Erio Trong Duong

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EDUCATION

PhD in Mechanical Engineering

RWTH Aachen University — Germany • 10/2025 - Present

Advisors: Norbert Hosters, Matthias Möller

M.Sc (cum Laude) in Applied Mathematics

Delft University of Technology • GPA: 8.45/10 — Netherlands • 09/2023 - 06/2025

Advisor: Matthias Möller

- Awarded QuTech scholarship for excellent students in quantum tracks.

B.Sc (cum Laude) in Mathematical Sciences

Korea Advanced Institute of Science and Technology (KAIST) • GPA: 3.74/4.3 — South Korea • 09/2019 - 06/2023

PUBLICATIONS

Quantum Lattice Boltzmann with Denoising Collision Operators

T. Duong, M. Möller, N. Hosters. Submitted to SIAM Journal on Scientific Computing: Special Section on Quantum Computing. [Access]

Tailoring polynomials for quantum signal processing using methods of Riemannian geometry

Y. Suzuki, L. Xiaoyue, A. Wright, T. L. Silva, **T. Duong**, O. Kiss, R. Zander, M. Petrič, N. H. Y. Ng, Z. Holmes, and M. Gluza.

Manuscript under internal review.

Quantum Neural Architecture Search with Quantum Circuits Metric and Bayesian Optimisation — 07/2022

T. Duong, S. T. Truong, M. Tam, B. Bach, J. Ryu, and J. K. Rhee. Presented in the *International Conference on Machine Learning (ICML), 2022, AI4Science Workshop*. [Access]

RESEARCH EXPERIENCE

RWTH Aachen, Chair for Computational Analysis of Technical Systems — Germany • 10/2025 - Present

Ph.D researcher

- Develop a gate-level quantum implementation for the Lattice Boltzmann methods for fluid simulations.
- Propose an amplitude-encoding scheme for fluid distributions and construct a projection-based operator that effectively models nonlinear dynamics of fluid particles, leading to an efficient multi-timestep fluid simulation protocol.
- Integrate the method to an open-source framework for quantum Lattice Boltzmann methods.

Independent Research Projects

on Polynomials for Quantum Signal Processing (10/2024 - Present)

- Collaborate with researchers from multiple institutes to work on adaptive optimization of polynomial approximations to imaginary-time evolution using methods from Riemannian optimization.
- Design numerical experiments to apply the polynomial approximations to the ground-state preparation problem and evaluate performance benchmarks using tensor network simulations for many-body systems.
- Contribute to a manuscript that is currently in the final preparation stage.

on Adiabatically Assisted Variational Quantum Eigensolver (5/2023 - 12/2023)

- Explored a variational ground-state method that jointly optimizes the ansatz and adapts the Hamiltonian to keep the state an eigenstate.
- Refined an adiabatic-style training algorithm to adaptively follow Hamiltonian paths with large estimated spectral gaps.
- Validated the approach on molecular Hamiltonians, achieving accuracy comparable to standard methods such as ADAPT-VQE in quantum chemistry.

Delft University of Technology, Institute of Applied Mathematics

Netherlands • 09/2024 - 06/2025

M.Sc Student Researcher

- Investigated quantum algorithms for the Navier-Stokes equations with a focus on the feasibility of various encoding schemes for fluid simulation.
- Proposed quantum Lattice Boltzmann frameworks for both phase-based and amplitude-based encoding of particle distribution functions.
- Performed analytical and numerical analysis of the proposed frameworks, benchmarking accuracy, robustness, and resource use against other quantum Lattice Boltzmann algorithms.
- Completed the Master's Thesis: "Quantum Algorithms for the Lattice Boltzmann Method: Encoding and Evolution" (graded 9/10). [Access]

National University of Singapore, Centre for Quantum Technologies

Singapore

Research Intern (6/2024 - 10/2024)

- Researched probabilistic methods for efficiently simulating coherent noise in quantum error-correcting codes.
- Derived sampling-efficient Clifford channels to approximate coherent noise and applied them to estimate the fault-tolerance threshold of surface codes.

Research Intern (6/2022 - 8/2022)

- Characterized the training dynamics of variational quantum algorithms in the infinite-width limit using the quantum neural tangent kernel.
- Engineered and analyzed kernel-based quantum algorithms that replicate the limiting behavior, providing a theoretical bridge between variational models and quantum kernel methods.

KAIST, Quantum Information and Communication Group

South Korea • 01/2021 - 06/2022

Student Researcher

- Developed a Bayesian Optimization framework for searching high-performance variational quantum architectures.
- Defined a distance between parameterized operators by comparing the geometry of the sets of states they can reach.
- Generalized the distance to a metric between complex variational architectures using optimal transport theory for efficient navigation within the search space.
- Published a conference paper highlighting the practical effectiveness of the framework.

SKILLS

Programming: qiskit, PennyLane, quimb, stim, QuTiP, PyTorch

Numerical methods: tensor networks, variational quantum algorithms, computational fluid dynamics, Riemannian optimization, Bayesian optimization