

# Speeding-up the Decision Making of a Learning Agent Using an Ion Trap Quantum Processor

Th. Sriarunothai<sup>1</sup>, S. Wölk<sup>2,1</sup>, Gouri S. Giri<sup>1</sup>, N. Friis<sup>3,2</sup>, V. Dunjko<sup>2,4</sup>, H. J. Briegel<sup>2,5</sup> and Ch. Wunderlich<sup>1</sup>

<sup>1</sup>Department Physik, Naturwissenschaftlich-Technische Fakultät, Universität Siegen, 57068 Siegen, Germany

<sup>2</sup>Institute for Theoretical Physics, University of Innsbruck, Technikerstraße 21a, 6020 Innsbruck, Austria

<sup>3</sup>Institute for Quantum Optics and Quantum Information, Austrian Academy of Sciences, Boltzmannngasse 3, 1090 Vienna, Austria

<sup>4</sup>Max Planck Institute of Quantum Optics, 85748 Garching, Germany

<sup>5</sup>Department of Philosophy, University of Konstanz, 78457 Konstanz, Germany

We report a proof-of-principle experimental demonstration of the quantum speed-up for learning agents utilizing a small-scale quantum information processor based on radiofrequency-driven trapped ions [1]. The decision-making process of a quantum learning agent within the projective simulation paradigm for machine learning is implemented in a system of two qubits. The latter are realized using hyperfine states of two frequency-addressed atomic ions exposed to a static magnetic field gradient. We show that the deliberation time of this quantum learning agent is quadratically improved with respect to comparable classical learning agents. The performance of this quantum-enhanced learning agent highlights the potential of scalable quantum processors taking advantage of machine learning.

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[1] Th. Sriarunothai et al., arXiv: 1709.01366 (2017).