

Methods of Machine Learning

Course Workload		Assessment form (examination/ graded test/ ungraded test)
ECTS	Hours	
6	216	Exam

Course goal and main objectives: This course aims to provide an introduction to classical machine learning (ML) and the state-of-the-art knowledge of new approaches based on new physical principles. The goal is to become familiar with applications of ML in physics and how physics can improve hardware for ML. First objective is to form a strong mathematical foundation for ML, get skills in coding ML algorithms, data acquisition and analysis of the results. The next objective is to learn problems that can be solved with ML and are faced by physicists, and get and new hardware for ML will be reviewed, the students will get experience in simulation of some of the hardware including quantum computing and quantum ML. Expected learning outcomes: After the course you will have a base in ML, get skills in the solution of real-world problems using ML, be familiar with principles and be used to simulation of artificial neural networks (ANN) and unconventional ANN including quantum networks. You will understand the modern techniques in ML and directions of further development both in theory of alternative computing and in implementation of ML using new physical principles. Relevance, novelty, significance, and uniqueness: The course targets understanding of state-of-the-art approaches to machine learning both doing simulation in classical computing and using specialized hardware utilizing new physical principles. The course combines modern results in physics with recent advances in artificial intelligence. It has a unique and specialized curriculum that is based on contemporary research, giving access to knowledge available only in the best research centers. The course teaches the way computing will be performed tomorrow

Course structure:

1. Методы машинного обучения / Methods of Machine Learning

1.1. Classical machine learning

1.2. Quantum Computing and Quantum Machine Learning
