

Master of Science (M.Sc.)

„Business Informatics“

University of Mannheim

– Module catalog –

for students starting in spring 2018 or later

Appendix

Academic Year

HWS 2021/ FSS 2022

Die folgenden Veranstaltungen wurden nach Veröffentlichung des Modulkatalogs dem Kursprogramm hinzugefügt.

C. Specialization Courses

i. CS-Courses

Modulnr.	Name des Moduls	Semester	Sprache	ECTS	Seite
CS 661	Parallel Programming	FSS	Englisch	6	4

ii. IE-Courses

Modulnr.	Name des Moduls	Semester	Sprache	ECTS	Seite
IE 678	Deep Learning	FSS	Englisch	6	6
IE 694	Artificial Intelligence Applications in Industry	FSS	Englisch	6	8

iii. IS-Courses

Modulnr.	Name des Moduls	Semester	Sprache	ECTS	Seite
IS 556	Public Blockchains	FSS	Englisch	3	MMM*
IS 622	Network Science	FSS	Englisch	6	MMM*

* For a detailed description please use the module catalog of the „Mannheim Master in Management“:

<https://www.bwl.uni-mannheim.de/studium/master/mmm/#c176637>

D. Projects and Seminars

iii. Seminar

Modulnr.	Name des Moduls	Semester	Sprache	ECTS	Seite
CS 720	Uncertainty Estimation	FSS	Englisch	4	10

CS 721	Seminar Data-Science I	FSS	Englisch	4	12
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CS 661	Parallel Programming
Form of module	Lecture with Exercise
Type of module	Specialization Course
Level	Master
ECTS	6
Workload	Hours per semester present: 56h (4 SWS)
	Self-study: 112h
Prerequisites	Good programming skills.
Aim of module	<p>In this course we will talk about various forms of parallelism:</p> <ul style="list-style-type: none"> • multi-threading • SIMD vectorization • GPUs • distributed systems <p>In order to target these hardware architectures, we will also discuss several programming languages/systems such as:</p> <ul style="list-style-type: none"> • Java • C/C++ • OpenCL/CUDA • assembly language • OpenMP • MPI
Learning outcomes and qualification goals	<p>Expertise:</p> <ul style="list-style-type: none"> • Know various forms of parallelism. <p>(MK1, MK2, MF1, MF3)</p>
	<p>Methodological competence:</p> <ul style="list-style-type: none"> • Students will be able to use various forms of parallelism in software projects. <p>(MF1, MF2, MF3)</p>
	<p>Personal competence:</p> <ul style="list-style-type: none"> • Learn how to read software documentation. • Teamwork skills. <p>(MK01, MK02)</p>
Media	Lecture slides, exercise sheets, project assignments, software, software documentation

Literature	Schmidt, Bertil; Gonzalez-Dominguez, Jorge; Hundt, Christian; Schlarb, Moritz (2017). Parallel Programming: Concepts and Practice. ISBN-13: 978-0128498903. ISBN-10: 0128498900.
Methods	<ul style="list-style-type: none"> • Lecture • Weekly Exercises/programming projects
Form of assessment	Written examination (90 minutes)
Admission requirements for assessment	>=50% points in homework assignments in groups of 2-3 students
Duration of assessment	90 minutes written exam
Language	English
Offering	FSS 22
Lecturer	Junior Professor Dr. Roland Leiða
Person in charge	Junior Professor Dr. Roland Leiða
Duration of module	1 semester
Further modules	-
Range of application	M. Sc. Wirtschaftsinformatik, M.Sc. Mannheim Master in Data Science, Lehramt Informatik
Semester	1 st /2 nd /3 rd semester

IE 678	Deep Learning
Form of module	Lecture with exercises
Type of module	Specialization Course
Level	Master
ECTS	6
Workload	Hours per semester: 56h (4 SWS)
	Self-study per semester: 98 h <ul style="list-style-type: none"> • 70 h: pre- and post-lecture studying and revision • 28 h: exam preparation
Prerequisites	IE 675b Machine Learning or equivalent, no exam procedure must have been started in IE 674
Aim of module	<p>Machine learning is concerned with building computer systems that improve with experience as well as the study of learning processes, including the design of algorithms that are able to make predictions or extract knowledge from data. Building upon IE 675b Machine Learning, this course focuses on deep learning and introduces basic and advanced deep learning architectures and techniques, training methods and hyperparameter optimization, as well as selected applications. Tentative topics include:</p> <ul style="list-style-type: none"> • Feedforward neural networks • Training deep learning models • Recurrent neural networks • Convolutional neural networks • Attention and self-attention • Deep learning for graphs • Deep generative modelling • Hyperparameter optimization
Learning outcomes and qualification goals	Expertise: Deep understanding of fundamental concepts, models, and algorithms of deep learning <div style="text-align: right;">(MK1, MF1)</div>
	Methodological competence: <ul style="list-style-type: none"> • Being able to build and train deep learning models • Being able to select suitable deep learning techniques for a given learning problem

	(MK2, MF3, MF4)
	Personal competence: <ul style="list-style-type: none"> • writing skills • presentation skills • statistical programming skills (MKO3, MF2)
Media	Slide set, exercise sheets, software, datasets
Literature	<ul style="list-style-type: none"> • I. Goodfellow, Y. Bengio, A. Courville. <i>Deep Learning</i>, The MIT Press, 2017 • K.P. Murphy. <i>Machine Learning: A Probabilistic Perspective</i>, The MIT Press, 2012 • D. Koller, N. Friedman. <i>Probabilistic graphical models</i>. The MIT Press, 2009 • Additional material and articles provided in lecture notes
Methods	The course consists of a lecture accompanied by theoretical and practical exercises as well as case studies with real data. In the exercises, students will deepen the material discussed in the lecture, apply the methods in practice, and present the result.
Form of assessment	Oral examination
Admission requirements for assessment	Homework assignments (pass at least 2 assignments)
Duration of assessment	25 minutes
Language	English
Offering	Spring semester
Lecturer	Prof. Dr. Rainer Gemulla
Person in charge	Prof. Dr. Rainer Gemulla
Duration of module	1 Semester
Further modules	-
Range of application	M.Sc. Wirtschaftsinformatik, M.Sc. Mannheim Master in Data Science
Semester	2 nd /3 rd semester

IE 694	Artificial Intelligence Applications in Industry
Form of module	Lectures and Accompanying Tutorials
Type of module	Specialization Course
Level	Master
ECTS	6
Workload	<i>Hours per semester present: 56 h (2 + 2 SWS)</i>
	<i>Self-study: 124 h per semester</i> Including the creation of a learning portfolio
Prerequisites	Recommended Knowledge: Machine Learning Concepts and Techniques Programming in Python
Aim of module	Participants will learn about the use of Artificial Intelligence methods, mostly from the field of machine learning in different sectors and industries. They will learn about application areas in the primary, secondary and tertiary sector, get an introduction to examples of such applications that have been published on a scientific level and gather some experience in working with data from the respective fields using publically available datasets.
Learning outcomes and qualification goals	Expertise: Students will acquire knowledge about possible applications of machine learning in different branches of industry as well as the dominant methods used in these areas.
	Methodological competence: Successful participants will be able to: <ul style="list-style-type: none"> • Identify potential for applying AI methods in different areas of industry; • Decide on a suitable method for addressing typical problems in these industries
	Personal competence: <ul style="list-style-type: none"> • Participants will learn to reflect and document their own learning process
Media	Slides, Book, Software Tools.
Literature	<ul style="list-style-type: none"> • Various Scientific Publications – details in the lecture slides
Methods	Lectures, tutorials, independent study

Form of assessment	Learning Portfolio
Admission requirements for assessment	n/a
Duration of assessment	-
Language	English
Offering	FSS
Lecturer	<i>Prof. Dr. Heiner Stuckenschmidt</i>
Person in charge	<i>Prof. Dr. Heiner Stuckenschmidt</i>
Duration of module	1 Semester
Further modules	-
Range of application	M.Sc. Wirtschaftsinformatik, Mannheim Master in Data Science
Semester	2.-4.

CS 720	Uncertainty Estimation
Form of Module	Seminar
Type of Module	Seminar
Level	Master
ECTS	4
Workload	120 h per semester
Prerequisites	Bachelor degree, the fundamentals
Aim of module	In this seminar, students perform scientific research, either in the form of a literature review or by conducting a small experiment, or a mixture of both, and prepare a written report about the results. Topics of interest focus around a variety of problems and tasks from the fields of Data Mining, Web Mining, or the Semantic Web.
Learning Outcomes and Qualification Goals	<p>Expertise: Students will acquire a deep understanding of the research topic. He/she is expected to describe in-depth and summarize the topic in detail in his/her own words, as well as to judge the contribution of the research papers to ongoing research.</p>
	<p>Methodological competence: Students will develop methods and skills to find relevant literature for his/her topic, to prepare methodologically sound scientific experiments, and to write a well-structured scientific paper and to present his/her results. He/she will be also aware of the need to avoid plagiarism. The key qualification Scientific Research is highly recommended as a prerequisite for the seminar.</p>
	<p>Personal qualification: Students will acquire skills on how to find relevant literature for a research topic, organize a small research task, write a well-structured, concise paper about it and present the results of their work. He/she is well prepared to write and present a Master's Thesis.</p>
Media	Scientific papers and books
Literature	Depends on the topic of the seminar
Teaching and Learning Methods	Do scientific work independently under the guidance of a professor or a research staff member
Form of Assessment	Grading of the seminar paper, Peer Review, Presentation

Admission requirements for assessment	-
Duration of Assessment	N/A
Language	English or German
Offering	Spring semester
Lecturers	Tobias Weller
Person in charge	Prof. Dr. Heiko Paulheim
Duration of module	1 semester
Further modules	-
Range of Application	M. Sc. Wirtschaftsinformatik, M.Sc. Mannheim Master in Data Science, Lehramt für Gymnasien
Semester	3 rd semester

CS 721	Seminar Data-Science I
Form of Module	Seminar
Type of Module	Seminar
Level	Master
ECTS	4
Workload	120 h per semester
Prerequisites	There are no formal requirements. However, previous participation in the courses “Network Science” and “Text Analytics” are recommended.
Aim of module	In this seminar, students perform scientific research, either in the form of a literature review or by conducting a small experiment, or a mixture of both, and prepare a written report about the results. Topics of interest focus around a variety of problems and tasks from the fields of Data-Science, Network Science and Text Mining.
Learning Outcomes and Qualification Goals	Expertise: Students will acquire a deep understanding of the research topic. He/she is expected to describe in-depth and summarize the topic in detail in his/her own words, as well as to judge the contribution of the research papers to ongoing research.
	Methodological competence: Students will develop methods and skills to find relevant literature for his/her topic, to prepare methodologically sound scientific experiments, and to write a well-structured scientific paper and to present his/her results. He/she will be also aware of the need to avoid plagiarism. The key qualification Scientific Research is highly recommended as a prerequisite for the seminar.
	Personal qualification: Students will acquire skills on how to find relevant literature for a research topic, organize a small research task, write a well-structured, concise paper about it and present the results of their work. He/she is well prepared to write and present a Master’s Thesis.
Media	slides, scientific papers, blackboard (electronic)
Literature	Depends on topic.

Teaching and Learning Methods	self-study of assigned material, presentation of scientific articles, joint discussion of work, collaboration with peers
Form of Assessment	Written report with oral presentation
Admission requirements for assessment	-
Duration of Assessment	N/A
Language	English
Offering	Spring Semester
Lecturers	Markus Strohmaier, Marlene Lutz
Person in charge	Markus Strohmaier, Marlene Lutz
Duration of module	1 semester
Further modules	-
Range of Application	M. Sc. Wirtschaftsinformatik, M.Sc. Mannheim Master in Data Science, Lehramt für Gymnasien
Semester	3 rd semester