An Update from Google Quantum AI

Google’s Quantum AI team is making steady progress on its roadmap to build a quantum computer with 1000 long lived logical qubits using superconducting electronics. In summer 2022, we demonstrated for the first time that by scaling up a surface code qubit we can reduce its logical error rate. We are now turning our attention to fabricating a long-lived logical qubit with a 10^-6 error rate. On the application side, a promising development is the increased cadence of simulations of quantum systems with intriguing properties. We were able to study the physics of time crystals, non-abelian exchange statistics, quantum gravity configurations, bound states of photons, or majorana edge modes. Arguably discoveries have already been made in these experiments, even though such simulations would have still been possible on classical computers. Another development was the discovery that quantum machine learning can learn properties of quantum systems with exponentially reduced sample complexity.