

# The data science Master degree

## Data & Knowledge Engineering (MDKE)



INF

FACULTY OF  
COMPUTER SCIENCE

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**Myra Spiliopoulou** (Studies Coordinator)



Knowledge  
Management &  
Discovery Lab



Chair Business Informatics II, Head of Knowledge Management & Discovery Lab

**Methods:** Machine learning algorithms for high-dimensional dynamic data

**Ongoing Projects:**

- ★ ImmunLearning (2019 - 2022): EFRE project on a diagnostic test for immunocompetence for elderly people (with U Med OVGU)
- ★ CHRODIS+ (2017-2020) EU Joint Action on “Implementing good practices for chronic diseases”
- ★ UNITI (2020-2022) EU Project on “Unification of treatments and Interventions for Tinnitus patients”

**Further cooperations in medical research:**

- Learning on longitudinal epidemiological data (U Med Greifswald)
- Intelligent wearables for patients with diabetic foot (U Med Magdeburg)
- Phenotyping, patient evolution - clinic & m/eHealth (U Med Regensburg)
- Phenotyping and patient response to treatment (CHARITE)

1. MDKE for data science
2. Planing your MDKE studies
3. Example Pathways
4. Getting Advice

# 1. MDKE for data science

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What do you need to do Data Science?

1. Data
2. Methods
  - to process data – efficiently
  - to learn from data
  - to describe complex objects
  - to present complex objects and what we know on them
3. Business understanding
4. Understand how to match Data with Methods

What do you need to do Data Science?

1. Data



- ▶ a social network
- ▶ a medical record
- ▶ a patient
- ▶ a disease
- ▶ a bicycle
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## Thematic areas:

Starting: Fundamentals of Data Science [12-18 ECTS]

1. Learning Methods and Models of Data Science [18-36 ECTS]

2. Data Processing for Data Science [18-30 ECTS]

3. Applied Data Science [18-24 ECTS]

and finally: the Master thesis [30 ECTS]



## Where to find more information?

Module catalogue of the degree, also known as “Module Hand Book” (MHB)

- ▶ This is a large PDF document:
  - ★ It contains the description of each module we offer in the FIN.
  - ★ It contains one section per thematic area of the degree, with all the modules that fit to this area.
  - ★ In it, you may find a module more than once! Some modules fit to more than one thematic area.
- ▶ You find it under <http://www.inf.ovgu.de/ordnungenma.html>  
Entry ‘Data & Knowledge Engineering’ (in the middle of the page)
- ▶ It is updated once per semester ⇒ Choose the most recent one.

and in the LSF

## **2. Planing your MDKE studies**

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### IMPORTANT:

- ▶ The data science Master DKE has no compulsory modules.
- ▶ It is up to you to choose the modules in each thematic area.
- ▶ The only obligatory modules are:  
one Scientific Teamproject and the Master thesis

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## HOW TO CHOOSE MODULES:

1. Make yourself familiar with the types of modules we offer
  - 1.1 Lecture (called “Vorlesung”) with Exercises (called “Übung”)
  - 1.2 Seminar
  - 1.3 Scientific Teamproject or Teamproject for short, intended for teams;  
is mapped exclusively to the area 'Applied Data Science'
  - 1.4 Individualproject, intended for one student only

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3. Consult the LSF to find what we offer in this term
4. Consult your mind and your heart: write down what you are interested in, listen to your curiosity, go with your strengths
5. Plan for three semesters, but be ready to re-plan later!

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## Wen you consider thematic areas

- ▶ DO NOT use LSF to map courses to areas; use exclusively the Module Hand Book
- ▶ DO map teamprojects exclusively to the area 'Applied Data Science' – even if the Module Hand Book seems to permit something different !!

## Where to find more information?

### URLs:

Landing page: `www.inf-international.ovgu.de`

and from there you follow the links to:

- ▶ Entry point for new students
- ▶ FAQs for new students
- ▶ Support for international students

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### Interviews with teachers on their courses under

[www.inf.ovgu.de/inf/en/Study/Being+a+student/Incoming/Courses+Introduction-p-5078.html](http://www.inf.ovgu.de/inf/en/Study/Being+a+student/Incoming/Courses+Introduction-p-5078.html)

From that page you reach interview videos, in which teachers elaborate on their courses: what the course is about, what expectations they have from the students, what can the students do after completing the course successfully

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### Mentors!

There is an international team of mentors to help you in the start of your studies. Infos on how to reach them from the URLs above.

### **3. Example Pathways**

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## Why pathways?

- ▶ Each course requires some background knowledge.
- ▶ Some courses build upon others.
- ▶ The MDKE does not consist only of courses: the last semester is for the Master thesis.

In the three semesters preceding it, you must acquire all the knowledge you need to master it.

## An example of a simple pathway

	<b>Module</b>	<b>Size</b>	<b>Prerequisite type</b>	<b>Prerequisites</b>
1	<i>Visualization</i>	ca. 120	should have	Programming skills
2	<i>Visual Analytics</i>	ca. 120	better have	<i>Visualization</i>
3	<i>Visual Analytics in Healthcare</i>	ca. 25	must have	<i>Visual Analytics</i>

More example pathways

	<b>Module</b>	<b>Prerequisites (must have)</b>
1	<i>Wissenschaftliches Rechnen I (WR1)</i>	Introduction to linear Algebra
2	<i>Wissenschaftliches Rechnen II (WR2)</i>	<i>WR1</i>
3	<i>Wissenschaftliches Rechnen III (WR2)</i>	<i>WR1, WR2</i>
4	<i>Geometric Formulations of Inviscid Fluids and their Discretizations</i>	<i>WR2, WR3</i>

1. WR1: Introduction to scientific computing
2. WR2: Dynamic systems and partial differential equations
3. WR3: Tensor analysis, vector calculus and applications

	<b>Module</b>	<b>Prereq type</b>	<b>Prerequisites</b>
ST	<i>Evolutionary Multi-Objective Optimization (EMO)</i>	prereq for examination	midterm exam
WT	<i>Swarm Intelligence (SI)</i>	prereq for examination	midterm exam
ST	<i>Computational Intelligence in Games (CIG)</i>	must have	programming skills

	Module	Prereq type	Prereqs	A	B
ST	<i>Datenbanken Implementierungstechniken (DB2)</i>			1st	2nd
WT	<i>Transaction Processing (TP)</i>			2nd	1st
WT	<i>Distributed Data Management (DDM)</i>			2nd	1st
ST	<i>Advanced Topics in Databases (ATDB)</i>	better have	<i>DB2</i>	3rd (1st)	2nd
WT	<i>Advanced Database Models (ADBM)</i>			2nd	1st
WT	<i>Data Warehouse Technologies (DWT)</i>	better have	<i>DB2</i>	2nd	3rd
both	<i>Scientific Team Project (ScTP)</i>	should have must pass	<i>DB2</i> or <i>ATDB</i> programming test	3rd –	3rd –
both	<i>Student Conference (StudConf)</i>	must have	<i>DB2</i> or <i>ATDB</i> or <i>ScTP</i>	3rd	3rd

**Note:** a well-founded database course is prerequisite for all modules; this you have from your bachelor degree (MDKE prerequisite).

	Module	Size	Prereq type	Prerequisites
ST	<i>Data Mining I</i>		prereq for examination	a number of within-term tests
WT	<i>Data Mining II</i>		should have	background in DM/ML
ST	<i>Recommenders</i>		should have	background in DM/ML
ST	<i>Data Science with R</i> [teacher: Uli Niemann]	30+	must have [★]	background in DM/ML programming skills
both	<i>Advanced Topics of KMD</i> (6 ECTS seminar)		must have [★, ⊙]	background in DM/ML programming skills
both	Teamproject	$n \times 3$	must have [★, ⊙]	background in DM/ML programming skills

- ★ Admission procedure in place (application with CV, eventually interview)
- ⊙ Further prerequisites apply, depending on the topic of seminar / teamproject



	Module	Size	Prereq type	Prerequisites
WT	<i>Introduction to Deep Learning</i>	60	must have one of	<ul style="list-style-type: none"> <li>· Grade 2.3 or better in <i>Neuronale Netze</i></li> <li>· Grade 1.7 or better in <i>Machine Learning</i></li> <li>· ... or in <i>Adv Topics of Machine Learning</i></li> <li>· Recommendation from a FIN-Professor</li> </ul>
ST	<i>Deep Learning II: Learning Generative Models</i>	30+	must have	<i>Introduction to Deep Learning</i>
both	Teamprojects, Advanced seminars on Deep Learning	small	must have	<i>Introduction to Deep Learning</i>

	Module	Size	Prereq type	Prerequisites
ST	<i>Introduction to Computer Vision</i> <sup>1</sup>	25	must have	Programming skills, basic knowledge in image or signal processing, basic knowledge in geometry, analysis and linear algebra
WT	<i>Computer Vision and Deep Learning</i> <sup>2</sup>	25	must have	Programming skills, basic knowledge in computer vision, optimization techniques, and in linear algebra

1. Topics of the course *Introduction to Computer Vision*:

- ▶ Early Vision Techniques: Feature extraction and artefact suppression in images, multiple view geometry for stereo vision and structure from motion.
- ▶ Introduction to High Level Computer Vision: Model-driven object detection, Object tracking, Introduction to image classification

2. Topics of the course *Computer Vision and Deep Learning*:

- ▶ Predefined and trained feature detection and reduction in images
- ▶ Discriminative and generative models for image classification
- ▶ Multilayer perceptrons and convolutional neural networks for image analysis
- ▶ Application of (deep) neural networks for/in image classification, object detection, semantic image segmentation, stereo vision, object tracking

## 4. Getting Advice

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- ▶ Exam issues: Examinations Office
- ▶ Complex plans of studies, general troubleshooting: Studies coordinator (me)  
[myra@iti.cs.uni-magdeburg.de](mailto:myra@iti.cs.uni-magdeburg.de)
- ▶ General issues on international studies: Coordinator of International Studies



Thank you for your attention!

Much success with your studies with us!