

Modul: 5173030

Introduction to Deep Learning

Modulprofil

Prüfungsnummer

5173030

Dauer

1 Semester

Häufigkeit des Angebots

Jedes Sommersemester

SWS

4

ECTS-Credits (CP)

5.0

Workload

Angeleitete Studienzeit:

Präsenzzeit: 60 Std.

Selbststudienzeit: 90 Std.

Gesamt: 150 Std.

Lehrveranstaltungsart(en)

Seminaristischer Unterricht

Lehrsprache

Englisch

Organisation

Modulverantwortung

Prof. Dr. Magda Gregorová

Dozierende

Prof. Dr. Magda Gregorová

Verwendbarkeit

MAI

Studiensemester

1. Semester

Art des Moduls

Pflichtmodul

Verpflichtende Voraussetzungen gemäß SPO

None

Empfohlene Voraussetzungen

None

Inhalte

- Artificial neural networks (ANN) in machine learning (ML)
- Basic concepts of learning algorithms and typical tasks
- Model development workflow, hyperparameter tuning, performance measures and model selection
- Ethical and societal aspects (open access, data governance, fairness, transparency, reproducibility, safety and robustness, interpretability and human oversight/trust, ecological footprint)
- Basic ANN architectures
- Multilayer perceptron (feed forward)
- Convolutional neural networks
- Attention
- ANN model regularization
- Norm penalties
- Data augmentation
- Early stopping
- Dropout
- ANN model optimization
- (Stochastic) gradient descent
- Backpropagation
- Momentum methods
- Learning rate scheduling
- Major ANN applications and selected advanced models
- Computer vision (object detection, image classification, style transfer)
- Natural language processing (word2vec, BERT)
- Autoencoders
- Generative models
- Deep learning software packages
- PyTorch

Prüfung

Verpflichtende Voraussetzung gemäß SPO für die Teilnahme an der Prüfung

Keine

Art der Prüfung

Sonstige Prüfung (soP) gemäß
§§ 26, 27 APO

Dauer/Form der Prüfung

Portfolio

Die konkrete Festlegung der
abzuleistenden Prüfung erfolgt
im Studienplan

Prüfungssprache

Englisch

Voraussetzung für die Vergabe von Leistungspunkten

Keine

Lernergebnisse

Upon completion of the module students:

- can place artificial neural networks within the broader area of machine learning, understand their major advantages and disadvantages, and are aware of major applications of ANN as well as selected advanced models under research and their fundamental ideas
- understand and assess the critical differences between the basic ANN architectures (MLP, CNN), can implement them in standard deep learning software packages, and can train, test, and evaluate the ANN models over real data
- building on the experience of working with their own ANN implementations, can reuse publicly available implementations of more complex models to carry out experiments over real datasets, can compare the performance of these across various models and their hyperparameter setups
- understand the importance of transparency and reproducibility in deep learning experimentation and can present in written as well as oral their learning and evaluation pipeline including relevant description of the selected software and hardware configuration
- are aware of the ethical and societal impacts of machine learning and deep learning and can critically assess deep learning reports along these lines

Literatur

1. Prince, Simon J.D. Understanding Deep Learning. The MIT Press, 2023. <http://udlbook.com>.
2. Zhang, Aston, Zachary C. Lipton, Mu Li, and Alexander J. Smola. Dive into Deep Learning. <https://d2l.ai/>, 2021
3. Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. Deep Learning. MIT Press, 2016