



Prof. R. Wattenhofer

Topics in Deep Reinforcement Learning

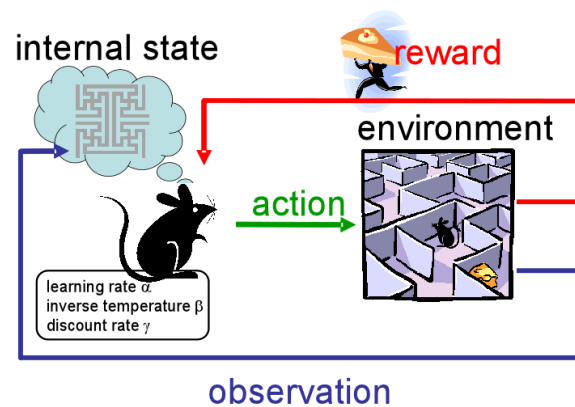


In 2015 Google Deepmind published their DQN paper in which they present an algorithm capable of learning to play Atari games at superhuman performance. Since then, research and applications of deep reinforcement learning (DRL) have gained more and more momentum. Results range from algorithms capable of mastering chess within 4 hours¹ to neural networks capable of constructing other neural networks.²

Despite all the astonishing results, DRL models still lack sample efficiency, i.e., training speed, and generality, such as training one algorithm for several tasks. Depending on your interests, we could improve on existing DRL architectures or apply the models to new tasks. A non-exhaustive list of possible topics is given below. However, you are welcome to come up with your own ideas. If you are interested in deep reinforcement learning, do not hesitate to contact us! We will then provide you with a more detailed list of current topics.

- Transferring knowledge between games
- Combining capsule networks with DRL
- Improving our map reading algorithm³
- Using curiosity as a reinforcement signal in DRL
- Comparing and evaluating existing DRL algorithms
- ...

Requirements: Knowledge in Deep Learning, or solid background in Machine Learning. Implementation experience is an advantage. You should be able to read and understand the first 12 chapters of the "Deep Learning Book" by Goodfellow et al. (available for free online from MIT press). If you are interested in the topic but new to deep learning we expect you to complete an introductory deep learning course before applying for the thesis, such as Andrew Ng's coursera course (use the free trial!)⁴ or this Udacity course⁵.



¹<https://arxiv.org/abs/1712.01815>

²<https://arxiv.org/abs/1611.01578>

³https://www.tik.ee.ethz.ch/file/702d1a47dcdc9c71b82f90bdfb9d78b7/mapreader_CR.pdf

⁴<https://www.coursera.org/specializations/deep-learning>

⁵<https://classroom.udacity.com/courses/ud730>

Contacts

- Oliver Richter: richtero@ethz.ch, ETZ G63
- Gino Brunner: brunnegi@ethz.ch, ETZ G63
- Yuyi Wang: yuwang@ethz.ch, ETZ 94