BosonQ Psi (BQP)
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BosonQPsi

BQPhy®

The World's First Quantum-Powered Simulation Platform

Accelerating Complex Simulations with Quantum Computing | Backend Platform with Seamless Integration

Simulations are slow, inaccurate, and expensive

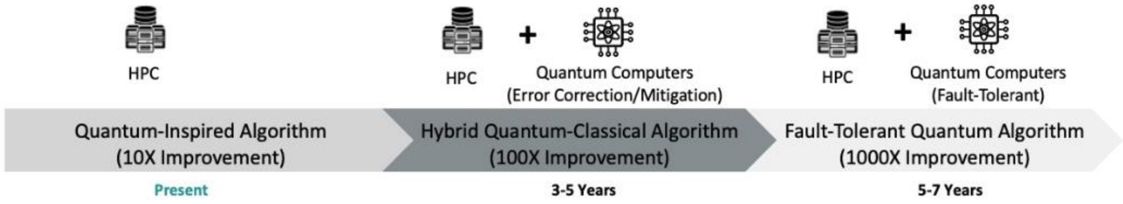
Algorithmic advancements have not kept pace with computing innovations over the past 40 years.

Current simulation providers face significant inefficiencies in time, accuracy, and cost, limiting their ability to run enough simulations for robust solutions. These outdated algorithms demand extensive computing power, which restricts their ability to effectively tackle complex, large-scale problems.

These limitations stifle innovation, preventing organizations from fully exploring complex scenarios and optimizing designs, which introduces risk. As a result, an estimated 70% of valuable analyses remain unexplored due to these constraints.

Quantum-Inspired Algorithms

Three advanced solvers are tightly coupled with quantum-inspired algorithms, enabling simulations beyond today's GPUs' capabilities. Running on today's high-power computers, the quantum-powered platform is multiples faster and more accurate. BQPhy® has three solvers: **1) Engineering Optimization** (e.g., design; route optimization), **2) Physics-Based** (e.g., Computational Fluid Dynamics; Finite Element Analysis), **3) Data-Based** (e.g., AI/ML parameter training). BQPhy® handles large, complex datasets, addresses today's computational limits, and future-proofing solutions as quantum computing advances.

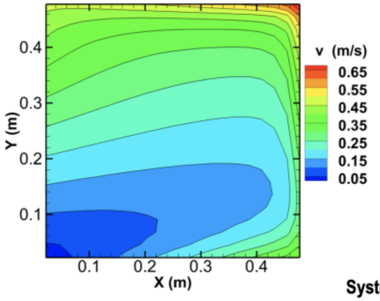


Physics-Based Solver | TRL 3

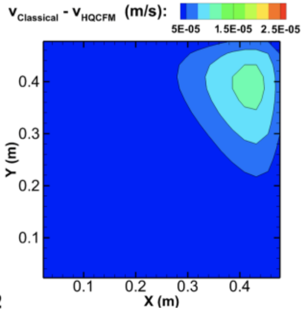
Hybrid Quantum-Classical Finite Method (HQCFM) algorithm accelerates the solving of high-fidelity CFD/FEA simulations while reducing the compute resources required. Benchmarking HQCFM algorithm for CFD problems:

- 2D Burger's Equation: Transient, incompressible, viscous, non-linear coupled partial differential equations
- Discretization: Finite Difference Method
- Classical linear solver: Generalized Minimal Residual method (GMRES)

Contour plot of y-velocity component with HQCFM

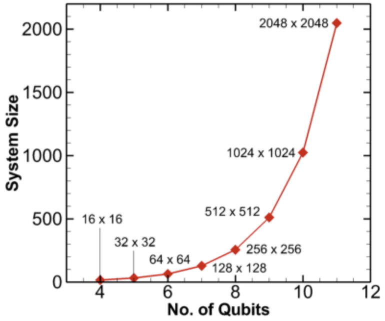


Contour plot of difference of velocity between classical linear solver and HQCFM



System Size: 512 x 512

A scalability study was conducted to simulate from 4 qubits (16x16 matrix) to 11 qubits (2048x2048 matrix). The study focused on resource estimation for increasing qubit numbers. In the right plot, a jet engine simulation on a classical system using high-performance computing (HPC) required 19.2 million cores. This simulation could be predicted using 30 logical qubits and 4,000 gates.



Fu, Y., Shen, W., Cui, J., Zheng, Y., Yang, G., Liu, Z., ... & Zheng, W. (2023). Towards Exascale Computation for Turbomachinery Flows. *arXiv preprint arXiv:2308.06605.*

Grids = 1.69 Bn
With HPC = 19.2 Mn cores
With QC = 30 Logical qubits