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Open-source scientific computing for quantum technology: QuTiP

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I address the growth of open-source software in scientific research and quantum technology research in particular, both in academia and industry. I will give a brief overview of multiple open-source libraries being developed to study quantum systems, using a variety of hybrid techniques, from chemistry to machine learning. QuTiP, the Quantum Toolbox in Python, has established itself as a major tool in the quantum optics community to study open quantum systems. Due to its capability to model noisy quantum systems, QuTiP is also being used by many players in the field of quantum computing, from startups to corporate research labs. The success of QuTiP lies in the development of an integrated environment to address quantum-specific tasks such as solving complex-valued ODEs and dealing with special algebras. I will give an overview of recent developments in QuTiP, focusing on the integration of permutational invariant techniques, which allow us to efficiently study cooperative effects in driven-dissipative many-body quantum systems out of equilibrium. Finally, I show the simple steps leading to the development of open-source tools for scientific exploration in quantum technology and how this can benefit the research community.

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