

## Exemplary study plan for the specialisation 'Theoretical Foundations of Machine Learning in Mathematics and Natural Science'.

### Semester 1

<b>Introduction to Data Science (6 CP)</b>	<b>Applied Deep Learning (6 CP)</b>	<b>Interdisc. Lect. Series Data Science &amp; Data Ethics (6 CP)</b>	<b>Statistical Learning (6 CP)</b>	<b>Probabilistic Machine Learning (6 CP)</b>
--	-------------------------------------	--	------------------------------------	--

### Semester 2

<b>compulsory elective specialisation (6 CP)</b>	<b>compulsory elective specialisation (6 CP)</b>	<b>additional compulsory elective core (6 CP)</b>	<b>compulsory elective core (6 CP)</b>	<b>compulsory elective core (6 CP)</b>
--	--	---	--	--

### Semester 3 (mobility window, if a stay abroad is desired)

<b>Group Project Theoretical Foundations of Machine Learning in Mathematics and Natural Science (12 CP)</b>	<b>Theoretical Foundations of Machine Learning and Data Science (6 CP)</b>	<b>compulsory elective specialisation (6 CP)</b>	<b>additional compulsory elective core (6 CP)</b>
---	--	--	---

### Semester 4

<b>Master thesis (30 CP)</b>
------------------------------

**core modules**   **specialisation modules**

Choice from the following elective core/specialisation modules. The distribution over the semesters is shown as an example.

elective core area: 24 CP	elective specialisation area: 18 CP
<ul style="list-style-type: none"> <li>Exploring Research Data Management (6 CP)</li> <li>Trustworthy Machine Learning (6 CP)</li> <li>Machine Learning II (6 CP)</li> <li>Advanced Topics in Applied Deep Learning (6 CP)</li> <li>Time Series Analysis (6 CP)</li> <li>Introduction to IT-Security (6 CP)</li> <li>Designing Explainable Artificial Intelligence (6 CP)</li> <li>Applied AI- Multimodal-Multisensor Interfaces I: Foundations, User Modelling, and Common Modality Combination (3 CP)</li> <li>Applied AI - Multimodal-Multisensor Interfaces III: Language Processing, Software, Commercialisation, and Emerging Directions (3 CP)</li> <li>Internship (6 CP)</li> <li>Current topics in Data Science and Machine Learning (6 CP)</li> <li>German language or Academic English courses (6 CP)</li> </ul>	<ul style="list-style-type: none"> <li>Mathematical Foundations of Statistical Learning (6 CP)</li> <li>Introduction to Numerical Methods for Partial Differential Equations (6 CP)</li> <li>Computational Physics (6 CP)</li> <li>Modelling of Complex Systems (6 CP)</li> <li>Current Topics in Theoretical Foundations of Machine Learning in Mathematics and Natural Sciences (6 CP)</li> <li>Information Processing and Communication (6 CP)</li> </ul>

If you are planning to study abroad, we recommend that you seek advice at the beginning of your degree programme in order to study compulsory modules earlier if necessary. In the core and in the specialisation, three modules (6 CP each) are integrated for the recognition of an optional study abroad in the third semester. The group project can also be performed abroad.

Prof Jörg Lücke, Prof Peter Ruckdeschel and Prof Alexander Hartmann offer advice on the specialisation 'Theoretical Foundations of Machine Learning in Mathematics and Natural Science'.

A binding description of the module contents can be found in the module handbook.

## Exemplary study plan for the specialisation 'Data Science and Machine Learning in Medicine and Health Care'

### Semester 1

<b>Introduction to Data Science (6 CP)</b>	<b>Applied Deep Learning (6 CP)</b>	<b>Interdisc. Lect. Series Data Science &amp; Data Ethics (6 CP)</b>	<b>Statistical Learning (6 CP)</b>	<b>Probabilistic Machine Learning (6 CP)</b>
--	-------------------------------------	--	------------------------------------	--

### Semester 2

<b>Medical Data Pipelines (6 CP)</b>	<b>Medical Data Analysis with Deep Learning (6 CP)</b>	<b>Big Data Analytics and Clinical Decision Support (6 CP)</b>	<b>compulsory elective specialisation (6 CP)</b>	<b>compulsory elective core (6 CP)</b>
--------------------------------------	--	--	--	--

### Semester 3 (mobility window, if a stay abroad is desired)

<b>Group project Data Science in Medicine and Healthcare (12 CP)</b>	<b>compulsory elective specialisation (6 CP)</b>	<b>compulsory elective specialisation (6 CP)</b>	<b>compulsory elective core (6 CP)</b>
--	--	--	--

### Semester 4

<b>Master thesis (30 CP)</b>
------------------------------

core modules specialisation modules

Choice from the following elective core/specialisation modules. The distribution over the semesters is shown as an example.

elective core area: 12 CP	elective specialisation area: 18 CP
<ul style="list-style-type: none"> <li>• Exploring Research Data Management (6 CP)</li> <li>• Trustworthy Machine Learning (6 CP)</li> <li>• Machine Learning II (6 CP)</li> <li>• Advanced Topics in Applied Deep Learning (6 CP)</li> <li>• Time Series Analysis (6 CP)</li> <li>• Introduction to IT-Security (6 CP)</li> <li>• Designing Explainable Artificial Intelligence (6 CP)</li> <li>• Applied AI- Multimodal-Multisensor Interfaces I: Foundations, User Modelling, and Common Modality Combination (3 CP)</li> <li>• Applied AI - Multimodal-Multisensor Interfaces III: Language Processing, Software, Commercialisation, and Emerging Directions (3 CP)</li> <li>• Internship (6 CP)</li> <li>• Current topics in Data Science and Machine Learning (6 CP)</li> <li>• German language or Academic English courses (6 CP)</li> </ul>	<ul style="list-style-type: none"> <li>• technology:               <ul style="list-style-type: none"> <li>○ Special Topics in "Medical Informatics" II (6 CP)</li> <li>○ Medical Technology (6 CP)</li> </ul> </li> <li>• medicine:               <ul style="list-style-type: none"> <li>○ Medical Basics (6 CP)</li> <li>○ Bioinformatics &amp; Omics (6 CP)</li> </ul> </li> <li>• seminar:               <ul style="list-style-type: none"> <li>○ Current Topics in Data Science in Medicine and Healthcare (6 CP)</li> </ul> </li> </ul>

If you are planning to study abroad, we recommend that you seek advice at the beginning of your degree. In the core and in the specialisation, three modules (6 CP each) are integrated for the recognition of an optional study abroad in the third semester. The group project can also be performed abroad.

It is recommended that students choose one module each from the areas of technology, medicine and seminar in the compulsory elective area of the specialisation in 'Data Science and Machine Learning in Medicine and Health Care'.

Prof Nils Strodthoff and Prof Antje Wulff offer advice on the specialisation 'Data Science and Machine Learning in Medicine and Health Care'.

A binding description of the module contents can be found in the module handbook.

## Exemplary study plan for the specialisation 'Data-driven Speech and Hearing Sciences'

### Semester 1

<b>Introduction to Data Science (6 CP)</b>	<b>Applied Deep Learning (6 CP)</b>	<b>Interdisc. Lect. Series Data Science &amp; Data Ethics (6 CP)</b>	<b>Statistical Learning (6 CP)</b>	<b>Probabilistic Machine Learning (6 CP)</b>
--	-------------------------------------	--	------------------------------------	--

### Semester 2

<b>Digital Signal Processing (6 CP)</b>	<b>Hearing and Communication Acoustics (6 CP)</b>	<b>Algorithms for Speech Processing (6 CP)<sup>1</sup></b>	<b>compulsory elective specialisation (6 CP)</b>	<b>compulsory elective core (6 CP)</b>
---	---	--	--	--

### Semester 3 (mobility window, if a stay abroad is desired)

<b>Group project Data-Driven Speech and Hearing Sciences (12 CP)</b>	<b>compulsory elective specialisation (6 CP)</b>	<b>compulsory elective specialisation (6 CP)</b>	<b>compulsory elective core (6 CP)</b>
--	--	--	--

### Semester 4

<b>Master thesis (30 CP)</b>
------------------------------

core modules | specialisation modules

<sup>1</sup>Depending on the course selected for the module, it is offered in the winter or summer semester.

Choice from the following elective core/specialisation modules. The distribution over the semesters is shown as an example.

elective core area: 12 CP	elective specialisation area: 18 CP
<ul style="list-style-type: none"> <li>Exploring Research Data Management (6 CP)</li> <li>Trustworthy Machine Learning (6 CP)</li> <li>Machine Learning II (6 CP)</li> <li>Advanced Topics in Applied Deep Learning (6 CP)</li> <li>Time Series Analysis (6 CP)</li> <li>Introduction to IT-Security (6 CP)</li> <li>Designing Explainable Artificial Intelligence (6 CP)</li> <li>Applied AI- Multimodal-Multisensor Interfaces I: Foundations, User Modelling, and Common Modality Combination (3 CP)</li> <li>Applied AI - Multimodal-Multisensor Interfaces III: Language Processing, Software, Commercialisation, and Emerging Directions (3 CP)</li> <li>Internship (6 CP)</li> <li>Current topics in Data Science and Machine Learning (6 CP)</li> <li>German language or Academic English courses (6 CP)</li> </ul>	<ul style="list-style-type: none"> <li>Information Processing and Communication (6 CP)</li> <li>Introduction to Neurophysics (6 CP)</li> <li>Processing and Analysis of Biomedical Data (6 CP)</li> <li>Human Computer Interaction (6 CP)</li> <li>Current Topics in Data-Driven Speech and Hearing Sciences (6 CP)</li> </ul>

If you are planning to study abroad, we recommend that you seek advice at the beginning of your degree programme in order to study compulsory modules earlier if necessary. In the core and in the specialisation, three modules (6 CP each) are integrated for the recognition of an optional study abroad in the third semester. The group project can also be performed abroad.

Prof Gerald Enzner and Prof Bernd Meyer offer advice on the specialisation 'Data-driven Speech and Hearing Sciences'.

A binding description of the module contents can be found in the module handbook.