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Quantum speed-ups in reinforcement learning

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Within artificial intelligence, of particular interest is reinforcement learning (RL), where autonomous agents learn to accomplish tasks via feedback exchange with their environment (the world they interact with). Thanks to rapid advances in quantum technologies, the idea of using quantum physics to boost the performance of RL agents was developed. I will focus on the bridge between RL and quantum mechanics, and show that a reduction in the agent's learning time is possible if agents and environments also interact quantum-mechanically[1]. This idea was implemented on a fully-tunable photonic processor. The achieved speed-up in learning time, compared to the fully classical picture, confirms the potential of quantum technologies for future RL applications.

[1] Saggio, V. et al. Nature 591, 229–233 (2021).

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