

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 <u>Funding:</u> Fully-funded by Mathematical Institute with Jane Street Graduate Scholarship
Oct. 2024 - 2025 Distinction.	MSc Mathematical and Theoretical Physics, St Hilda's College, University of Oxford <u>Quantum algorithms & Tensor Networks:</u> Extended dissertation on <i>Quantum-Inspired Classical Simulation Through Randomized Time Evolution</i> 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 First-Class.	BSc Honours Physics and Philosophy, University of St Andrews <u>Class medal:</u> Highest grade average in third year physics.
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Publications

2026:

1. *Quantum-Inspired Classical Simulation Through Randomized Time Evolution* **F. Hasselgren** and B. Koczor. [Preprint arXiv](#)
2. *Structure-Aware Variance Reduction for Unbiased Randomized Hamiltonian Simulation.* J. W. Dai, **F. Hasselgren**, and C. Kiumi, [Preprint arXiv](#)
3. *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. Möslin, R. Aboushelbaya, M. von der Leyen, [Preprint arXiv](#)

2025:

4. *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 (£150,000)	Mathematical Institute Scholarship with Jane Street Graduate Scholarship Awarded competitively by the University of Oxford mathematics department; covers full course fees and an annual stipend.
2025 (£2,000)	2nd place - Quantum Dice Michaelmas Challenge 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

- July 2026 presentation** *Quantum-Inspired Classical Simulation Through Randomized Time Evolution.*
Invited presentation for **Center for Quantum Information and Quantum Biology**, University of Osaka.
- 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 2026** **Quantum theory intern at Quantum Motion, London, UK**
- 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 have been submitted based on this work.
 - 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**

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 (ITensor, Quimb, custom implementations). Quantum software and quantum algorithm design (ZX-Calculus, Qiskit, pyQuEST).

Programming languages & software development: Julia, Python, React, Java/TypeScript (professional experience), 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 20-07-2026