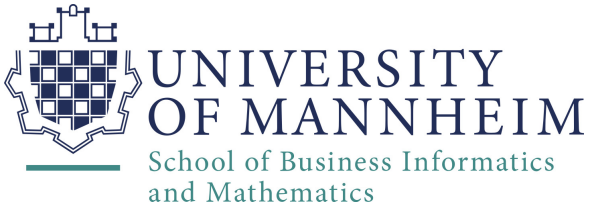
Master of Science (M.Sc.)

"Mannheim Master in Social Data Science"



– Module catalog –

Academic Year
HWS 2026 / FSS 2027

Contents

Foreword **2**

A. Overview **3**

B. Foundations of Data Science **5**
1. Overview 5
2. Detailed descriptions 6

C. Data Science Methods: Fundamentals **16**
1. Overview 16
2. Detailed descriptions 17

D. Data Science Methods: Specialization **23**
1. Overview 23

E. Data Science Applications **25**
1. Overview 25
2. Detailed descriptions 26

F. Master Thesis **29**

Abbreviations **31**

Foreword

This document describes the courses that will be offered in HWS 2026/ FSS 2027 for students studying M. Sc. Mannheim Master in Social Data Science (Examination Regulations for the Master's program from 26th April 2023). You can find the Examination Regulations on the website of the Student Services (Studienbüros):

https://www.uni-mannheim.de/en/academics/during-your-studies/examinations/examination-regulations/

It is possible that additional courses will be made available during the course of the academic year. These will be published in an appendix available on the following web page:

https://www.wim.uni-mannheim.de/en/academics/organizing-your-studies/mannheim-master-in-social-data-science/#c368706

A. Overview

		ECTS
Foundations of Data Science	Five courses	27
Data Science Methods: Fundamentals	Three courses	27
Data Science Methods: Specializations	Minimum of three courses from the areas "Data Management" or "Data Analytics Methods" of the MMDS Curriculum	18-23
Data Science Applications	At least two Master elective courses from the School of Social Sciences	18-23
Master's Thesis	Six-months-long written academic assignment	30
Total		**120**

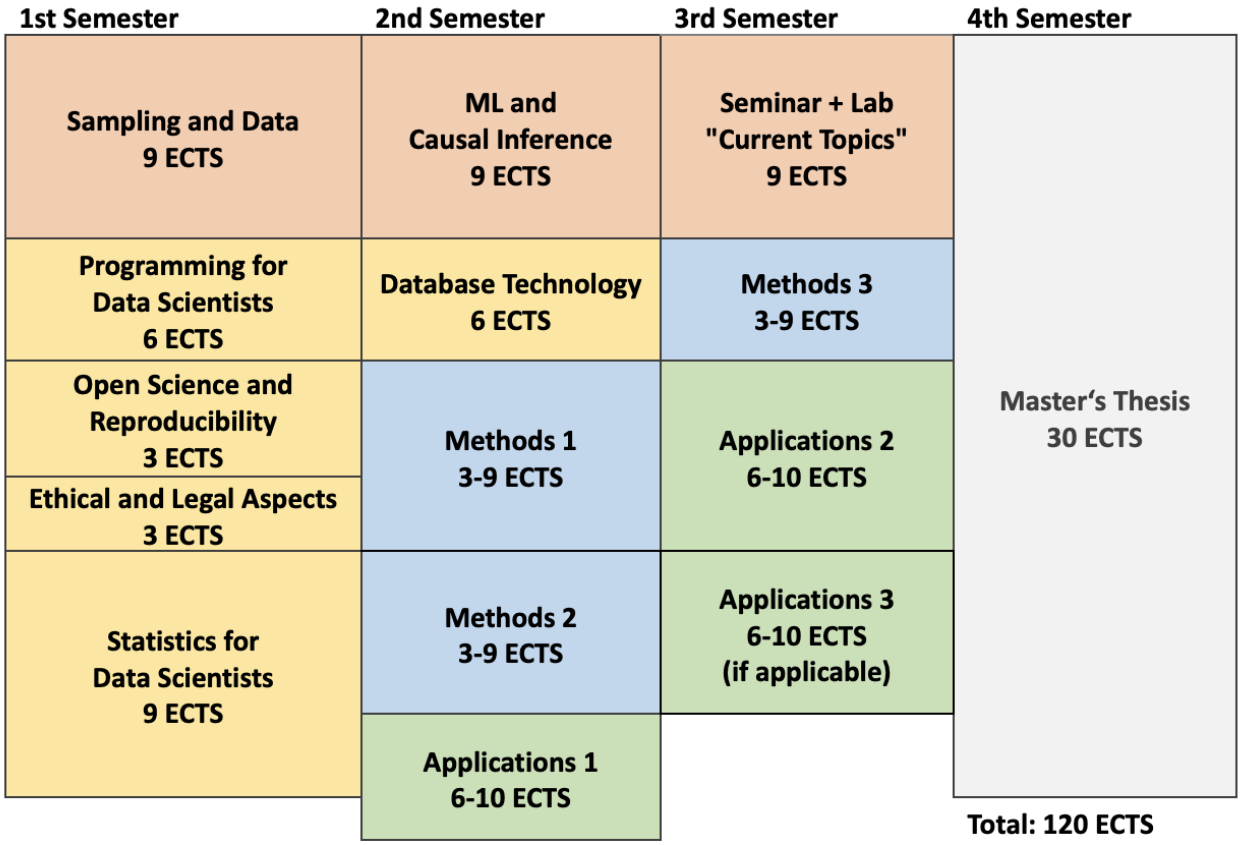
General constraints:

- Courses with 3-10 ECTS can be taken.
- All Foundations of Data Science courses worth a combined 27 ECTS must be taken.
- All Data Science Methods: Fundamentals courses worth a combined 27 ECTS must be taken.
- Three Data Science Methods: Specializations courses must be taken (18-23 ECTS) from the "Data Management" or "Data Analytics Methods" areas of the MMDS curriculum.
- At least two Master elective courses (18-23 ECTS) from the School of Social Sciences must be taken in Data Science Applications.
- You must write a Master Thesis.

Abbreviations:

- HWS (Herbst-/Wintersemester): Course is offered in the respective Fall semester.
- FSS (Frühjahrs-/Sommersemester): Course is offered in the respective Spring semester.
- HWS/FSS: Course is offered both in Fall semester and Spring semester.

Example Study Plan



B. Foundations of Data Science

1. Overview

Module no.	Name of Module	Offered	Language	ECTS	Page
DS 100	Statistics for Data Scientists	HWS	E	6+3	6
CS 460	Databases for Data Scientists	FSS	E	6	8
DS 450	Programming for Data Scientists	HWS	E	6	10
DS 500	Open Science & Reproducible Research	HWS	E	3	12
	Legal and Ethical Aspects of Privacy	HWS	E	3	14

2. Detailed descriptions

DS 100: Statistics for Data Scientists

Module number	DS 100
Title	Statistics for Data Scientists
Form of module	Lecture and Tutorial
Type of module	Foundations of Data Science
Level	Master
ECTS	9
Workload	**Hours in presence:** 56 h per semester (4 SWS) **Self-study:** 214 h per semester, including • 91 h: Pre- and post-lecture/tutorial studying and revision • 42 h: Studying for and taking weekly online tests • 40 h: Examination preparation • 41 h: Preparation and presentation of weekly exercises
Prerequisites	A sound introduction of the linear regression model (OLS) is required. Knowledge in linear algebra and calculus is useful. This is the first in a two-course sequence covering statistical models and causal inference, continuing into Data Science 201 next semester. The topics in both courses will be integrated through the year. It is expected that students will take both semesters
Aim of module	The course provides an introduction to the basics of regression models, including: • The theoretical development of linear regression • Extensions to generalized linear models • Extensions to machine learning and model selection • Regular practice on applied data analysis
Learning outcomes and qualification goals	**Professional competence:** • Understand how to appropriately translate research question into statistical models • Be able to apply statistical models appropriate for non-linear problems • Learn how to present and interpret estimation results in a substantive meaningful way (MK1, MK3) **Methodological competence:** • Estimate regression parameters using the maximum likelihood principle • Perform hypothesis tests for regression models using the maximum likelihood principle • Be able to identify violations of the respective regression assumptions of the discussed GLMs • Be able to identify limitations of non-linear regression models (MK1, MK3)

	Personal competence: • The course supports students to develop competences with regard to choosing the appropriate statistical method(s) to answer respective research questions and how to present and communicate statistical results (MF1, MF2, MF3, MKO1, MKO2)
Media	Lecture slides available online, exercises available online
Literature	• Verbeek, M. 2017. *A Guide to Modern Econometrics.* 5th ed. Chichester: Wiley • Hansen, Bruce E. 2022. *Econometrics.* Princeton: Princeton University Press • Angrist, Joshua D., and Jörn-Steffen Pischke. 2009. *Mostly Harmless Econometrics: An Empiricist's Companion.* Princeton: Princeton University Press • Wooldridge, J.M. 2002. *Econometric Analysis of Cross Section and Panel Data.* Cambridge, MA: MIT Press
Methods	Lecture elements, weekly tests, literature studies
Form of assessment	Written examination
Admission requirements for assessment	Oral participation, homework, presentations, compulsory attendance
Duration of assessment	90 minutes
Language	English
Offering	HWS
Person in charge	Prof. Dr. Marc Ratkovic
Duration of module	1 semester
Further modules	-
Programs	M.Sc. Social Data Science, M.Sc. Data Science
Semester	1st semester

CS 460: Databases for Data Scientists

Module number	CS 460
Title	Databases for Data Scientists
Form of module	Lecture with exercise
Type of module	Foundations of Data Science (MMSDS) Fundamental (MMDS for students who started before 2024)
Level	Master
ECTS	6
Workload	**Hours in presence:** 56 h per semester (4 SWS) **Self-study:** 98 h per semester, including • 70 h: Pre- and post-lecture studying and revision • 28 h: Examination preparation
Prerequisites	-
Aim of module	The course provides an introduction to data storage and database systems. The course will cover the following topics: • Principles of data storage • Relational modelling • Query languages for relational databases (SQL) • Keys and normal forms • Hash and index structures • Concurrency • Databases for non-relational data • Principles of data integration
Learning outcomes and qualification goals	**Professional competence:** • Basic understanding of data storage, relational data modelling and database design, as well as the functionality of relational database management systems, query handling, and transaction management • Handling non-relational data (MK1, MK2, MK3) **Methodological competence:** • Abstraction, Modelling, Complexity consideration (MF1, MF2) **Personal competence:** • Understanding the role of data management in enterprises (MKO1, MKO2)
Media	Electronic slides and exercise sheets
Literature	Avi Silberschatz, Henry F. Korth, S. Sudarshan: *Database System Concepts*
Methods	The course consists of a lecture together and exercises. The exercises encompass both theoretical exercises as well as practical assignments, which are conducted with a free modern database management system and allow the students to deepen their theoretical understanding of the course contents, as well as to gather hands-on experience with database management systems
Form of assessment	Written or oral examination

Admission requirements for assessment	-
Duration of assessment	60 minutes (written examination) / 30 minutes (oral examination)
Language	English
Offering	FSS
Person in charge	Prof. Dr. Heiko Paulheim, Dr. Sven Hertling
Duration of module	1 semester
Further modules	Database Systems II, Large Scale Data Management, Web Data Integration
Programs	M.Sc. Social Data Science, M.Sc. Data Science
Semester	1st/ 2nd semester

DS 450: Programming for Data Scientists

Module number	DS 450
Title	Programming for Data Scientists
Form of module	Lecture with exercise
Type of module	Foundations of Data Science
Level	Master
ECTS	6
Workload	**Hours in presence:** 56 h per semester (4 SWS) **Self-study:** 84 h per semester, including • 28 h: Pre- and post-lecture study and revision • 56 h: Preparation and presentation of tutorial exercises
Prerequisites	None (programming skills recommended)
Aim of module	The course provides data scientists with the knowledge required to apply Python 3 in data science projects. It assumes that students have basic knowledge of a programming language, but does not assume any prior Python knowledge. Topics covered include: • The Python interpreter & programming paradigms • Basic expressions & control flow statements • Functions & scoping • Data structures • Modules • Classes & object-oriented concepts • Errors and exceptions • Testing and debugging • Exploring & visualizing data with Python
Learning outcomes and qualification goals	**Professional competence:** • After taking the course, students will be familiar with Python3 and will be able to use it in data science projects **Methodological competence:** • Students will acquire the skills to develop high-quality Python software for data science and other applications **Personal competence:** • Ability to work independently • Ability to work in a team
Media	Projector, PC (Linux), printed lecture slides
Literature	• *Introduction to Computation and Programming Using Python*, J. V. Guttag, MIT Press • *Think Python: How to Think Like a Computer Scientist*, A. B. Downey, O'Reilly • The (Official) Python Tutorial
Methods	Lectures, tutorials/practical sessions, independent study
Form of assessment	Programming test

Admission requirements for assessment	Successful completion of several small programming exercises and of one programming project in a small team (including a group presentation)
Duration of assessment	120 minutes
Language	English
Offering	HWS
Person in charge	Dr. Ursula Rost
Duration of module	1 semester
Further modules	-
Programs	M.Sc. Social Data Science
Semester	1st/ 2nd semester

DS 500: Open Science & Reproducible Research

Module number	DS 500
Title	Open Science & Reproducible Research
Form of module	Lecture + Exercise
Type of module	Foundations of Data Science
Level	Master
ECTS	3
Workload	**Hours in presence:** 28 h per semester (2 SWS) **Self-study:** 62 h per semester, including • 28 h: Pre- and post-lecture studying and revision • 34 h: Exercises + report writing
Prerequisites	-
Aim of module	This course deals with Open Science which focuses on openness, transparency and reproducibility in research. Students learn about Open Science practices like Open Data, Open Materials, and Open Access publishing. Reproducible research and questions around replications are covered as well. In addition, students will gain practical skills in Open Science and reproducible research (e.g., pre-registration, code documentation, technical workflows, research data management and planning)
Learning outcomes and qualification goals	**Professional competence:** • The students will know Open Science principles and understand how reproducible research can be done (MK1, MK3) **Methodological competence:** • Students will be able to implement a diverse range of Open Science practices tailored for their research purposes (MF1, MF4) **Personal competence:** • Students will be able to assess where and which Open Science practices can be implemented within their own and others' research (MKO1)
Media	Lecture slides and exercises will be available online
Literature	• Christensen, G., Freese, J., & Miguel, E. (2019). *Transparent and reproducible social science research: How to do open science.* University of California Press • Miedema, F. (2022). *Open science: The very idea.* Springer Nature
Methods	This course consists of weekly lectures and practical exercises. The concepts and skills acquired during lectures and workshops will then be applied to an independent final written report (e.g. preregistration using secondary data, reporting the attempt of reproducing results from previous research)
Form of assessment	Written report (5-10 pages)

Admission requirements for assessment	• Oral participation • Practical work • Presentations
Duration of assessment	4-8 weeks (writing of the report)
Language	English
Offering	HWS
Person in charge	Dr. David Philip Morgan, Open Science Office, Dr. Philipp Zumstein
Duration of module	1 semester
Further modules	-
Programs	M.Sc. Social Data Science
Semester	1st semester

Legal and Ethical Aspects of Privacy

Title	Legal and Ethical Aspects of Privacy
Form of module	Lecture
Type of module	Responsible Data Science
Level	Master
ECTS	3
Workload	**Hours in presence:** 28 h per semester (2 SWS) **Self-study:** 60 h per semester, including • 30 h: Pre- and post-lecture studying and preparation • 30 h: Examination preparation
Prerequisites	-
Aim of module	In the first section, the course acquaints the students with the notion of privacy, the challenges of conceptualizing privacy and the importance of protecting privacy. The course addresses the origins and basic principles of privacy law in Europe and contrast the European privacy foundations with the U.S. approach. In the second section, students are introduced to the European General Data Protection Regulation (GDPR) and its applicability to specific cases and basic principles. The course also addresses the question if the GDPR is suitable to protect privacy issues. In a third section the course will cover legal and ethical aspects of the use of personal and non-personal data. Data potentially allows to identify and target individuals. Sometimes this kind of individualization might be legal under the auspices of the GDPR, but the legal assessment can be more challenging when looking at it from a fundamental rights perspective. Furthermore, the question arises whether those use cases are desirable from an ethical and societal point of view. The course will use selected examples in order to illustrate the ambivalence of legality, legitimacy, and ethics. During the course, students will be familiarized with (selected) current challenges to privacy by big data, big data analytics and the use of artificial intelligence

Learning outcomes and qualification goals	Students will... • be aware of the challenges of conceptualising privacy and the importance of protecting privacy • have an understanding of why privacy issues are treated differently in Europe and the U.S. and the problems and weaknesses of the respective approaches • have a basic knowledge on the applicability of the General Data Protection Regulation (GDPR) and its basic principles • be aware of privacy issues and potential legal limitations when processing data • be aware of current challenges to privacy • be aware of currently discussed new approaches to privacy (e.g., privacy by design) • be aware of legal and ethical issues of using personal as well as non-personal data • have an understanding of the chances and challenges of the use of artificial intelligence for privacy
Media	Lectures, Online quizzes
Literature	Students receive reading assignments for each unit
Methods	The class will generally be conducted as a lecture
Form of assessment	Written examination
Admission requirements for assessment	-
Duration of assessment	90 minutes
Language	English
Offering	HWS
Person in charge	Prof. Dr. Svenja Behrendt
Duration of module	1 semester
Further modules	-
Programs	M.Sc. Data Science, M.Sc. Social Data Science
Semester	1st/ 2nd/ 3rd semester

C. Data Science Methods: Fundamentals

1. Overview

Module no.	Name of Module	Offered	Language	ECTS	Page
DS 200	Sampling and Data	HWS	E	6+3	17
DS 201	Machine Learning and Causal Inference	FSS	E	6+3	19
DS 202	Seminar and Lab on Machine Learning and Causal Inference	HWS	E	9	21

2. Detailed descriptions

DS 200: Sampling and Data

Module number	DS 200
Title	Sampling and Data
Form of module	Lecture and Tutorial
Type of module	Data Science Methods: Fundamentals
Level	Master
ECTS	9
Workload	**Hours in presence:** 56 h per semester (4 SWS) **Self-study:** 214 h per semester, including • 91 h: Pre- and post-lecture studying and revision • 42 h: Studying for and taking weekly online tests • 41 h: Preparation and presentation of weekly exercises • 40 h: Examination preparation
Prerequisites	-
Aim of module	The course introduces the relevant methods for research design and data analysis in the social science. The course will center on causal inference, identification, and estimation. Reading and critiquing papers will be emphasized along with the data and statistical analyses
Learning outcomes and qualification goals	**Professional competence:** • Students can independently formulate research questions and empirically verifiable hypotheses (MK1) **Methodological competence:** • Students know different data collection methods and their advantages and disadvantages • They are able to assess the appropriateness of the methods used to answer various questions • They understand and critically evaluate the design of empirical studies (MK1) **Personal competence:** • The course supports students to develop competences with regard to choosing the appropriate research design and sampling frame (MF2, MKO1, MKO2)
Media	Lecture slides available online
Literature	• Angrist, Joshua D., and Jörn-Steffen Pischke. *Mostly Harmless Econometrics: An Empiricist's Companion.* Princeton: Princeton University Press, 2009 • Imbens, Guido W., and Donald B. Rubin. *Causal Inference for Statistics, Social, and Biomedical Sciences: An Introduction.* Cambridge: Cambridge University Press, 2015 • Cunningham, Scott. *Causal Inference: The Mixtape.* New Haven and London: Yale University Press, 2021

Methods	Lecture elements, weekly tests, literature studies
Form of assessment	Written examination
Admission requirements for assessment	Oral participation, homework, presentations, compulsory attendance
Duration of assessment	90 minutes
Language	English
Offering	HWS
Person in charge	Prof. Dr. Marc Ratkovic
Duration of module	1 semester
Further modules	-
Programs	M.Sc. Data Science, M.Sc. Social Data Science
Semester	-

DS 201: Machine Learning and Causal Inference

Module number	DS 201
Title	Machine Learning and Causal Inference
Form of module	Lecture and Tutorial
Type of module	Data Science Methods: Fundamentals
Level	Master
ECTS	9
Workload	**Hours in presence:** 56 h per semester (2 SWS) **Self-study:** 214 h per semester, including • 91 h: Pre- and post-lecture studying and revision • 42 h: Studying for and taking weekly online tests • 41 h: Preparation and presentation of weekly exercises • 40 h: Examination preparation
Prerequisites	A sound understanding of basic statistical methods incl. regression analysis, estimation methods (OLS, MLE) and statistical inference is required. Knowledge in linear algebra and calculus is also required. This is the third in a three-course sequence covering statistical models and causal inference for MMSDS. The topics in all three courses (DS 100, DS 200) will be integrated. It is expected that students will take both semesters
Aim of module	The course aims to introduce students to likelihood-based and Bayesian methods, machine learning methods, then deep learning methods. Extensions and connections to causal methods will be made at each stage. Advanced and popular techniques of machine learning are introduced
Learning outcomes and qualification goals	**Professional competence:** • Students are aware of how machine learning can help answer causal questions • They can analyze (large) data sets using popular techniques of machine learning (MK1) **Methodological competence:** • Students are able to translate their research question(s) into a causal framework • They can apply different techniques of machine learning (MK1, MK3) **Personal competence:** • The course supports students to develop competences with regard to choosing the appropriate statistical method(s) to answer respective research questions (MF1, MF2, MF4, MKO1, MKO2)
Media	Lecture slides available online

Literature	• McElreath, Richard. 2020. *Statistical Rethinking: A Bayesian Course with Examples in R and STAN.* Routledge • Murphy, Kevin P. 2012. *Machine Learning: A Probabilistic Perspective.* Cambridge: MIT Press • Hastie, Trevor, Robert Tibshirani, and Jerome Friedman. 2008. *The Elements of Statistical Learning.* 2nd ed. New York: Springer • Jurafsky, Daniel, and James H. Martin. 2009. *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition.* 2nd ed. Upper Saddle River, NJ: Prentice Hall • Imbens, Guido W., and Donald B. Rubin. 2015. *Causal Inference for Statistics, Social, and Biomedical Sciences: An Introduction.* Cambridge: Cambridge University Press
Methods	Lecture elements, weekly tests, literature studies
Form of assessment	Written examination
Admission requirements for assessment	Oral participation, homework, presentations, compulsory attendance
Duration of assessment	90 minutes
Language	English
Offering	FSS
Person in charge	Prof. Dr. Marc Ratkovic
Duration of module	1 semester
Further modules	-
Programs	M.Sc. Social Data Science, M.Sc. Data Science
Semester	2nd semester

DS 202: Seminar and Lab on Machine Learning and Causal Inference

Module number	DS 202
Title	Seminar and Lab on Machine Learning and Causal Inference
Form of module	Seminar
Type of module	Data Science Methods: Fundamentals
Level	Master
ECTS	9
Workload	**Hours in presence:** 56 h per semester (4 SWS) **Self-study:** 214 h per semester, including • 70 h: Pre- and post-seminar studying and revision • 70 h: Analyzing data, programming Python scripts • 74 h: Preparation and presentation of research project
Prerequisites	Students should be familiar with Python or R or at least with any other object-programming language
Aim of module	The module introduces, discusses and offers hands-on experience in state-of-the-art topics in data science. It consists of a "theoretical" part (seminar) which offers room for discussion on hot topics of data science and an "empirical" part where students formalize research questions and analyze data (of their own) using advanced techniques of machine learning
Learning outcomes and qualification goals	**Professional competence:** • Students are able to find appropriate techniques of machine learning to answer complex research questions • They can analyze (large) data sets using state-of-the-art techniques of machine learning (MK1) **Methodological competence:** • Students are able to program in Python • They can apply advanced techniques of machine learning to individual research questions • They have in-depth knowledge in application of data science (MK1, MK2, MK3) **Personal competence:** • Students are able to independently implement their research question in a research project • They can deal with and solve theoretical and empirical problems (MF1, MF2, MF3, MF4, MKO1, MKO2)
Media	Slides available online

Literature	• Downey, Allen B. 2016. *Think Python. How to Think Like a Computer Scientist.* 2nd ed. Needham: Green Tea Press. (available online: http://greenteapress.com/thinkpython2/thinkpython2.pdf) • McElreath, Richard. 2020. *Statistical Rethinking: A Bayesian Course with Examples in R and STAN.* Routledge • Martin and Jurafsky. 2024. *Speech and Language Processing.* Available at: https://web.stanford.edu/~jurafsky/slp3/ • Guttag, John V. 2021. *Introduction to Computation and Programming Using Python.* 3rd ed. Cambridge: MIT Press • The Python Tutorial (online: https://docs.python.org/3/tutorial/)
Methods	Lecture elements, classroom discussion, weekly lab-sessions, literature studies, external speakers
Form of assessment	Written examination
Admission requirements for assessment	Oral participation, homework, presentations, compulsory attendance
Duration of assessment	90 minutes
Language	English
Offering	HWS
Person in charge	Prof. Dr. Marc Ratkovic
Duration of module	1 semester
Further modules	-
Programs	M.Sc. Social Data Science
Semester	3rd semester

D. Data Science Methods: Specialization

1. Overview

Module no.	Name of Module	Offered	Language	ECTS	Page
CS 500	Advanced Software Engineering	HWS	E	6	MMDS*
CS 550	Algorithmics	FSS	E	6	MMDS*
CS 560	Large Scala Data Management	HWS	E	6	MMDS*
CS 600	Model-driven Development	HWS	E	6	MMDS*
CS 646	Higher Level Computer Vision	HWS	E	6	MMDS*
CS 647	Image Processing	FSS	E	6	MMDS*
CS 651	Cryptography II	HWS	E	6	MMDS*
CS 664	Blockchain Security	HWS	E	6	MMDS*
CS 668	Generative Computer Vision Models	FSS	E	6	MMDS*
IE 500	Data Mining	HWS/FSS	E	6	MMDS*
IE 560	Foundations of Artificial Intelligence - Reasoning and Decision Making	HWS	E	6	MMDS*
IE 650	Knowledge Graphs	HWS	E	6	MMDS*
IE 670	Web Data Integration	HWS	E	3	MMDS*
IE 675b	Machine Learning	HWS	E	9	MMDS*
IE 678	Deep Learning	FSS	E	6	MMDS*
IE 679	AI Deployment and Operations	HWS	E	3	MMDS*
IE 683	Web Data Integration Project	HWS	E	3	MMDS*
IE 685	Large Language Models and Agents	FSS	E	3	MMDS*
IE 686	Large Language Models and Agents Project	FSS	E	3	MMDS*
IE 692	Advanced Process Mining	FSS	E	6	MMDS*
IE 696	Advanced Methods in Text Analytics	FSS	E	6	MMDS*
IS 617 (IS 6170)	Large Language Models for the Economic and Social Sciences	MMM*	E	6	MMM*
IS 661 (IS 6610)	Text Analytics	HWS	E	6	MMM*
	Any other elective from MMDS	HWS/FSS	E	3-6	MMDS*

* For a detailed description, please see the module catalogues of the respective following degree programs:

- MMM: Mannheim Master in Management
  https://www.bwl.uni-mannheim.de/en/module-catalog-mmm/

- MMDS: Mannheim Master in Data Science
  https://www.wim.uni-mannheim.de/studium/studienorganisation/mannheim-master-in-data-science-beginn-hws-2024-25/
  (only courses form the modules "Data Management" and "Data Analytics Methods" are allowed)

Choose courses to match 18-23 ECTS

E. Data Science Applications

1. Overview

Module no.	Name of Module	Offered	Language	ECTS	Page
	Advanced Seminar (AS) MA Pol, School of Social Sciences	HWS/FSS	E	8-10	MA Pol*
	Elective MA Soc, School of Social Sciences	HWS/FSS	E	6	MA Soc*
	Elective MA Psy, School of Social Sciences	HWS/FSS	E	4	M.Sc. Psy*
CS 630	Generative Software Engineering	FSS	E	6	MMDS*
IE 655	Industrial Applications of Artificial Intelligence	FSS	E	9	MMDS*
IE 698	Foundations and Applications of Digital Health Technologies	FSS	E	3	MMDS*
CS 735	Computational Analysis of Communication	HWS/FSS	E	4	MMDS*
	Themenseminar Digitale Medien	FSS	E	6	MKW*
	Course from "Methodenmodul Grundlagen"	HWS	E	6-10	MKW*
	Course from "Methodenmodul Vertiefung"	HWS/FSS	E	6-7	MKW*
AC 001	Additional Course - Data Science Applications	HWS/FSS	E	Max. 18	26
IS 704 (IS 7040)	Data Science III: Social Data Science	HWS/FSS	E	4	27

* For a detailed description, please see the module catalogues of the respective following degree programs:

- MA Pol: Master of Arts in Political Science
  https://www.sowi.uni-mannheim.de/studium/studierende/politikwissenschaft/ma-political-science/
- MA Soc: Master of Arts in Sociology
  https://www.sowi.uni-mannheim.de/studium/studierende/soziologie/ma-sociology/
- M.Sc. Psy: Master of Science Psychologie - Arbeit, Wirtschaft, Gesellschaft (only in German)
  https://www.sowi.uni-mannheim.de/en/academics/students/psychology/msc-in-psychology-work-economy-and-society/
- MMDS: Mannheim Master in Data Science
  https://www.wim.uni-mannheim.de/en/academics/organizing-your-studies/mannheim-master-in-data-science-starting-from-hws-2024-25/
- Master Medien und Kommunikationswissenschaft (MKW):
  https://www.phil.uni-mannheim.de/studium/modulkataloge/#c111078

For detailed information about offered modules by the School of Social Sciences (MA Pol, MA Soc, and M.Sc. Psy) and in Master Medien- und Kommunikationswissenschaft (MKW), please refer to Portal[2].

Choose at least two electives from the School of Social Sciences.

Choosen courses to match 18-23 ECTS

2. Detailed descriptions

AC 001: Additional Course - Data Science Applications

Module number	AC 001
Title	Additional Course - Data Science Applications
Form of module	Typically: lecture, other forms of modules might be credited upon request
Type of module	Depends on course
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. One ECTS credit equals 30 hours of work
Prerequisites	The prerequisites are determined by the credited course.
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 at any university abroad
Learning outcomes and qualification goals	The learning outcomes and qualification goals are determined by the credited course.
Media / Literature / Methods / Form and duration of assessment	The media, literature, and methods are determined by the credited course. 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	HWS/FSS
Person in charge	Lecturer at the host university
Duration of module	1 semester
Further modules	-
Programs	M.Sc. Sozial Data Science
Semester	2nd/ 3rd/ 4th semester

IS 704 (IS 7040): Seminar Data Science III: Social Data Science

Module number	IS 704 (IS 7040)
Title	Seminar Data Science III: Social Data Science
Form of module	Seminar
Type of module	Seminar
Level	Master
ECTS	4
Workload	**Hours in presence:** 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	-
Form of assessment	• Seminar paper (40%, scope depends on the assigned topic) • Peer review of a seminar paper draft (10%) • Presentation (40%) • 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
Person in charge	Prof. Dr. Markus Strohmaier

Duration of module	1 semester
Further modules	-
Programs	M.Sc. Social Data Science
Semester	-

F. Master Thesis

Master Thesis

Title	Master‘s Thesis
Form of module	Master‘s Thesis
Type of module	Thesis
Level	Master
ECTS	30
Workload	**Self-study:** 900 h per semester
Prerequisites	-
Aim of Modules	Develop a deep understanding of an advanced topic of social data science
Learning outcomes and qualifications goals	**Professional competence:** • The student has a deep understanding of an advanced topic (MK1) **Methodological competence:** • The student is familiar with methods for analysing and independently solving advanced, complex problems (MK1, MK2, MK3) **Personal competence:** • The student has the capability to understand, analyse and independently find solutions to advanced, complex problems • The student has the capability to assess and understand the state-of-the-art in social sciences and data science and adapt the latest technologies and methods to solve real world problems • The student is able to present a complex topic in written and oral form in a clear and understandable way (MF1, MF2, MF3, MF4, MKO2, MKO3)
Media	Various
Literature	Topic dependent
Methods	Independent research work
Form of assessment	Written thesis, 10-120 pages
Admission requirements for assessment	To be permitted to write the master’s thesis, the student is to obtain at least 60 ECTS
Duration of assessment	6 months (execution of the thesis work and writing of the thesis manuscript)
Langauges	English only
Offering	HWS/FSS
Person in charge	Examiners: University teachers, auxiliary professors, honorary professors and senior academic staff members of the School of Social Sciences, the Business School, the School of Humanities, or the School of Business Informatics and Mathematics

Duration of module	1 semester
Further modules	-
Programs	M.Sc. Social Data Science
Semester	4th semester

Abbreviations

Knowledge

This degree program provides students with a solid theoretical foundation as well as practical skills for data management and data analytics methods. The courses are divided into two groups - fundamental courses and advanced courses. After studying optional fundamental courses in computer science and empirical social sciences, in their advanced courses students can focus on the concepts and methods of computer science and advanced empirical methods and the application of these methods.

During their studies

- (MK1) all students develop a deep understanding of the relevant concepts, methods and problem-solving strategies used in different application domains;
- (MK2) technology-oriented students learn the concepts, algorithms and strategies used to solve concrete, practical application-oriented problems in informatics;
- (MK3) social sciences-oriented students develop a deep understanding of how to set up, analyse and interpret advanced empirical research questions.

As part of this education, students become familiar with a wide range of models, modelling languages, methods and tools. Regardless of their specialization, students also learn how to collect, structure, manipulate, prepare, interpret, communicate and use data, information and knowledge.

Capabilities

After completing their studies, students have the ability to

- (MF1) apply a wide range of abstraction and analysis techniques;
- (MF2) understand, interpret, describe and present relevant scientific publications;
- (MF3) exploit the latest scientific results;
- (MF4) independently tackle problems in data management and analytics and describe their results in a structured, written form;
- (MF5) continue their studies at the PhD level, if their results are of sufficient quality.

Competencies

After completing their studies, students have the competences needed to

- (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.