

## Northwestern Quantum Week Quantum Innovation Symposium

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Abhinav Kandala

**Abhinav Kandala** received his B Tech. in Engineering Physics from the Indian Institute of Technology Bombay in 2008, and Ph.D. in Physics from the Pennsylvania State University in 2015. He was a postdoctoral researcher at IBM T. J. Watson Research Center from 2015 to 2017, where he is currently a Principal Research Scientist. Over his time at IBM, his research has spanned the control and coherence of superconducting qubits, multi-qubit characterization, and near-term applications of quantum computers. His most significant contributions have been towards exploring whether useful information can be obtained from pre-fault tolerant quantum computers. He was recognized by MIT Tech Review as one of 35 innovators under 35 in 2019, by IIT Bombay with a Young Alumni Achiever award in 2024, and by the American Physical Society with the Landauer-Bennett Prize in Quantum Computing in 2026.

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### From Utility to Advantage

**Abstract:** Although today's quantum computers remain noisy and imperfect, they are already entering regimes that challenge classical computation. In this talk, I will present recent progress on quantum advantage candidates, showing how advances in hardware, combined with classical co-processing, enable error mitigation and early error correction techniques to deliver accurate results beyond the reach of exact classical verification—while simultaneously stressing the limits of leading classical approximations. I will also discuss efforts to systematically benchmark these developments through the Quantum Advantage Tracker, and highlight emerging demonstrations where quantum computations are directly validated against real-world laboratory experiments. Together, these results chart a credible path from early utility to quantum advantage on pre-fault-tolerant hardware.