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Digital-analog quantum Fourier transform

Quantum computers will allow calculations beyond existing classical computers. However, current technology is still too noisy and imperfect to construct a universal digital quantum computer with quantum error correction. Inspired by the evolution of classical computation, an alternative paradigm merging the flexibility of digital quantum computation with the robustness of analog quantum simulation has emerged. This universal paradigm is known as digital-analog quantum computing. I will introduce an efficient digital-analog quantum algorithm to compute the quantum Fourier transform, a subroutine widely employed in several relevant quantum algorithms. In our work, we show that, under reasonable assumptions about noise models, the fidelity of the quantum Fourier transformation improves considerably using this approach when the number of qubits involved grows. This suggests that, in the Noisy Intermediate-Scale Quantum (NISQ) era, hybrid protocols combining digital and analog quantum computing could be a sensible approach to reach useful quantum supremacy.