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What Can Reinforcement Learning Teach Us About Non-Equilibrium Quantum Dynamics MARIN BUKOV, ALEXANDRE DAY, DRIES SELS, PHILLIP WEINBERG, ANATOLI POLKOVNIKOV, PANKAJ MEHTA, Boston University — Equilibrium thermodynamics and statistical physics are the building blocks of modern science and technology. Yet, our understanding of thermodynamic processes away from equilibrium is largely missing. In this talk, I will reveal the potential of what artificial intelligence can teach us about the complex behaviour of non-equilibrium systems. Specifically, I will discuss the problem of finding optimal drive protocols to prepare a desired target state in quantum mechanical systems by applying ideas from Reinforcement Learning [one can think of Reinforcement Learning as the study of how an agent (e.g. a robot) can learn and perfect a given policy through interactions with an environment.]. The driving protocols learnt by our agent suggest that the non-equilibrium world features possibilities easily defying intuition based on equilibrium physics.

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