Fredrik Johannes Olsen Hasselgren

Oxford Mathematical Institute | LinkedIn | Google Scholar

Research interests

My research interests lie in the transition from high-powered computing to quantum advantage, including topics from both ends like tensor networks and quantum algorithms, simulation, and dynamics.

Education

Oct. 2025 - 2029 — **DPhil Quantum Information, Computation and Cryptography Group, Mathematical Institute, Keble College, University of Oxford**
Funding: Fully-funded by Mathematical Institute with Jane Street Graduate Scholarship

Oct. 2024 - 2025 — **MSc Mathematical and Theoretical Physics, St Hilda's College, University of Oxford**
Distinction.
Quantum algorithms & Tensor Networks: Extended dissertation on *Quantum-Inspired Classical Simulation Through Randomized Time Evolution* supervised by Prof. Balint Koczor Preprint arXiv.

Graduate courses include: Quantum Information Theory, Quantum Field Theory (and Advanced-QFT, Topological-QFT), Groups and Representations, ZX-Calculus, Machine- & Deep- Learning.

Sep. 2020 – 2024 — **BSc Honours Physics and Philosophy, University of St Andrews**
First-Class.
Exciton-Polariton Modelling: First class dissertation on modelling the strong coupling of excitons to cavity photons, supervised by Dr. Hamid Ohadi.
Class medal: Highest grade average in third year physics.

Publications

2026:

1. *Quantum-Inspired Classical Simulation Through Randomized Time Evolution* **F. Hasselgren** and B. Koczor. Preprint arXiv
2. *A virtually connected probabilistic computer as a solver for higher-order, densely connected, or reconfigurable combinatorial optimisation problems,* A. Searle, H. Youel, **F. Hasselgren**, A. Möslein, R. Aboushelbaya, M. von der Leyen, Preprint arXiv

2025:

3. *Probabilistic computing optimization of complex spin-glass topologies*, **F. Hasselgren**, M. O. Al-Hasso, A. Searle, J. Tindall, and M. von der Leyen, Preprint arXiv

Scholarships and Awards

2025 - 2029 — **Mathematical Institute Scholarship with Jane Street Graduate Scholarship**
(£150,000)
Awarded competitively by the University of Oxford mathematics department; covers full course fees and an annual stipend.

2025 — **2nd place - Quantum Dice Michaelmas Challenge**
(£2,000)
October - December challenge focusing on out-competing classical methods in solving the Unit Commitment Problem with probabilistic computing.

2023 — **Medal (Physics Third level) - University of St Andrews**
Awarded for attaining the highest grade average among third year physics students.

2023 — **1st place - Computational Physics challenge - University of St Andrews**

2021, 2022, 2023, 2024 — **Dean's list award for academic excellence - University of St Andrews**
Awarded for having a credit-weighted mean grade above a First-Class standard.

Presentations and posters

May 2026 seminar — *Quantum-Inspired Classical Simulation Through Randomized Time Evolution.* Invited seminar for **Google Quantum AI** Santa Barbara team (virtually).

April 2026 posters — *Quantum-Inspired Classical Simulation Through Randomized Time Evolution* & *Probabilistic computing optimization of complex spin-glass topologies* at **QCTIP 2026.**

Work experience

Summer 2025 — **Research summer intern at Quantum Dice, Oxford, UK**

- Probabilistic computing: Worked on photonic probabilistic computing architecture implementing Virtually Connected Boltzmann Machines (PC-VCBM). Two pre-prints to be submitted.
- Spin-glass and QUBO optimization: Developed PC-VCBM architecture to solve for low energy states of the spin-glass model and solve quadratic unconstrained binary optimization problems faster than classical solvers and quantum annealers.
- Real-world optimization: Tailored PC-VCBM development towards solving real-world optimization problems for clients.

Summer 2023 — **Full-Stack developer summer intern at DN Bank, Bergen, Norway**

- Front-end: Developed a visualisation tool for the Bank's mainframe jobs using TypeScript and React in Customer and Core Services division.
- Back-end: Used Python to parse, validate, and analyse a dataset of 30 000 daily mainframe jobs.
- Data-analysis: Used graph theory to create interactive web of nodes and edges, with functionality to navigate and filter via search as well as generate and download reports on the data.
- Result: The finished product was immediately put to use by the full-time developers in our division, and is being prepared for online deployment for the company at large.

Teaching

Spring 2026

- Class tutor for *Quantum Processes and Computation* (Computer Science)
- Teaching-assistant for *B7.4 Special Relativity* and *B7.3 Further Quantum Theory* (Mathematical Institute)

Skills

Research skills: Tensor network methods (Quimb, ITensor, custom implementations). Quantum software and quantum algorithm design (ZX-Calculus, Qiskit, pyQuEST).

Programming languages & software development: Python, React, Java/TypeScript (professional experience), Julia, Mathematica, JavaFX, C++, and Swift (limited experience).

Technical and Computational Tools LaTeX; Git; Jupyter; MQLib; Cytoscape; Linux batch processing and computing clusters.

Languages: Fully fluent in Norwegian and English.

Last updated 07-05-2026