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

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

2. Detailed descriptions

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	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. 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. . 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. 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. 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. 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.

Learning outcomes and qualification goals	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)
	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)
	Personal competence: -
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	*Hours per semester present: 56 h (4 SWS)*
	Presentations: 124 h per semester ● *40 h: Practicing class exercises* ● *84 h: Working on class group project*
Prerequisites	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. 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. Details for the application submission will be on the website of Prof. Ratkovic's Chair.
Aim of module	The primary aim of this course is to equip students with the skills to transform their project ideas into viable business products, all while maintaining a steadfast focus on the core principles of responsible computing and explainable AI.

	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.
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