

Plenary Talk

PV I Mon 8:30 B Audimax

Learning and artificial intelligence in the quantum domain —

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Quantum mechanics has changed the way we think about the scope and possibilities of information processing, and the foundations of computer science. Recently researchers have started to apply ideas from quantum information to machine learning, and even commercial companies are pursuing research efforts in this direction.

In this talk, I will discuss possible future roles of quantum information for artificial intelligence, and vice versa. These include the use of

learning agents in quantum physics laboratories, as well as the use of quantum information in machine learning and artificial-agent design. I will focus on the model of projective simulation (PS), which employs random-walk processes in the agent's memory for learning and decision-making. Projective simulation has been applied, e.g., in autonomous robotic playing and in the design of quantum experiments. The PS model can be naturally quantized, allowing for a quantum speed-up of the agent's decision process. I will review some recent results of our research on (classical and) quantum-enhanced learning agents, including applications in quantum experiment and quantum foundations.