Fakultät für Naturwissenschaften, Fachbereich Physik

Announcement

Quantum Machine Learning

Dr. Sabine Wölk

Description

Machine learning has become a very important tool in many areas of research including physics. This lecture aims to introduce the students to the basic concepts of classical machine learning (ML) and discusses examples of its application to physical problems from current research. In addition, methods from quantum information will be introduced which combined with machine learning methods form the new area of quantum machine learning (QML).

Content

- Neural networks
- Support vector machines
- Restricted Boltzmann machine
- Reinforcement Learning
- Quantum annealing
- Amplitude amplification

Prerequisites

Good knowledge of theoretical quantum mechanics is mandatory for this course. Basic knowledge of quantum information and programming skills are helpful but not required.

Literature

- Goodfellow, Bengio and Courville, “Deep Learning”, MIT Press, 2016;
- Lämmel and Cleve, “Künstliche Intelligenz”, Hanser Verlag, 2008;
- J. Biamonte et al., “Quantum Machine Learning”, Nature **549**, 195 (2017);
- Dunjko and Briegel, “Machine learning & artificial intelligence in the quantum domain, Rep. Prog. Phys. **81**, 074001 (2018);

Additional information

Lecture (2 hours per week) with exercises (1 hour per week)
Examination: orally or written
4 ECTS credits

Lecturer

Dr. Sabine Wölk, DLR Institute QT