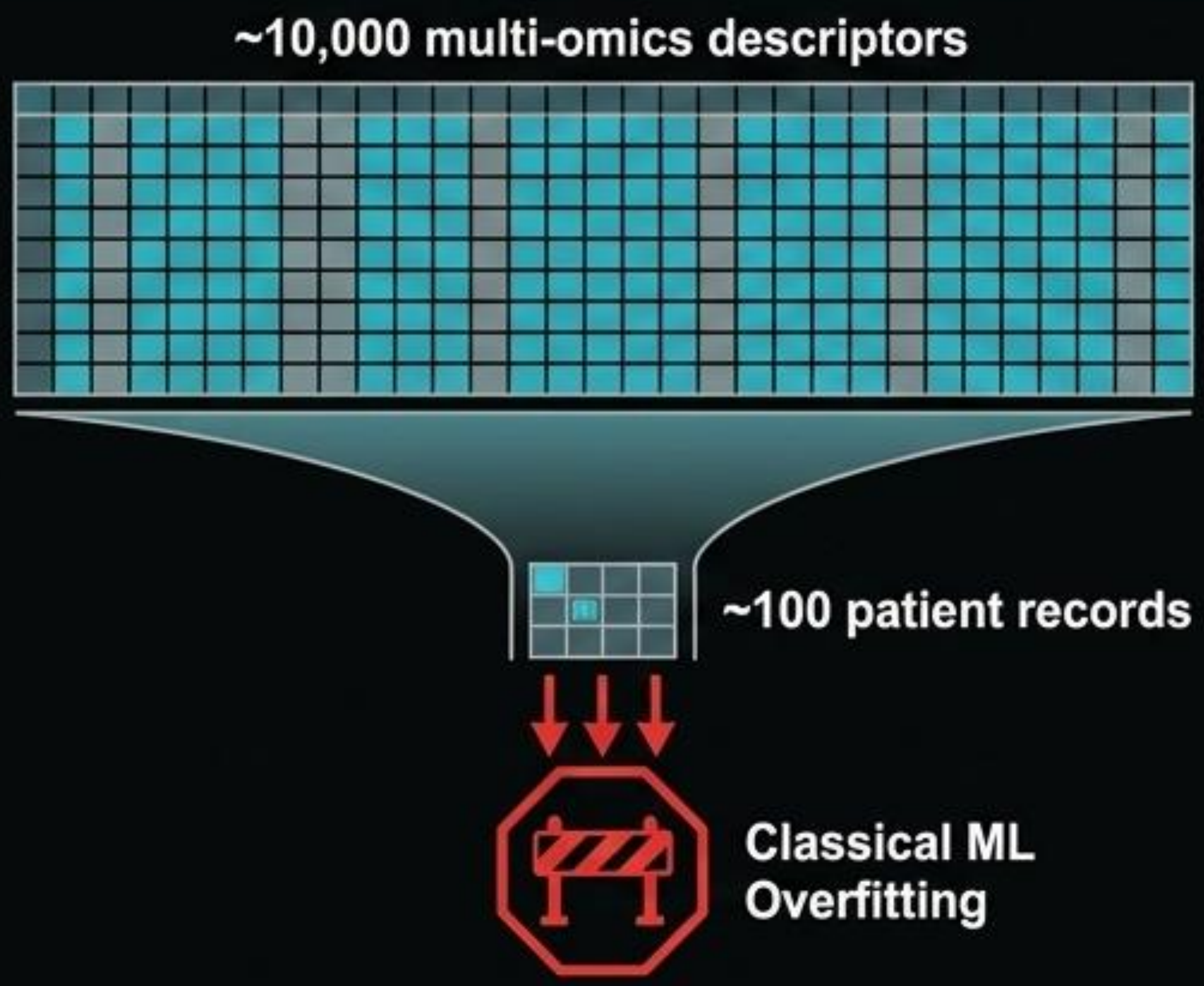
Overcoming the Curse of Dimensionality in Clinical AI

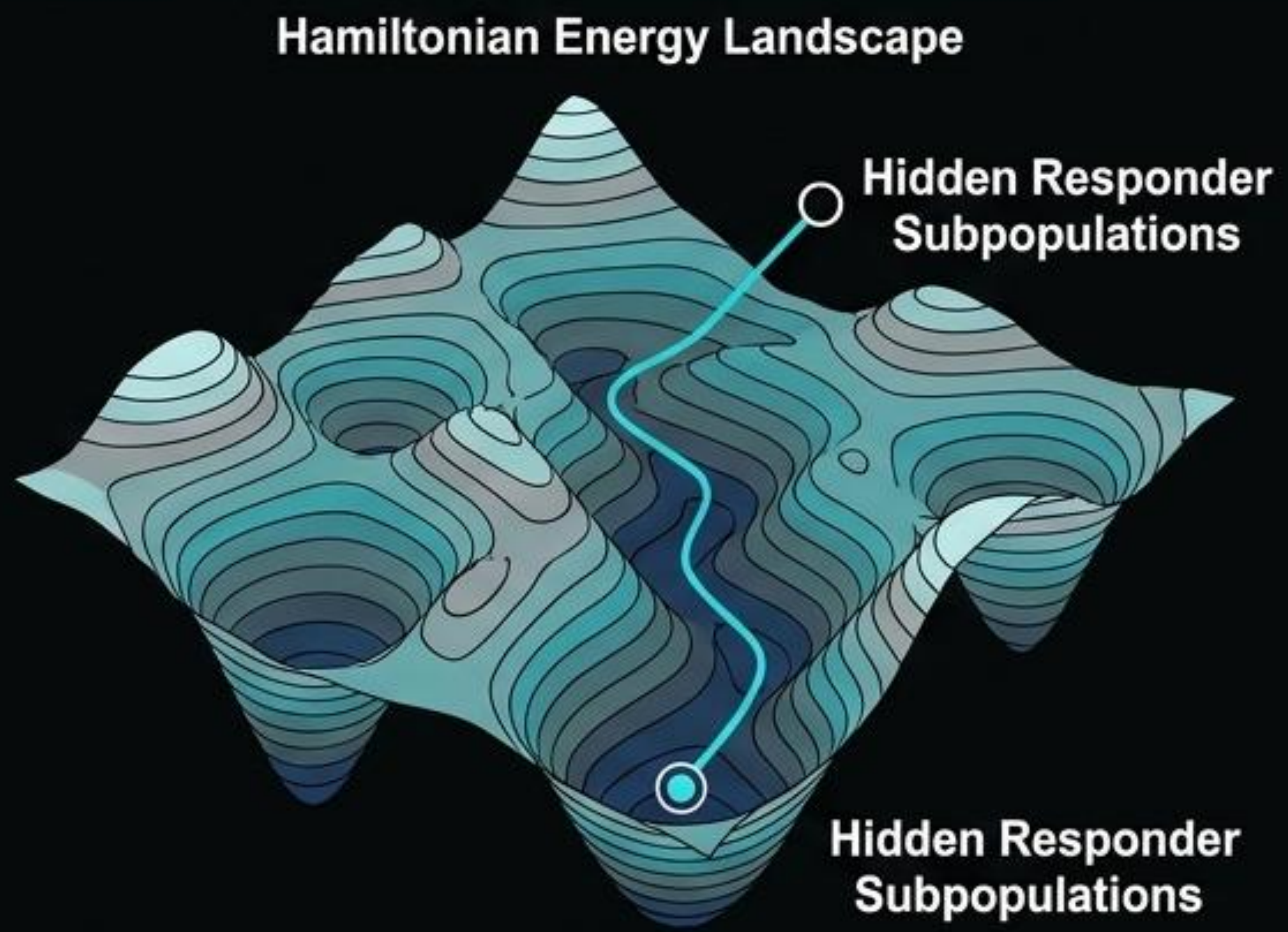
CLiNiQUANTUM x NVIDIA

Why discovering hidden biological patterns requires quantum-native exploration.



The Clinical Reality: Modern precision trials capture vast continuous biological data but test highly constrained cohorts.

The Classical Roadblock: In this extreme data-to-feature imbalance, classical algorithms stall in rugged state-spaces.



The Quantum Hypothesis: Mapping biological correlation structures into Hamiltonian representations unlocks computational advantage.

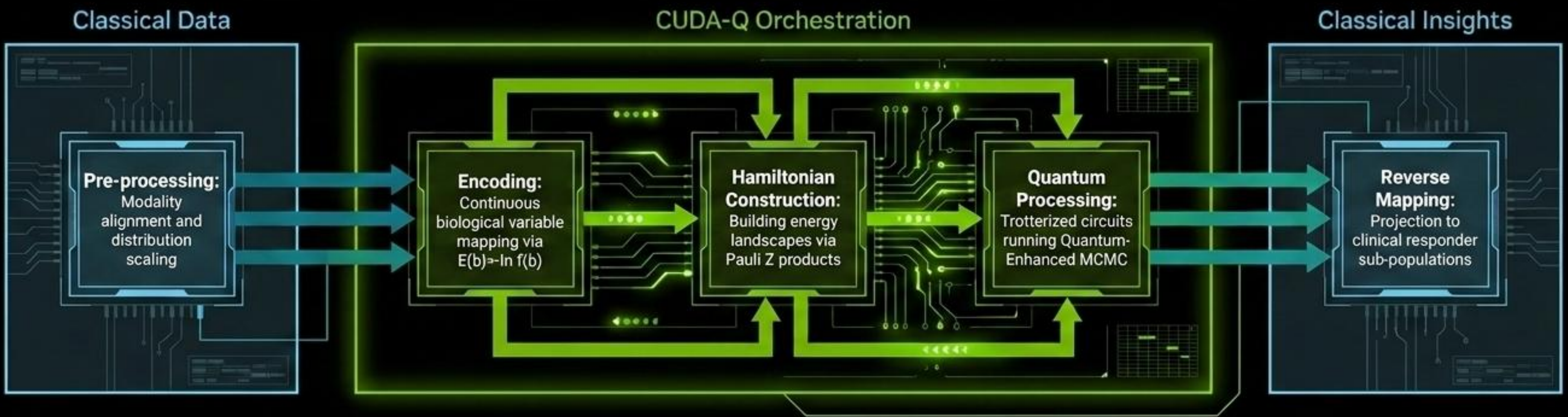
The Impact: Quantum-enhanced sampling navigates complex energy landscapes natively, transforming precision trial design.

CLiNiQUANTUM x NVIDIA

Dete Quentum Care.

Hybrid Quantum-Classical Computing with CUDA-Q

Objective: Build production-grade hybrid infrastructure bridging GPU and QPU.



The NVIDIA Value Proposition

Real-world **CUDA-Q** validation, GPU as the core accelerator for complex matrix formulation, and production feedback from edge-case multi-omics workloads.

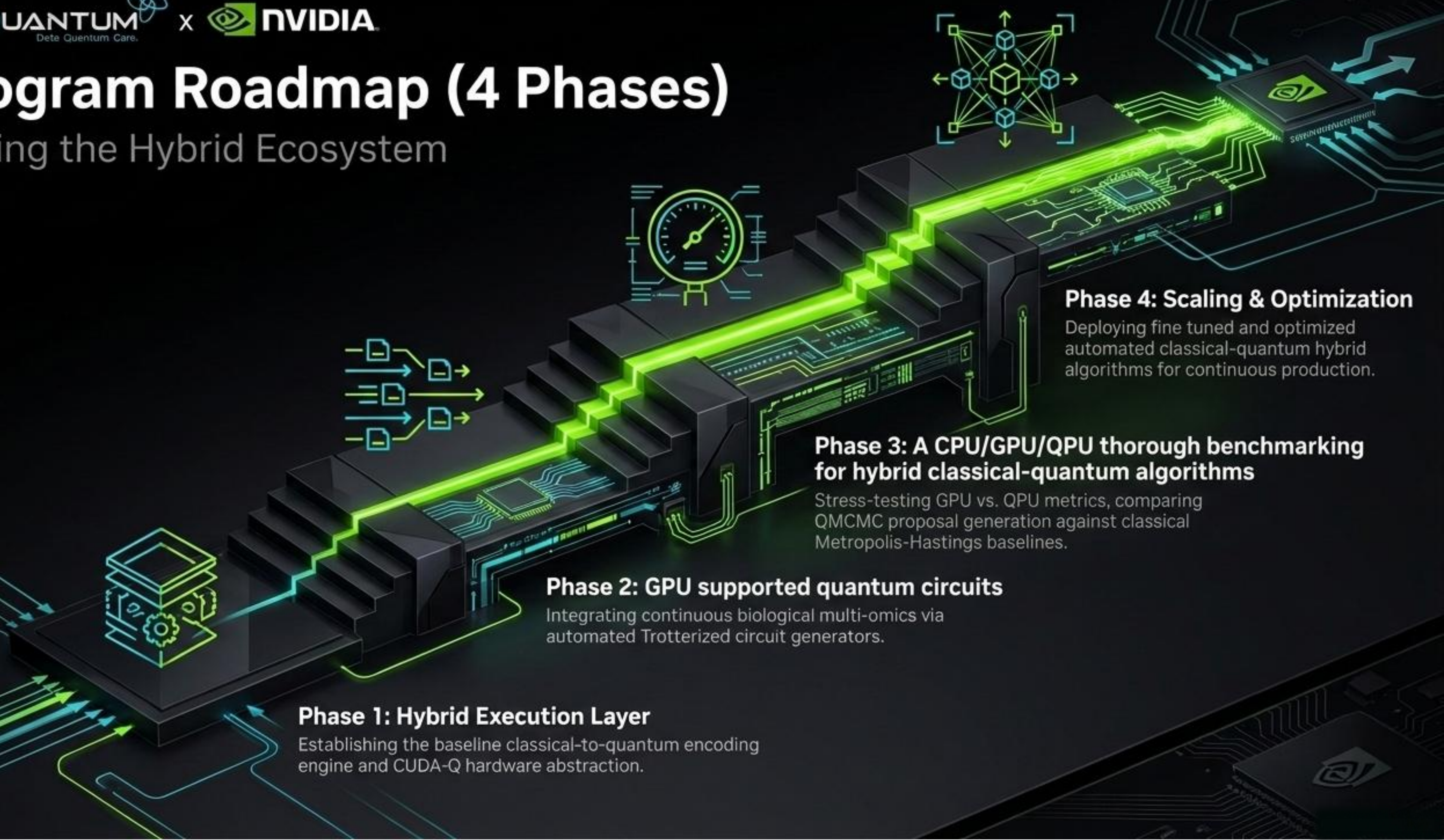
Performance KPIs

Execution Success	GPU Efficiency	Pipeline Latency	Reproducibility
✓ 100%	98%	<5ms	✓ Confirmed

CLINIQUANTUM x NVIDIA

Program Roadmap (4 Phases)

Scaling the Hybrid Ecosystem



Phase 4: Scaling & Optimization

Deploying fine tuned and optimized automated classical-quantum hybrid algorithms for continuous production.

Phase 3: A CPU/GPU/QPU thorough benchmarking for hybrid classical-quantum algorithms

Stress-testing GPU vs. QPU metrics, comparing QMCMC proposal generation against classical Metropolis-Hastings baselines.

Phase 2: GPU supported quantum circuits

Integrating continuous biological multi-omics via automated Trotterized circuit generators.

Phase 1: Hybrid Execution Layer

Establishing the baseline classical-to-quantum encoding engine and CUDA-Q hardware abstraction.

CLiNiQUANTUM Dete Quentum Care. x NVIDIA

What We Aim to Achieve with NVIDIA

Leveraging accelerated quantum computing and CUDA-Q to build scalable hybrid workflows for real-world clinical applications.

Scalable Hybrid Quantum Workflows (CUDA-Q)

- Deploy seamless GPU-QPU orchestration via CUDA-Q.
- Establish a unified platform for hybrid algorithm execution.
- Enable large-scale distribution of complex quantum workloads.
- Automate circuit management for efficient hybrid pipelines.

Accelerated Quantum Computing using GPUs

- Utilize GPUs to accelerate classical simulation and pre-/post-processing.
- Overcome critical computational bottlenecks in hybrid algorithms.
- Optimize data transfer between classical and quantum resources.
- Enhance performance of variational quantum algorithms.

High-Performance Computing Integration

- Integrate hybrid workflows into existing HPC infrastructure.
- Achieve end-to-end performance optimization across the full stack.
- Enable efficient handling of large-scale biological datasets.
- Ensure robust, production-grade reliability for critical tasks.

Real-World Clinical & Insight Generation

- Apply hybrid methods to precision clinical trial analysis.
- Evaluate potential for quantum advantage in specific clinical tasks.
- Generate actionable insights for accelerated drug discovery.
- Benchmark real-world impact against classical baselines.

Outputs

- Validated hybrid quantum-classical platform for real-world clinical applications.
- Comprehensive benchmarking insights across NISQ simulators and QPU hardware.
- Real-world hybrid applications actively utilized in precision clinical trial analysis.

KPIs

Performance Improvement

Hybrid System Speedup

Assessment of computational acceleration in complex landscapes.

Experiment Throughput

Pipeline Latency Reduction

Evaluation of end-to-end hybrid workflow efficiency.

Algorithm Scalability

Resource Scalability

Analysis of qubit efficiency and GPU utilization for larger problems.