

Module im Bereich: Methoden des Digital Engineering

- [△ Hinweise zu Modulen für den Bereich: Methoden des Digital Engineering](#)
- [Assistenzrobotik](#)
- [Clean Code Development](#)
- [Data Management for Engineering Applications](#)
- [Estimation for Autonomous Mobile Robots](#)
- [Introduction to Distributed Sensor Data Fusion](#)
- [Recommenders](#)
- [Seminar on Advanced Topics of Predictive Maintenance](#)
- [Sensor Networks Seminar](#)
- [Software-Development for Industrial Robotics](#)
- [Visual Analytics](#)
- [Wissenschaftliches Individualprojekt](#)

⚠ Hinweise zu Modulen für den Bereich: Methoden des Digital Engineering

Im Folgenden werden Module aus anderen Fakultäten für den Bereich *Methoden des Digital Engineering* aufgelistet; sie können in den Modulhandbüchern der [entsprechenden Fakultäten](#) gefunden werden.

Abweichende Module müssen vom Studiengangsleitenden genehmigt werden.

- CAx-Anwendungen (Sommer)

Assistenzrobotik

Sommer

(engl. Assistance robotics)

Modulnummer: FIN-INF-120443

Kürzel
AROB

CP
6

Semester
Sommer

Fachsem.
ab 1.

Dauer
1 Semester

Sprache
deutsch

Niveau
Master

Link zum LSF:

[LSF](#)

Zugang beschränkt:

Verantwortung:

Norbert Elkmann (Fraunhofer IFF)

Dozent:in:

Norbert Elkmann (Fraunhofer IFF)

Lehrveranstaltungen:

- Vorlesung *Assistenzrobotik*
- Übung *Assistenzrobotik*

Verwendbarkeit:

- M.Sc. INF: Informatik
- M.Sc. INF: Informatik Wahlpflicht (SPO 2027)
- M.Sc. INGINF: Informatik
- M.Sc. DKE: Applied Data Science
- M.Sc. DE: Methoden des Digital Engineering
- M.Sc. DE: Methoden der Informatik
- M.Sc. DE: Fachliche Spezialisierung
- M.Sc. DE: Informatik Wahlpflicht (SPO 2027)
- M.Sc. DE: Digital Engineering (SPO 2027)
- M.Sc. DE: Engineering Specialization (SPO 2027)

Angestrebte Lernergebnisse:

Absolvent*innen dieses Moduls ...

- kennen mathematische Transformationen zur geometrischen und differentiellen Beschreibung von Roboterkinematiken
- kennen die Bewegungsgleichung von Roboter-Manipulatoren und können sie für Fragestellungen zur kollaborativen Sicherheit anwenden
- kennen die unterschiedlichen Interpolationsarten zum Beschreiben einer Roboterbahn und können eigenständig C^2 -Trajektorien generieren

- können die Kinematik von mobilen Robotern modellieren und ihre Position unter Berücksichtigung von Unsicherheiten im Raum bestimmen
- kennen verschiedene Methoden des maschinellen Lernens (unüberwachtes und überwachtes Lernen sowie Deep Learning) und können deren Einsatzmöglichkeiten für die Bildverarbeitung im Kontext der Robotik einordnen
- verstehen die Grundprinzipien des Reinforcement Learnings und wissen, wie damit optimale Handhabungsstrategien für Roboter generiert werden können
- kennen die Grundlagen der Maschinensicherheit (Risikobeurteilung und CE-Kennzeichnung)
- kennen die Sicherheitsbetriebsarten für kollaborative Robotersysteme und können sie anwenden

Inhalt:

- Einführung in die Assistenzrobotik
- Grundlagen der Assistenzrobotik (Modellierung von Roboterkinematiken, Bahnplanung, Bewegungs- und Kraftregelung, Sensoren, mobile Systeme)
- Mensch-Roboter-Kollaboration und Sicherheit: Technologien, Maschinensicherheit, Normen, Rechtslage
- KI-Verfahren in der Robotik

Arbeitsaufwand:

42h Präsenzzeit + 138h selbstständige Arbeit

Prüfungsvorleistungen:	Studien-/Prüfungsleistungen:	Lehrform / SWS:
	Mündliche Prüfung	• 2 SWS Vorlesung • 2 SWS Übung

Voraussetzungen nach Prüfungsordnung:	Empfohlene Voraussetzungen:
keine	• Programmierkenntnisse • Lineare Algebra

Medienformen:	Literatur:

Hinweise:

Clean Code Development

Winter

(in German: Clean Code Development)

Module-ID: FIN-INF-120432

Abbreviation	Credit Points	Semester	Term	Duration	Language	Level
CCD	6	Winter	starting at 1.	1 Semester	english	Master

Link:	LSF
Limited accessibility:	true
Responsibility:	Prof. Dr. Frank Ortmeier
Lecturer:	Prof. Dr. Frank Ortmeier
Classes:	• Vorlesung <i>Clean Code Development</i> • Übung <i>Clean Code Development</i>
Applicability in curriculum:	- M.Sc. INF: Informatik - M.Sc. INF: Schlüssel- und Methodenkompetenzen - M.Sc. INGINF: Informatik - M.Sc. INGINF: Schlüssel- und Methodenkompetenzen - M.Sc. DKE: Applied Data Science - M.Sc. DE: Methoden des Digital Engineering - M.Sc. DE: Methoden der Informatik - M.Sc. DE: Fachliche Spezialisierung - M.Sc. VC: Computer Science - M.Sc. VC: Schlüssel- und Methodenkompetenzen

Intended learning outcomes:

Students:

- know and understand the principles of Clean Code Development
- are able to apply the associated tools and practices in practice
- learn to independently select and adapt the concepts suitable for a project

- learn to distribute tasks within a team and collaborate in an organized manner

Content:

- Software engineering deals with the creation and development of software, the organization and modeling of related data structures, and the operation of software systems. It thus encompasses software design, implementation, and management.
- The introductory lecture *Software Engineering I* provided the foundational knowledge for designing and writing good software.
- This advanced lecture introduces modern techniques and methods that are commonly used in the development of large software systems.
- We align with the four core values of *Clean Code Development* – evolvability, correctness, production efficiency, and comprehensibility.
- To achieve these goals, a variety of programming principles and practices will be introduced.
- These include, among others, team formation and organization in software development, principles and tools of Clean Code Development, continuous integration and automated build systems, bug tracking, error localization and debugging, automated and model-based testing, code analysis and quality metrics, requirements engineering and tracing, as well as distributed and component-based software architectures.
- The course will offer a high degree of practical engagement with tools and software development techniques, especially in the exercises. The goal is not only to convey abstract knowledge but also to develop hands-on competencies.
- Participation in the exercises is mandatory and will be conducted in groups.

Workload:

56h Präsenzzeit + 124h selbständige Arbeit am Projekt

Pre-examination requirements:	Type of examination:	Teaching method / lecture hours per week (SWS):
Projekt	Mündliche Prüfung	• Vorlesung (2 SWS) • Übung (2 SWS)

Prerequisites according to examination regulations:	Recommended prerequisites:
keine	Software Engineering

Media:	Literature:

Comments:

Enrollment Restriction: Limited number of participants. The selection process will be announced during the first lecture.

Data Management for Engineering Applications

Winter

(in German: Data Management for Engineering Applications)

Module-ID: FIN-INF-120326

Abbreviation	Credit Points	Semester	Term	Duration	Language	Level
DMEA	6	Winter	starting at 1.	1 Semester	english	Master

Link:	LSF
Limited accessibility:	false
Responsibility:	Gunter Saake
Lecturer:	Eike Schallehn
Classes:	• Lecture <i>Data Management for Engineering Applications</i> • Exercise <i>Data Management for Engineering Applications</i>
Applicability in curriculum:	- M.Sc. DE: Methoden des Digital Engineering

Intended learning outcomes:

The students ...

- understand and assess engineering applications
- understand basics of information systems
- design databases in the context of engineering applications

Content:

- Introduction in the design of relational and non-relational database systems
- Requirements of engineering data management
- Product data management with database systems
- Workflow support and interoperability
- Product lifecycle management

Workload:

56 contact hours + 94 h independent study + 30 h lab

Pre-examination requirements:	Type of examination:	Teaching method / lecture hours per week (SWS):
To be eligible to take the exam, you must have completed certain prerequisites. Further details will be announced in the first lecture.	Written exam (120 min)	• 2 SWS lecture • 2 SWS exercise class

Prerequisites according to examination regulations:	Recommended prerequisites:
keine	

Media:	Literature:

Comments:

Estimation for Autonomous Mobile Robots

Winter

(in German: Estimation for Autonomous Mobile Robots)

Module-ID: FIN-INF-120485

Abbreviation n AMR	Credit Points 6	Semester Winter	Term starting at 1.	Duration 1 Semester	Language english	Level Master
---------------------------------	---------------------------	---------------------------	-------------------------------	-------------------------------	----------------------------	------------------------

Link:	LSF
Limited accessibility:	false
Responsibility:	Prof. Dr.-Ing. Benjamin Noack
Lecturer:	Prof. Dr.-Ing. Benjamin Noack
Classes:	• Lecture <i>Estimation for Autonomous Mobile Robots</i> • Exercise <i>Estimation for Autonomous Mobile Robots</i>

Applicability in curriculum:	- M.Sc. INF: Informatik - M.Sc. INF: Informatik Wahlpflicht (SPO 2027) - M.Sc. INGINF: Informatik - M.Sc. INGINF: Ingenieurinformatik - M.Sc. WIF: Informatik - M.Sc. WIF: Informatik Wahlpflicht (SPO 2027) - M.Sc. DKE: Applied Data Science - M.Sc. DE: Methoden des Digital Engineering - M.Sc. DE: Methoden der Informatik - M.Sc. DE: Fachliche Spezialisierung - M.Sc. DE: Informatik Wahlpflicht (SPO 2027) - M.Sc. DE: Digital Engineering (SPO 2027) - M.Sc. DE: Engineering Specialization (SPO 2027) - M.Sc. VC: Computer Science - M.Sc. VC: Computer Science (SPO 2027)
-------------------------------------	---

Intended learning outcomes:

Students who complete the course ...

- have an overview of basic problems and methods in parameter and state estimation for mobile systems.
- understand how to develop kinematic models for mobile robots and how to derive discrete-time prediction models.
- are familiar with the required mathematical tools and can derive and apply least-squares methods for localization and tracking of mobile systems, e.g., based on distance measurements.
- have a deep understanding of Kalman filtering and its nonlinear generalizations for dynamic state estimation and localization of mobile systems.

Content:

- Kinematics, System Models, and Dead Reckoning for Mobile Systems
- Sensor Models and Optimization Methods for Localization and Tracking
- DynamicState Estimation for Real-Time Localization and Tracking
- Linear Kalman Filtering and Nonlinear Generalizations

Workload:

56 h contact time 124 h independent study

Pre-examination requirements:	Type of examination:	Teaching method / lecture hours per week (SWS):
	Oral exam (30 min)	• Lecture (2 SWS) • Exercise (2 SWS)

Prerequisites according to examination regulations:	Recommended prerequisites:
none	Linear Algebra, Analysis

Media:	Literature:
	Literature will be announced in the lecture.

Comments:

Introduction to Distributed Sensor Data Fusion

Summer

(in German: Introduction to Distributed Sensor Data Fusion)

Module-ID: FIN-INF-120497

Abbreviation	Credit Points	Semester	Term	Duration	Language	Level
SDF	6	Summer	starting at 1.	1 Semester	english	Master

Link:	LSF
Limited accessibility:	
Responsibility:	Prof. Dr.-Ing. Benjamin Noack
Lecturer:	Prof. Dr.-Ing. Benjamin Noack
Classes:	• Lecture <i>Introduction to Distributed Sensor Data Fusion</i> • Exercise <i>Introduction to Distributed Sensor Data Fusion</i>
Applicability in curriculum:	- M.Sc. INF: Informatik - M.Sc. INF: Informatik Wahlpflicht (SPO 2027) - M.Sc. INGINF: Informatik - M.Sc. INGINF: Ingenieurinformatik - M.Sc. WIF: Informatik - M.Sc. WIF: Informatik Wahlpflicht (SPO 2027) - M.Sc. DKE: Applied Data Science - M.Sc. DE: Methoden des Digital Engineering - M.Sc. DE: Methoden der Informatik - M.Sc. DE: Fachliche Spezialisierung - M.Sc. VC: Computer Science - M.Sc. VC: Computer Science (SPO 2027)

Intended learning outcomes:

Students who complete the course ...

- have an overview of basic problems and methods in designing distributed sensor systems and their applications.
- understand how to process data in a network of sensors, what requirements the infrastructure must meet, and how to model and describe errors like measurement noise.
- are familiar with the mathematical tools and can apply them.
- can analyze, compare, and evaluate different approaches to information processing of sensor data.

Content:

This lecture introduces basic principles, requirements, and methods of sensor data processing. Since data are more often gathered by networked sensor systems, this lecture places particular emphasis on distributed sensor data fusion methods. We will start by discussing the technical specifications of a sensor system and the basics of digital sensor data processing. Our study includes sampling theorems, compressive sensing, and signal matching. We will consider the required infrastructure to processing sensor data in networked systems, i.e., sensor networks. Based on this infrastructure, we can apply methods for multisensor data fusion to spatially distributed sensors and can monitor spatio-temporal processes.

Workload:

56 h contact time 124 h independent study

Pre-examination requirements:	Type of examination:	Teaching method / lecture hours per week (SWS):
	Oral exam (30 min)	• Lecture (2 SWS) • Exercise (2 SWS)

Prerequisites according to examination regulations:	Recommended prerequisites:
none	

Media:	Literature:
	Literature will be announced in the lecture.

Comments:

Recommenders

Summer

Learning Methods and Evaluation Methods for Recommenders

(in German: Recommenders - Master level)

Module-ID: FIN-INF-120525

Abbreviation	Credit Points	Semester	Term	Duration	Language	Level
RECSYS-M	9	Summer	starting at 1.	1 Semester	english	Master

Link:	LSF
Limited accessibility:	false
Responsibility:	Myra Spiliopoulou
Lecturer:	Myra Spiliopoulou
Classes:	• Lecture <i>Recommenders</i> • Exercise class <i>Recommenders</i>
Applicability in curriculum:	- M.Sc. INF: Informatik - M.Sc. INGINF: Informatik - M.Sc. WIF: Wirtschaftsinformatik - M.Sc. DKE: Learning Methods and Models for Data Science - M.Sc. DE: Methoden des Digital Engineering - M.Sc. DE: Methoden der Informatik - M.Sc. VC: Computer Science

Intended learning outcomes:

When successfully completing this module, the students have acquired soft skills and technical expertise, as follows: **SOFT SKILLS:** They

- have learned how to critically discuss and value a scientific paper

TECHNICAL EXPERTISE: They

- comprehend the business context of recommenders
- comprehend the different types of recommenders, their advantages and disadvantages from the business perspective and from the mining perspective and are familiar with advanced recommendation methods
- have acquired advanced insights on how to critically evaluate a recommender from the mining perspective and the business perspective
- understand why adaption is necessary in recommenders and comprehend the behaviour of temporal methods for recommenders

and have thus acquired skills they need in order to critically appreciate off-the-shelf or state-of-the-art methods and to design workflows that encompass recommender learning, tuning and evaluation

Content:

The course consists of two blocks:

- Block 1 is on Fundamentals of Recommenders and has multiple parts: (1.1) recommender goals and workflows, (1.2) simple recommendation methods, (1.3) evaluation mechanisms, (1.4) recommender adaption on a stream
- Block 2 covers advanced topics of recommenders: students read and critically discuss papers in class

Workload:

- 28 Std/hours: Vorlesung/Lecture - in presence (lecture class: 2 hours per week, 28 hours)
- 28 Std/hours: Übung/Exercises - in presence (exercise class: 2 hours per week, 28 hours)
- 214 Stunden: Individual working time on
 - Preparation for lectures and exercise classes
 - Reading and understanding the articles provided
 - Discussion of the articles in class

Pre-examination requirements:	Type of examination:	Teaching method / lecture hours per week (SWS):
A minimum number of points must be achieved during the classes	Schriftliche Prüfung (Klausur)	• Vorlesung (2 SWS) - Lecture class (2 hours-per-week) • Übung (2 SWS) - Exercise class (2 hours-per-week)

Prerequisites according to examination regulations:	Recommended prerequisites:

keine	• Data Mining I • Machine Learning • Data Mining II • Introduction to Deep Learning • Advanced English skills • Reading of scientific papers, as acquired eg in a bachelor seminar
-------	---

Media:	Literature:
	• Literature for Block 1: selected chapters from the 'Recommender Systems Handbook' in the editions: ◦ Recommender Systems Handbook by Francesco Ricci, Lior Rokach and Bracha Shapira (editors), SPRINGER (2015), 2nd edition, https://doi.org/10.1007/978-1-4899-7637-6 ◦ Recommender Systems Handbook by Francesco Ricci, Lior Rokach and Bracha Shapira (editors), SPRINGER (2022), 3rd edition, https://doi.org/10.1007/978-1-0716-2197-4 ◦ Further cited literature, including scientific articles and use cases are cited at the beginning of each unit. • Literature for Block 2: the papers for the discussions in class will be announced during the course

Comments:

Seminar on Advanced Topics of Predictive Maintenance

every

(in German: Seminar on Advanced Topics of Predictive Maintenance)

Module-ID: FIN-INF-120489

Abbreviation PredMa_Masterseminar	Credit Points 6	Semester every	Term starting at 1.	Duration 1 Semester	Language english	Level Master
---	---------------------------	--------------------------	-------------------------------	-------------------------------	----------------------------	------------------------

Link:	LSF
Limited accessibility:	true
Responsibility:	Prof. Dr.-Ing. Benjamin Noack, Prof. Dr. Myra Spiliopoulou
Lecturer:	Prof. Dr.-Ing. Benjamin Noack, Prof. Dr. Myra Spiliopoulou
Classes:	Seminar <i>Advanced Topics of Predictive Maintenance</i>

Applicability in curriculum:	- M.Sc. INF: Informatik - M.Sc. INF: Schlüssel- und Methodenkompetenzen - M.Sc. INF: Informatik Wahlpflicht (SPO 2027) - M.Sc. INF: Schlüssel- und Methodenkompetenz (SPO 2027) - M.Sc. INGINF: Informatik - M.Sc. INGINF: Schlüssel- und Methodenkompetenzen - M.Sc. WIF: Wirtschaftsinformatik - M.Sc. WIF: Informatik - M.Sc. WIF: Schlüssel- und Methodenkompetenzen - M.Sc. WIF: Informatik Wahlpflicht (SPO 2027) - M.Sc. WIF: Wirtschaftsinformatik (SPO 2027) - M.Sc. WIF: Schlüssel- und Methodenkompetenz (SPO 2027) - M.Sc. DKE: Learning Methods and Models for Data Science - M.Sc. DKE: Applied Data Science - M.Sc. DE: Methoden des Digital Engineering - M.Sc. DE: Methoden der Informatik - M.Sc. DE: Digital Engineering (SPO 2027) - M.Sc. DE: Schlüssel- und Methodenkompetenz (SPO 2027) - M.Sc. VC: Computer Science - M.Sc. VC: Computer Science (SPO 2027)
-------------------------------------	--

Intended learning outcomes:

Students who complete the course ...

- read scientific articles given to them on introductory topics of predictive maintenance
- discuss these articles and reflect on them
- compare the methods that appear in these articles and discuss the pros and contra of each method in comparison to other methods
- summarize article contents on predictive maintenance in a report and present them
- formulate questions on these articles and answer questions formulated by other seminar participants

Content:

In this seminar, the participants will learn about

- challenges and methods for data acquisition in industrial processes
- data analysis tools in predictive maintenance
- process modeling, fault detection, and state prediction for industrial applications

Workload:

28h in presence (consultation meetings, presentations) + 156 h self study

Pre-examination requirements:	Type of examination:	Teaching method / lecture hours per week (SWS):
--------------------------------------	-----------------------------	--

	Referat	Seminar (2 SWS)
--	---------	-----------------

Prerequisites according to examination regulations:	Recommended prerequisites:
none	• Signal and information processing • Learning algorithms • Underpinnings of engineering sciences and/or business informatics (some topics only) • Principles of scientific writing

Media:	Literature:
	Literature depends on topic assignment and is given to each student together with the assignment

Comments:

Sensor Networks Seminar

Winter

(in German: Sensor Networks Seminar)

Module-ID: FIN-INF-120514

Abbreviation	Credit Points	Semester	Term	Duration	Language	Level
SN	6	Winter	ab 1.	1 Semester	english	Master

Link:	LSF
Limited accessibility:	true
Responsibility:	Prof. Dr.-Ing. Benjamin Noack
Lecturer:	Prof. Dr.-Ing. Benjamin Noack
Classes:	Seminar <i>Sensor Networks</i>
Applicability in curriculum:	- M.Sc. INF: Informatik - M.Sc. INF: Schlüssel- und Methodenkompetenzen - M.Sc. INF: Informatik Wahlpflicht (SPO 2027) - M.Sc. INF: Schlüssel- und Methodenkompetenz (SPO 2027) - M.Sc. INGINF: Informatik - M.Sc. INGINF: Schlüssel- und Methodenkompetenzen - M.Sc. WIF: Informatik - M.Sc. WIF: Schlüssel- und Methodenkompetenzen - M.Sc. WIF: Informatik Wahlpflicht (SPO 2027) - M.Sc. WIF: Schlüssel- und Methodenkompetenz (SPO 2027) - M.Sc. DKE: Applied Data Science - M.Sc. DE: Methoden des Digital Engineering - M.Sc. DE: Methoden der Informatik - M.Sc. DE: Fachliche Spezialisierung - M.Sc. VC: Schlüssel- und Methodenkompetenzen - M.Sc. VC: Schlüssel- und Methodenkompetenz (SPO 2027)

Intended learning outcomes:

Students who complete the course ...

- can independently research complex topics
- write clear scientific articles
- present informative and understandable scientific talks
- understand challenges and methods in sensor networks
- understand how to these challenges are addressed in practical applications of sensor networks

Content:

In this seminar, the participants will learn about

- challenges and methods used in sensor networks
- the variety of applications and application-specific sensor network design

Workload:

28 h in presence (consultation meetings, presentations) + 156 h self study

Pre-examination requirements:	Type of examination:	Teaching method / lecture hours per week (SWS):
	• Presentation • Discussion • Scientific Article (Referat und Hausarbeit)	Seminar (2 SWS)

Prerequisites according to examination regulations:	Recommended prerequisites:
keine	• Lecture <i>Introduction to Distributed Sensor Data Fusion</i> • Learning algorithms • Underpinnings of engineering sciences and/or business informatics (some topics only) • Principles of scientific writing

Media:	Literature:
	Literature depends on topic assignment and is given to each student together with the assignment

Comments:

Software-Development for Industrial Robotics

Winter

(engl. Software-Development for Industrial Robotics)

Modulnummer: FIN-INF-120432

Kürzel
SDIR

CP
6

Semester
Winter

Fachsem.
ab 1.

Dauer
1 Semester

Sprache
deutsch

Niveau
Master

Link zum LSF:	LSF
Zugang beschränkt:	true
Verantwortung:	Prof. Dr. Frank Ortmeier
Dozent:in:	Prof. Dr. Frank Ortmeier
Lehrveranstaltungen:	• Vorlesung <i>Software-Development for Industrial Robotics</i> • Übung <i>Software-Development for Industrial Robotics</i>
Verwendbarkeit:	- M.Sc. INF: Informatik - M.Sc. INGINF: Informatik - M.Sc. INGINF: Ingenieurinformatik - M.Sc. WIF: Informatik - M.Sc. DKE: Applied Data Science - M.Sc. DE: Methoden des Digital Engineering - M.Sc. DE: Methoden der Informatik - M.Sc. DE: Fachliche Spezialisierung - M.Sc. VC: Computer Science

Angestrebte Lernergebnisse:

The students have ...

- Understanding of problems in the robotics domain
- Understanding and applicability of the mathematical background

- Practical experience in programming industrial robots on the basis of various tasks

Inhalt:

The use of industrial robots is increasing rapidly these days. In 2014, the expected number of industrial robots increased by 27% compared to the previous year. The main reason is their flexibility, especially their ability to perform a wide range of tasks. In the lecture “Software Development for Industrial Robotics” an overview of this domain is given as well as the mathematical background. The latter deals in particular with the idea of forward and inverse kinematics, point-to-point movements, linear movements, trajectory planning, recognition of singularities, Denavit-Hartenberg convention, rotation and translation matrices. The final project deals with control using a collision-free path planner, KUKA youBot kinematics, numerical approaches to solving inverse kinematics, etc.

Arbeitsaufwand:

180h = 56h attendance time + 124h independent work

Prüfungsvorleistungen:	Studien-/Prüfungsleistungen:	Lehrform / SWS:
Projekt	mündliche Prüfung	• Lecture (2 SWS) • Exercise (2 SWS)

Voraussetzungen nach Prüfungsordnung:	Empfohlene Voraussetzungen:
none	

Medienformen:	Literatur:

Hinweise:

Zuangsbeschränkung: Limitierte Teilnehmerzahl. Auswahlverfahren wird in erster Vorlesung bekannt gegeben

Visual Analytics

Summer

(in German: Visual Analytics)

Module-ID: FIN-INF-120524

Abbreviation	Credit Points	Semester	Term	Duration	Language	Level
	6	Summer	starting at 1.	1 Semester	english	Master

Link:	LSF
Limited accessibility:	true
Responsibility:	Bernhard Preim
Lecturer:	Bernhard Preim
Classes:	• Lecture <i>Visual Analytics</i> • Exercise class <i>Visual Analytics</i>
Applicability in curriculum:	- M.Sc. INF: Informatik - M.Sc. INGINF: Informatik - M.Sc. WIF: Informatik - M.Sc. DKE: Applied Data Science - M.Sc. DE: Methoden des Digital Engineering - M.Sc. DE: Methoden der Informatik - M.Sc. VC: Visual Computing

Intended learning outcomes:

Students ...

- know machine learning methods and the visualization of their results
- apply this knowledge to analyse financial and business data
- use statistical methods to improve visual analytics solutions
- can assess and compare clustering methods

Content:

- Introduction: Potential and applications of Visual Analytics
- Visual Analytics based on clustering
- Visual Analytics based on subspace clustering and biclustering
- Visual Analytics with decision trees
- Visual Analytics with association rules
- Scatterplot-based visualizations
- Visual Analytics of events sequences
- Interaktive und Kooperative Methoden von Visual Analytics
- Visual Analytics im Gesundheitswesen

Workload:

'- 56 contact hours + 124 h self study

Pre-examination requirements:	Type of examination:	Teaching method / lecture hours per week (SWS):
	Written exam, 2 hours	• 2 SWS Lecture • 2 SWS Exercise class

Prerequisites according to examination regulations:	Recommended prerequisites:
none	• Lecture Visualization • Knowledge of Data Analysis, for example Intelligent Data Analysis • Data Mining • Machine Learning • Artificial Intelligence

Media:	Literature:
--------	-------------

• Powerpoint presentation • Whiteboard • Videos	• J. J. Thomas, K. A. Cook (Hrsg.): Illuminating the path: The research and development agenda for visual analytics. IEEE Computer Society 2005 • D. A. Keim, F. Mansmann, J. Schneidewind, J. Thomas, H. Ziegler: Visual analytics: Scope and challenges. Visual Data Mining, 2008 • Andrienko, N., Andrienko, G., Fuchs, G., Slingsby, A., Turkay, C., & Wrobel, S. (2020). <i>Visual analytics for data scientists</i>. Springer Nature. • Kohlhammer, J., Proff, D. U., & Wiener, A. (2018). <i>Visual business analytics: effektiver Zugang zu Daten und Informationen</i>. dpunkt. verlag.
---	---

Comments:

Wissenschaftliches Individualprojekt

jedes

(engl. Individual Scientific Project)

Modulnummer: FIN-INF-120301

Kürzel
WIP

CP
6

Semester
jedes

Fachsem.
ab 1.

Dauer
1 Semester

Sprache
deutsch

Niveau
Master

Link zum LSF:

[LSF](#)

Zugang beschränkt:

Verantwortung:

Studiendekan:in der FIN

Dozent:in:

Alle Dozenten der FIN

Lehrveranstaltungen:

keine

Verwendbarkeit:

- M.Sc. INF: Informatik
- M.Sc. INF: Schlüssel- und Methodenkompetenz (SPO 2027)
- M.Sc. INF: Projekte (SPO 2027)
- M.Sc. INGINF: Informatik
- M.Sc. INGINF: Ingenieurinformatik
- M.Sc. WIF: Wirtschaftsinformatik
- M.Sc. WIF: Informatik
- M.Sc. WIF: Schlüssel- und Methodenkompetenz (SPO 2027)
- M.Sc. WIF: Projekte (SPO 2027)
- M.Sc. DKE: Learning Methods and Models for Data Science
- M.Sc. DKE: Data Processing for Data Science
- M.Sc. DKE: Applied Data Science
- M.Sc. DKE: Projects (SPO 2027)
- M.Sc. DE: Human Factors
- M.Sc. DE: Methoden des Digital Engineering
- M.Sc. DE: Methoden der Informatik
- M.Sc. DE: Fachliche Spezialisierung
- M.Sc. DE: Schlüssel- und Methodenkompetenz (SPO 2027)
- M.Sc. DE: Projekte (SPO 2027)
- M.Sc. VC: Visual Computing
- M.Sc. VC: Computer Science
- M.Sc. VC: Schlüssel- und Methodenkompetenz (SPO 2027)
- M.Sc. VC: Projekte (SPO 2027)

Angestrebte Lernergebnisse:

Die Studierenden ...

- arbeiten selbstständig an einer wissenschaftlichen Fragestellung
- arbeiten sich selbstständig in ein wissenschaftliches Spezialgebiet ein
- erarbeiten vertiefte Kenntnisse auf einem wissenschaftlichen Spezialgebiet
- präsentieren und interpretieren ihre Ergebnisse in mündlicher und/oder schriftlicher Form
- können ihren Erfolg und die Bedeutung ihrer Ergebnisse einschätzen
- beschreiben die Auswirkungen ihrer Entscheidungen auf den Verlauf und die Ergebnisse des Projektes

Inhalt:

Die Studierenden bearbeiten in selbstständiger Arbeit eine individuell vereinbarte, wissenschaftliche Fragestellung unter Anleitung eines Hochschullehrers. Im Projekt entwickeln die Studierenden eine eigenständige Informatik-Lösung. Dadurch erwerben sie ein detailliertes und kritisches Verständnis in einem Spezialbereich der Informatik. Dieses Modul wird von unterschiedlichen Hochschullehrern implementiert. Die fachlichen Inhalte sind daher angebotsspezifisch.

Arbeitsaufwand:

180h selbstständige Arbeit

Prüfungsvorleistungen:	Studien-/Prüfungsleistungen:	Lehrform / SWS:
	Wissenschaftliches Projekt	Angeleitetes wissenschaftliches Individualprojekt

Voraussetzungen nach Prüfungsordnung:	Empfohlene Voraussetzungen:
keine	

Medienformen:	Literatur:

Hinweise:

Projekte außerhalb der FIN müssen von Studiengangsleiter abgesegnet werden.