ZAPATA

THE ENTERPRISE QUANTUM SOFTWARE COMPANY AT THE FOREFRONT OF THE QUANTUM REVOLUTION.

Selected Quantum Use Cases Available on Orquestra™
Proprietary Zapata techniques in green

FINANCE

Optimization
- Sampling from risk-neutral probability measure for asset pricing
- Portfolio optimization by quantum annealing or gate-model quantum heuristics
- Improved asset allocation by quantum-inspired optimization

Simulation & Modeling
- Quantum-assisted Monte Carlo for derivative pricing, credit valuation adjustment
- Imaginary-time propagation for multi-asset Black-Scholes equation
- Accelerated sampling from stochastic processes for risk analysis

Machine Learning
- Improved graph clustering analysis for anomaly and fraud detection
- Time series analysis of financial data using quantum Boltzmann machines
- Dimensionality reduction for financial data using quantum-classical hybrid optimization

HEALTHCARE & PHARMACEUTICALS

Optimization
- Optimal healthcare resource allocation e.g. patient-treatment matching and priority scheduling of doctors and therapies
- Molecular structure analysis by combinatorial optimization
- Protein design using unconstrained discrete optimization

Simulation & Modeling
- QM/MM method for molecular binding affinity prediction in drug discovery
- *Ab initio* transition state analysis for catalytic reaction simulation
- *Ab initio* determination of the crystalline structure of organic molecules

Machine Learning
- Quantitative structure-activity relationship (QSAR) using quantum enhanced supervised learning
- Molecular screening in drug discovery using continuous latent space
- Natural language processing for automated literature analysis using quantum Boltzmann machine

TRANSPORTATION & LOGISTICS

Optimization
- Generating efficient transportation routes for vehicle fleets with improved qubit cost
- Improving timing in job scheduling

- Disruption management by optimized traffic re-routing

Machine Learning
- Irregular operation (IROP) prediction using quantum-enhanced supervised learning

MATERIALS

Optimization
- Prediction of alloy ground state orderings from cluster expansions

Simulation & Modeling
- Determining thermodynamics of alloys by applying quantum amplitude amplification to cluster expansion models

- *Ab initio* simulations to accelerate materials discovery (e.g., Li-ion electrolytes/electrodes, photovoltaics, catalysts, alloys)

ENERGY & UTILITIES

Optimization
- Finite time-window scheduling in energy allocation for smart grids

Simulation & Modeling
- Turbulent mixing simulation in predictive environmental modeling for climate change

- Quantum accelerated stochastic simulation of Reynolds-Averaged Navier-Stokes (RANS) systems

AEROSPACE & AUTOMOTIVE

Optimization
- Identifying failure modes through fault tree analysis as combinatorial optimization

Simulation & Modeling
- Variational methods for general linear PDEs arising in engineering design
- Heat transfer related PDE-constrained optimization for engine design

- Wave equation simulation using variational linear systems solver

CHEMISTRY

Optimization
- Process optimization in chemical reaction networks for maximizing yield

Simulation & Modeling
- Homogeneous and heterogeneous catalysis modeling using electronic structure calculations
- Singlet-triplet transition energy prediction for OLED molecules

- Quantum-enhanced force-field methods for chemical dynamics simulation

DIGITAL CONTENT

Optimization
- Display advertising optimization for maximizing click-through rate (CTR)

Machine Learning
- Hybrid quantum-classical generative modeling for content creation

BLOCKCHAIN

Optimization
- Hash collision for proof-of-work cryptocurrency mining

Simulation & Modeling
- Certified randomness from quantum supremacy for proof-of-stake blockchains

DEFENSE

Machine Learning
- Predictive maintenance using variational quantum classifier

- Anomaly detection by time series analysis using quantum Boltzmann machine

- Image and audio generation and classification using quantum-enhanced supervised learning