Data Science

Formal Details of the Module

module no.	location in course of study	duration	responsibility	language
	3rd year	2 terms		English

Teaching Methods

teaching forms	teaching methods
lecture, tutorial, lab work	lecture, discussion, case studies, group work

Forms of Examination

examination forms	exam duration (in minutes)	Grading
written exam or combined examination		yes

Workload and ECTS Credit Points

total workload (in hours)	of which online	of which self-study	ECTS
150	72	78	5

Qualification Goals and Competences

professional competence

Students have basic knowledge of methods and techniques in the subject area of data science. Students know methods and techniques of automatic data analysis and have in-depth knowledge in one of the areas (data mining, machine learning, internet of things, semantic web).

methodical competence

Students have methodological knowledge of data analysis, in particular the collection and processing of data.

personal and social competence

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interdisciplinary competence

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Learning Units and Contents

teaching and learning units	online	self-study
Data Mining	36	39

- Data and data analysis
- Clustering
- Classification
- Association analysis
- Other methods, e.g:
  - Regression
  - Deviation detection
  - Visualisation

As an alternative to the treatment of algorithmic approaches, graphical methods can be dealt with.

Basics of Data Science 36 39

- Basics of Data Science
- Use of tools (e.g. R-programming, Octave etc.)
- Data collection and processing
- Exploratory Data Analysis
- Statistical Inference
- Regression models
- Machine Learning Algorithms
- Data Mining
- Data Visualisation
- Text Mining and Analytics (e.g. Web, Social Media)
- Pattern recognition and cluster analysis

Basics of Machine Learning 36 39

- Introduction to machine learning
- Symbolic learning methods
- Basics of neural networks
- Probabilistic learning models
- Advanced concepts and deep learning
- Design and implementation of selected techniques for an application

Big Data 36 39

Big Data Programming

- Introduction to the subject area of Big Data programming
- Explanation of the horizontal scaling of systems when processing digital mass data
- Introduction to distributed processing of digital mass data
- Introduction to batch and stream processing
- Presentation of current frameworks, libraries, programming languages, etc.
- Implementation of practical examples

Big Date Storage

- Introduction to the topic of Big Data storage
- Explanation of the horizontal scaling of systems for the storage of digital mass data
- Introduction to the storage of digital mass data using different types of storage and access (file systems, databases, etc.)
- Presentation of current frameworks, libraries, programming and query languages, etc.
- Implementation of practical examples

Semantic Web 36 39

- Short introduction to semantic technologies
- The idea of Linked Data
- The Resource Description Framework (RDF): Triples and URLs
- RDF syntax: XML and TTL
- The query language SPARQL
- Semantics in RDF: RDF Schema (RDFS) and the Web Ontology Language (OWL)
- Interaction of the individual components: The Semantic Web Layer Cake
- Application of Linked Data in the context of Industry 4.0

Internet of Things 36 39

- Introduction to IoT
- Application areas