UTN

Technische Universität Nürnberg

Master of Science (M.Sc.)
Artificial Intelligence and Robotics

Module Handbook

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Contents

1. Overview

Artificial intelligence (AI) is a rapidly growing field that is changing the way we live and work. As a result, there is a growing demand for professionals with experience in robotics and artificial intelligence in various industries.

The Master's in Artificial Intelligence and Robotics degree program provides students with the opportunity to develop advanced skills and knowledge in these exciting fields. By combining theoretical and practical courses with our new learning design, students will gain an in-depth understanding of the concepts, algorithms, and applications of robotics and AI. They also learn to design, implement, and evaluate complex robotic systems and AI algorithms.

Graduates of the program are equipped to pursue careers in a variety of industries, including manufacturing, healthcare, transportation, and entertainment. They are also ready to pursue research and academic opportunities in robotics and artificial intelligence.

Our innovative teaching and learning approach, rooted in extensive research, emphasizes active engagement and reflective practices. Rather than memorization-based learning, our approach entails students undertaking learning-oriented assignments throughout the semester and receiving personalized feedback from faculty on their progress.

The scientific core will be the essential content of the program. In the case of M.Sc. Artificial Intelligence and Robotics, the following six basic modules serve as your scientific core.

1. Artificial Intelligence
2. Mobile Robot Navigation
3. Machine Learning
4. Computer Vision
5. Deep Learning
6. Data Science

The curriculum of this master's program is a modular study program. Students will learn about problem solving, decision making, and knowledge representation in AI as well as the design and implementation of algorithms for autonomous robot navigation. They will study neural networks, training algorithms, optimization techniques, and applications in computer vision and natural language processing. Students will also learn about data analysis, statistical methods, data visualization, and data mining techniques. Through practical assignments and projects, they will gain hands-on experience in designing and implementing algorithms and systems in these fields.

The unique highlight of this program is the learning in transformation project, an interdisciplinary scientific research project that focuses on practical learning experiences. The project aims to provide students with a scientific-based approach to solving real-world problems.

2. Learning Outcomes

Goal 1: Provide students theory-grounded and science-based content and methods for the innovative, effective, and sustainable design or development of technologies for AI and robotics systems.

> ***Objective 1.1:*** Students are able to understand advanced fundamental approaches in Artificial Intelligence (AI) and robotics, including machine learning, computer vision, and data science.
>
> ***Objective 1.2:*** Students are able to articulate and differentiate their knowledge from different domains regarding innovative ideas.
>
> ***Objective 1.3:*** Students are able to critically reflect on limitations of state-of-the-art approaches.

Goal 2: Provide students with scientific experiences (e.g., content, methods, assignments) to develop and apply skills in data collection, analysis, and evaluation for AI and robotics systems.

> ***Objective 2.1:*** Students are able to apply state-of-the-art methods to given problems and existing datasets.
>
> ***Objective 2.2:*** Students are able to scientifically analyze AI approaches.
>
> ***Objective 2.3:*** Students are able to combine their knowledge from different domains to identify innovative solutions.

Goal 3: Provide students with scientific experiences to create novel solutions using AI or robotics technologies in response to current and future challenges of emerging technologies.

> ***Objective 3.1:*** Students are able to create novel AI or robotic systems that extend the current capabilities of such systems.
>
> ***Objective 3.2:*** Students are able to evaluate the consequences of the application of AI and robotics approaches on spheres outside their own core area of expertise and make appropriate adaptations.

Goal 4: Provide students content and methods grounded in theory and science from complementary academic fields to critically reflect on AI and robotic approaches and their consequences.

> ***Objective 4.1:*** Students are able to understand fundamental approaches in selected fields of social sciences or humanities.
>
> ***Objective 4.2:*** Students are able to combine knowledge from different academic fields to evaluate AI and robotics approaches.

Goal 5:

- Provide students with techniques to work effectively in diverse teams and continuously develop their own expertise and learning.
- Provide students with the abilities needed to practice sustainability and democratic citizenship.
- Enable students to reflect on and relate their own actions to social and ethical contexts.

Objective 5.1: Students are able to appropriately coordinate, cooperate, and communicate with the target group.

Objective 5.2: Students are able to demonstrate effective problem solving and critical thinking skills in resolving job-related issues.

Objective 5.3: Students are able to utilize adaptive expertise and pursue creativity and lifelong learning.

Objective 5.4: Students are able to embrace the values of a democratic society and a sustainable environment and act accordingly.

Objective 5.5: Students are able to reflect on technology leadership and knowledge of ethics and relate them to current and future sociotechnical contexts.

3. Study Program Outline

AIR: Artificial Intelligence (AI) and Robotics (R)

	Module	ECTS	Associated courses
Mandatory	Artificial Intelligence Basic Module	6	Artificial Intelligence
	Mobile Robot Navigation Basic Module	6	Mobile Robot Navigation
	Machine Learning Basic Module	6	Machine Learning
	Deep Learning Basic Module	6	Deep Learning
	Computer Vision Basic Module	6	Computer Vision
	Data Science Basic Module	6	Data Science
Elective	Advanced Module 1	6	All advanced AIR courses Students select one advanced AI course course per module. (We recommend finishing the base module before beginning the advanced module.)
	Advanced Module 2	6	
	Advanced Module 3	6	
Mandatory	Learning in Transformation Project	12	Learning in Transformation Project
	Key Qualification (KQ) Basic Module	6	Good Scientific Practice, Project Management, Communication
Elective	Key Qualification Module 1	6	All KQ courses Students select KQ courses that provide a total of 6 ECTS points (usually 2-3 courses) per module.
	Key Qualification Module 2	6	
	Interdisciplinary (ID) Module 1	6	All ID courses Students select one ID course per module.
	Interdisciplinary Module 2	6	
	Master's Thesis	24	Master's Thesis and Colloquium

Note. ECTS = European Credit Transfer System

4. Recommended Study Plan

Sem.					
1	Artificial Intelligence Basic (mandatory)	Mobile Robot Navigation (mandatory)	Machine Learning (mandatory)	Data Science (mandatory)	Key Qualification Basic Module (mandatory)
2	Deep Learning (mandatory)	Computer Vision (mandatory)	Interdisciplinary Module 1	Key Qualification Module 1	Learning in Transformation (Project)
3	Advanced Module 1	Advanced Module 2	Advanced Module 3	Key Qualification Module 2	
4	Interdisciplinary Module 2	Master's Thesis (Colloquium + Thesis)			

5. Modules

5.1 Artificial Intelligence Basic Module			**6 ECTS**
Recommended semester	**1st semester**	**Total workload**	**180 hours**

Module number	1-M-AIR-AIB-1
Duration	One semester
Course frequency	Winter semester
Module language	English
Prerequisites	None
Associated courses	Artificial Intelligence
Instructor	Prof. Dr. Wolfram Burgard
Examination	Learning-oriented assignments
Grading	Graded
Learning outcomes	Students are able to • describe different approaches to define artificial intelligence; • classify different types of problems, environments, and intelligent agents; • formulate problems as search problems and apply different algorithms to solve them; • explain basic concepts of first-order and predicate logic; • apply basic approaches to probabilistic reasoning and decision making under uncertainty; • identify advanced concepts of AI; and • assess ethical consequences of AI and its application and discuss interdisciplinary aspects of AI.
Content	The content of this module is mainly based on the contents of the textbook by Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Chapters 1-4. The book is available in the library. • Approaches to AI • Problem solving using AI • Knowledge, reasoning, and planning in AI • Probabilistic reasoning
Teaching and learning formats	See syllabus
Related programs	M.Sc. AI and Robotics

5.2 Mobile Robot Navigation Basic Module			**6 ECTS**
Recommended semester	**1st semester**	**Total workload**	**180 hours**

Module number	1-M-AIR-MRB-1
Duration	One semester
Course frequency	Winter semester
Module language	English
Prerequisites	None
Associated courses	Mobile Robot Navigation
Instructor	Prof. Dr. Wolfram Burgard
Examination	Learning-oriented assignments
Grading	Graded
Learning outcomes	Students are able to • explain basic approaches to probabilistic sensor and motion models as well as state estimation; • compare basic approaches to robot localization, robot mapping, simultaneous localization and mapping, motion and path planning, and exploration; • design basic architectures for vehicles that navigate autonomously in complex environments; • identify advanced concepts of mobile robotics; and • assess ethical consequences of robotics and its application and discuss interdisciplinary aspects.
Content	• Probabilistic sensor and motion models • Robot localization • Robot mapping • Simultaneous localization and mapping • Motion and path planning and exploration
Teaching and learning formats	See syllabus
Related programs	M.Sc. AI and Robotics

5.3 Machine Learning Basic Module			**6 ECTS**
Recommended semester	**1st semester**	**Total workload**	**180 hours**

Module number	1-M-AIR-MLB-1
Duration	One semester
Course frequency	Winter semester
Module language	English
Prerequisites	None
Associated courses	Machine Learning
Instructor	NN (not known yet)
Examination	Learning-oriented assignments
Grading	Graded
Learning outcomes	Students are able to • explain basic approaches to supervised, unsupervised, and weakly supervised learning as well as reinforcement learning, gradient descent, and optimization; • compare basic approaches to regression, classification, clustering, and principal component analysis; • implement techniques for model selection and regularization; • develop strategies to solve problems using machine learning approaches; • identify advanced concepts of machine learning; and • assess ethical consequences of machine learning and its application and discuss interdisciplinary aspects.
Content	• Supervised learning (regression and classification) • Unsupervised learning (clustering, principal component analysis) • Weakly supervised learning • Model selection and regularization
Teaching and learning formats	See syllabus
Related programs	M.Sc. AI and Robotics

5.3 Data Science Basic Module			**6 ECTS**
Recommended semester	**1st semester**	**Total workload**	**180 hours**

Module number	1-M-AIR-DSB-1
Duration	One semester
Course frequency	Winter semester
Module language	English
Prerequisites	None
Associated courses	Data Science
Instructor	Prof. Dr. Andreas Kipf
Examination	Learning-oriented assignments
Grading	Graded
Learning outcomes	Students are able to • explain basic approaches to data engineering and visualization; • compare basic approaches to data cleaning and integration; • design basic architectures for data processing systems and data pipelines; • identify advanced concepts of data engineering; and • assess ethical consequences of large data and its application and discuss interdisciplinary aspects.
Content	• Data engineering foundations • Data cleaning • Data integration • Data processing systems • Data pipelines • Visualization
Teaching and learning formats	See syllabus
Related programs	M.Sc. AI and Robotics

5.4 Computer Vision Basic Module			6 ECTS
Recommended semester	**2nd semester**	**Total workload**	**180 hours**

Module number	1-M-AIR-CVB-1
Duration	One semester
Course frequency	Summer semester
Module language	English
Prerequisites	None
Associated courses	Computer Vision
Instructor	NN
Examination	Learning-oriented assignments
Grading	Graded
Learning outcomes	Students are able to • explain the working principles of a digital camera; • implement basic approaches to feature extraction, scene reconstruction, object detection and recognition, and pose and motion estimation; • develop strategies to solve computer vision problems by using approaches based on deep learning; • identify advanced concepts of computer vision; and • assess ethical consequences of computer vision and its application and discuss interdisciplinary aspects.
Content	• Working principles of a digital camera • Feature extraction • Scene reconstruction • Object detection and recognition • Pose and motion estimation • Approaches to computer vision based on deep learning
Teaching and learning formats	See syllabus
Related programs	M.Sc. AI and Robotics

5.5 Deep Learning Basic Module			**6 ECTS**
Recommended semester	**2nd semester**	**Total workload**	**180 hours**

Module number	1-M-AIR-RLB-1
Duration	One semester
Course frequency	Summer semester
Module language	English
Prerequisites	None
Associated courses	Deep Learning
Instructor	Prof. Dr. Wolfram Burgard
Examination	Learning-oriented assignments
Grading	Graded
Learning outcomes	Students are able to • understand basic foundations of deep feedforward networks, regularization for deep learning, and convolutional networks; • explain recurrent recursive networks and practical aspects of deep learning; • analyze deep learning approaches in the context of practical applications from computer vision, robotics, and related fields; • implement techniques for model selection and regularization for deep learning; • identify advanced concepts of deep learning; and • assess ethical consequences of deep learning and its application and discuss interdisciplinary aspects.
Content	• Deep feedforward networks • Regularization for deep learning • Convolutional networks • Recurrent recursive networks • Practical aspects of deep learning • Model selection and regularization for deep learning
Teaching and learning formats	See syllabus
Related programs	M.Sc. AI and Robotics

5.6 Advanced Module 1			**6 ECTS**
Recommended semester	**3rd semester**	**Total workload**	**180 hours**
Module number	1-M-AIR-AM1-1		
Duration	One semester		
Course frequency	Winter semester		
Module language	English		
Prerequisites	Associated basic module is recommended		
Associated courses	One course must be selected from all advanced AIR courses		
Instructor	Depends on selected course		
Examination	See syllabus (varies by course)		
Grading	See syllabus (varies by course)		
Learning outcomes	Students are able to • develop in-depth knowledge in selected fields of AI and robotics; • demonstrate an advanced and comprehensive understanding of the fundamental concepts, principles, and theories in AI and robotics, such as machine learning, data science, deep learning, robotics, natural language processing, computer vision, reinforcement learning, and control systems; • analyze and find solutions to a given problem; • generate novel solutions and approaches to problems based on a concept or a combination of concepts presented in this course; • develop proficiency in using state-of-the-art AI and robotics tools and platforms; and • effectively reflect upon their knowledge and experiences in an interdisciplinary context by identifying connections between different disciplines and applying them in a meaningful way.		
Content	In the advanced module, students deepen their knowledge in up to three of the six fields of AI, robot navigation, deep learning, data science, machine learning, and computer vision. Students select one course from the advanced course offerings. The syllabus outlines the specific course content.		
Teaching and learning formats	See syllabus		
Related programs	M.Sc. AI and Robotics		

5.7 Advanced Module 2			**6 ECTS**
Recommended semester	**3rd semester**	**Total workload**	**180 hours**
Module number	1-M-AIR-AM2-1		
Duration	One semester		
Course frequency	Winter semester		
Module language	English		
Prerequisites	Associated basic module is recommended		
Associated courses	One course must be selected from all advanced AIR courses		
Instructor	Depends on selected course		
Examination	See syllabus (varies by course)		
Grading	See syllabus (varies by course)		
Learning outcomes	Students are able to • develop in-depth knowledge in selected fields of AI and robotics; • demonstrate an advanced and comprehensive understanding of the fundamental concepts, principles, and theories in AI and robotics, such as machine learning, data science, deep learning, robotics, natural language processing, computer vision, reinforcement learning, and control systems; • analyze and find solutions to a given problem; • generate novel solutions and approaches to problems based on a concept or a combination of concepts presented in this course; • develop proficiency in using state-of-the-art AI and robotics tools and platforms; and • effectively reflect upon their knowledge and experiences in an interdisciplinary context by identifying connections between different disciplines and applying them in a meaningful way.		
Content	In the advanced module, students deepen their knowledge in up to three of the six fields of AI, robot navigation, deep learning, data science, machine learning, and computer vision. Students select one course from the advanced course offerings. The syllabus outlines the specific course content.		
Teaching and learning formats	See syllabus		
Related programs	M.Sc. AI and Robotics		

5.8 Advanced Module 3			**6 ECTS**
Recommended semester	**3rd semester**	**Total workload**	**180 hours**

Module number	1-M-AIR-AM3-1
Duration	One semester
Course frequency	Winter semester
Module language	English
Prerequisites	Associated basic module is recommended
Associated courses	One course must be selected from all advanced AIR courses
Instructor	Depends on selected course
Examination	See syllabus (varies by course)
Grading	See syllabus (varies by course)
Learning outcomes	Students are able to • develop in-depth knowledge in selected fields of AI and robotics; • demonstrate an advanced and comprehensive understanding of the fundamental concepts, principles, and theories in AI and robotics, such as machine learning, data science, deep learning, robotics, natural language processing, computer vision, reinforcement learning, and control systems; • analyze and find solutions to a given problem; • generate novel solutions and approaches to problems based on a concept or a combination of concepts presented in this course; • develop proficiency in using state-of-the-art AI and robotics tools and platforms; and • effectively reflect upon their knowledge and experiences in an interdisciplinary context by identifying connections between different disciplines and applying them in a meaningful way.
Content	In the advanced module, students deepen their knowledge in up to three of the six fields of AI, robot navigation, deep learning, data science, machine learning, and computer vision. Students select one course from the advanced course offerings. The syllabus outlines the specific course content.
Teaching and learning formats	See syllabus
Related programs	M.Sc. AI and Robotics

5.9 Learning in Transformation Project			**12 ECTS**
Recommended semester	**2nd and 3rd semester**	**Total workload**	**360 hours**
Module number	1-M-AIR-LTP-1		
Duration	Two semesters		
Course frequency	Summer semester		
Module language	English		
Prerequisites	Two basic modules and Key Qualifications Basic Module recommended		
Associated courses	Transformative Learning Project		
Instructor(s)	1-2 professor(s) from any department who can supervise the projects and coaches/teaching assistants		
Examination	Project, scientific paper, or presentation		
Grading	Pass/fail		
Learning outcomes	Students are able to • identify steps to solving a real-world research problem and design an action plan to implement these steps; • develop and test a working prototype; • critically evaluate and provide feedback on solution approaches from other student groups; • explain and present the solution approach to the stakeholder(s) and peers; and • assess/evaluate the outcome of the project and defend the development steps.		
Content	The Learning in Transformation Project is an interdisciplinary scientific research project that focuses on practical learning experiences. The project aims to provide students with a scientific-based approach to solving real-world industrial, societal, or political problems faced by non-university stakeholders. The project encourages students to creatively apply their prior knowledge to solve these problems in groups. For further information see the syllabus.		
Teaching and learning formats	The module is set up as a mixture of learning units, discussion and supervision sessions, field trips, and a high proportion of independent work within student groups. Over the course of the two semesters, milestones help structure the project planning and assure that the group is on track and on time. They are further used to document the project and learning progress. For further information see the syllabus.		
Related programs	M.Sc. AI and Robotics		

5.10 Interdisciplinary Module 1			**6 ECTS**
Recommended semester	**2nd semester**	**Total workload**	**180 hours**

Module number	2-M-IND-IM1-1
Duration	One semester
Course frequency	Summer semester
Module language	English
Prerequisites	None
Associated courses	One course must be selected from all interdisciplinary courses
Instructor	Depends on selected course
Examination	See syllabus (varies by course)
Grading	Graded
Learning outcomes	Students are able to • understand selected scientific approaches and methods in the social sciences and humanities; • develop critical thinking and problem-solving skills and apply them to real-world problems; • apply knowledge of social science and liberal arts theories to analyze and evaluate the impact of technology on society; • analyze the social, ethical, legal, and cultural implications of technology using social science and liberal arts methodologies; and • combine technological, social science, and liberal arts knowledge and methods to create novel technological solutions.
Content	In the interdisciplinary module, students develop an interdisciplinary perspective that complements their scientific core courses. Students select one course from the interdisciplinary course offerings. Courses are offered in the areas of design, social sciences, ethics and philosophy, law, and economics and business studies. The syllabus outlines the specific course content.
Teaching and learning formats	See syllabus
Related programs	M.Sc. AI and Robotics

5.11 Interdisciplinary Module 2			**6 ECTS**
Recommended semester	**4th semester**	**Total workload**	**180 hours**

Module number	2-M-IND-IM2-1
Duration	One semester
Course frequency	Summer semester
Module language	English
Prerequisites	None
Associated courses	One course must be selected from all interdisciplinary courses
Instructor	Depends on selected course
Examination	See syllabus (varies by course)
Grading	Graded
Learning outcomes	Students are able to • understand selected scientific approaches and methods in the social sciences and humanities; • develop critical thinking and problem-solving skills and apply them to real-world problems; • apply knowledge of social science and liberal arts theories to analyze and evaluate the impact of technology on society; • analyze the social, ethical, legal, and cultural implications of technology using social science and liberal arts methodologies; and • combine technological, social science, and liberal arts knowledge and methods to create novel technological solutions.
Content	In the interdisciplinary module, students develop an interdisciplinary perspective that complements their scientific core courses. Students select one course from the interdisciplinary course offerings. Courses are offered in the areas of design, social sciences, ethics and philosophy, law, and economics and business studies. The syllabus outlines the specific course content.
Teaching and learning formats	See syllabus
Related programs	M.Sc. AI and Robotics

5.12 Key Qualification Basic Module			**6 ECTS**
Recommended semester	**1st semester**	**Total workload**	**180 hours**

Module number	8-M-KQU-KQB-1
Duration	One semester
Course frequency	Winter semester
Module language	English
Prerequisites	None
Associated courses	Good Scientific Practice Project Management Communication All three courses must be completed.
Instructor	Depends on the course
Examination	Learning-oriented assignments
Grading	Pass/fail
Learning outcomes	Students are able to • understand basic principles of good scientific practice; • identify different forms and situations of scientific misconduct and apply strategies to avoid them; • discuss various project management techniques and tools; • identify potential problems within teams and respond appropriately; • understand communication forms and techniques and apply them appropriately to different situations; • apply principles of intercultural communication; and • communicate effectively in groups with individuals of different scientific or professional backgrounds.
Content	*Good Scientific Practice* Students learn the rules and values of responsible and ethical research. This includes proper handling of data, sources, and ideas of others as well as citation

	rules, forms of scientific misconduct and how to avoid them, and research ethics. *Project Management* Students learn basic project management tools and techniques and how to apply them correctly. This includes project planning, risk management, roles and associated tasks, team management, project monitoring, and evaluation. The course specifically prepares students for the Learning in Transformation Project. *Communication* Students acquire communication techniques to communicate effectively in intercultural and interprofessional teams. The course specifically prepares students for the Learning in Transformation Project.
Teaching and learning formats	See Syllabus
Related programs	M.Sc. AI and Robotics

5.13 Key Qualification Module 1			6 ECTS
Recommended semester	**2nd semester**	**Total workload**	**180 hours**

Module number	8-M-KQU-KQ1-1
Duration	One semester
Course frequency	Summer semester
Module language	English
Prerequisites	None
Associated courses	Students select KQ courses that provide a total of 6 ECTS points (usually 2-3 courses) per module. A total of 6 ECTS points must be earned from the available KQ courses.
Instructor	Depends on selected course
Examination	See syllabus (varies by course)
Grading	Pass/fail
Learning outcomes	Students are able to • apply key techniques and methodologies needed to work in an academic and professional environment; • communicate effectively in foreign languages; and • reflect on and extend their knowledge independently.
Content	In the key qualification module, students acquire academic and professional key qualifications. Students select two or three courses from the key qualifications course offerings. The syllabus outlines the specific course content.
Teaching and learning formats	Courses are offered in weekly sessions or as block courses during the course-free period. The syllabus outlines specific course information.
Related programs	M.Sc. AI and Robotics

5.14 Key Qualification Module 2			**6 ECTS**
Recommended Semester	**3rd semester**	**Total Workload**	**180 hours**

Module number	8-M-KQU-KQ2-1
Duration	One semester
Course frequency	Winter semester
Module language	English
Prerequisites	None
Associated courses	Students select KQ courses that provide a total of 6 ECTS points (usually 2-3 courses) per module. A total of 6 ECTS points must be earned from the available KQ courses.
Instructor	Depends on selected course
Examination	See syllabus (varies by course)
Grading	Pass/fail
Learning outcomes	Students are able to • apply key techniques and methodologies needed to work in an academic and professional environment; • communicate effectively in foreign languages; and • reflect on and extend their knowledge independently.
Content	In the key qualification module, students acquire academic and professional key qualifications. Students select two or three courses from the key qualifications course offerings. The syllabus outlines the specific course content.
Teaching and learning formats	Courses are offered in weekly sessions or as block courses during the course-free period. The syllabus outlines specific course information.
Related programs	M.Sc. AI and Robotics

5.15 Master's Thesis			**24 ECTS**
Recommended semester	**4th semester**	**Total workload**	**720 hours**

Module number	1-M-AIR-THE-1
Duration	One semester
Course frequency	Winter and Sommer semester
Module language	English
Prerequisites	None
Associated courses	Master's Colloquium
Instructor	Student select the thesis advisor
Examination	Thesis and oral exam
Grading	Graded
Learning outcomes	Students are able to • formulate a research question in AI and robotics, select the appropriate methodology and literature, and design an evaluation strategy; • use scientific methods to propose an innovative solution to a complex problem; • critically analyze and evaluate theories and approaches and reflect on their assumptions and limitations in an interdisciplinary context; • integrate knowledge from different domains to create novel solutions to the research problem; • independently plan a research project within a given time frame; • apply the rules of good scientific practice to all parts of the research project; and • structure and communicate research results in accordance with academic standards.
Content	The students select their research topics in coordination with their advisor. The students present their work during a research colloquium that takes place during the term.
Teaching and learning formats	Independent research and colloquium See syllabus
Related programs	M.Sc. AI and Robotics