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Toward open-source software for quantum computing

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Abstract

We present Qibo, an open-source quantum computing framework offering a full-stack solution for efficient deployment of quantum algorithms and calibration routines on quantum hardware. Quantum computers require compilation of high-level circuits tailored to specific chip architectures and integration with control electronics. Our framework tackles these challenges through Qibolab, a versatile backend that interfaces with a wide range of electronics -both commercial and open-source- for seamless program execution on quantum devices. Moreover, frequent calibration is essential for maintaining quantum computers in an operational state. Qibocal simplifies this process, providing a hardware-agnostic interface that automates calibration routines across supported platforms, complete with advanced reporting tools. We will demonstrate our software suite on platforms based on superconducting qubit technology, highlighting performance benchmarks using different electronics. The ease of integrating new hardware drivers makes Qibo particularly valuable for labs aiming to control their own self-hosted quantum systems.