Title:	***Quantum Machine Learning and Applications in Physics***
Lecturers:	Dr. Amira Abbas (Univ. Amsterdam), Prof. Zoe Holmes (EPFL), Prof. Dario Gerace (UNIPV), Dr. Michele Grossi (CERN), Dr. Francesco Tacchino (IBM Research Zurich)
Duration:	24-28h
CFU:	4
Period:	May - June 2024
Content:	The course will give an overview of the emerging field of quantum machine learning, with a focus on quantum neural networks, quantum kernel methods and, in general, on parametrised quantum circuits as learning models. Besides the theoretical foundations, the course will cover examples of state-of-art applications to the physical sciences, with a cross-disciplinary view ranging from condensed matter physics to high-energy physics. The main purpose is to give an impartial overview of these emerging techniques, discussing their expected advantages, critically assessing their known limitations, and highlighting open research directions, particularly in the spirit of identifying potential synergies with current classical approaches. Module (2 lectures): *"Introduction to Quantum Computing: basics"* Module (2 lectures): *"Introduction to Quantum Machine Learning"* Module (3 lectures): *"Focus on quantum neural networks and kernel methods"* Module (3 lectures): *"Trainability of parametrized quantum circuits"* Module (2 lectures): *"Applications in the Physical Sciences"*
Notes	The evaluation will be based on the presentation of a topic treated during the course, or a small project developed with the tools learned during the course.