

# Introduction to Deep Learning

Summer

(in German: Introduction to Deep Learning )

**Module-ID: FIN-INF-120521**

| Abbreviation | Credit Points | Semester | Term           | Duration   | Language | Level  |
|--------------|---------------|----------|----------------|------------|----------|--------|
| IDL          | 6             | Summer   | starting at 1. | 1 Semester | english  | Master |

|                                     |                                                                                                                                                                                                                                                                                               |
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| <b>Link:</b>                        | <a href="#">LSF</a>                                                                                                                                                                                                                                                                           |
| <b>Limited accessibility:</b>       | true                                                                                                                                                                                                                                                                                          |
| <b>Responsibility:</b>              | Sebastian Stober                                                                                                                                                                                                                                                                              |
| <b>Lecturer:</b>                    | Sebastian Stober                                                                                                                                                                                                                                                                              |
| <b>Classes:</b>                     | <ul style="list-style-type: none"><li>• Lecture <i>Introduction to Deep Learning</i></li><li>• Exercise class <i>Introduction to Deep Learning</i></li></ul>                                                                                                                                  |
| <b>Applicability in curriculum:</b> | <ul style="list-style-type: none"><li>- M.Sc. INF: Informatik</li><li>- M.Sc. INGINF: Informatik</li><li>- M.Sc. WIF: Informatik</li><li>- M.Sc. DKE: Learning Methods and Models for Data Science</li><li>- M.Sc. DE: Methoden der Informatik</li><li>- M.Sc. VC: Computer Science</li></ul> |

## Intended learning outcomes:

Students ...

- confidently apply DL techniques to develop a solution for a given problem

- follow recent DL publications and critically assess their contributions
- formulate hypotheses and design & conduct DL experiments to validate them
- document progress & design decisions for reproducibility and transparency
- have advanced competencies in scientific research in topics of the module

### Content:

- Artificial neural network fundamentals (gradient descent & backpropagation, activation functions)
- Network architectures (Convolutional Neural Networks, Recurrent/Recursive Neural Networks, Auto-Encoders, Transformers)
- Regularization techniques
- Introspection & analysis techniques
- Optimization techniques
- Advanced training strategies (e.g. teacher-student)

### Workload:

- 56h contact hours (2 SWS lecture + 2 SWS exercise groups)
- 124h self study (reading assignments (flipped classroom), programming exercises)

| Pre-examination requirements: | Type of examination:                                                                                                                                                                                                              | Teaching method / lecture hours per week (SWS):                                                 |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
|                               | Exam requirements: participation and active involvement in the course and the exercises (defined in the 1st lecture and published on the course website) Final exam: written (120 minutes) Schein: pass final exam (at least 4.0) | <ul style="list-style-type: none"> <li>• Lecture (2 SWS)</li> <li>• Exercise (2 SWS)</li> </ul> |

| Prerequisites according to examination regulations: | Recommended prerequisites:  |
|-----------------------------------------------------|-----------------------------|
| keine                                               | Machine Learning (required) |

| Media: | Literature:                                                                        |
|--------|------------------------------------------------------------------------------------|
|        | Ian Goodfellow, Yoshua Bengio & Aaron Courville: "Deep Learning", MIT Press, 2016. |

### Comments:

Revision #1

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