

Alice & Bob Supercharge Quantum Simulations with Dynamiqs by Integrating with Accelerated Computing

Alice & Bob developed the open-source Dynamiqs library to enable unprecedented speed in quantum simulations, boosting efficiency of operations by up to 60x

PARIS, FRANCE, November 19, 2024 /EINPresswire.com/ -- [Alice & Bob](#), a global leader in the race for fault-tolerant quantum computing, has announced the release of Dynamiqs, Alice & Bob's pioneering quantum simulation library. Dynamiqs integrates NVIDIA accelerated computing, driving quantum simulations beyond state-of-the-art levels of performance and setting the stage for major breakthroughs in quantum research.

The Alice & Bob research team recognized the need for a disruption in the quantum simulation space, leading to the creation of Dynamiqs. From the beginning of development, it was clear that GPUs could provide huge benefits and accelerate simulations at scale. Based on this observation, the team developed Dynamiqs based on the latest machine learning library developed by Google AI, JAX, and on Difffrax, a state-of-the-art library for differential equations.

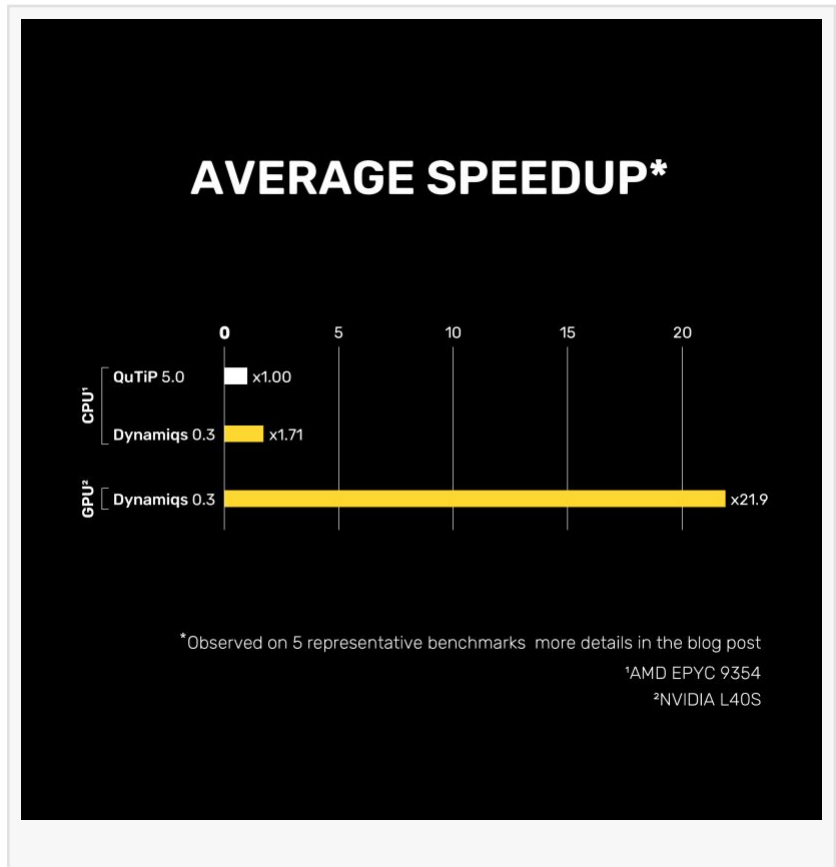
The NVIDIA-powered GPU acceleration increases the efficiency of matrix operations—a critical factor in quantum simulations—by up to 60x, allowing Dynamiqs to simulate large, complex systems such as Quantum Processing Units (QPUs) that involve multiple qubits and physical hardware components like resonators. Dynamiqs underscores Alice & Bob's core business as QPU developers and cements the company's role in the quantum computing industry.

Dynamiqs will enable rapid and efficient quantum simulations, which are notoriously complex,



particularly when dealing with large Hilbert spaces, open systems interacting with their environments, and fast time-dependent dynamics. These challenges often push conventional computing resources to their limits, resulting in slow performance and inefficient scaling.

Dynamiqs is an open-source Python library sponsored by Alice & Bob, with collaboration from Inria and the University of Sherbrooke, that enables high-speed simulation of open and closed quantum systems leveraging NVIDIA accelerated computing. Dynamiqs is engineered to address the limits of traditional quantum simulations libraries by leveraging two key features: GPU acceleration and differentiability, providing researchers with both improved and completely new functionalities.



GPU acceleration allows researchers to:

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said Ronan Gautier, Lead for Dynamiqs at Alice & Bob

- Accelerate large-scale simulations
- Extend the size of systems that can be practically simulated
- Perform parameter sweeps

Differentiability enables computing gradients for:

- Quantum optimal control
- Parameters estimation
- Quantum state tomography

“Dynamiqs brings unprecedented speed to quantum simulations, empowering researchers and engineers to explore new realms of quantum optimization and system control,” said Ronan Gautier, Lead for Dynamiqs and Theoretical Physicist at Alice & Bob. “Dynamiqs was designed for performance, and with GPU acceleration, we can now tackle simulations that were previously infeasible.”

“Alice and Bob’s work shows how simulations powered by NVIDIA accelerated computing are increasingly critical to the future of quantum computing,” said Tim Costa, Senior Director CAE

EDA & Quantum at NVIDIA. "Dynamiqs is prescient in leveraging accelerated computing to drive research breakthroughs within the quantum computing community."

Visit www.dynamiqs.org to access the documentation or [explore the library](#) on Github.

About Alice & Bob

Alice & Bob is a quantum computing company based in Paris and Boston whose goal is to create the first universal, fault-tolerant quantum computer. Founded in 2020, Alice & Bob has already raised €30 million in funding, hired over 100 employees and demonstrated experimental results surpassing those of technology giants such as Google or IBM. Alice & Bob specializes in cat qubits, a pioneering technology developed by the company's founders and later adopted by Amazon. Demonstrating the power of its cat architecture, Alice & Bob recently showed that it could reduce the hardware requirements for building a useful large-scale quantum computer by up to 200 times compared with competing approaches. Alice & Bob cat qubit is available for anyone to test through cloud access. Follow Alice & Bob on LinkedIn, X or YouTube, visit their website www.alice-bob.com, or join The Cat Tree on Slack to learn more.

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