

# Q-CTRL Unites AI and Quantum Technology to Boost Progress with World-First Software

*Upgraded version of Boulder Opal delivers exponential improvements in quantum computer and sensor hardware capabilities; Q-CTRL presenting at APS March Meeting*

SYDNEY, AUSTRALIA, March 1, 2023 /EINPresswire.com/ -- Q-CTRL, a global leader in developing useful quantum technologies through quantum infrastructure software, today announced groundbreaking new AI capabilities in its Boulder Opal software, promising to serve as a “rocket booster” for the emerging industry.



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*Marina Kudra, Ph.D. student,  
Chalmers University of  
Technology*

The convergence of quantum technology and AI promises a technological revolution on par with the advent of electricity. Despite intense theoretical interest, the fields have largely remained separate in practice because of the challenge of making AI relevant to real, imperfect quantum hardware.

Q-CTRL today changes that narrative by delivering the most advanced AI agents to every R&D team working to

realize the full potential of quantum technology for computing, sensing, and communications. It’s the first practical step towards making the future of machine learning quantum.

“This technological intersection has been under development at Q-CTRL for some years,” said Q-CTRL CEO and Founder Michael J. Biercuk. “Now we’re excited to make custom-engineered AI agents available to solve some of the toughest challenges faced by researchers in the quantum sector. It’s thrilling to know that Q-CTRL is the true global leader in taking this technology from promise to practical.”

Research in quantum computing and sensing is held back by the fact that unstable hardware must be manually calibrated, tuned, and configured - this can take up to a third of a typical researcher’s day and holds back the entire community’s progress.

Q-CTRL has been a pioneer in the application of AI to the operation and optimization of quantum hardware. The team published groundbreaking [results](#) which showed that an AI agent could be connected to a quantum computer and learn how to write a new “machine language” for the

computer better than any expert-designed solution.

Building on these early successes, Q-CTRL is making AI for quantum technology available to everyone at scale, enabling any research team to use AI to tune-up, calibrate, and optimize entire experiments better than they ever could before, and all without manual intervention.

Q-CTRL's core product for R&D teams, Boulder Opal, is a versatile Python package used by national laboratories, top-tier universities and private-sector quantum companies to accelerate research in quantum technology with cutting-edge quantum control techniques.

A new tool suite in Boulder Opal allows users to accelerate manual tasks with the power of AI automation, freeing up researchers' time to achieve more and dedicate their efforts to delivering the most foundational insights needed to make quantum technology useful. The new Boulder Opal features include:

- AI-automated system calibration: Users can replace manual, stepwise routines to tuneup hardware with an autonomous "experiment scheduler" which allows automated calibration of many intersecting tasks across entire systems in minutes.
- Low-latency AI: A new hybrid software architecture combines the best of cloud and local computing resources to deliver high-performance AI agents at the edge. Now users can connect their hardware directly to local AI agents in a closed loop, reducing hours of manual tuneup to fractions of a second and enabling optimization tasks that were previously impossible.
- Enhanced cloud computing platform: A huge boost to cloud computing power enables AI agents to handle much more complex learning tasks and empowers users to solve simulation and optimization problems that are out of reach for any other software package. Parallelization across CPUs, GPUs and large memory allocations is fully automatic.

These new capabilities are delivered with the simplest user experience, allowing researchers to focus on the new results they're achieving rather than complex software and hardware configurations.

Researchers in the Quantum Technology Laboratory at Chalmers University are leveraging Q-CTRL's Boulder Opal software to reduce error in quantum systems to implement so-called SNAP gates - a quantum operation that can be used as a building-block to generate arbitrary quantum operations in their resonator.

Marina Kudra, a Ph.D. student at Chalmers, said, "Boulder Opal made it very easy to go from code to experiments. I started from the relevant notebook in the documentation, followed the steps, adapted when necessary, and it simply worked. We're now using Q-CTRL pulses that allow us to cut the time of our gates by eight times."

“Boulder Opal has always delivered the most advanced capabilities in dynamic simulation, hardware characterization, and control optimization to the research community,” said Q-CTRL Product Manager, Jack Li. “We’re excited to now bring the most advanced custom-built and trained AI agents to this toolkit to help the community really take off.”

Boulder Opal works with all quantum computing and quantum sensing hardware. Researchers, students, and educators can sign up for an account and access all features of Boulder Opal [here](#).

Q-CTRL will demonstrate the new AI capabilities at this year’s APS March Meeting, the world’s largest physics conference, in Las Vegas, March 5-10. Attendees interested in learning more can find the team at Booth 506 of the exhibition.

In addition, the company will be presenting the below [eight technical talks](#) at the conference across a range of topics:

Optimized Bayesian System Identification in Quantum Devices led by Ashish Kakkar, Senior Scientist  
B72.00009

Maximizing success and minimizing resources: An optimal design of hybrid algorithms for NISQ era devices led by Yulun Wang, Senior Scientist, Quantum Control  
D58.00008

Improving algorithmic performance of tunable superconducting qubits using deterministic error mitigation led by Pranav S Mundada, Ph.D., Lead Scientist  
G73.00002

Using machine learning for autonomous selection of optimal qubit layouts on quantum devices led by Aaron Barbosa, Senior Scientist  
G70.00007

Eliminating overhead: Improving the performance of hybrid algorithms using deterministic error suppression led by Smarak Maity  
G73.00008

Efficient autonomous system-wide gate calibration led by Marti Vives, Research Scientist, Quantum Control  
K70.00011

Improving the performance of cold-atom inertial sensors and gravimeters using robust control led by Russell P Anderson, Head of Quantum Sensing  
N65.00001

Improving syndrome detection using quantum optimal control led by Gavin S Hartnett, Senior Scientist, Quantum Control  
S72.00015

To learn more about Q-CTRL, please visit: [www.q-ctrl.com](http://www.q-ctrl.com).

#### About Q-CTRL

Quantum computers promise huge strategic benefits to enterprise users struggling with difficult computational challenges - from finance to pharma. However, quantum computers are unable to deliver on their promise because the hardware is susceptible to error and instability, making this the Achilles Heel of the field. Q-CTRL has developed a unique technology that improves quantum hardware utility and performance by addressing the existential problem of hardware error.

Founded by Michael J. Biercuk in 2017, Q-CTRL has pioneered the quantum infrastructure software segment, and has become the leading product-focused software company in the broad quantum sector. In 2022, Q-CTRL augmented its product leadership, bringing in deeptech executive Aravind Ratnam as Chief Strategy Officer and Silicon Valley veteran Alex Shih as Head of Product.

Q-CTRL's quantum control infrastructure software for R&D professionals and quantum computing end users delivers the highest performance error-correcting and suppressing techniques globally, and provides a unique capability accelerating the pathway to the first useful quantum computers and quantum sensors. The company's products are applied outside of quantum computing as well, and Q-CTRL operates a globally leading quantum sensing division focused on software-level innovation for strategic capability. In an effort to bring quantum tech to as many users as possible, Q-CTRL has also built the world's leading edtech platform for quantum computing, Black Opal, which can help anyone go from zero to programming real quantum computers in minutes a day.

Q-CTRL has been an inaugural member of the IBM Quantum Startup network since 2018, and recently announced partnerships with quantum industry partner Classiq and end-users Xerox PARC, Capgemini, and Transport for NSW. The company has international headquarters in Sydney, Los Angeles, and Berlin.

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