply, reflect on and extend their knowledge.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	Students are able to work with structured and unstructured data and can understand and solve complex programming problems in the realm of data science. This includes working with remote development systems, the development of algorithms, structuring applications with OOP concepts, and the deployment of packages or libraries. Students are able to evaluate the possibilities and limitations of the Python programming language and can decide which methods to use for solving a specific problem. Students learn to analyze programmable tasks and to solve them with the programming language Python. Students are able to discuss general programming issues and Python methodologies with colleagues from various disciplines. They can formulate problems comprehensibly and will be able to contribute on collaborative platforms (e.g. forums) looking for optimal solutions. Students exchange problems and contribute to a good learning atmosphere within a group. Students learn to recognize and evaluate their own learning and/or timing issues.
Learning content and structure	Topic 1: Understanding and applying the basics of Python 1. Numbers, variables 2. The use of 'strings' 3. Lists 4. Casting data types 5. Control structures: 5.1 Selection: if, else, match-case 5.2 Iteration: while, for 6. The use of operators 7. Introduction to different Python IDEs (Intelligent Development Environments) Topic 2: Advanced principles 1. Local and global variables 2. Functions 3. Reading and writing files 4. Examining lists, e.g. slicing 5. Dictionaries, tuple, set 6. List comprehensions vs. lambda functions 7. Object orientation with Python:

	7.1 Class and objects and their implementation in practice 7.2 Single and multiple inheritance 7.3 Static, class, and object methods Topic 3: Understanding and working with modules 1. Organizing programs with modules. 2. Exception handling and testing: basic principles. 3. Iterators and generators 4. Basics of decorators.
Teaching and learning methods	Classroom or Online: This basic module enables students to complete e-learning units in advance. During the class, selected code examples are created or reviewed. Exercises allow students to understand the content they have learned in detail and to identify any ambiguities. In special situations (e.g. Corona) the teaching style may be different. Coaching: In a course specific "forum", students and lecturers provide support for any Python related issues in a "low-noise" way. Self-study: The content of the second half of the lecture deliberately prepares students for various subsequent modules in which they use Python as programming language. Further exercises enable students to understand practical examples themselves. Other: This Python module also provides in-depth references to literature and videos on selected topics. GPT / AI-Bots: The use of GPT/AI-Bots to support understanding of learning content is demonstrated.
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance: 80%
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	individual examination

Time	end of semester/block week
In group	No
Scope	90.00 Minute(s)
Contribution to final grade	100 %
Electronic	no
Comments	Part 1: (30 Min) Open-book theory (printed media allowed) Part 2: (60 Min) Open-book programming exam in IDE (all media allowed except of interactions with other persons)

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_PDS01

Version: 1.0

Preliminary Study (without Project based Learning)

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_PMT03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	6
Module category	project module (PM)
Workload	
Contact hours, in hrs	0.00
Supervised self-study, in hrs	0.00
Unsupervised self-study, in hrs	180.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	none
Module coordinator(s)	Andreas Brandenberg (andreas.brandenberg@hslu.ch)
Teaching language	English

Record

Record	Preliminary study as preparation for the main study.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning content and structure	Preliminary scientific study for the substantive and methodological preparation of the main study
Teaching and learning methods	Preliminary scientific study as an independent teaching and learning format.

Assessed assignment

Grading scale	HSLU.Halbe Noten

Examination/assessment 1	
Type	written examination/assessment
Format	assessed assignment
Time	during the semester/block week
Location	remote
In group	No
Electronic	no

Created: 26/08/2026

Module code: W.MSCDAI_PMT03

Version: 1.0

Pattern Recognition in Audio Signals

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_PRA03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Kilian Schuster (kilian.schuster@hslu.ch)
Teaching language	English

Record

Record	We constantly perceive audio signals, either directly or indirectly, and our brain continuously processes sound and feeds us information about our surroundings, for example when we hear street noises. In this module, students learn about the sources of audio data, the format in which it is stored in computers, and how it can be processed. Before audio signals can be analyzed, audio data must generally first be processed with some preliminary steps. Once the data has been converted in a suitable format, it becomes possible to extract its attributes and let an algorithm carry out the tasks we have defined. For example, students learn how to apply machine learning methods when assigning pieces of music to a certain genre, recommending suitable music for a radio station, or recognizing and translating sequences of spoken text. Machine learning can also be used to compose pieces of music in a certain genre, or to create artificial voices for entertainment purposes. Students are able to explain and contrast the main machine learning methods for processing audio data. They are able to explain the underlying algorithms and technologies of these methods, select suitable options for a given data set, and explain their choice.

	Furthermore, they have the necessary practical experience in solving exemplary problem tasks of varying complexity in order to explain the possibilities and limitations of the methods used, and they can apply them to new image data sets. Students are able to deepen their understanding of the underlying technologies independently, follow developments in new research methods, and apply what they have learned.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_MPM02 **and** W.MSCIDS_CIP02

Module content

Learning objectives	Students are able to explain the essential attributes and peculiarities of audio signals from different sources (speech, music, nature and environment, technology). They are able to display image data, store them in different formats and process and extract specific attributes from them. They can explain the most important machine learning problems and are familiar with the methods for solving them, such as Bayesian Decision, Clustering, Statistical Learning, Neural Networks, Kernel Methods and Markovian Models. They are able to explain the theoretical principles of these methods in order to justify a suitable use in an applied field. Students are able to independently assess whether a simple problem can be solved, select suitable steps and methods for doing so, and apply these steps and methods to the data. Students are able to explain the specific requirements, conditions and limits that apply to the methods used. They are able to summarize the historical development up to the latest state of research of the discipline and can anticipate the appropriate development steps accordingly. Students are familiar with cutting-edge tools and can apply them accurately and efficiently to solve specific problems. Students are able to present the analysis of audio data correctly, coherently and vividly to expert and lay audiences. Students are able to reflect on and evaluate their own knowledge against the current level of expertise on technology.
Learning content and structure	Topic 1: Acoustics 1. Physical / mathematical description and properties 2. Generation / Propagation / Perception of sound 3. Technical systems for recording, storage & processing Topic 2: Signals 1. Time domain 2. Frequency domain

	3. Transformation (Fourier) 4. Spectrograms Topic 3: Applications 1. Synthesis of audio signals 2. Transformation of audio signals 3. Analysis of audio signals Topic 4: Models I 1. Sequential data 2. Hidden Markov Model 3. Viterbi decoder 4. Learning & adaptation Topic 5: Models II 1. Neural Networks 2. Recurrent Neural Networks 3. Attention & Transformers 4. Application to audio signals Topic 6: Intelligent Virtual Assistants 1. Language & speech 2. Linguistics 3. Historical evolution of methods 4. State of the art 5. Outlook
Teaching and learning methods	Classroom: Lectures including demonstrations and short exercises that students do individually or in groups. These conclude with a discussion on what has been achieved. The module uses a problem-based learning approach that aims to incrementally build and consolidate the content throughout the course. Coaching: Weekly written homework to be submitted individually. A written and individual assessment is given on a weekly base. In addition, a review to the previous homework is given to the audience at the beginning of each lesson. Self-study: Weekly homework. Other: Students prepare a short speech (presentation) to be held to the audience during the last lecture of the course.
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	individual examination
Time	during the semester/block week
Location	remote
In group	No
Contribution to final grade	100 %
Electronic	no
Comments	There is weekly homework that must be completed individually. These results must be submitted in the form of a written report.

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_PRA03

Version: 1.0

Preliminary Study

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_PRE03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	6
Module category	project module (PM)
Workload	
Contact hours, in hrs	0.00
Supervised self-study, in hrs	0.00
Unsupervised self-study, in hrs	180.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	none
Module coordinator(s)	Andreas Brandenberg (andreas.brandenberg@hslu.ch)
Teaching language	English

Record

Record	Preliminary study as preparation for the main study.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning content and structure	Preliminary scientific study for the substantive and methodological preparation of the main study
Teaching and learning methods	Preliminary scientific study as an independent teaching and learning format.

Assessed assignment

Grading scale	HSLU.Halbe Noten

Examination/assessment 1	
Type	written examination/assessment
Format	assessed assignment
Time	during the semester/block week
Location	remote
In group	No
Contribution to final grade	100 %
Electronic	no

Created: 26/08/2026

Module code: W.MSCDAI_PRE03

Version: 1.0

Preliminary Study (with Project based Learning)

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_PRS03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	project module (PM)
Workload	
Contact hours, in hrs	0.00
Supervised self-study, in hrs	0.00
Unsupervised self-study, in hrs	90.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	none
Module coordinator(s)	Andreas Brandenberg (andreas.brandenberg@hslu.ch)
Teaching language	English

Record

Record	Preliminary study as preparation for the main study.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_BYD12

Module content

Learning content and structure	Preliminary scientific study for the substantive and methodological preparation of the main study
Teaching and learning methods	Preliminary scientific study as an independent teaching and learning format.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	assessed assignment
Time	during the semester/block week
Location	remote
In group	No
Electronic	no

Created: 26/08/2026

Module code: W.MSCDAI_PRS03

Version: 1.0

R-Bootcamp

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_RB01.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	32.00
Supervised self-study, in hrs	58.00
Unsupervised self-study, in hrs	0.00
Block week	yes
Delivery / execution	Autumn semester Spring semester
Regularity of classes	block teaching
Module coordinator(s)	Claude Renaux (claude.renaux@hslu.ch)
Teaching language	English

Record

Record	R is THE statistical software. It is open source and free, is constantly developed by the R-core Team and via add-on packages written by thousands of contributors. Along with Python R represents the most widely used tool for data analysis in Data Science. Often tools such as R are learned "on the way" with no formal introduction to it. This leads to a knowledge gap in the usage of the software. This course, along with the companion course "a modern introduction to R for data scientists", tries to fill this gap by providing students with a solid and complete introduction into R and its modern use in data science. This course guides you hands-on through the important steps of a data analysis and proposes ways how to deliver your results. Students will learn how to use R and related softwares to carry out a data science project from A to Z.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Further entry requirements	Attending the online course "a modern introduction to R for data scientists" is absolutely mandatory; see folder "07_R-Intro" on Ilias https://elearning.hslu.ch/ilias/ilias.php?baseClass=ilrepositorygui&ref_id=6784922. No exceptions can be made. Presence on all four days is absolutely mandatory. Students not being able to attend the course in full, must re-enroll the missed part to get the credits. The format of the course is as follows: - Autumn semester (January / February): Online - Spring semester (August / September): On-site (no passive streaming) If you consider taking the R Bootcamp, then it is recommended to participate before Applied Machine Learning and Predictive Modelling 1 (W.MSCIDS_MPM02.18).

Module content

Learning objectives	Students know how to manipulate, visualise, and analyse data, as well has how to best report results to clients or stakeholders in a static or interactive way using R. Students practice interacting with generative AI to learn, reflect, and discuss the usefulness and limitation of these tools.
Learning content and structure	Topic 1: Reading data into R 1. From spreadsheet 2. From databases Topic 2: Data preparation and data manipulation 1. Taking care of objects class 2. Creating new variables 3. Dealing with missing values 4. Joining datasets from multiple sources 5. Reshaping datasets Topic 3: Graphical analyses 1. Displaying data 2. Tailoring of graphs (focus on {ggplot2}) Topic 4: Dynamic reporting 1. Rmarkdown 2. Knitr 3. Quarto Topic 5: R packages and beyond 1. Better understand peculiarities of add-on packages 2. Set up unit tests 3. Built an API 4. Creating interactive and static maps Topic 6: Shiny Apps 1. Introduce Shiny Apps 2. Write your own Shiny App Topic 7: Other and optional topics 1. Write your own functions 2. Control structures (eg. for loops and apply functions) 3. Parallel Computing 4. Write your own package

	5. Create a database
Teaching and learning methods	Exchange-oriented teaching.
Learning objectives acc. the competency model	Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	project assignment
Time	end of semester/block week
In group	Yes
Contribution to final grade	100 %
Electronic	no
Comments	Create a dynamic report or document that demonstrates your knowledge in R through a practical analysis of a data set. The group project is completed in pairs.

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_RB01

Version: 1.0

Recommender Systems

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_REC03.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	30.00
Supervised self-study, in hrs	60.00
Unsupervised self-study, in hrs	0.00
Block week	yes
Delivery / execution	Spring semester Autumn semester
Regularity of classes	block teaching
Module coordinator(s)	Guang Lu (guang.lu@hslu.ch)
Teaching language	English

Record

Record	Recommender systems are widely used in the business world, for example in the field of marketing. It is therefore important that students have a good grasp of the corresponding technologies and their applications. In this module, students will gain theoretical knowledge and practical experience about building modern recommender systems. They will write Python code to implement what they have learnt from the classroom on an algorithmic and project level. They will also have the opportunity to interact with data scientists working in industry who have extensive relevant experience. The concrete examples of building recommendation systems given in this module will better prepare students for their future roles as data scientists in industry. This module is also an ideal continuation and deepening of previous modules on topics such as machine learning and deep learning. The module is delivered in one full week. Through the course, students must be able to understand the key principles behind recommender systems commonly found in commercial applications. This understanding must be gained alongside practical coding practice.

	Students learn how to implement recommendation systems independently in Python. They also learn about classic applications of recommender systems in business.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_MPM02 **and** W.MSCIDS_CIP02
Further entry requirements	A basic understanding of deep learning concepts is recommended, but not mandatory. The course is designed so that motivated students can catch up and participate fully.

Module content

Learning objectives	Students will be able to understand the fundamentals of recommendation systems used by businesses, such as Bayesian-based methods, user-based and item-based collaborative filtering, matrix factorization, other model-based collaborative filtering methods, and knowledge graph-based recommendations. Students are able to put theory into practice by implementing a recommendation system in Python. They are able to train, tune and evaluate the performance of the algorithms. Students are able to deepen their previous knowledge and gain new experience in Python programming and machine/deep learning. Students are able to clearly explain their investigations and findings throughout the block week. Students will be able to work in teams to complete the final project. The recommended team size is 2-3 students. Students are able to meet face-to-face with industry experts on what they have learnt from the classroom. They should also expand their industry network in the field of data science.
Learning content and structure	Topic 1: Fundamentals of recommender systems Topic 2: Content-based recommender systems Topic 3: Collaborative filtering for recommender systems Topic 4: Matrix Factorization for collaborative filterin Topic 5: Other model-based collaborative filtering methods Topic 6: Knowledge graph-based recommender systems Topic 7: Generative AI (GenAI) in recommender systems Topic 8: Real-world challenges in building recommender systems
Teaching and learning methods	Classroom: The learning content will be taught and distributed in class. During the in-class learning period, students will be expected to set up their own architecture for implementing the recommendation system.

	Coaching: The necessary documents and study materials will be published by the lecturer in good time. These materials will also include a literature survey following the first 4 days of study, which is expected to be completed by groups of students. Self-study: Independent repetition and deepening of important themes. Learning resources will be recommended to students as a reference for that block week and for future learning. Other: Students will work in teams of 2-3 to solve a final project about building a real-world recommendation system. They will report their investigations and findings in the form of a scientific report.
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Admission requirements, end-of-module exam	Attendance is expected as the module is delivered in one full week in a tight schedule. Students are guided step by step to build their own recommendation system.
Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	project assignment
Time	end of semester/block week
Scope	30.00 Hour(s)
Contribution to final grade	100 %
Electronic	no

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_REC03

Version: 1.0

Discrete Response, Time Series, and Panel Data

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_RTP02.26
Type of module	C–Core Module
Module level	I-Intermediate level
ECTS credits	3
Module category	learning module (LM)
Workload	
Contact hours, in hrs	40.00
Supervised self-study, in hrs	50.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Philipp Schütz (philipp.schuetz@hslu.ch)
Teaching language	English

Record

Record	Measuring data at different points in time quickly raises a new set of questions: How does the behavior of the system change over time, and is it possible to predict the results of future measurements? This module explores the basic technologies with which to analyse time series data and use it for making predictions. To determine the most suitable method for a problem at hand, the module showcases the application of the techniques learned and quantifies the effect of individual decisions on the prediction quality Students are able to identify and quantify structures in time dependent data and make well-founded predictions for given time-dependent data sets by applying the steps they learned during the module. They will independently research new methods and compare them with those from the course and then select the most suitable ones for tackling a given problem.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Entry requirements (modules)	
Group A	W.MSCIDS_SA01

Module content

Learning objectives	Students - understand the main concepts for analysing time-dependent data - are able to list common methods for analysing time-dependent data and explain how they function by referring to the underlying principles. - understand different methods for analysing time series data - can compare different methods with regard to their suitability for solving an existing problem. Students are able to identify appropriate methods for solving a new analytical problem and to apply them and evaluate the results. Students are able to apply the presented methods to new data and interpret the results of the statistical package they used. Use of Generative AI (e.g. ChatGPT): Students - are able to use GenAI on a low level as an alternative to using Google. - must master the skills without GenAI aids. Students are able to jointly identify and apply different methods to solve a problem and evaluate the results of their fellow students. Students - are able to evaluate the results of externally analysed data in terms of their plausibility and choice of methods. - are able to independently research additional forecasting methods for a given task and learn to use them of their own accord.
Learning content and structure	Topic 1: Decomposition, noise treatment 1. Types of noise, reduction of noise contributions 2. Decomposition and delineation of seasonality and trend effects Topic 2: Quantitative description 1. Dependent mass 2. Correlation functions Topic 3: Modeling 1. Linear models (AR, MA, ARMA) 2. Extensions (ARIMA, SARIMA) of linear models, incl. trend and seasonal effects 3. Non-linear models such as (G)ARCH Topic 4: Forecasting 1. Forecast procedures for linear models 2. Forecasts for models with seasonal effects and trends Topic 5: Panel data 1. Analytical procedures 2. Modeling with fixed effect models Topic 6: Discrete response 1. Modelling of processes with binary and integer values 2. Linear probability / probit / logit model

	General Topic: Generative AI This is a required module; therefore Generative AI (GenAI) may not be used in the final exam. Accordingly, the learning content is independent of the use of GenAI. However, for solving the exercises the aid of GenAI as inspiration is allowed.
Teaching and learning methods	Classroom: Discussion-based lessons with exercise sequences for applying the techniques that have been learned. Coaching: Exercises to further explore the methods by means of problem-based learning.
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	practical examination/assessment
Format	individual examination
Time	end of semester/block week
Contribution to final grade	10 %
Electronic	yes
Comments	Several plausibly processed series during the semester (submission at the end of the semester)
Examination/assessment 2	
Type	written examination/assessment
Format	individual examination
Time	end of semester/block week
Scope	60.00 Minute(s)
Contribution to final grade	90 %
Electronic	no
Comments	closed book

Created: 26/08/2026

Module code: W.MSCDAI_RTP02

Version: 1.0

Classical and Bayesian Statistics

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_SA01.26
Type of module	C–Core Module
Module level	I-Intermediate level
ECTS credits	6
Module category	learning module (LM)
Workload	
Contact hours, in hrs	60.00
Supervised self-study, in hrs	120.00
Unsupervised self-study, in hrs	0.00
Delivery / execution	Autumn semester Spring semester
Regularity of classes	weekly
Module coordinator(s)	Peter Büchel (peter.buechel@hslu.ch)
Teaching language	English

Record

Record	Inadequate data analysis can result in non-existing correlations being accepted or the correlations being over- or underestimated, as well as other faulty conclusions being drawn. Mathematics offers rigorous methods that, if applied consistently, help to avoid such errors, and it summarizes them in its "statistics" sub-discipline. This module discusses these mathematical methods with regard to the handling of big data. The Bayesian approach to statistics has become more important in recent years and will be discussed extensively but the classical approach will still play an important role. Both approaches will be compared with each other. As a second focus of this module, the statistics software R is a powerful tool for working with these methods. Students are able to answer specific questions about data sets when completing tasks of medium difficulty.

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence

Module content

Learning objectives	Students - are able to test hypotheses. - are able to model and analyze data by means of regression models, which they are able to carry out. - are able to build models in the Bayesian context. Students understand regression models as the basis for modeling and analyzing data (basis for the advanced modules). Students are able to verify the plausibility of statistical statements in reports and whether the methods used are adequate. Students - understand the situations in which hypothesis testing is appropriate. - are able to decide which test to use. Students - are able to apply the steps they have learned to a specific context. - are able to solve problems using the software R. - are able to interpret the outputs of the statistics software R. Use of Generative AI (e.g. ChatGPT): Students - are able to use GenAI on a low level as an alternative to using Google. - must master the skills without GenAI aids. Remark: Assessments will be constructed in such a way that GenAI will be of extremely limited use due to the time constraints. Students are able to describe their model and analysis to a customer or third party appropriately and are able to communicate the results of their inquiry effectively. Students are open to having their own results reviewed critically and to examining them from other perspectives.
Learning content and structure	Topic 1: Introduction to R based on examples Exploratory data analysis Topic 2: Introduction to probability theory 1. Fundamentals of probability theory 2. Probability distributions (general, normal distribution, t-distribution) Topic 3: Hypothesis testing Tests for specific distributions (t-test, Wilcoxon test) Topic 4: Regression models 1. Simple linear regression 2. Multilinear regression Topic 5: Introduction to the Bayesian thinking 1. Bayes Theorem 2. Introducing statistical models using Bayesian techniques 3. Comparing classical to Bayesian statistics
Teaching and learning methods	Classroom: Discussion-based lessons with examples Presentation Coaching:

	Exercises with tasks taken from real life
Learning objectives acc. the competency model	Graduates demonstrate the subject-expertise required to manage organizations in their field of business. Graduates apply research-based problem-solving skills. Graduates create innovative, research-based solutions in practically oriented settings. Graduates implement innovative, research-based solutions in practically oriented settings. Graduates critically evaluate the impact of their solutions. Graduates present research-based solutions through functionally appropriate forms of communication. Graduates know the strengths and weaknesses, and the effects of their own personality in business contexts. Graduates demonstrate resilience when confronted with difficult individual, societal, and international business team situations.

Assessed assignment

Grading scale	HSLU.Halbe Noten
Examination/assessment 1	
Type	written examination/assessment
Format	individual examination
Time	during the semester/block week
Contribution to final grade	30 %
Electronic	yes
Comments	Questions concerning the exercises during the semester (2 dates)
Examination/assessment 2	
Type	written examination/assessment
Format	individual examination
Time	end of semester/block week
In group	No
Scope	60.00 Minute(s)
Contribution to final grade	70 %
Electronic	no
Comments	open book (own summary)

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_SA01

Version: 1.0

SAS Joint Certificate "SAS Business Analytics Expert"

Module description valid from 01/09/2026

General Module Information

Module number	W.MSCDAI_SAS02.26
Type of module	C–Core Module
Module level	A-Advanced level
ECTS credits	6
Module category	learning module (LM)
Workload	
Contact hours, in hrs	0.00
Supervised self-study, in hrs	0.00
Unsupervised self-study, in hrs	150.00
Delivery / execution	Spring semester Autumn semester
Regularity of classes	weekly
Module coordinator(s)	Andreas Brandenberg (andreas.brandenberg@hslu.ch)
Teaching language	English

Record

Record	The SAS Specialization "SAS Business Analytics Expert" is a Joint Certification of HSLU and SAS. It is part of the SAS Academic Program and listed here: https://www.sas.com/content/dam/SAS/documents/technical/education/en/sas-joint-academic-programs.pdf It is a business certification, because it consists of handling data and working on a project, the way you would do it – in business… The SAS specialization consists of over 150 hours of SAS learning material and • a SAS quarterly students online live school (3 days on topics such as analytics trends, analytics lifecylce, SAS Viya environment, turning data into value, usecases, Certification preperation) • a choice of 2 different elearning pathways • 2 online certifications that you need to pass It results in a dedicated, jointly signed certificate and badge (HSLU and SAS). It gets you the SAS skills, the ECTS credits, and an excellent boost in career. There are two pathways available to reach the SAS Specialization. Choose your pathway depending on your interest.

	1: Visual Analytics and Modeling • SAS quarterly student school (3 days web-based live course) • Visual Business Analyst (2 elearnings and 1 online certification to complete) • Visual Modeling Specialist (1 elearning and 1 online certification to complete) 2: Machine Learning and SAS Programming • SAS quarterly student school (3 days web-based live course) • SAS Base Programming Specialist (2 elearnings and 1 online certification to complete) • Machine Learning Specialist (1 elearning and 1 online certification to complete) For the successfully completed pathway and passed certifications, students will get 6 ECTS credits applied towards the general core elective modules as well as the joint certificate and badge. The SAS certifications are free of charge for our students. How to apply: https://www.hslu.ch/en/lucerne-school-of-business/degree-programmes/master/applied-information-and-data-science/joint-certificate-sas/

Placement in the course of studies

Degree programme	Master of Science in Applied Data Science and Artificial Intelligence
Entry requirements (modules)	
Group A	W.MSCIDS_MPM02

Module content

Learning objectives	Overall objective: Joint Certificate | Lucerne University of Applied Sciences and Arts (hslu.ch) Intro Video (short): Why SAS? Why this Joint Certification and why this might be great for your Career? - YouTube And on ILIAS: 03_SAS-courses Organizations face increasing demands for high-powered analytics that produce fast, trustworthy results. The SAS Viya platform enables everyone – data scientists, business analysts, developers and executives alike – to collaborate and realize innovative results faster. www.sas.com/viya SAS Visual Analytics (VA) is a part of SAS Viya and provides an interactive user experience that combines advanced data visualization, an easy-to-use interface and powerful in-memory technology. This lets users visually explore data, execute analytics and understand what data means. SAS VA complements other technologies like programming, with the focus of seeing the big picture and underlying connections faster! www.sas.com/va SAS Visual Data Mining and Machine Learning (ML) is a part of SAS Viya platform and supports the end-to-end data mining and machine learning process with a comprehensive visual – and programming – interface. It

	mpowers analytics team members of all skill levels with a simple, powerful and automated way to handle all tasks in the analytics life cycle. SAS ML complements other technologies with the focus of seeing the big picture and underlying connections faster! www.sas.com/vdmml
Learning content and structure	Pathway 1: SAS Visual Analytics (2 Modules): 1. Getting Started with SAS Visual Analytics 2. Preparing Data in SAS Visual Analytics 3. Analyzing Data in SAS Visual Analytics 4. Designing Reports with SAS Visual Analytics https://support.sas.com/edu/schedules.html?crs=YVA1&ctry=ch#s1=1 Visual Statistics / Model Building: 1. Building and exploring descriptive models 2. Building and exploring predictive models with continuous and categorical targets 3. Performing model validation 4. Assessing model goodness of fit 5. Modifying and comparing models 6. Scoring models https://www.sas.com/de_ch/certification/credentials/bi□analytics/visual-statistics-84.html Pathway 2: SAS Programming (2 Modules): 1. Essentials 2. Accessing Data 3. Exploring and Validating Data 4. Preparing Data 5. Analyzing and Reporting on Data 6. Using SQL in SAS SAS Training in the United States -- SAS® Programming 1: Essentials SAS Machine Learning Specialist 1. Apply the analytical life cycle to a business need. 2. Incorporate a business-problem-solving approach in daily activities. 3. Prepare and explore data for analytical model development. 4. Create and select features for predictive modeling. 5. Develop a series of supervised learning models based on different techniques such as decision trees, ensembles of trees (forest and gradient boosting), neural networks, and support vector machines. 6. Evaluate and select the best model based on business needs. 7. Deploy and manage analytical models under production. SAS Training in the United States -- Machine Learning Using SAS Viya How to register on Skillbuilder is explained here: ILIAS: 03_SAS-Courses
Teaching and learning methods	Self-study: In order to get the technical certification, you need to go – besides the elearning - through all the material additionally provided. Also, you need to do the practical tasks on SAS Viya for Learners as well as the certification preparation.

Assessed assignment

Admission requirements, end-of-module exam	External certification / validation.
Grading scale	HSLU.bestanden-nicht bestanden

Examination/assessment 1	
Type	practical examination/assessment
Format	assessed assignment
Time	during the semester/block week
Location	remote
In group	No
Electronic	no
Comments	External certification / validation. Pathway 1 See exam content: https://www.sas.com/en_us/certification/credentials/bi-analytics/visual-business-analytics.html See exam content: https://www.sas.com/en_us/certification/credentials/bi-analytics/modeling-using-visual-statistics.html Pathway 2 See exam content: https://www.sas.com/de_ch/certification/credentials/foundation-tools/base-programming-specialist.html See exam content: https://www.sas.com/de_ch/certification/credentials/advanced-analytics/machine-learning-specialist.html
Examination/assessment 2	
Type	written examination/assessment
Format	assessed assignment
Time	during the semester/block week
Location	remote
In group	No
Electronic	yes
Comments	The exams can be taken at any time.

Comments

Comments	The implementation modalities may be adjusted by announcing the framework conditions for the module examinations.

Created: 26/08/2026

Module code: W.MSCDAI_SAS02

Version: 1.0