Module	***Quantum Machine Learning***
Code	
Instruction language	English
ECTS credits	4
Attendance time	3 hours per week
Duration	1 semester
Cycle	Irregularly
Coordinator	Dean of Physics Studies
Instructors	Dr. Sabine Wölk
Allocation to study programmes	Physics M.Sc., elective module Wirtschaftsphysik M.Sc., elective module
Recommended prerequisites	Theoretical Quantum Mechanics (mandatory) Theory of Quantum Information (helpful but not required)
Learning objectives	Students who successfully passed this module • are familiar with basic concepts of classical machine learning such as supervised, unsupervised and reinforcement learning • know examples of quantum algorithm which provide advantages for machine learning
Syllabus	• Neural networks • Support vector machines • Restricted Boltzmann machine • Reinforcement learning • Quantum annealing • Amplitude amplification
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);
Teaching and learning methods	Lecture (2 hours per week) Exercise (1 hours per week)
Workload	30 hours lecture (attendance time) 15 hours exercise (attendance time) 75 hours self-study Total: 120 hours
Assessment	The module assessment consists of a graded written or oral exam. The examination form will be announced at the beginning of the lecture.
Examination	
Grading procedure	The module grade is equal to the examination grade.
Basis for	Research in the field of Quantum Technologies