Carl von Ossietzky
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Oldenburg

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

**Semester 1**

| | | | | |
|---|---|---|---|---|
| inf040 Introduction to Data Science (6 CP) | inf5408 Applied Deep Learning (6 CP) | gsw550 Interdisc. Lect. Series Data Science & Data Ethics (6 CP) | psy300 Statistical Learning (6 CP) | phy730 Machine Learning (6 CP) |

**Semester 2**

| | | | | |
|---|---|---|---|---|
| compulsory elective specialisation (6 CP) | compulsory elective specialisation (6 CP) | additional compulsory elective core (6 CP) | compulsory elective core (6 CP) | compulsory elective core (6 CP) |

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

| | | | |
|---|---|---|---|
| phy971 Group Project Theoretical Foundations of Machine Learning in Mathematics and Natural Science (12 CP) | phy970 Theoretical Foundations of Machine Learning and Data Science (6 CP) | compulsory elective specialisation (6 CP) | additional compulsory elective core (6 CP) |

**Semester 4**

| |
|---|
| Master thesis (30 CP) |

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** |
|---|---|
| • inf820 Exploring Research Data Management (6 CP)*<br>• inf5402 Trustworthy Machine Learning (6 CP)<br>• phy694 Machine Learning II (6 CP)<br>• inf5400 Advanced Topics in Applied Deep Learning (6 CP)<br>• mat940 Time Series Analysis (6 CP)<br>• inf420 Introduction to IT-Security (6 CP)<br>• inf1212 Designing Explainable Artificial Intelligence (6 CP)<br>• inf5456 Applied AI- Multimodal-Multisensor Interfaces I: Foundations, User Modelling, and Common Modality Combination (3 CP)<br>• inf5460 Applied AI - Multimodal-Multisensor Interfaces III: Language Processing, Software, Commercialisation, and Emerging Directions (3 CP)<br>• gsw555 Internship (6 CP)<br>• gsw560 Current topics in Data Science and Machine Learning (6 CP)<br>• gsw565 German language or Academic English courses (6 CP) | • mat941 Mathematical Foundations of Statistical Learning (6 CP)*<br>• mat942 Introduction to Numerical Methods for Partial Differential Equations (6 CP)<br>• phy972 Computational Physics (6 CP)<br>• mar753 Modelling of Complex Systems (6 CP)<br>• phy973 Current Topics in Theoretical Foundations of Machine Learning in Mathematics and Natural Sciences (6 CP)<br>• phy974 Information Processing and Communication (6 CP)* |

* currently not available

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 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.

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

**Semester 1**

| | | | | |
|---|---|---|---|---|
| inf040 Introduction to Data Science (6 CP) | inf5408 Applied Deep Learning (6 CP) | gsw550 Interdisc. Lect. Series Data Science & Data Ethics (6 CP) | psy300 Statistical Learning (6 CP) | phy730 Machine Learning (6 CP) |

**Semester 2**

| | | | | |
|---|---|---|---|---|
| inf525 Medical Data Pipelines (6 CP) | inf5406 Medical Data Analysis with Deep Learning (6 CP) | inf527 Big Data Analytics and Clinical Decision Support (6 CP) | compulsory elective specialisation (6 CP) | compulsory elective core (6 CP) |

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

| | | | |
|---|---|---|---|
| gsw575 Group project Data Science in Medicine and Healthcare (12 CP) | compulsory elective specialisation (6 CP) | compulsory elective specialisation (6 CP) | compulsory elective core (6 CP) |

**Semester 4**

| |
|---|
| Master thesis (30 CP) |

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** |
|---|---|
| • inf820 Exploring Research Data Management (6 CP)*<br>• inf5402 Trustworthy Machine Learning (6 CP)<br>• phy694 Machine Learning II (6 CP)<br>• inf5400 Advanced Topics in Applied Deep Learning (6 CP)<br>• mat940 Time Series Analysis (6 CP)<br>• inf420 Introduction to IT-Security (6 CP)<br>• inf1212 Designing Explainable Artificial Intelligence (6 CP)<br>• inf5456 Applied AI- Multimodal-Multisensor Interfaces I: Foundations, User Modelling, and Common Modality Combination (3 CP)<br>• inf5460 Applied AI - Multimodal-Multisensor Interfaces III: Language Processing, Software, Commercialisation, and Emerging Directions (3 CP)<br>• gsw555 Internship (6 CP)<br>• gsw560 Current topics in Data Science and Machine Learning (6 CP)<br>• gsw565 German language or Academic English courses (6 CP) | technology:<br>• inf589 Special Topics in "Medical Informatics" II (6 CP)<br>• inf305 Medical Technology (6 CP)<br><br>medicine:<br>• inf524 Medical Basics (6 CP)<br>• gsw220 Bioinformatics & Omics (6 CP)<br><br>seminar:<br>• gsw580 Current Topics in Data Science in Medicine and Healthcare (6 CP) |

* currently not available

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.

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

**Semester 1**

| | | | | |
|---|---|---|---|---|
| inf040 Introduction to Data Science (6 CP) | inf5408 Applied Deep Learning (6 CP) | gsw550 Interdisc. Lect. Series Data Science & Data Ethics (6 CP) | psy300 Statistical Learning (6 CP) | phy730 Machine Learning (6 CP) |

**Semester 2**

| | | | | |
|---|---|---|---|---|
| phy605 Digital Signal Processing (6 CP) | phy976 Algorithms for Speech Processing (6 CP)[1] | compulsory elective specialisation (6 CP) | compulsory elective specialisation (6 CP) | compulsory elective core (6 CP) |

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

| | | | |
|---|---|---|---|
| phy977 Group project Data-Driven Speech and Hearing Sciences (12 CP) | phy975 Hearing and Communication Acoustics (6 CP)[1] | compulsory elective specialisation (6 CP) | compulsory elective core (6 CP) |

**Semester 4**

| |
|---|
| Master thesis (30 CP) |

core modules | specialisation modules

[1]Depending on the courses selected for the module, it is offered in the winter and/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** |
|---|---|
| • inf820 Exploring Research Data Management (6 CP)*<br>• inf5402 Trustworthy Machine Learning (6 CP)<br>• phy694 Machine Learning II (6 CP)<br>• inf5400 Advanced Topics in Applied Deep Learning (6 CP)<br>• mat940 Time Series Analysis (6 CP)<br>• inf420 Introduction to IT-Security (6 CP)<br>• inf1212 Designing Explainable Artificial Intelligence (6 CP)<br>• inf5456 Applied AI- Multimodal-Multisensor Interfaces I: Foundations, User Modelling, and Common Modality Combination (3 CP)<br>• inf5460 Applied AI - Multimodal-Multisensor Interfaces III: Language Processing, Software, Commercialisation, and Emerging Directions (3 CP)<br>• gsw555 Internship (6 CP)<br>• gsw560 Current topics in Data Science and Machine Learning (6 CP)<br>• gsw565 German language or Academic English courses (6 CP) | • phy974 Information Processing and Communication (6 CP)*<br>• phy734 Introduction to Neurophysics (6 CP)<br>• phy678 Processing and Analysis of Biomedical Data (6 CP)<br>• phy220 Human Computer Interaction (6 CP)<br>• phy978 Current Topics in Data-Driven Speech and Hearing Sciences (6 CP) |

* currently not available

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.