The Data Science Master degree

*Data & Knowledge Engineering*

Updates (most important one on slide #11)

Vishnu Unnikrishnan – PhD student, alumnus Master DKE
Prof. Myra Spiliopoulou – Studies coordinator

http://www.kmd.ovgu.de/
DKE in the times of Data Science

What do you need to do Data Science?

1. Data

2. Methods
   - Methods for processing data – efficiently
   - Methods for learning from data
   - Methods for describing complex objects
   - Methods for visualizing complex objects and what we know on them

3. Business understanding

4. Understanding on how to match Data with Methods
DKE in the times of Data Science

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DKE in the times of Data Science

What Expertise do you need to become a Data Scientist?

2. Methods
   - Methods for processing data – efficiently
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   - Methods for describing complex objects
   - Methods for visualizing complex objects and what we know on them

Data Engineering
Data Mining / Machine Learning
Knowledge Engineering
Visualization
DKE in the times of Data Science

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   - Methods for processing data – efficiently
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3. Business understanding

Hands-on using DKE in business applications

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DKE in the times of Data Science

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   - Methods for processing data – efficiently
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3. Business understanding

Master DKE

Data Engineering
Data Mining / Machine Learning
Knowledge Engineering
Visualization

Hands-on using DKE in business applications
Data Science Master DKE in the Faculty of Computer Science

Bachelor degree (at least 10 CS courses)

Data Science Master DKE

4 semesters / 120 ECTS

3 semesters=90 ECTS for courses
+ 1 semester=30 ECTS for the Master thesis
Structure of the Master DKE

FIVE thematic areas:

1. Fundamentals
2. Models
3. Methods I
4. Methods II
5. Applications
Structure of the Master DKE

FIVE thematic areas:

1. **Fundamentals**: Basics of data mining, database processing, data/image/multimedia engineering

2. **Models**: Knowledge representation, knowledge modeling, knowledge processing

3. **Methods I**: Knowledge discovery, artificial intelligence, machine learning

4. **Methods II**: Information processing and retrieval

5. **Applications**: Application of DKE, including business applications, medical applications, engineering applications, core CS applications (e.g. security, image understanding)
Structure of the Master DKE

Choose modules in the FIVE thematic areas:

1. Fundamentals: 30 ECTS

2. Models: 12-24 ECTS

3. Methods I: 12-24 ECTS

4. Methods II: 12-24 ECTS

5. Applications: 12-24 ECTS

Master thesis: 30 ECTS

6 ECTS reserved for a TeamProject in one of the thematic areas 2 to 5.
Where to choose modules from?

Fundamentals:
- Late semesters of the FIN programme for Bachelor degrees
- Modules from the FIN programme for Master degrees
- No teamproject in this area

Models, Methods I & II, Applications:
- Modules from the FIN programme for Master degrees
Information on all modules

Module catalogues, with the assignment of courses to each thematic area are under

http://www.inf.ovgu.de/ordnungenma.html

- Move down the page to Data & Knowledge Engineering
- Under the entry Modulhandbuch you find all offered modules under

→ Modulkatalog (Übersicht über alle Module): <current term>

The modules offered in the current term are in the LSF.

DO NOT use LSF to map modules to thematic areas.
Information on all modules

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  Modulkatalog (Übersicht über alle Module): <current term>

This catalogue is updated once per semester, so make sure you choose the most recent one.

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- Under the entry Modulhandbuch you find all offered modules under

→ Modulkatalog (Übersicht über alle Module): <current term>

The index provides a fast overview on which modules fit to which area.
We expect changes in this overview only in exceptional cases (e.g. for fully redesigned modules).

DO NOT use LSF to map modules to thematic areas.
Choosing modules to
PLAN YOUR STUDIES
How to choose modules?

YOU
choose the courses you want to attend
How to choose modules?

YOU
choose the courses you want to attend

But from this semester on, we have a recommended plan for the 1st semester.
RECOMMENDED PLAN for 1st semester: Winter term 17/18

- **Fundamentals**: Machine Learning, Information Retrieval, PPSW (3 ECTS), Swarm Intelligence
- **Models**: Introduction to Simulation
- **Methods I**: Bayes Networks, BMRECSYS
- **Methods II**: Distributed Data Management
RECOMMENDED PLAN for 1st semester: Winter term 17/18

• **Fundamentals:** Machine Learning, Information Retrieval, PPSW (3 ECTS), Swarm Intelligence
• **Models:** Introduction to Simulation
• **Methods I:** Bayes Networks, BMRECSYS
• **Methods II:** Distributed Data Management

➢ Start with modules in the area Fundamentals!

➢ Grey modules require more background.
Example Plan – with focus on "Mining"

Fundamentals + Methods I
30+24 ECTS

- Data Mining
- Machine Learning
- Intelligent Data Analysis
- Swarm Intelligence
- Computational Intelligence topics
- Neural Networks
- Adv. Topics in KMD
- Adv. Topics in Machine Learning
- Seminars & Teamprojects in DKE, KMD, SwarmIntelligence, FuzzySys

And many more

Models: 12 ECTS

- Applied Discrete Modelling
- Bayesian Networks
- Fuzzy Systems
- Introduction to Simulation
- Neural Networks and more

Methods II: 12 ECTS

- Data Warehousing and more
- Advanced Topics in Databases
- In-Memory Technologies

Applications: 12 ECTS

- Biometrics
- CRM, Recommenders
- Multimedia, Security

And more

Prof. Myra Spiliopoulou – Knowledge Management & Discovery
Example Plan – with focus on "Big Data"

**Fundamentals + Methods I:** 18++ ECTS
- Data Mining
- Machine Learning
- Intelligent Data Analysis
- Adv. Topics in KMD
- Adv. Topics in Machine Learning
- Seminars DKE, KMD, FuzzySys

**Fundamentals + Methods II:** 36++ ECTS
- Distributed Data Management
- Advanced Topics in DB
- In-Memory Technologies I & II
- Seminar & Teamproject DBSE
- Data Warehousing
- Information Retrieval
- Multimedia Retrieval

**Models:** 12 ECTS
- Ontologies
- Introduction to Simulation
- Bayesian Networks
- Neural Networks

**Applications:** 12 ECTS
- Very Large Business Applications
- Multimedia and Security
- CRM, Recommenders
- Image Analysis

and more and more and more
Example Plan – with focus on "Business"

Fundamentals +Methods I: 18 ECTS
- Data Mining and more
- Machine Learning
- Intelligent Data Analysis
- BMRECSYS

Methods II: 18 ECTS
- Data Warehousing and more
- Advanced Topics in DB
- In-Memory Technologies
- Distributed Data Management

Models: 12 ECTS
- Bayesian Networks
- Introduction to Simulation
- Fuzzy Systems and more

Fundamentals +Applications: 30++ ECTS
- Very Large Business Applications
- Recent Topics in Business Inf
- Information Retrieval
- Multimedia Retrieval
- Multimedia and Security
- Teamprojects WIF I, WIF III
- Seminars + Teamprojects of DBSE, DKE, KMD, AMSL
(Attention: Only some topics fit!)

and more and more
Focus "Data Science Methods"

Get a solid understanding on learning methods  
Methods I: 18

Get a solid understanding on data management  
Methods II: 18

Master some modeling technologies  
Models: 12

Understand business applications  
Applications: 12

Spread your block judiciously between

• learning methods (see: Example plan for "Mining")

• data management (see: Example plan for "Big Data")

Fundamentals: 30
Make a plan NOW!

1. Find modules
2. Assign each module you chose to one of the thematic areas
3. Write down your plan and cross-check that you have the right number of modules in each thematic area!
4. When you register for the exam of a course, pick your plan and make sure that you assign the course to the correct thematic area.
5. ...

Personalized Plan of Studies
Write down the plan for your studies

1. Find modules
   - Go through the modules offered, according to the LSF
   - Read the module descriptions (web pages) and
   - Drop by at the first one or two meetings
   - Make sure you have the background needed to attend the course – ASK the teacher if you are not sure

2. Assign each module you chose to one of the thematic areas
Write down the plan for your studies

1. Find modules

2. Assign each module you chose to one of the thematic areas
   - You find the mapping of modules to thematic areas in the DKE module handbook.

The LSF also lists the areas to which a module belongs, but this is often obsolete. IGNORE it!

The DKE module handbook is in German, but the index is in English.
Write down the plan for your studies

1. Find modules

2. Assign each module you chose to one of the thematic areas
   - You find the mapping of modules to thematic areas in the DKE module handbook.
   - Make sure that you assign only as many modules to an area as are permitted.

For example, you cannot assign 30 ECTS to Applications.
Write down the plan for your studies

1. Find modules

2. Assign each module you chose to one of the thematic areas
   - You find the mapping of modules to thematic areas in the DKE module handbook.
   - Make sure that you assign only as many modules to an area as are permitted.
   - If a module can be assigned to more than one area, check:
     - Is it a seminar or a team project?
       Then, the thematic area depends on the concrete topic.
Write down the plan for your studies

1. Find modules

2. Assign each module you chose to one of the thematic areas
   - You find the mapping of modules to thematic areas in the DKE module handbook.
   - Make sure that you assign only as many modules to an area as are permitted.
   - If a module can be assigned to more than one area, check:
     - Is it a seminar or a teamproject?
       Then, the thematic area depends on the concrete topic.

There are default areas for seminars & teamprojects, for example:
- most seminars/teamprojects with the word "business" in the name belong to APPLICATIONS.
- most seminars/teamprojects on databases belong to Methods II.
- seminars and teamprojects that belong to FUNDAMENTALS must deliver fundamental knowledge on methods I or II.
Write down the plan for your studies

1. Find modules

2. Assign each module you chose to one of the thematic areas
   - You find the mapping of modules to thematic areas in the DKE module handbook.
   - Make sure that you assign only as many modules to an area as are permitted.
   - If a module can be assigned to more than one area, check:
     - Is it a seminar or a teamproject? Then, the thematic area depends on the concrete topic.
     - If it is a course (e.g. Swarm Intelligence), then choose one of the permitted thematic areas carefully!
Write down the plan for your studies

1. Find modules

2. Assign each module you chose to one of the thematic areas

3. Write down your plan and cross-check that you have the right number of modules in each thematic area!
### Example template for PLAN OF STUDIES

**Name**  
**Date**  

<table>
<thead>
<tr>
<th>Fundamentals</th>
<th>Models</th>
<th>Methods I</th>
<th>Methods II</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sem 1</strong></td>
<td></td>
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<tr>
<td>1. ...</td>
<td>1. ...</td>
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<tr>
<td>2. ...</td>
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<tr>
<td><strong>Sem 2</strong></td>
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<tr>
<td>3. ...</td>
<td>2. ...</td>
<td>2. ...</td>
<td>1. ...</td>
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<tr>
<td>4. ...</td>
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</tr>
<tr>
<td><strong>Sem 3</strong></td>
<td></td>
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</tr>
<tr>
<td>5. ...</td>
<td>2. ...</td>
<td>3. ...</td>
<td>3. ...</td>
<td>2. ...</td>
</tr>
<tr>
<td><strong>Sem 4</strong></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30 ECTS</td>
</tr>
</tbody>
</table>

- 30 ECTS
- ...  
- ...  
- ...  
- ...  
- ...  

**Sem 4: Master thesis**

Prof. Myra Spiliopoulou – Knowledge Management & Discovery
Write down the plan for your studies

1. Find modules
2. Assign each module you chose to one of the thematic areas
3. Write down your plan and cross-check that you have the right number of modules in each thematic area!
4. When you register for the exam of a course in HISQIS: Consult your plan of studies!
   - Is the course's area, as is in your plan, also listed in HISQIS?
     
     YES: Click into the area you want.
     
     Do not forget to click the area you want! Each course has a default area. If you click nothing, you get the default.
Write down the plan for your studies

1. Find modules
2. Assign each module you chose to one of the thematic areas
3. Write down your plan and cross-check that you have the right number of modules in each thematic area!
4. When you register for the exam of a course in HISQIS:
   Consult your plan of studies!
   - Is the course's area, as is in your plan, also listed in HISQIS?
     YES: Click into the area you want.
     NO: Cross-check into the latest version of the module hand book!
     • If HISQIS disagrees with the module hand book: go to the Examinations Office and ask for help
Write down the plan for your studies

1. Find modules

2. Assign each module you chose to one of the thematic areas

3. Write down your plan and cross-check that you have the right number of modules in each thematic area!

4. When you register for the exam of a course in HISQIS:
   Consult your plan of studies!
   - Is the course's area, as is in your plan, also listed in HISQIS?
     
     **YES:** Click into the area you want.

     **NO:** Cross-check into the latest version of the module hand book!
     If your plan disagrees with the module hand book, you must change your plan!
Write down the plan for your studies

1. Find modules
2. Assign each module you chose to one of the thematic areas
3. Write down your plan and cross-check that you have the right number of modules in each thematic area!
4. Register to the course exams according to your plan of studies.
5. After the exam, check in HISQIS:

   Is your course (and the ECTS) assigned in the area you wanted?

   YES
   NO: Pick the printout of your enrollment and ask for help.
Write down the plan for your studies

1. Find modules
2. Assign each module you chose to one of the thematic areas
3. Write down your plan and cross-check that you have the right number of modules in each thematic area!
4. Register to the course exams according to your plan of studies.
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   Is your course (and the ECTS) assigned in the area you wanted?

   YES

   NO: Pick the printout of your enrollment and ask for help.
Write down the plan for your studies

1. Find modules

2. Assign each module you chose to one of the thematic areas

3. Write down your plan and cross-check that you have the right number of modules in each thematic area!

4. Register to the course exams according to your plan of studies.

5. After the exam, check in HISQIS whether the courses are assigned as you wanted them.

6. At each semester, UPDATE your plan of studies according to the most recent version of the module hand book.
Frequently Asked Questions on the Choice of Modules
Q1: Are all modules I can choose in LSF?

Answer: NO

• Modules are being added each semester: If you look now, you do not necessarily see all modules of the next semester.
• Seminars and individual projects are not listed (see later Q)
Q2: Can I enroll to any further module I find?

Answer: NO
- Modules must fit thematically
- Some modules that fit thematically are not permitted, e.g. early bachelor modules
- Get permission before enrolling

Never enroll to a module for which you have no prior approval! You risk that you cannot have the credits counted.
Q3: Can I make an internship during my studies?

ANSWER:

• You can do an internship if you want,

• but it is not part of your studies!

IMPLICATIONS:

1. The company may ask for a verification that an internship is part of your studies.

2. If you need a visa to do the internship, the visa-issuing authority will ask for a verification that an internship is part of your studies.

You cannot get such a verification. Under no circumstances.
Q3: Can I make an internship during my studies?

ANSWER:

• You can do an internship if you want,
• but it is not part of your studies!

We can certify that the specific internship is good for your further study, but IF AND ONLY IF:

➢ The internship fits excellently into one area of your studies, and in this area you still must make ECTS.
Q3: Can I make an internship during my studies?

ANSWER:

• You can do an internship if you want,
• but it is not part of your studies!

A specific internship may be good for your further study.

Example: You want to write your master thesis on the analysis of ecommerce data. You got an internship at a company to do data engineering on such data. TODO 1: Find a supervisor for your master thesis. TODO 2: Discuss with your supervisor whether this internship would be good for your master thesis.

If your supervisor thinks that the internship is important for your master thesis, s/he may decide to write for you a confirmation on that.

Do not apply for an internship, unless you are sure that it fits to the rest of your studies.
Q4a: Can I spend part of my studies at another University?

ANSWER:

Yes, you can use either

the Erasmus exchange programme or

one of our bilateral exchange programmes.

BEWARE: Restrictions apply!
Q4b: How do I make sure that my ECTS from my semester abroad are taken over?

1. Prepare a learning agreement between OVGU and the target university BEFORE you leave.
   - Choose the modules carefully.
   - Map the modules to the thematic areas.
   - Make sure that the Credit Points agree.

2. Get the learning agreement approved by your Studies Advisor and have it filed in the Examinations Office.

3. Get the learning agreement approved by the target university.

4. Report any changes to the learning agreement, as soon as you encounter them, and have the changes approved (see Step 2).
Q5: What *kinds* of modules are there?

Modules in Master DKE:
- Eligible courses that fit to the thematic areas of Master DKE
- 6 ECTS per course (5 or less ECTS possible)

Course Types offered in the FIN:
- Vorlesung mit Übung
- Scientific Seminar
- Team Project
- Individual Project
- ...  

- Individual projects: are not listed in LSF are designed individually for each student

=> Ask the Faculty members for individual projects they offer
Q6: How many team projects can I enroll to?

ANSWER: At least one!
- no explicit limit
- must fit to one of the thematic areas Models, Methods I, Methods II or Applications
- must give 6 ECTS each
Q6: How many scientific seminars can I enroll to?

ANSWER:
- no explicit limit
- must fit to thematic area (see issues 1-3)
- must give 6 ECTS each
Taking over ECTS/courses from your previous studies

! NOT POSSIBLE !
Examinations
Examinations for Master students

Each module must be completed with an exam.

What types of exam are there?

- Oral examination – mündliche Prüfung
- Written examination – Klausur
- Homework – Hausarbeit

Type of exam depends on module. ASK: teacher
Examinations for Master students

When planning the 1st exam for a course, BEWARE:

- NO automatic enrollment – YOU must take action!
- There are enrollment deadlines; if you miss a deadline, you cannot enroll.
- You can cancel an enrollment until 7 days before exam.

BEWARE:

- At most three tries per course.
- You can have three tries for three courses total.
  For all other courses you have two tries.
- No way of stepping back from the exam of a course!

ASK: Teacher, Exam Office
Examinations for Master students: Repetitions

If you fail the first try for an exam:

- You have **AT MOST TWO** more tries.
- These tries are subject to deadlines!

**BEWARE:**
No way of stepping back from the exam of a course!

ASK:
Studies Coordinator, Exam Office
Examinations for Master students: Repetitions

If you fail the first try for an exam:

- You have AT MOST TWO more tries.
- The enrollment to the 2nd try is often done automatically, so make sure you do not miss the 2nd try.

**Beware:**
No way of stepping back from the exam of a course!

**Q:** I have heard that I CAN replace a course, in which I failed, with another.

**A:** You can replace a master seminar with another master seminar
You can replace a bachelor seminar with another bachelor seminar
You can replace a teamproject with another teamproject
You can replace an IndvProject with another IndvProject

in the same MDKE area.
How much to study?
Data Science is fascinating – the more of it the better

Q 1: Can I enroll to more courses than 90 ECTS?

A: Perhaps. Get approval before enrolling!

Extra courses appear in your Transcript of Records in a separate field. So, you have evidence that you passed them.

BUT

Extra courses are not counted in the final grade.
Data Science is fascinating – the more of it the better

Q2: I have enrolled to more than 90 ECTS. What now?

A: Courses are sorted by 1st exam, earliest first, and the ECTS sum up.
As soon as 90 ECTS are reached, the remaining courses are extra courses.

The courses are sorted by the 1st exam, and the ECTS are summed up, even if you did not pass the exam.

- The ECTS you will get from a course are counted as soon as you had an exam for it. They are already reserved for you. This is a consequence of the fact that you cannot step down from an exam.
Getting Advice
You can get advice from:

1. Studies Coordinator
2. Coordinator for International Students: Dr. Claudia Krull
3. Examinations Office
4. FARAFIN & Mentors for international students
You can get advice from:

1. Studies Coordinator
2. Coordinator for International Students: Dr. Claudia Krull
3. Examinations Office
4. FARAFIN & Mentors for international students

FARAFIN is the Students' Board of the Faculty of Computer Science (FIN). They are students. They are already familiar with the studies here. They are volunteers who support other students in their studies. They organize several events – from time management courses to come-together parties.

www.inf-international.ovgu.de/Welcome/Mentoring+Program.html
Studies Coordinator

Prof. Myra Spiliopoulou
myra@ovgu.de
R135
http://www.kmd.ovgu.de/

Advisory meetings: Monday
15:15 – 16:00

Studies Vice-Coordinator

Prof. Andreas Nürnberger
andreas.nuernberger@ovgu.de

http://www.findke.ovgu.de/
Which Studies Coordinator to contact?

Prof. Myra Spiliopoulou
myra@ovgu.de
R135
http://www.kmd.ovgu.de/

1. Advice for choosing modules
2. Advice for making plans of studies
3. Crosscheck of module mappings (seminars, projects)
4. Arbitrary questions