82006000 / Ma-DS-7
Analysing Networks
Analysing Networks

Module coordinator:	Prof. Dr. rer. nat. Peter Niemeyer
Full-time teaching staff of this module:	Prof. Dr. rer. nat. Peter Niemeyer
Courses to be attended:	1 lecture (2 contact hours)
This module is assigned to the following fields:	Masterprogramm Management (M.A./M.Sc.): Management & Data Science (2. Semester)
Content:	Students learn the basics of graph theory and network analysis. Furthermore, the following topics will be treated in-depth: network metrics, generative models, community detection, social influence in networks. Tools for the generation, the representation and the analysis of networks will be discussed (e.g.Pajek, UCInet, Rsiena).

Professional competence:

Specialized Knowledge:
· graph theoretical foundations
· network metrics
· models of random graphs (Erdös-Renyi, Preferential Attachement, Watts-Strogatz, Exponential Random, Graph Models)
· clustering methods

Professional Competences:
· analysis of networks with appropriate software tools (e.g. R, UCInet, Pajek)
· tests of network hypothesis
· visualization of networks

Personal competence:	Students, as teamwork, can develop project goals and time those realistically. Furthermore, they can reflect on their working results and evaluate them.
Teaching and learning formats:	lecture /student-led tutorial
Options of examinations:	Klausur (90 Minuten) ODER Kombinierte wissenschaftliche Arbeit
Information on coursework and assessments:	1 written examination (90 min.) or 1 combined examination

Number of teaching/ learning hours:

Hours of attendance of course(s) of module: 28 Hours
Preparation and follow-up of course(s): 56 Hours
Performing coursework, if required: 0 Hours
Assessment: preparation and examination(s): 66 Hours
Entire workload: 150 Hours

Credit points:	5

Duration and frequency of offer:	Duration: 1 semester Frequency: once a year, in the summer term
Recommended prior knowledge:	not specified
Other:	not specified

82014000 / Ma-DS-3
Applied Statistical Data Analysis
Applied Statistical Data Analysis

Module coordinator:	Prof. Dr. Henrik von Wehrden
Full-time teaching staff of this module:	Prof. Dr. Henrik von Wehrden
Courses to be attended:	1 lecture (2 contact hours) and 1 exercise (2 contact hours)
This module is assigned to the following fields:	Masterprogramm Management (M.A./M.Sc.): Management & Data Science (1. Semester)
Content:	The module introduces available software tools with regard to the topic "Big Data". The focus is set on R. After introducing the programming language R, the students learn how to create loops and functions as well as data management instructions. The course closes with data instructions for data mining and visualization.
Professional competence:	Basics in Big Data software, especially R. Learning relevant instructions in R and knowledge of Big Data analysis in R. Methodological competence Fundamentals in data editing and analysis.
Personal competence:	Learning how to create own instructions (e.g. functions) and research in R regarding new analysis steps.
Teaching and learning formats:	Lecture and exercise
Options of examinations:	Klausur (90 Minuten) ODER Kombinierte wissenschaftliche Arbeit
Information on coursework and assessments:	1 written examination (90 min.) or 1 combined examination
Number of teaching/ learning hours:	Hours of attendance of course(s) of module: 56 Hours Preparation and follow-up of course(s): 28 Hours Performing coursework, if required: 0 Hours Assessment: preparation and examination(s): 66 Hours Entire workload: 150 Hours
Credit points:	5
Duration and frequency of offer:	Duration: 1 semester Frequency: once a year, in the winter term
Recommended prior knowledge:	Skills in R, basics in statistics

Other: not specified

82003000 / Ma-DS-4
Data Economy
Data Economy

Module coordinator:	Prof. Dr. Paul Drews
Full-time teaching staff of this module:	Prof. Dr. Paul Drews
Courses to be attended:	1 lecture (2 contact hours)
This module is assigned to the following fields:	Masterprogramm Management (M.A./M.Sc.): Management & Data Science (1. Semester)
Content:	The module deals with basics in data economy. The topics comprise: data repositories, data valuation by different stakeholder groups, data quality management, e-business and digital business models, open data initiatives as well as knowledge co-creation. A crucial topic is utilizing data by algorithms and technologies of data science in enterprises and the accompanying transformation of enterprises, business models and branches.
Professional competence:	The students acquire a good knowledge in the implementation of methods and technologies of data sciences in different business contexts and branches as well as methods to evaluate und manage business data. They learn how to analyse business models in a systematic way and how to further develop those by using data science methods and technologies.
Personal competence:	The students are able to gather the economic and social dimensions of data-driven business models and to reflect them in multiple perspectives. They deepen their team working skills in producing results, writing them down and presenting them cooperatively.
Teaching and learning formats:	Lecture and project (groupwork)
Options of examinations:	Klausur (90 Minuten) ODER Kombinierte wissenschaftliche Arbeit
Information on coursework and assessments:	1 written examination (90 min.) or 1 combined examination
Number of teaching/ learning hours:	Hours of attendance of course(s) of module: 28 Hours Preparation and follow-up of course(s): 56 Hours Performing coursework, if required: 0 Hours Assessment: preparation and examination(s): 66 Hours Entire workload: 150 Hours
Credit points:	5
Duration and frequency of offer:	Duration: 1 semester Frequency: once a year, in the winter term
Recommended prior knowledge:	not specified

Other: not specified

82008000 / Ma-DS-9
Data Privacy and Ethics
Data Privacy and Ethics

Module coordinator:	Prof. Dr. Andreas Möller
Full-time teaching staff of this module:	Prof. Dr. Andreas Möller
Courses to be attended:	1 Lectures (2 SWS)
This module is assigned to the following fields:	Masterprogramm Management (M.A./M.Sc.): Management & Data Science (3. Semester)

Content:

Within the last 20 years, the data-centered field of computer sciences has been massively improved: data bases, search engines, data mining, distributed storage and distributed processing, virtualization, real-time simulation, sensors, etc. These technologies represent the basis for the subject field of "Big Data", a buzz word which is in itself rather unspecific. The idea behind the term is to combine and evaluate all the available data, whether it comes from wind sensors or personal smart phones. This approach results in interesting questions regarding data privacy up to questions regarding public safety and the public good.

For more details read the content of the two lectures.

Professional competence:

While combining huge quantities of data from different sources in order to deduce further economic, social or even political relevant information, ethical questions arise. These questions are strongly connected with the term "responsibility". The topic "Big Data" prompts ethical questions of how to deal scientifically and economically with heterogeneous data, which can be collected worldwide and is thus subject to different legal conditions.

The students learn how to deal with questions like:
- What are previous and new, specific challenges of this topic area?
- What are the challenges in generating new information out of extensive heterogeneous databases?
- To whom belong the data, which data should or may I not use? Which data should / must not be used or combined in order to derive further information? Are there agreements - out of ethical reasons - that should be retained even if there might be a big economic benefit otherwise?
- Which technical possibilities can support complying with these boundaries?

In addition to the purely mathematic-technical perspective, strategies and tools in the context of data security are also taught. Thus, the students gain an insight into ethical aspects of scientific and economic values in terms of "What should possibly not be done even if it could be done?"

Personal competence:

The students build up ethical perspectives in order to deal with public and private data in a responsible way within the IT-oriented civil society.

Teaching and learning formats:

Seminar with assignments of texts, presentations, discussions, analysis of exemplary case studies

Options of examinations:

Klausur (90 Minuten) ODER Kombinierte wissenschaftliche Arbeit

Information on coursework and assessments:

1 written examination (90 min.) or 1 combined examination

Number of teaching/ learning hours:	Hours of attendance of course(s) of module: 28 Hours Preparation and follow-up of course(s): 56 Hours Performing coursework, if required: 0 Hours Assessment: preparation and examination(s): 66 Hours Entire workload: 150 Hours
Credit points:	5
Duration and frequency of offer:	Duration: 1 semester Frequency: once a year, in the winter term
Recommended prior knowledge:	not specified
Other:	

82010000 / Ma-DS-11a
Data Science Seminar
Data Science Seminar

Module coordinator:	Prof. Dr. Paul Drews
Full-time teaching staff of this module:	Prof. Dr. Paul Drews, Prof. Dr. rer. nat. Burkhardt Funk, Prof. Dr. rer. nat. Jürgen Jacobs, Prof. Dr. rer. nat. Peter Niemeyer, Prof. Dr. Lin Xie
Courses to be attended:	1 seminar (2 contact hours)
This module is assigned to the following fields:	Masterprogramm Management (M.A./M.Sc.): Management & Data Science (3. Semester)
Content:	In this module up-to-date topics in the field of data science are deepened. The students work independently on certain topics of this subject field. The topics may focus on a methodical, content-related or reflective approach. The main topics will be described in the course announcements.
Professional competence:	Depends on the thematic focus of this module. The students obtain the competence to become acquainted with challenging areas within the field of data science.
Personal competence:	The students broaden their skills to search and evaluate international scientific references in a systematic way. Moreover, they extend their skills in presenting and documenting their own scientific results corresponding to requirements of the international research community.
Teaching and learning formats:	Seminar
Options of examinations:	Kombinierte wissenschaftliche Arbeit
Information on coursework and assessments:	1 combined examination
Number of teaching/ learning hours:	Hours of attendance of course(s) of module: 28 Hours Preparation and follow-up of course(s): 56 Hours Performing coursework, if required: 0 Hours Assessment: preparation and examination(s): 66 Hours Entire workload: 150 Hours
Credit points:	5
Duration and frequency of offer:	Duration: 1 semester Frequency: once a year, in the winter term
Recommended prior knowledge:	not specified
Other:	not specified

82007000 / Ma-DS-8
Forecasting and Simulation
Forecasting and Simulation

Module coordinator:	Prof. Dr. rer. nat. Jürgen Jacobs
Full-time teaching staff of this module:	Prof. Dr. rer. nat. Jürgen Jacobs
Courses to be attended:	1 lecture (2 contact hours) and 1 exercise (2 contact hours)
This module is assigned to the following fields:	Masterprogramm Management (M.A./M.Sc.): Management & Data Science (2. Semester)
Content:	The module provides a survey of the theory and application of data-based computational techniques to forecast and simulate data with temporal dependencies. Selected statistical and/or machine learning approaches dealing with the special role of time in modeling will be discussed in detail. Topics of interest include: - stationary and non-stationary time series (ARIMA models) - conditional heteroscedastic time series (ARCH and GARCH models) - multivariate time series (VAR and VARMA models) - state space models (Kalman Filter) - neural network models (e.g. recurrent neural networks)
Professional competence:	On successful completion of the module, students will have gained knowledge in selected methods of forecasting and simulating data with temporal dependencies and will be able to use these methods in various applications.
Personal competence:	Students can critically reflect on results of forecasting and simulations.
Teaching and learning formats:	Classical and interactive lectures with embedded exercises, self-study assignments.
Options of examinations:	Klausur (90 Minuten) ODER Kombinierte wissenschaftliche Arbeit
Information on coursework and assessments:	1 written examination (90 min.) or 1 combined examination
Number of teaching/ learning hours:	Hours of attendance of course(s) of module: 56 Hours Preparation and follow-up of course(s): 28 Hours Performing coursework, if required: 0 Hours Assessment: preparation and examination(s): 66 Hours Entire workload: 150 Hours
Credit points:	5
Duration and frequency of offer:	Duration: 1 semester Frequency: once a year, in the summer term

Recommended prior knowledge:	not specified
Other:	not specified

82001000 / Ma-DS-2
Learning from Data
Learning from Data

Module coordinator:	Prof. Dr. rer. nat. Burkhardt Funk
Full-time teaching staff of this module:	Prof. Dr. rer. nat. Burkhardt Funk
Courses to be attended:	1 lecture (2 contact hours) and 1 exercise (1 contact hours per week)
This module is assigned to the following fields:	Masterprogramm Management (M.A./M.Sc.): Management & Data Science (1. Semester)
Content:	This module provides theoretical foundations and frameworks of statistical learning. These include linear models (regression, classification) and concepts like regularization, model selection and evaluation. Besides a broad variety of methods, practical implementations will be looked at.
Professional competence:	Students know the theoretical underpinning of supervised learning and understand the mathematical details and implementation of basic machine learning algorithms (linear and logistic regression, perceptron, neural networks, KNN).
Personal competence:	Students are able to reflect and discuss own (and their peer's) working results.
Teaching and learning formats:	2 hour lecture per week and 2 hour exercise with assignments every other week
Options of examinations:	Klausur (90 Minuten)
Information on coursework and assessments:	1 written examination (90 min.)
Number of teaching/ learning hours:	Hours of attendance of course(s) of module: 42 Hours Preparation and follow-up of course(s): 56 Hours Performing coursework, if required: 0 Hours Assessment: preparation and examination(s): 52 Hours Entire workload: 150 Hours
Credit points:	5
Duration and frequency of offer:	Duration: 1 semester Frequency: once a year, in the winter term
Recommended prior knowledge:	basic math and programming skills (Python) and
Other:	not specified

8000 / Ma-DS13
Master-Arbeit
Masters dissertation

Module coordinator:	Prof. Dr. rer. nat. Peter Niemeyer
Full-time teaching staff of this module:	Prof. Dr. Paul Drews, Prof. Dr. rer. nat. Burkhardt Funk, Prof. Dr. rer. nat. Jürgen Jacobs, Prof. Dr. rer. nat. Peter Niemeyer, Prof. Dr. Lin Xie, Prof. Dr. Henrik von Wehrden
Courses to be attended:	No course/lecture
This module is assigned to the following fields:	Masterprogramm Management (M.A./M.Sc.): Management & Data Science (4. Semester)

Content:	The students show that, within 5 months, they are able to apply relevant scientific methods and/or theories to a specific research question.

Qualification objectives:
The students are able to pose a research question within the specialist field of their major on a Master's level. They are able to class the research question in a wide-ranging economic research context and to examine this with regard to their respective discipline. |
| Professional competence: | The students deepen their professional skills in a selected subject field within their major. They widen their knowledge by classing a specific question with a wide-ranging economic context and strengthen their skills to reflect on and refine their specialist knowledge.

Methodological competence:
The students conceive the methods of scientific work and those that are necessary to deal with the specific research question. They practice to choose, establish and structure theoretical approaches, methodical access and empirical subject areas in a problem-centered and adequate way. |
Personal competence:	The students strengthen their competence to work autonomously and write a scientific sophisticated thesis effectively while pushed for time and performance. They are able to organize themselves in a productive way and motivate themselves to solve constructively unexpected problems.
Teaching and learning formats:	Learning forms: The students work on the exercise independently. They choose the methods and implement the studies by themselves.
Options of examinations:	Mündliche Prüfung (30 Minuten)
Information on coursework and assessments:	1 Master's Thesis // 1 oral examination (30 min.)
Number of teaching/ learning hours:	Hours of attendance of course(s) of module: 0 Hours
Preparation and follow-up of course(s): 0 Hours
Performing coursework, if required: 0 Hours
Assessment: preparation and examination(s): 750 Hours
Entire workload: 750 Hours
Credit points:	25

Duration and frequency of offer:	Duration: 5 months Frequency: each semester
Recommended prior knowledge:	The Master's Thesis is usually written in the fourth semester after finishing all modules.
Other:	not specified

82012000 / Ma-DS-12
Master-Forum
Master-Forum

Module coordinator:	Prof. Dr. rer. nat. Peter Niemeyer
Full-time teaching staff of this module:	Prof. Dr. Paul Drews, Prof. Dr. rer. nat. Burkhardt Funk, Prof. Dr. rer. nat. Jürgen Jacobs, Prof. Dr. rer. nat. Peter Niemeyer, Prof. Dr. Lin Xie, Prof. Dr. Henrik von Wehrden
Courses to be attended:	1 colloquium (1 contact hour)
This module is assigned to the following fields:	Masterprogramm Management (M.A./M.Sc.): Management & Data Science (4. Semester)

Content:

Within the Masterforum, the students present their current status of their Master's Thesis in form of a presentation and discuss open questions. The Masterforum allows for the exchange between students as well as students and supervisor.

Qualification objectives:
The students gain fundamental knowledge and skills to develop, draft, present and discuss their own scientific work on a Master's level.

Professional competence:

The students can work on, present and discuss analytical sophisticated research questions with the help of disciplinary methods and technics.

Methodological competence:
The students master methods of scientific work, i.e. disciplinary methods necessary to deal with the research question. They are able to present both the status of their work and research questions in a structured way and to discuss it goal-oriented.

Personal competence:

The students are able to discuss scientifically ambitious questions constructively. They can frame and represent a scientific point of view and argue problem solving. They are prepared to discuss questions of their fellow students. The competence to articulate suggestions, criticism and objections is further enhanced by a critical reflection on the presented research projects.

Teaching and learning formats:

Presentation, position paper, discussion, moderation, evaluation, protocol, independent study (research, lecture, disambiguation)

Options of examinations:

Schriftliche wissenschaftliche Arbeit

Information on coursework and assessments:

1 term paper (passed / failed)

Number of teaching/ learning hours:

Hours of attendance of course(s) of module: 14 Hours
Preparation and follow-up of course(s): 70 Hours
Performing coursework, if required: 0 Hours
Assessment: preparation and examination(s): 66 Hours
Entire workload: 150 Hours

Credit points:

5

Duration and frequency of offer:	Duration: 1 semester Frequency: once a year, in the summer term
Recommended prior knowledge:	not specified
Other:	not specified

82000000 / Ma-DS-1
Mathematical Foundation
Mathematical Foundation

Module coordinator:	Prof. Dr. rer. nat. Peter Niemeyer
Full-time teaching staff of this module:	Prof. Dr. rer. nat. Peter Niemeyer, Prof. Dr. Kathrin Padberg-Gehle
Courses to be attended:	1 lecture (2 contact hours) and 1 exercise (2 contact hours)
This module is assigned to the following fields:	Masterprogramm Management (M.A./M.Sc.): Management & Data Science (1. Semester)

Content:

This module provides mathematical foundations in the following areas:

· probability theory and statistics
- concept of probability (W-room, dependancy, random variables, conditional probability)
- random variables
- distributions
- descriptive statistics
- parameter estimation
- statistical tests

· linear algebra
- vector spaces and subspaces
- orthogonality
- eigenvalues and -vectors

· stochastic processes (markov chains)
·analysis
- differentiation of real-valued functions with several variables (partial derivative, gradients)
- integration of real-valued functions with several variables

Professional competence:

Specialized Knowledge:

· discrete and constant random variables
- popular distributions (PMF/PDF, CDF, variance, expected value)

·parameter estimation
·testing procedure
·regression analysis
·vector spaces (scalar products)
·eigenvalues
·(finite) Marcov-chains (irreducability, stationary distribution, application examples)

Professional Competences:
The participants of the seminar are able to
-reflect statistical statements critically
-calculate with vectors
-apply finite Markov-chains

Personal competence:

The students can reflect on their working results and evaluate them.

Teaching and learning formats:	lecture / excecise
Options of examinations:	Klausur (90 Minuten)
Information on coursework and assessments:	1 written examination (90 min.)
Number of teaching/ learning hours:	Hours of attendance of course(s) of module: 56 Hours Preparation and follow-up of course(s): 28 Hours Performing coursework, if required: 0 Hours Assessment: preparation and examination(s): 66 Hours Entire workload: 150 Hours
Credit points:	5
Duration and frequency of offer:	Duration: 1 semester Frequency: once a year, in the winter term
Recommended prior knowledge:	Basics in statistics and linear algebra
Other:	not specified

82005000 / Ma-DS-6
Probabilistic Modelling
Probabilistic Modelling

Module coordinator:	Prof. Dr. rer. nat. Burkhardt Funk
Full-time teaching staff of this module:	Prof. Dr. rer. nat. Burkhardt Funk
Courses to be attended:	1 lecture (2 contact hours)
This module is assigned to the following fields:	Masterprogramm Management (M.A./M.Sc.): Management & Data Science (2. Semester)
Content:	The module deals with advanced concepts of modelling and focusses on the basics and implementation of probabilistic modelling (Bayesian Inference). The topics are: graphical models, Belief Networks, Monte Carlo approach and specific application packages (e.g. JAGS, Stan). The implementation will be demonstrated by multi-level regression- and classification methods.
Professional competence:	Students understand the role of probabilistic models and methods in machine learning and are equipped to apply methods from Bayesian Inference. Students are able to conceptualize and build probabilistic models for various application contexts.
Personal competence:	Students are able to discuss and evaluate scientific papers (in the pobabilistic modeling domain) in small teams and can manage their own project work focussing on the implementation of probabilistic models.
Teaching and learning formats:	2 hour lecture per week and project work
Options of examinations:	Klausur (90 Minuten) ODER Kombinierte wissenschaftliche Arbeit
Information on coursework and assessments:	1 written examination (90 min.) or 1 combined examination
Number of teaching/ learning hours:	Hours of attendance of course(s) of module: 28 Hours Preparation and follow-up of course(s): 42 Hours Performing coursework, if required: 0 Hours Assessment: preparation and examination(s): 80 Hours Entire workload: 150 Hours
Credit points:	5
Duration and frequency of offer:	Duration: 1 semester Frequency: once a year, in the summer term
Recommended prior knowledge:	Programming skills

Other: not specified

82009000 / Ma-DS-10
Research Project
Research Project

Module coordinator:	Prof. Dr. Ulf Brefeld
Full-time teaching staff of this module:	Prof. Dr. Ulf Brefeld, Prof. Dr. Paul Drews, Prof. Dr. rer. nat. Burkhardt Funk, Prof. Dr. rer. nat. Jürgen Jacobs, Prof. Dr. rer. nat. Peter Niemeyer, Prof. Dr. Henrik von Wehrden
Courses to be attended:	1 seminar (2 contact hours)
This module is assigned to the following fields:	Masterprogramm Management (M.A./M.Sc.): Management & Data Science (3. Semester)
Content:	Under guided instruction, students will elaborate on a research question or a question from the field of practice.
Professional competence:	Depending on the subject of the Research Project. The students learn how to deal analytically with the subject of a specific research project and to understand the scientific basics of their subject area. The focus is set on the critical analysis of the subject. Hence, the students gain competence to transfer knowledge to new research questions and to transfer scientific results from the field of practice to other research questions. Methodological competence: Research ability, planning and project management competence, consultation expertise, methodological skills, structure of scientific publications. The students train effective progress planning and the respective techniques. They are able to collect relevant information, evaluate and interpret these, deduce decisions from it and create further learning processes. Moreover, students present their intermediate and final results with the help of audiovisual systems.
Personal competence:	Ability to work in a team, to deal with conflicts, to lead a group and manage projects, to moderate meetings. The students learn how to advocate their own objectives and to follow an agenda without ignoring the interests of others. They take over responsibility in their project team. Hence, they train to formulate and defend argumentatively their point of view or their problem-solving approach.
Teaching and learning formats:	A lot of hands-on data science/machine learning, weekly feedback rounds, mile stone presentations, producing a written report
Options of examinations:	Kombinierte wissenschaftliche Arbeit
Information on coursework and assessments:	1 combined examination
Number of teaching/ learning hours:	Hours of attendance of course(s) of module: 28 Hours Preparation and follow-up of course(s): 56 Hours Performing coursework, if required: 0 Hours Assessment: preparation and examination(s): 66 Hours Entire workload: 150 Hours
Credit points:	5

Duration and frequency of offer:	Duration: 1 semester Frequency: once a year, in the winter term
Recommended prior knowledge:	not specified
Other:	not specified

82011000 / Ma-DS-11b
Special Topics in Data Science
Special Topics in Data Science

Module coordinator:	Prof. Dr. Lin Xie
Full-time teaching staff of this module:	Prof. Dr. Paul Drews, Prof. Dr. rer. nat. Burkhardt Funk, Prof. Dr. rer. nat. Jürgen Jacobs, Prof. Dr. rer. nat. Peter Niemeyer, Prof. Dr. Lin Xie
Courses to be attended:	1 lecture (2 contact hours)
This module is assigned to the following fields:	Masterprogramm Management (M.A./M.Sc.): Management & Data Science (3. Semester)
Content:	This module deals with methods of data science in a specific application context (e.g. Geo Information, Semantic Web, Social Media Platforms, Recommender Systems, Online Marketing, e-health).
Professional competence:	Depending on the respective topic and context of application. The students learn to adapt data science technologies and methods to questions allocated in the respective context of application. In the course of this process, the critical reflection is focus on. Students learn how to apply data science technologies and methods to new research questions and how to transfer research results to further questions within the field of practice.
Personal competence:	The students are able to collect relevant information, evaluate and interpret these, deduce decisions from it and create further learning processes. Moreover, students present their intermediate and final results with the help of audiovisual systems.
Teaching and learning formats:	lecture
Options of examinations:	Kombinierte wissenschaftliche Arbeit
Information on coursework and assessments:	1 combined examination
Number of teaching/ learning hours:	Hours of attendance of course(s) of module: 28 Hours Preparation and follow-up of course(s): 56 Hours Performing coursework, if required: 0 Hours Assessment: preparation and examination(s): 66 Hours Entire workload: 150 Hours
Credit points:	5
Duration and frequency of offer:	Duration: 1 semester Frequency: once a year, in the winter term
Recommended prior knowledge:	not specified

Other: not specified

82013000 / Ma-DS-5
Deep Learning
Deep Learning

Module coordinator:	Prof. Dr. Ulf Brefeld
Full-time teaching staff of this module:	Prof. Dr. Ulf Brefeld
Courses to be attended:	1 Lecture (2 CH) and 1 Exercise (2 CH)
	1 Vorlesung (2 SWS) und 1 Übung (2 SWS)
This module is assigned to the following fields:	Masterprogramm Management (M.A./M.Sc.): Management & Data Science (2. Semester)
Content:	This course deals with deep neural networks, perceptrons, multi-layer perceptrons, backpropa-gation, autoencoder, GANs, LSTMs, deep rein-forcement learning, etc.
	Dieses Modul behandelt tiefe neuronale Netze, Perzeptrons, Multi-layer Perzeptrons, Backpropa-gation, Autoencoder, GANs, LSTMs, Deep Rein-forcement Learning, usw.
Professional competence:	Students learn about general information processing in neural networks on the example of selected models. They are able to use and evaluate artificial neural networks and related approaches in a wide variety of applications.
	Studierende erwerben Kenntnisse in Bezug auf die allgemeine Informationsverarbeitung in neuronalen Netzen anhand von ausgewählten Modellen. Sie können diese und auch andere Methoden in verschiedensten Anwendungen einsetzen und evaluieren.
Personal competence:	Students acquire knowledge about general information processing in neural networks on the example of selected models. They can use and evaluate these models and related approaches in various applications.
	Studierende erwerben Kenntnisse in Bezug auf die allgemeine Informationsverarbeitung in neuronalen Netzen anhand von ausgewählten Modellen. Sie können diese und auch andere Methoden in verschiedensten Anwendungen einsetzen und evaluieren.
Teaching and learning formats:	lecture, exercise
	Vorlesung, Übung
Options of examinations:	Klausur (90 Minuten) ODER Kombinierte wissenschaftliche Arbeit
Information on coursework and assessments:	

Number of teaching/ learning hours:	Hours of attendance of course(s) of module: 56 Hours Preparation and follow-up of course(s): 28 Hours Performing coursework, if required: 0 Hours Assessment: preparation and examination(s): 66 Hours Entire workload: 150 Hours
Credit points:	5
Duration and frequency of offer:	Dauer: 1 Semester Häufigkeit: i.d.R. jährlich im Sommersemester
Recommended prior knowledge:	
Other:	

82004000 / Ma-DS-5
Storage and Mining of Massive Datasets
Storage and Mining of Massive Datasets

Module coordinator:	Prof. Dr. Ulf Brefeld
Full-time teaching staff of this module:	Prof. Dr. Ulf Brefeld
Courses to be attended:	1 lecture (2 contact hours) and 1 exercise (2 contact hours)
This module is assigned to the following fields:	Masterprogramm Management (M.A./M.Sc.): Management & Data Science (2. Semester)
Content:	This module deals with data base concepts RDBMS and NoSQL, and their practical implementations; preprocessing, reduction, analysis and mining of massive datasets; theory of MapReduce, typical applications and algorithms for diverse applications, e.g. link analysis, analysis of item sets, mining of data streams.
Professional competence:	Professional knowledge: Knowledge of different database concepts and of how to handle and analyse huge amounts of data. Professional skills: Evaluation of appropriate software tools and techniques, practical experiences in dealing with databases.
Personal competence:	The students evaluate current developments in the field of analysis and storage of big data regarding their potentials, applications and risks. They are able to present and argue for their results.
Teaching and learning formats:	not specified
Options of examinations:	Klausur (90 Minuten) ODER Kombinierte wissenschaftliche Arbeit
Information on coursework and assessments:	1 written examination (90 min.) or 1 combined examination
Number of teaching/ learning hours:	Hours of attendance of course(s) of module: 56 Hours Preparation and follow-up of course(s): 28 Hours Performing coursework, if required: 0 Hours Assessment: preparation and examination(s): 66 Hours Entire workload: 150 Hours
Credit points:	5
Duration and frequency of offer:	Duration: 1 semester Frequency: once a year, in the summer term
Recommended prior knowledge:	not specified

Other: