



Shek Lun Leung

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Summary

Quantum Engineer and Computational Physicist specializing in **Machine Learning for Quantum Many-Body Systems**. Expert in designing **JAX/PyTorch optimization pipelines** for complex physical simulations (achieving ~270x speedup in QKD). Experienced in modeling non-equilibrium dynamics (Chaos) and combinatorial optimization (Ising Machines). Eager to develop computational tools for next-generation quantum simulators at the University of Jyväskylä.

Core Competencies & Technical Skills

Scientific Computing

Languages: Python (Expert), C++ (Proficient), JAX, PyTorch, Fortran (Basic), Linux/Bash.

Methods: Optimization Pipelines, Neural Surrogate Models, Numerical Stability Analysis.

Quantum & Physics

Simulation: Exact Diagonalization, Monte Carlo Methods, Finite Element Method (FEM), Runge-Kutta.

Quantum: Many-Body Physics, Open Quantum Systems, Tensor Networks (MPS), QKD.

Professional Experience

DreamToDo | Technical Director

October 2025 - Present

- Architecting an AI reasoning ecosystem for creative workflows; selected as a **finalist** for the KTH Innovation/SSE pitch competition.

Grant Seeker AI | Technical Lead (Google x Kaggle Hackathon)

2025

- Designed a multi-agent ecosystem using Google ADK & Gemini Flash; implemented sequential orchestration (Reasoning -> Search -> Extraction) and parallel web scraping for automated proposal generation. [\[Demo\]](#)

Metvibee | CTO & Co-founder

2023-2024

- Designed core algorithmic architecture for sustainable urban planning; translated complex data models into actionable stakeholder demonstrations.

Selected Research & Technical Projects

ML for BB84 QKD Network Optimization | KTH

2024-2025

- Designed a **neural surrogate model** to replace computationally expensive Dual Annealing simulations... Achieved ~270x speedup... Validated generalization to unseen channel parameters (domain generalization).
- Conducted rigorous testing across 6,000 simulated scenarios (0–200 km fiber length), maintaining a final secret key rate error of <6%.
- Validated the model's **generalization ability** on unseen channel conditions, demonstrating viability for dynamic, real-world deployment on resource-constrained devices.
- Technologies:** PyTorch, JAX, Python, SciPy, Pandas. [\[Demo\]](#) [\[Github\]](#)

Photonic Ising Machine (Spatial Light Modulation)



- Architected an optical Ising machine to simulate **spin-glass models**... Solved NP-hard energy minimization problems... Investigated phase-coupling dynamics. [\[Github\]](#)

Nonlinear Dynamics & Bifurcation Analysis (IPT)



- Derived first-principles ODEs for chaotic systems... modeled period-doubling bifurcations. [\[Github\]](#)

Simulation of Non-Newtonian Glacier Dynamics (Numerical Analysis II)

- Implemented **Finite Element (FEM)** and **Finite Difference** solvers for the NASA First-Order (FO) model... Solved non-linear PDEs using **Picard iterations**... Analyzed numerical stability and convergence.

Master Thesis: Secure Communication Protocol Design & Simulation

2023

- Authored and published a thesis analyzing a novel protocol, "Beyond Pulse Position Modulation" (BPPM), for energy-efficient secure communication.
- Demonstrated the protocol's viability** via Python simulation, proving BPPM achieves a superior information density (bits/photon) over standard protocols (PPM, OOK, General) in noisy, long-distance channels.
- Conducted an in-depth analysis of channel capacity using mutual information to **evaluate its robustness** against photon loss and addition errors. [\[Github\]](#)

Education

M.S. Computational Physics | Stockholm University

Concurrent Coursework, 2025-Present

- Numerical Analysis II (FEM/FDM), Mathematical Methods in Physics

M.S. Engineering Physics (Quantum Technology) | KTH

Expected graduation: Feb, 2026

- Advanced Quantum Mechanics, Quantum Information, Quantum Photonics, Quantum Materials, Superconductivity and other quantum liquids, Methodology of Science, Research Methodology

M.S. Physics (Honors) | The Chinese University of Hong Kong

2018

- Topics in Theoretical Physics (Advanced Statistical Mechanics), Quantum Computing, Quantum Mechanics, Soft Matter, Material Science

Advanced Technical Training & Summer Schools

VCQ & TURIS

2024

Vienna, Austria

- Quantum Information, General Relativity, Quantum Algorithms, Standard Model, Quantum Gravity

Minato School

2024

Toulouse, France

- Cutting-edge Microelectronics, Nanochemistry, Advanced Fabrication Techniques for Quantum Devices

7th Superconductivity School

2022

Oxford, UK

- Fundamentals of Superconductivity, Applications in Quantum Computing, Materials, Modelling, and Measurements

Google x Kaggle Agents Crash Course

2025

- Technical Lead for Multi-Agent AI Systems.

Awards & Community Leadership

Winner: IBM Qiskit Global Hackathon (2020)

National Winner: International Physicists' Tournament (2022)

IBM Qiskit Advocate & Certified Developer

Mentor: Qiskit Hackathon Taiwan (2021)

Teaching Experience

Academic Tutor

2019–2022

- Teaching Physics and Mathematics (SL & HL) at EIB and BluePrint Academy

Teacher

2018-2019

- Teaching Mathematics and Computer Literacy at CCC Mongkok Church Kai Oi School

Selected Additional Projects

Quantum Error Correction (Google AI Quantum/Stim)

2025

- Constructed and simulated surface code circuits
- Analyzed error propagation and noise-model thresholds. [\[Github\]](#)

Autonomy in AI Report

2025

- Co-authored 15-page analysis on simulation-reality gaps in AI (KTH) [\[Github\]](#)