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Quantum computing applications: recent developments

Wednesday, 10 September 2025 10:00 (30 minutes)

In this talk, I will survey recent progress at PsiQuantum, a company based in Silicon Valley and pioneering large-scale fault-tolerant quantum computing using photonic architecture. I will first give a brief update on our path toward scalable fault-tolerant hardware and provide an overview of the activities of our quantum applications team. Fault-tolerant quantum computers are expected to become transformative technologies of the 21st century, and their most prominent applications are anticipated to lie in the simulation of quantum systems for chemistry and materials science. However, a significant share of today's supercomputing power is devoted to simulating classical dynamical systems, such as plasmas and fluids. This has motivated a new research direction aimed at exploring the potential to extend quantum algorithms beyond quantum dynamics, while retaining meaningful advantage (exponential or high-polynomial) over classical algorithms. Thus, in the main part of the talk, I will present our recent results, obtained in collaboration with Los Alamos National Laboratory, concerning quantum algorithms for simulating the dynamics of nonlinear classical systems.

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