

Master of Science (M.Sc.)
„Mannheim Master in Social Data Science“

University of Mannheim

– Module catalog –

Appendix

Academic Year

HWS 25/26

The following modules were added to the course program after the publication of the module catalogue.

1. Overview

D. Data Science Methods: Specialization

Module no.	Name of Module	Offered	Language	ECTS
DS 204	Mathematical Foundations of Machine Learning for Social Data Scientists	FSS	E	6
IE 685	Large Language Models and Agents (Lecture)	FSS	E	3
IE 692	Advanced Process Mining	FSS	E	6
IS 617	Large Language Models for the Economic and Social Sciences	HWS	E	6
IS 618	Social Media Data Analysis	FSS	E	6

E. Data Sciences Applications

Module no.	Name of Module	Offered	Language	ECTS
	Unwrapping the mind: knowledge, cognition, and AI	HWS	E	5
DS 601	AI product development	FSS	E	6
IS 704	Seminar Data Science III: Social Data Science	HWS/FSS	E	4
IE 698	Foundations and Applications of Digital Health Technologies	FSS	E	3
AC 001	Additional Course- Data Science Applications	HWS/FSS	-	Max. 18

2. Detailed descriptions

D. Data Science Methods: Specialization

For a detailed description please use the module catalog and appendix of the “Mannheim Master in Data Science and the „Mannheim Master in Management“:

<https://www.wim.uni-mannheim.de/studium/studienorganisation/mannheim-master-in-data-science-beginn-hws-2024/#c390496>

<https://www.bwl.uni-mannheim.de/en/programs/master/mmm/module-catalogs-2011-2020/>

E. Data Sciences Applications

	Unwrapping the mind: knowledge, cognition, and AI
Form of module	Lecture
Type of module	Elective
Level	Master
ECTS	5
Workload	Hours per semester present: 28 h (2 SWS)
	Self-study: 112 h per semester
Prerequisites	None
Aim of module	<p>With the rise of AI models like GPT-4, machines seem capable of mimicking human cognitive processes—thinking, perceiving, learning, and even making decisions. Hence, the question what the core of “human cognition” actually is, has become a focus of interest. In this lecture series, experts in cognitive science will explore different questions, for example what makes human cognition exceptional (if at all), how AI challenges our understanding of intelligence, and what we might gain from integrating AI into cognitive research. We will also address how insights from human cognition can help develop more efficient, interpretable AI models and examine the ethical considerations that come with their use.</p> <p>The perspective of psychology will approach human cognition using both experiments and formal modeling. Lectures will tackle human judgment and decision making, memory processes and memory strategies developing across the life-span, categorization and estimation as well as metacognition - the knowledge about one’s own cognitive processes. .</p> <p>From the linguistic perspective, we will focus on language acquisition and processing, as well as on the question how language relates to other domains of cognition. We will present both experimental results and historical corpus data to showcase how language is represented and processed in the mind and how learners acquire language along the dimension of time.</p>

	<p>From a computational and AI-driven standpoint, the series will cover the modeling of cognitive processes, investigating how human judgment and decision-making are represented in computational frameworks. We will also explore the inner workings of AI language models, discussing how they process and generate language and how they can be extended through multimodal learning and interaction with users.</p> <p>The philosophy lectures will explore what it means to say that something or someone "thinks" or "feels". We examine whether attributing mental states to artificial machines differs fundamentally from doing so to humans or non-human animals. We hope that this will also shed light on the broader implications of AI for our general understanding of mind and agency.</p> <p>Bringing together research from psychology, linguistics, computational science, and philosophy, this series offers a rich and interdisciplinary exploration of intelligence, learning, and perception—both human and artificial.</p>
Learning outcomes and qualification goals	<p>Expertise: Students will acquire knowledge of current research on language and the mind at the crossroads of linguistics, natural language processing, psychology and philosophy. (MK1, MK2, MK3)</p>
	<p>Methodological competence: Students learn to understand and summarize the state of the art in a certain area and discuss achievements and open problems. (MF2, MKO2)</p>
	<p>Personal competence: -</p>
Media	Slides, Research Papers
Literature	Recommended Papers from invited speakers
Methods	Lectures, independent study
Form of assessment	Written examination
Admission requirements for assessment	-
Duration of assessment	90 Minutes
Language	English

Offering	Fall semester
Lecturer	Prof. Dr. Arndt Bröder, Prof. Dr. Beatrice Kuhlmann, Prof. Dr. Carola Trips, Prof. Dr. Nicole Altvater-Mackensen, Prof. Dr. Simone Paolo Ponzetto, Prof. Dr. Wolfgang Freitag, Invited Speakers
Person in charge	Prof. Dr. Arndt Bröder, Prof. Dr. Beatrice Kuhlmann, Prof. Dr. Carola Trips, Prof. Dr. Nicole Altvater-Mackensen, Prof. Dr. Simone Paolo Ponzetto, Prof. Dr. Wolfgang Freitag
Duration of module	1 Semester
Further modules	-
Range of application	M.Sc. Wirtschaftsinformatik, MMDS, MMSDS
Semester	2.-4.

DS 601	AI product development
Form of module	Lecture and Tutorial
Type of module	Foundations of AI product development
Level	Masters
ECTS	6 (180 hours)
Workload	<i>Hours per semester present: 56 h (4 SWS)</i>
	<i>Presentations: 124 h per semester</i> <ul style="list-style-type: none"> ● 40 h: Practicing class exercises ● 84 h: Working on class group project
Prerequisites	<p>To excel in this course, students should have a solid foundation in data science, data analysis, and machine learning algorithms. A basic understanding of Large Language Models (LLMs) is essential. Working knowledge of advanced AI concepts like Retrieval-Augmented Generation (RAG), various prompting methods, and practical experience in developing prototypes with AI tools will be highly beneficial.</p> <p>Prior to admission, students must submit a one-page, single spaced statement of purpose. This will share their interest in this project, summarize relevant coursework and grades, experience, and ideas. Students can apply on one of two tracks: as software engineers or business entrepreneurs. Please state clearly which track is being selected and what academic program and degree you are currently pursuing. Groups will integrate members from each track, integrating product development with software design and implementation. A willingness to focus in one area but work and learn across both is essential.</p> <p>Details for the application submission will be on the website of Prof. Ratkovic's Chair.</p>
Aim of module	The primary aim of this course is to equip students with the skills to transform their project ideas into viable business

	<p>products, all while maintaining a steadfast focus on the core principles of responsible computing and explainable AI.</p> <p>Students will collaborate with organizations in technology, policy, and government, developing projects that advance key areas like journalism, fact-checking, digital literacy, and healthcare. The program provides continuous mentoring and access to vital resources and networks, enabling participants to move beyond traditional academic boundaries and engage in real-world product development.</p>
Learning outcomes and qualification goals	(MK2) technology-oriented students learn the concepts, algorithms and strategies used to solve concrete, practical application-oriented problems in informatics.
	(MF4) independently tackle problems in data management and analytics and describe their results in a structured, written form.
	(MKO1) apply their knowledge and capabilities to solve specific problems in a team context.
	(MKO2) use their interdisciplinary education to mediate between technical and non-technical individuals.
	(MKO3) evaluate the latest changes in programming languages, systems, models and, wherever possible, exploit them to develop better solutions to data-science related problems.
Media	Lecture slides and exercises will be available online.
Literature	Since the course emphasizes practical applications and AI product development, project-specific literature will be provided during the sessions alongside the presentation slides.
Methods	Lecture elements, weekly product development updates
Form of assessment	Final product (report or dashboard; 70%); Preliminary oral or written reports (20%); Comments and feedback on other groups (10%)
Admission requirements for assessment	Homework, practical programming projects, or written and oral reports, in-class exams.
Duration of assessment	
Language	English

Offering	Spring semester
Lecturer	Dhara Mungra
Person in charge	Prof. Dr. Marc Ratkovic
Duration of module	1 semester
Further modules	
Range of application	MMSDS, MMDS, Mannheim Master in Management, CDSS
Semester	Second or fourth semester

IS 704	Seminar Data Science III: Social Data Science
Form of module	Seminar
Type of module	Seminar
Level	Master
ECTS	4
Workload	Hours in present: 2 SWS per semester Self-study: 15 SWS per semester
Prerequisites	-
Aim of module	The achievement of the learning goals is pursued by practicing on the basis of personally assigned in-depth scientific topics as well as by actively participating in the presentation dates. The organizer will choose subject areas within the field of Data-Science and provide scientific papers to students to work through
Learning outcomes and qualification goals	Skills: On the basis of suitable literature, in particular original scientific articles, students independently familiarize themselves with a topic in data-science, classify and narrow down the topic appropriately and develop a critical evaluation. Students work out concepts, procedures and results of a given topic clearly and with appropriate formalisms in a timely manner and to a defined extent in depth in writing; Evidence of independent development by presenting self-selected examples. Descriptive oral presentation of an in-depth data science topic using suitable media and examples in a given format (CG 4)
Media	Depending on the assigned topics
Literature	Depending on the assigned topics
Methods	Depending on the assigned topics
Form of assessment	Seminar paper (50%, scope depends on the assigned topic), presentation (40%), and discussion (10%)
Admission requirements for assessment	The seminar will kick off with an assignment of subtopics in data-science, afterwards students will work through papers and related literature. A written report is produced and the work is presented and discussed in joint meetings

Duration of assessment	-
Language	English
Offering	HWS, FSS
Lecturer	Marlene Lutz, Georg Ahnert
Person in charge	Prof. Dr. Markus Strohmaier
Duration of module	1 semester
Further modules	-
Range of application	M.Sc. Social Data Science
Semester	-

IE 698	Foundations and Applications of Digital Health Technologies
Form of module	Lecture
Type of module	Specialization Course
Level	Master
ECTS	3
Workload	Hours per semester in presence: 28 h per semester
	Self-study: 56 h per semester
Prerequisites	Necessary: Basic knowledge about AI systems (knowledge-based systems, machine learning, deep neural networks)
	Optional:
	• Participation of Lecture “Responsible AI” Winter Term 2023/24
	• Basic knowledge about digital health systems
Aim of module	<u>Conceptual foundations:</u>
	• Understanding of important concepts in digital health (eHealth, mHealth, telehealth, digital phenotyping, digital twins, and other concepts)
	<u>Methods:</u>
	• e.g., interviewing, group discussions, design research methods (prototyping, design thinking, co-design), (digital) ethnography
	<u>Applications:</u>
	• AI in digital health apps in medicine and healthcare
	• AI-based robots
	• AI-based VR systems
Learning outcomes and qualification goals	<u>Knowledge:</u> Students gain insights and understanding of important concepts in digital health. They learn modes of transdisciplinary thinking and theorizing on digital health. (MK1)

	<p><u>Capabilities:</u> Students learn elements of mixed-methods study design for digital health research and co-design methodology and learn to assess scientific publications in this domain critically. (MF1 and MF2)</p> <p><u>Competencies:</u> Students learn to critically assess the conceptual, technical, ethical, legal, and social aspects of digital health applications. (MKO1)</p>
Media	Slides and supporting media will be available online.
Literature	<ul style="list-style-type: none"> • Fagherazzi, G. Deep Digital Phenotyping and Digital Twins for Precision Health: Time to Dig Deeper. Journal of Medical Internet Research 22, e16770 (2020). • Hahn, H. & Schreiber, A. E-Health. in Digital Transformation (ed. Neugebauer, R.) 311–334 (Springer Berlin Heidelberg, 2019). • Budd, J. et al. Digital technologies in the public-health response to COVID-19. Nat Med 26, 1183–1192 (2020). • Voeneky, S., P. Kellmeyer, O. Mueller, and W. Burgard, ed. 2022. The Cambridge Handbook of Responsible Artificial Intelligence: Interdisciplinary Perspectives. Cambridge Law Handbooks. Cambridge: Cambridge University Press.
Methods	Interactive lecture
Form of assessment	Written exam
Admission requirements for assessment	-
Duration of assessment	45 min
Language	English
Offering	Spring semester
Lecturer	Jun.-Prof. Dr. Philipp Kellmeyer
Person in charge	Jun.Prof. Dr. Philipp Kellmeyer
Duration of module	1 Semester

Further modules	Lecture on Responsible AI, Fall 2024
Range of application	Msc Business Informatics, Msc Data Science, Lehramt Informatik
Semester	All semesters possible

AC 001	Additional Course – Data Science Applications
Form of module	Typically: lecture, other forms of modules might be credited upon request.
Level	Master
ECTS	Max. 18 (The individual modules can vary between 2 and 10 ECTS. A total of 18 ECTS can be recognized as additional courses). A total of 18 ECTS can be recognized over all possible Additional courses.
Workload	The workload and its distribution on different activities are determined by the credited course. For courses taken at the University of Mannheim, they can be found in the respective module catalogue. One ECTS credit equals 30 hours of work.
Prerequisites	The prerequisites are determined by the credited course. For courses taken at the University of Mannheim, they can be found in the respective module catalogue
Aim of module	The course falls into the data science applications area of the MMSDS and covers topics related to data science application, but is not directly equivalent to any course in the MMSDS module catalogue. The course level equals a regular course in MMSDS study program. The module can be taken either at the University of Mannheim or at any other university in Germany or abroad.
Learning outcomes and qualification goals	The learning outcomes and qualification goals are determined by the credited course. For courses taken at the University of Mannheim, they can be found in the respective module catalogue.
Media / Literature / Methods / Form and duration of assessment	The media, literature, and methods are determined by the credited course. For courses taken at the University of Mannheim, they can be found in the respective module catalogue. The form of assessment is typically a written or oral examination, but can also include other forms of examination. Details are determined by the examination modalities of the credited course.

Language	English preferred, but any other language possible if Mannheim faculty member is able to identify content and level
Offering	Spring semester / Fall semester
Lecturer	Lecturer at the host university
Person in charge	Lecturer at the host university
Duration of module	1 Semester
Further modules	-
Range of application	MMSDS
Semester	2 nd /3 rd /4 th semester