

Deep Learning, Winter 2025/26

Course Outline

Instructors:

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Schedule: Wednesdays 15:20 – 18:50, room DS1 (Sabinki) - 16

Course Content

Number	Lecture
Week 1	Course organization, Mathematical Foundations of Deep Learning (Chapters 6 to 8)
Week 1	Mathematical Foundations of Deep Learning cont.
Week 2	Basics of Deep Learning Modelling (Chapters 6 to 8)
Week 2	Basics of Deep Learning Modelling cont.
Week 3	Convolutional Neural Networks (Chapter 9)
Week 3	Convolutional Neural Networks cont.
Week 4	Generative modelling: Autoencoders and Variational Autoencoders (Chapters 14 and 20.10.3)
Week 4	Generative modelling: Autoencoders and Variational Autoencoders cont.
Week 5	Generative modelling: Generative Adversarial Networks (Chapter 20.10.4)
Week 5	Generative modelling: Generative Adversarial Networks cont.
Week 6	Generative modelling: Diffusion models (Chapter 20.10.4)
Week 6	Generative modelling: Diffusion models cont.
Week 7	Recurrent Neural Networks (Chapter 10)
Week 7	Attention models

Textbooks

- Goodfellow I., Bengio Y., Courville A. (2016), Deep Learning (<http://www.deeplearningbook.org/>)
- Roberts D. A., Yaida S., Hanin B. (2022), The Principles of Deep Learning Theory: An Effective Theory Approach to Understanding Neural Networks, Cambridge University Press (<https://deeplearningtheory.com/>)
- Calin O. (2020), Deep Learning Architectures: A Mathematical Approach, Springer (https://www.academia.edu/78605175/Deep_Learning_Architectures?email_work_card=view-paper)
- Howard J., Gugger S. (2020), Deep Learning for Coders with Fastai and PyTorch: AI Applications Without a Ph.D first Edition (<https://course.fast.ai/Resources/book.html>)
- Boyd S., Vandenberghe L. (2018), Introduction to Applied Linear Algebra – Vectors, Matrices, and Least Squares (<http://vmls-book.stanford.edu/>)
- Hastie T., Tibshirani R., Friedman J. (2013), The Elements of Statistical Learning (<http://www-stat.stanford.edu/~tibs/ElemStatLearn/>)

Julia Programming Materials

Course Evaluation

Students evaluation will be based on the report from building a deep learning model (60 points) and open book exam (40 points). Grading depends on the points obtained from the report and additional tasks (up to 50 points):

Points		Grade
From	To	
0	49	Fail (2.0)
50	59	Sufficient (3.0)
60	69	Sufficient Plus (3.5)
70	79	Good (4.0)
80	89	Good Plus (4.5)
90	100	Very good (5.0)