

MODULE-OVERVIEW OF THE BACHELOR'S DEGREE PROGRAMME ARTIFICIAL INTELLIGENCE

MODULÜBERSICHT DES BACHELORSTUDIENGANGS KÜNSTLICHE INTELLIGENZ

Compulsory courses

Module group „Foundations of Computer Science & Programming“

Module	Contact hours	ECTS	Professor	Language
Foundations of Computer Science	3V+2Ü	7	Hammer	English
Programming I	2V+2Ü	6	Bachmaier, Größlinger	English
Programming for Data Analytics	2V+2Ü	6	Lemmerich, Heinzl	English
Algorithms and Data Structures	4V+2Ü	9	Sudholt, Rutter	English
Sum of the module group		28		

Module group „Mathematics & Theoretical Computer Science“

Module	Contact hours	ECTS	Professor	Language
Linear Algebra I or Mathematics for Computer Science I	4V+2Ü	9	Kaiser, Wirth, Zumbrägel, Kreutzer, Harks, Glock	English
Analysis I or Mathematics for Computer Science II	4V+2Ü	9	Sauer, Prochno, Kaiser, Rudolf, Forster-Heinlein	English
Introduction to Stochastics or Mathematics for Computer Science III	4V+2Ü	9	Rudolf, Müller-Gronbach	English
Theoretical Computer Science	3V+2Ü	7	Rutter, Sudholt, Müller	English
Sum of the Module group		34		

Module group „Foundations of Artificial Intelligence“

Module	Contact hours	ECTS	Professor	Language
Foundations of AI: Machine Learning	2V+1Ü	5	Herbold	English
Foundations of AI: Deep Learning	2V+1Ü	5	Lemmerich	English
Foundations of AI: Probabilistic Machine Learning	2V+1Ü	5	Granitzer	English
Foundations of AI: Multiagent Systems	2V+1Ü	5	Harks	English
Sum of the Module group		20		

Module Group „Responsible Artificial Intelligence“

Module	Contact hours	ECTS	Professor	Language
Ethical Aspects of AI	2V	3	Reinhardt	English
Legal Aspects of AI	1V	3	Beurskens	English
Sum of the module group		6		

Module „SEP, Seminar and Presentation“

Module	Contact hours	ECTS	Professor	Language
AI Seminar	2V	4	FIM professors	English
AI Project	6P	10	FIM professors	English
Presentation of Bachelor Thesis		3	FIM professors	English
Bachelor Thesis		12	FIM professors	English
Overview/ Consultation Module	1	2	FIM professors	English
Sum of the module group		31		

Compulsory electives

Module group „Advanced AI – Applied”

Module	Contact hours	ECTS	Professor	Language
Data Base & Information Systems I	2V+1Ü	5	Scherzinger	English
Software Engineering	2V+1Ü	5	Fraser	English
Data and Knowledge Engineering	2V + 2Ü	6	N.N.	English
AI-Driven Software Development	2Ü	5	Fraser	English
Sum of the module group		21		

Module group „Advanced AI – Theoretical”

Module	Contact hours	ECTS	Professor	Language
Analysis II	4V+2Ü	9	Sauer, Prochno, Kaiser, Rudolf, Forster-Heinlein	English
Mathematics of Machine Learning	3V+1Ü	7	Rudolf, Müller-Gronbach, Wirth, Sauer, Prochno, Harks	English
Sum of the module group		16		

Electives

Module group „Business Analytics” (BuAn)

Module	Contact hours	ECTS	Professor	Language
Computergestützte Statistik - Einführung in R	2V	3	Schnurbus	Deutsch
Einführung in die Ökonometrie	3V+2Ü	5	Haupt	Deutsch
Einführung in die Zeitreihenanalyse	2V+2Ü	5	Haupt	Deutsch
Financial Data Analytics	2V+2Ü	5	Kellner	English
Data Analysis and Digital Reporting with Python	2V+2Ü	5	Kellner	English
Data and Decisions	2V+2Ü	5	Goerigk	English
Fundamentals of Management Science II	2V+2Ü	5	Goerigk	English

Module group „Entrepreneurship”(Ent)

Module	Contact hours	ECTS	Professor	Language
Market Research	2V+2Ü	5	Schumann	English
Fundamentals of Entrepreneurship	2V+2Ü	5	Bort	English
5-Euro-Business-Wettbewerb	4 SWS	5	Häussler	German
Technology and Innovation Management	2V+2Ü	5	Häussler	English
Ethische Konzepte in einer globalen Wirtschaft	2 SWS	5	Meißner, Bort	German
Praxismodul Entrepreneurship/ Honours Degree	8 SWS	10	Totzek	English
Sustainable Business Transformation & Entrepreneurship	3 SWS	5	Meißner, Bort	English
Entrepreneurial Marketing	2V	5	Totzek	English

Module group „Natural Language Processing and Multilingual Computational Linguistics”(NLP)

Module	Contact hours	ECTS	Professor	Language
Computer-Assisted Language Comparison	2V+1Ü	5	List	German/ English
Information Retrieval & NLP	2V+1Ü	5	Hautli-Janisz	English
NLP for Social Media Analysis	2V+1Ü	5	Hautli-Janisz	English
Multilingual Computational Linguistics	2V+2Ü	5	List	German/ English
Advances in Multilingual Computational Linguistics	2V	3	List	German/ English
Advances in NLP	2V	3	Hautli-Janisz, List	English

Module group „Software Engineering” (SE)

Module	Contact hours	ECTS	Professor	Language
Object-oriented Programming with C++	2V+2Ü	6	Hammer	English
Software Testing	2V+2Ü	6	Fraser	English
Programming II	2V+2Ü	6	Bachmaier	English
Programming paradigms	2V+2Ü	6	Hammer	English
Practical Parallel Programming	3V+2Ü	7	Größlinger	English

Module group „Regulation of AI and Data” (RAI)

Module	Contact hours	ECTS	Professor	Language
Grundzüge des IT- und Datenrechts	2V	5	Bomhard/Rücker	Deutsch
Internetrecht für Nichtjuristen	2V	5	Beurskens	Deutsch
Medienrecht für Nebenfachstudierende	2V	5	von Lewinski	Deutsch
Datenschutzrecht für Nebenfachstudierende	2V	5	von Lewinski	Deutsch
KI im Strafrecht	2V	5	Bomhard/Rücker	Deutsch
Urheberrecht	2V	5	Sorge	Deutsch

Module group „Theoretical Foundations of AI - Random Structures and Dynamics” (RSD)

Module	Contact hours	ECTS	Professor	Language
Random Graphs	2V+2Ü	6	Glock	English
Stochastic Simulation	3V+1Ü	7	Müller-Gronbach	English
Probability Theory	4V+2Ü	9	Müller-Gronbach	English
Measure and Integration	4V+2Ü	9	Müller-Gronbach	English
Monte Carlo Methods	3V+1Ü	7	Rudolf	English
Markov Chain Monte Carlo	4V+2Ü	9	Rudolf	English
Bayesian Inference and Machine Learning	2V+1Ü	5	Rudolf	English
Stochastic Processes	3V+1Ü	7	Rudolf	English
Information Theory	4V+2Ü	9	Zumbrägel	English
Classical Limit Theorems and Large deviations	4V+2Ü	9	Prochno	English

Module group „Theoretical Foundations of AI - Algorithms and Optimization” (AO)

Module	Contact hours	ECTS	Professor	Language
Numerical Linear Algebra	4V+2Ü	9	Forster-Heinlein	English
Competitive Programming	2V+4Ü	4	Rutter	English
Efficient Algorithms	3V+2Ü	7	Rutter, Sudholt	English
Introduction to Information-Based Complexity and Compressed sensing	3V+1Ü	6	Prochno	English
Introduction to Numerical Analysis	4V+2Ü	9	Forster-Heinlein, Sauer	English
Linear and Discrete Optimization	3V+1Ü	7	Harks	English
Mathematical Logic	4V +2Ü	9	Kaiser, Müller	English

Computational Logic	4V+2Ü	9	Müller	English
Introduction to Convex Geometry and Linear Programming	3V+1Ü	6	Prochno	English
Classical Harmonic Analysis	2V+1Ü	5	Prochno	English
Machine Learning Control and Optimization	4V+2Ü	9	Wirth	English
Functional Analysis	4V+2Ü	9	Prochno	English
Randomised Algorithms	3V+2Ü	7	Sudholt	English

Module group „Visual Computing and Data Science” (VCDS)

Module	Contact hours	ECTS	Professor	Language
Digital Image Processing	4V+2Ü	9	Forster-Heinlein, Sauer	English
Computer Graphics	2V+1Ü	5	Sauer	English
Visualization	2V+2Ü	6	Heinzl	English
Data Science	2V+1Ü	5	Granitzer	English
Web and Network Science	2V+2Ü	5	Granitzer	English
SQL for Data Science	2V+2Ü	6	Scherzinger	English

Module group "German as a Foreign Language"

Based on the initial language level (determined by a placement test), the aim is to improve the language level in German by 2-3 levels according to the Common European Framework of Reference for Languages in order to better understand or write German texts or to be able to present and discuss in German, especially with regard to the language requirements in professional life.

	Contact hours	ECTS
German language courses	8	10 per level
Sum of the module group	16	20

Module group English as a Foreign Language

Based on the initial language level (determined by a placement test), the aim is to improve the language level in English by 2 levels according to the Common European Framework of Reference for Languages in order to better understand or write English technical texts or to be able to present and discuss in English, especially with regard to the language requirements as a scientist.

	Contact hours	ECTS
English language courses	8	10 per level
Sum of the module group	16	20

Sample study plan for Applied track *with German language courses*

1. Study semester		SWS	ECTS
	Linear Algebra I	4V+2Ü	9
	Foundations of Computer Science	3V+2Ü	7
	Programming I	2V+2Ü	6
	Overview/Consultation Module	1 SWS	2
	Language Course I		5
	Sum of the ECTS:		29
2. Study semester			
	Analysis I	4V+2Ü	9
	Programming for Data Analytics	2V+2Ü	6
	Algorithms and Data Structures	4V+2Ü	9
	Foundations of AI: Machine Learning	2V+1Ü	5
	Language Course II		5
	Sum of the ECTS:		34
3. Study semester			
	Introduction to Stochastics	4V+2Ü	9
	Foundations of AI: Deep Learning	2V+1Ü	5
	Foundations of AI: Probabilistic Machine Learning	2V+1Ü	5
	Theoretical Computer Science	2V+2Ü	7
	Language Course III		5
	Sum of the ECTS:		31
4. Study semester			
	Foundations of AI: Multiagent Systems	2V+1Ü	5
	Data Base & Information Systems I	2V+1Ü	5
	Software Engineering	2V+2Ü	5
	Language Course IV		5
	Legal Issues of AI	1V	3
	Compulsory Elective (Not language courses)		5
	Sum of the ECTS:		28
5. Study semester			
	Data and Knowledge Engineering	2V+2Ü	6
	Ethical Aspects of AI	2V	3
	Bachelor Seminar	2S	4
	AI Project	6P	10
	Compulsory Elective (Not language courses)		5
	Sum of the ECTS:		28
6. Study semester			
	Bachelor Thesis and Presentation		15
	Compulsory Elective (Not language courses)		15
	Sum of the ECTS:		30
Total ECTS			180

Sample study plan with applied track and *without language courses*

1. Study semester		SWS	ECTS
	Linear Algebra I	4V+2Ü	9
	Foundations of Computer Science	3V+2Ü	7
	Programming I	2V+2Ü	6
	Overview/Consultation Module	1 SWS	2
	Ethical Aspects AI	2V	3
	Sum of the ECTS:		27
2. Study semester			
	Analysis I	4V+2Ü	9
	Programming for Data Analytics	2V+2Ü	6
	Algorithms and Data Structures	4V+2Ü	9
	Foundations of AI: Machine Learning	2V+1Ü	5
	Data Base & Information Systems I	2V+1Ü	5
	Sum of the ECTS:		34
3. Study semester			
	Introduction to Stochastics	4V+2Ü	9
	Foundations of AI: Deep Learning	2V+1Ü	5
	Foundations of AI: Probabilistic Machine Learning	2V+1Ü	5
	Theoretical Computer Science	2V+2Ü	7
	Data and Knowledge Engineering	2V+2Ü	6
	Sum of the ECTS:		32
4. Study semester			
	Foundations of AI: Multiagent Systems	2V+1Ü	5
	Software Engineering	2V+2Ü	5
	Legal Issues of AI	1V	3
	Compulsory Elective (Not language courses)		18
	Sum of the ECTS:		31
5. Study semester			
	Bachelor Seminar	2S	4
	AI Project	6P	10
	Compulsory Elective (Not language courses)		13
	Sum of the ECTS:		27
6. Study semester			
	Bachelor Thesis and Presentation		15
	Compulsory Elective (Not language courses)		14
	Sum of the ECTS:		29
Total ECTS			180

Abkürzungsverzeichnis und Wörterbuch / List of abbreviations and dictionary

Abkürzung / Abbreviation	Deutsch	English
B.Sc.	Bachelor of Science	Bachelor of Science
ECTS	Leistungspunkte nach dem European Credit Transfer System	Credits within the European Credit Transfer System
P	Praktikum	Lab/practicum
S	Seminar	Seminar
SWS	Semesterwochenstunden	contact teaching hours per week
Ü	Übung	Exercise/Tutorial
V	Vorlesung	Lecture