

Modulbeschreibung

Foundations of Deep Reinforcement Learning

Allgemeine Angaben

Modulbezeichnung

EVA_DeepRL

Modulkategorie

Fachliche Vertiefung

Anzahl der Credits

3

Modulverantwortliche/r

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Durchführungssetting

| | | | |
|------------------|--|--|--|
| Campus | <input checked="" type="checkbox"/> Buchs | <input type="checkbox"/> Rapperswil-Jona | <input type="checkbox"/> St. Gallen |
| Online Teilnahme | <input type="checkbox"/> keine Onlineteilnahme möglich | <input type="checkbox"/> hybrid | <input checked="" type="checkbox"/> ausschliesslich online |
| Durchführung | <input checked="" type="checkbox"/> zwei-wöchentlich | <input type="checkbox"/> als Blockwoche | <input checked="" type="checkbox"/> nach Absprache |

Ziele, Inhalt und Methoden

Lernziele, zu erwerbende Kompetenzen

The students...

- learn the *theory* and *application* of models and algorithms used in Reinforcement Learning (RL)
- understand *the key concepts of Deep Reinforcement Learning*: Markov Process, Bellman equation, Q-Learning, TD-Learning, Deep Q-Learning, policy gradients and actor-critic methods.
- get to know a wide range of possible *application examples and useful RL environments*
- learn how to approach their own DRL projects and how to implement them in a working Python code.
- get the skills to research, study and *understand primary sources in form of academic papers*.
- get the skills in Python and Tensorflow to work on and implement practical, industrial DRL control projects.

Modulinhalt

- Reinforcement learning is one of the most exciting areas of machine learning and unfortunately, also one of the most complex. It is a machine learning (ML) paradigm that is capable of optimizing sequential decisions. RL is interesting because it mimics how we, as humans, learn. We are instinctively capable of learning strategies that help us master complex tasks like riding a bike or taking a mathematics exam. RL attempts to copy this process by interacting with the environment to learn strategies. RL is also a highly mathematical topic.

Lehr- und Lernmethoden

- Online-Lectures: roughly every two weeks (2 x 45')
- Self-study with supervision (book, online-ressources)
- Original paper study
- Exercises (U01-U06)

Voraussetzungen, Vorkenntnisse, Eingangskompetenzen

- This course is aimed at MSE students of data science and other technical disciplines. It is intended to be an introduction to deep RL and no prior knowledge of the subject is required. However, we do assume that readers have a basic familiarity with *machine learning* and *deep learning* as well as a good level of Python programming skills. Some experience with tensorflow, keras is also useful but not necessary.
- MSE_FTP_MachLe and/or MSE_TSM_DeLearn or comparable courses.

Bibliografie

1. Phil Winder: *Reinforcement Learning, Industrial Applications of Intelligent Agents*, By Phil, O'Reilly Media, Inc., Sebastopol, CA 95472 (2020), ISBN 9781098114831, <https://ri-book.com/>
2. Laura Graesser, Keng Wah Loon: *Foundations of Deep Reinforcement Learning: Theory and Practice in Python*, Addison-Wesley Data & Analytics (2019)
3. Sutton, Richard S., and Andrew G. Barto: *Reinforcement Learning: An Introduction*. MIT Press, 2018
4. Sergey Levine: *Deep Reinforcement Learning*, <http://rail.eecs.berkeley.edu/deeprlcourse-fa19/>
5. Sayon Dutta: *Reinforcement Learning with TensorFlow*, A beginner's guide to designing self-learning systems with TensorFlow and OpenAI Gym, Packt, Birmingham, Mumbai (2018)
6. Brandon Brown, Alexander Zai: *Deep Reinforcement Learning in Action*, Manning, Shelter Island (2020)

Leistungsbewertung

Prüfungsart

- Documented Deep Reinforcement Learning-Project in form of a working Python Code and documentation or working, documented Jupyter notebook (weight 75%)
- Presentation and short oral interview (20') (weight 25%)
- Participation in online-lessons (>75%)

Zulassungsbedingungen

- MSE_FTP_MachLe and/or MSE_TSM_DeLearn or comparable courses

Prüfungsdauer

- Oral presentation of the work and short oral interview, ca. 20'

Hilfsmittel