Study Regulations Governing the Master's Degree Programme in Data Science and Artificial Intelligence

25 April 2019

> **Note:** This translation is provided for information purposes only. In the event of any discrepancy between the translation and the original German version published in the Official Bulletin (*Dienstblatt der Hochschulen des Saarlandes*), the provisions of the latter shall take precedence.

Pursuant to Section 60 of the Saarland University Act of 30 November 2016 (Official Gazette of Saarland, p. 1080) as amended by the Act of 22 August 2018 (Official Gazette, p. 674) and pursuant to the Joint Examination Regulations for Bachelor's and Master's Degree Programmes of Faculty 6 (Natural Science and Technology Faculty I – Mathematics and Computer Science) of 2 July 2015 (Official Bulletin, p. 616) as amended by the Ordinance to Amend the Joint Examination Regulations for Bachelor's and Master's Degree Programmes of Faculty 6 (Natural Science and Technology Faculty I – Mathematics and Computer Science) of 28 April 2016 (Official Bulletin, p. 404) and with the consent of the Saarland University Senate, the Faculty of Mathematics and Computer Science at Saarland University hereby issues the following Study Regulations for the Master's Degree Programme in Data Science and Artificial Intelligence.

Section 1
Scope

These study regulations, which govern the contents and structure of the Master's degree programme in Data Science and Artificial Intelligence, are based on the Joint Examination Regulations for Bachelor's and Master's Degree Programmes of the Faculty of Mathematics and Computer Science (Official Bulletin No. 72, p. 616) and the Subject-Specific Regulations Governing the Bachelor's and Master's Degree Programmes in Data Science and Artificial Intelligence at Saarland University of 20 March 2019 (Official Bulletin No. 56, p. 589). The Faculty of Mathematics and Computer Science is responsible for organizing the teaching, study curriculum and examinations relating to these programmes.

Section 2
Objectives of the degree programme and
career relevance

The objective of this international, consecutive Master's degree programme is to expand on and deepen the knowledge acquired in the preceding Bachelor's degree programme and prepare graduates for challenging national and international research and development work. The Master's degree programme in Data Science and Artificial Intelligence is based on complex data analysis and automation from mathematics and statistics to machine learning, artificial intelligence, big data, data management, modelling and simulation, and date visualization. Complementary methodologies drawn from a wide variety of disciplines are used to analyse data, automate processes and to design and engineer the models that make autonomous systems possible.

Section 3
Start and duration of programme

(1) Students can begin the programme at the beginning of the winter or summer semester of each year.

(2) The curriculum is organized such that the programme can be completed in four semesters (standard period of study).

Section 4
Types of academic
instruction

The curriculum content is taught using the following types of academic instruction:

1. Lectures ('L', standard class size = 100): Lectures serve to introduce a particular subject area and also provide an overview of the relevant theoretical concepts and principles, methodologies and skills, technologies and practical implementations that are common to the subject. Lecture courses provide suggestions for further reading on a topic and open the way to acquiring a deeper understanding of an area through subsequent exercise and problem-solving classes, practical skills classes and self-directed study.

2. Exercise and problem-solving classes ('EP', standard class size = 20): Exercise and problem-solving classes are small-group sessions used primarily to supplement and reinforce what was learned in the lectures. Students work on representative problems as this provides an opportunity for them to apply and deepen the knowledge they acquired in the lectures, to assess their personal understanding of a specific area and to clarify any questions that they may have.

3. Seminars ('S', standard class size = 15): Seminars provide an opportunity for students to broaden the knowledge and skills that they have already acquired and to gain a deeper understanding of a particular field of research by participating in discussions, giving presentations or completing seminar assignments based on their study of the specialist literature and relevant academic sources. They also help students acquire the skills necessary for the effective oral and visual presentation of scientific and academic content and encourage students to engage in critical analysis and discussion of research results. A seminar may also include project-related work in areas of current scientific interest or debate. The deeper understanding of a particular field that students acquire through project-related work in the Master's seminar may provide the basis for their final-year Master's thesis.

4. Practical skills classes and project work ('P', standard class size = 15; Master's level practical assignments or projects, standard class size = 6): Practical skills classes or projects offer a number of practical subject-related topics that introduce students to the specific approaches and methods used in a particular discipline or field of study. The necessary theoretical knowledge underlying a specific topic is acquired by attending lectures and studying the relevant scientific literature. An additional goal of the practical skills classes is to provide students with the opportunity to gain practical experience with computer-aided methods. Projects tend to address interdisciplinary topics. Working on a topic offers students the opportunity to work in supervised groups to tackle specific assignments from the initial solution design concept through to its final practical implementation. Students learn about the relationships between theory and practice not only through their own independent study and research, but also through project-based teamwork. Participation in a particular practical skills class or project may be dependent on a student having first successfully completed a required course of lectures and exercise and problem-solving classes.

Section 5
Structure and content of the
programme

(1) To graduate from the Master's programme in Data Science and Artificial Intelligence, students are required to earn a total of 120 credits as defined by the European Credit Transfer System (ECTS). Of these, at least 103 credits and at most 107 credits shall be from graded assignments. As a rule, students are required to earn 30 credits per semester.

(2) The degree programme covers modules associated with the sections listed below. Appendix A provides details of the modules and module elements offered in the different sections of the programme, the type of academic instruction used, the number of credit hours per week and the ECTS credits earned, the module frequency, the type of academic assessment and whether the module is graded.

1. 18 graded credits from the core lecture courses in 'Data Science and Artificial Intelligence' (DSAI) (each worth 9 credits; mandatory elective)

2. 9 graded credits from the core lecture courses in 'Computer Science' (each worth 9 CP; mandatory elective)

3. At least 27 and at most 31 graded credits from the core lecture courses in DSAI (each worth 9 credits), from the advanced lecture courses in DSAI (number of credits earned depends on course) or from the DSAI seminars (each worth 7 credits) (mandatory elective section): of which only one further seminar may be included (cf. Section 5(2), item 4).

4. 7 graded credits from the DSAI seminars offered (each worth 7 credits; mandatory elective)

5. 12 graded credits from the 'Master's Seminar' module (12 credits)

6. 30 graded credits from the 'Master's Thesis' module (30 credits)

7. At least 17 ungraded credits from selectable modules in the following areas (mandatory elective section):
    a. Master's level practical assignments or projects (6 credits),
    b. Selectable modules from the following areas: core lecture courses in DSAI, advanced lecture courses in DSAI or seminars in DSAI or the corresponding module categories in the Master's degree programme in Computer Science
    c. Tutoring and supervising undergraduate students in exercise and problem-solving classes (usually 4 credits). Tutoring several groups of students is permitted, provided that the exercise and problem-solving classes are from different modules.
    d. Language courses (maximum of 6 credits; modern languages only and not the student's native language)
    e. Soft Skills Seminar,
    f. Work placement or internship in industry (maximum of 6 credits) for which an application has been submitted to and approved by the Examination Board
    g. Modules for which an application has been submitted to and approved by the Examination Board. Students may, for example, submit an application to the Examination Board requesting recognition of certain student activities (particularly university-related administrative activities) or of attendance at courses teaching key skills (maximum of 3 credits in each case).

(3) Students may select either entire modules or individual module elements from the mandatory electives offered. Credits from academic assessments and examinations that were used to obtain the preceding Bachelor's degree cannot also be used to meet the degree requirements of the Master's programme. However, any credits from academic assessments and examinations that were earned during the Bachelor's degree period but that were not used to meet the total credit requirements for the Bachelor's programme may be transferred to the Master's programme provided that they do not exceed 30 credits in total.

(4) Students are required to accumulate a total of 42 credits in the mandatory section (of which 30 credits are from the 'Master's Thesis' module and 12 credits are from the 'Master's Seminar') and at least 78 credits in the mandatory electives section.

(5) The number of places available in practical skills classes, seminars and in the mandatory elective modules 'Tutoring', 'Soft Skills Seminar' and 'Language Courses' are limited and vary depending on the specific module or module element. Admission to these modules is managed by the module coordinator.

(6) Academic credits are either graded or ungraded. A graded academic assessment or examination cannot be split into ungraded and graded credits.

(7) A student who received academic credits for successfully completing a module from the core lecture courses in 'DSAI' and in 'Computer Science', is permitted to retake the assessment or examination on one further occasion within the same examination period and during the standard period of study in order to improve the grade awarded (cf. Sec. 13(4) of the Joint Examination Regulations for Bachelor's and Master's Degree Programmes of Faculty 6 (Natural Science and Technology Faculty I – Mathematics and Computer Science) of 2 July 2015 (Official Bulletin, p. 616). A student who received academic credits for successfully completing an advanced lecture course in 'DSAI' is permitted to retake the assessment or examination on one further occasion within the same examination period in order to improve the grade awarded, provided that the lecturer gave notice at the beginning of the course that the final examination or assessment may be repeated for this purpose. The student will be awarded the better of the two grades achieved. In all other cases, students are not permitted to repeat an assessment or examination for which they have already achieved at least the minimum passing grade.

(8) The core lecture courses taken within the mandatory electives block are offered at least once every two years. Seminars and advanced lecture courses will not necessarily be repeated. The Dean of Studies will ensure that a sufficient number of courses and modules are offered each year.

(9) The language of instruction is usually English and will be announced at the beginning of each module or module element.

(10) The modules offered as mandatory electives may be modified, though any such change shall require the approval of the Examination Board. New or modified modules or module elements, their weighting in ECTS credits and their classification within the different sections of the programme will be announced before the semester begins.

(11) Detailed information regarding the content of modules and module elements are described in the module catalogue that will be made available in suitable form. Any changes or amendments to the information in the module catalogue that are not covered by the provisions of these regulations shall be reported to the Dean of Studies and documented appropriately.

(12) Course attendance may be compulsory for certain seminars, exercise or problem-solving classes and practical skills classes. Students will be notified of this by the instructor at the beginning of the course.

Section 6
Study plan

The Dean of Studies will compile a study plan based on these study regulations that includes details of the types and scope of the module elements offered (Appendix A) with

recommendations on how students can organize and structure their studies efficiently (Appendix B). The study plan will be made available in suitable form. The range of modules offered in a particular semester will be published in the Saarland University course catalogue for that semester.

Section 7
Study counselling

(1) The Central Student Advisory Service (*Zentrale Studienberatung*) at Saarland University provides counselling and guidance to prospective students and enrolled students concerning the content, structure and requirements of academic study at Saarland University. It also can advise and assist students with respect to their study options as well as with planning and organizing their studies.

(2) Questions concerning curricular demands, learning objectives, admission requirements and study planning and organization can be addressed to the departmental academic adviser for the Data Science and Artificial Intelligence programme.

(3) Questions specific to individual modules should be addressed to the respective module coordinators.

Section 8
Studying abroad

Students have the opportunity to spend part of the programme studying abroad. Students interested in studying abroad should attend a study-abroad consultation session, take preparatory language courses if required, and should clarify credit transfer arrangements in accordance with the relevant examination regulations by completing a study abroad learning agreement. Information on study abroad opportunities, exchange programmes, scholarships and administrative formalities is available from Saarland University International Office or from the relevant departmental or subject representative. As foreign host universities and scholarship-awarding bodies often have early application deadlines and long application processing times, study abroad applications should normally be submitted to the Examinations Office one year before the planned start date.

Section 9
Master's thesis and Master's seminar

(1) By completing a Master's thesis, students demonstrate that they are able to work independently on tackling problems in data science, artificial intelligence or machine learning. The thesis topic will be taken from one of these subdisciplines and will be supervised by a member of teaching staff on the Data Science and Artificial Intelligence degree programme. The completion period for the Master's thesis is six months. Students are awarded 30 CP for completing their Master's thesis.

(2) Before finishing their Master's thesis, each student shall have successfully completed a Master's seminar in an area with direct relevance to the topic being addressed in the thesis. Students attending a Master's seminar shall give an oral presentation on the problem they propose to tackle in their Master's thesis and submit a written description of the issues to be addressed.

(3) Students shall register their thesis project with the Examinations Office no later than one semester after successfully completing the Master's seminar. Students who fail to meet this deadline will be required to successfully complete another Master's seminar.

Section 10
Specialist subject areas

(1) If a student on the Master's programme in Data Science and Artificial Intelligence has obtained at least 70 credits from the Master's thesis, the Master's seminar and other modules all of which are classified as lying within the same specialist subject area, the student may apply to have this specialist subject area included on the degree certificate.

(2) The specialist subject areas in the Master's degree programme Data Science and Artificial Intelligence are: machine learning, artificial intelligence, data science and big data engineering. The modules associated with each of these specialist subject areas and the classification of a Master's thesis and Master's seminar with respect to these specialist subject areas will be determined by the Examination Board and published in suitable form. The Examination Board may modify the list of specialist subject areas offered and may change the modules or curricular content associated with them.

Section 11
Commencement

These regulations shall come into force on the day after they are announced in the Official Bulletin of the Institutions of Higher Education in Saarland (*Dienstblatt der Hochschulen des Saarlandes*).

Saarbrücken, 30 July 2019

President of Saarland University
(Univ.-Prof. Dr. Manfred J. Schmitt)

Appendix A – Modules, assessments and examinations in the Master's degree programme 'Data Science and Artificial Intelligence'

M.Sc. degree programme 'Data Science and Artificial Intelligence'

Category	Module name	Type of assessment	Grading	ECTS credits		Winter semester		Summer semester		Winter semester		Summer semester	
						Subject semester							
						1		2		3		4	
				ungraded	graded	L / EP / P hrs/wk	Credits	L / EP / P hrs/wk	Credits	L / EP / P hrs/wk	Credits	L / EP / P hrs/wk	Credits
Core lecture course in DSAI	(modules offered subject to change, 9 credits each, see below)	written exam(s), PA	g	0	18	4/2/0 each	9	2/2/2	9				
Core lecture course in computer science	(modules offered subject to change, 9 credits each, see below)		g	0	9	4/2/0 each	9						
Core lecture course in DSAI or advanced lecture course in DSAI or DSAI seminar	(modules offered subject to change; seminar (7 credits each), core lecture course (9 credits each) or advanced lecture course (variable credits); see below)	written exam(s), PA, oral, written	g	0	27–31	2/2/0	6	2/2/2	6	2/2/0	6		
DSAI seminar	(modules offered subject to change, 7 credits each, see below)	oral, written	g	0	7	2/2/0	6	0/0/3	7	2/0/0	3		
Mandatory electives section	(modules offered subject to change, variable credits, see below)		u	at least 17	0			4/2/0	8	4/2/0	9		
	Master's Seminar	oral, written	g	0	12						12		
	Master's Thesis	Master's thesis	g	0	30								30
	TOTAL						30		30		30		30

Core lecture course in DSAI					
	Artificial Intelligence	written exam(s), PA	g	0	9
	Information Retrieval and Data Mining	written exam(s), PA	g	0	9
	Database Systems	written exam(s), PA	g	0	9
	Machine Learning	written exam(s), PA	g	0	9
	Neural Networks: Theory and Implementation	written exam(s), PA	g	0	9
	Image Processing and Computer Vision	written exam(s), PA	g	0	9
The Examination Board may add modules to or withdraw modules from this list.*	Automated Reasoning	written exam(s), PA	g	0	9

Core lecture courses in computer science					
(corresponds to core lecture courses from the Master's degree programme in Computer Science, excluding the core and advanced lecture courses in DSAI)					
	Algorithms and Data Structures	written exam(s), PA	g	0	9
	Compiler Construction	written exam(s), PA	g	0	9
	Complexity Theory	written exam(s), PA	g	0	9
	Computer Algebra	written exam(s), PA	g	0	9
	Computer Graphics	written exam(s), PA	g	0	9
	Cryptography	written exam(s), PA	g	0	9
	Data Networks	written exam(s), PA	g	0	9
	Distributed Systems	written exam(s), PA	g	0	9
	Embedded Systems	written exam(s), PA	g	0	9
	Geometric Modelling	written exam(s), PA	g	0	9
	Human Computer Interaction	written exam(s), PA	g	0	9
	Introduction to Computational Logic	written exam(s), PA	g	0	9
	Operating Systems	written exam(s), PA	g	0	9
	Optimization	written exam(s), PA	g	0	9
	Semantics	written exam(s), PA	g	0	9
	Software Engineering	written exam(s), PA	g	0	9
	Telecommunication 1	written exam(s), PA	g	0	9
	Verification	written exam(s), PA	g	0	9
The Examination Board may add modules to or withdraw modules from this list.					

Advanced lecture courses in DSAI					
The advanced lecture courses in DSAI may vary from semester to semester.	Ethics for Nerds (aka Data Ethics)	written exam(s), PA	g	0	variable
	Security	written exam(s), PA	g	0	9
	Stochastics 1	written exam(s), PA	g	0	9
	Stochastics 2	written exam(s), PA	g	0	9
	Mathematical Statistics	written exam(s), PA	g	0	9
	AI Planning	written exam(s), PA	g	0	9
The Examination Board may add modules to or withdraw modules from this list.*					

DSAI seminars					
The DSAI seminars offered may vary from semester to semester.		oral, written	g	0	7
The Examination Board may add modules to or withdraw modules from this list.*					

Mandatory electives section					
	Tutoring	Student tutoring work	u	4	0
	Soft Skills Seminar	oral, written	u	variable	0
	Language Courses (max. 6 credits)	oral, written	u	3 or 6	0
	Industrial Work Placement / Internship (max. 6 credits)		u	6	0
	Master's level practical assignments or projects (each worth 6 credits)		u	6	0
	Additional modules from the areas DSAI or computer science	written exam(s), PA	u	variable	0
The Examination Board may add modules to or withdraw modules from this list.					

* For a list of the modules currently offered, please go to the website of the Examinations Office.
Key: L = Lecture, EP = Exercise and problem-solving class, P = Project or practical training, PA = Preliminary assessment, credits = ECTS credits, credit hrs/wk = no. of class or supervised hours per week during the semester

Appendix B

Sample study plan – Master's degree programme in Data Science and Artificial Intelligence

1	Core lecture course in DSAI (9 credits)	Core lecture course in computer science (9 credits)	DSAI advanced lecture course (6 credits)	DSAI advanced lecture course (6 credits)	30
2	Core lecture course in DSAI (9 credits)	DSAI advanced lecture course (6 credits)	DSAI seminar (7 credits)	Mandatory electives section (8 credits)	30
3	DSAI advanced lecture course (6 credits)	DSAI advanced lecture course (3 credits)	Mandatory electives section (9 credits)	Master's Seminar (12 credits)	30
4	Master's Thesis (30 credits)				30