

Samuel Sutherland

Quantum computing PhD with experience in numerical methods and applied machine learning. I specialise in differentiable programming and tensor networks, with keen interest in applying these techniques in frontier AI models.

Education

UNSW **Doctor of Physics, 2021-2026, Thesis submitted, under examination**

- Primary Supervisor Prof. Michelle Simmons AC FRS

University of Oxford **Master of Physics, 2015-2019, 1st class**

- Studied Quantum Information Processing, Theoretical Physics, and Lasers and Optics in my final year
- Academic scholarships awarded for second and third year results

Experience

Silicon Quantum Computing **PhD Student, 2021-2026, University of New South Wales, Sydney**

- Designed, built, and tested a novel reservoir computing device, "Watermelon", based on an array of phosphorus-doped silicon quantum dots, which became a primary revenue stream for the company
- Created a differentiable simulator using PyTorch for tuning and designing quantum devices
- Derived and implemented an end-to-end differentiable pipeline for eigensolving in tensor network algorithms

Optiver **Quantitative Researcher Intern, November 2023 - February 2024, Sydney**

- Completed accelerated training in market making and quantitative trading
- Evaluated the viability of a news-based trading signal using Bloomberg headline data
- Developed improved estimators of intermediate-scale volatility in global equity indices

Ocado Technology **Innovation Engineer, July 2019- December 2020, Hatfield**

- Applied representation learning techniques to Ocado product image data
- Built, tested and integrated an image segmentation model on a robot platform for autonomous navigation in complex environments

University of Oxford **MPhys Research Project, 2018-2019, Oxford**

- Trained a model on satellite data to detect Pockets of Open Cells in clouds on an unprecedented scale
- Paper from subsequent analysis won the climate change AI workshop best paper award at ICML 2019

Personal Blog **little Language Models, 2026, <https://samasutherland.github.io/llms/>**

- Personal small-scale experiments investigating architectural modifications to transformers
- Designed and built scalable config-driven training pipeline using Pydantic and PyTorch
- Experiments to date: transformer baseline, multi-head latent attention, tensor network layers (in progress)

Skills

Numerical

- Tensor Network Methods
- Vectorised Methods
- Quantum Simulation

ML & AI

- Transformer Architectures
- Differentiable Programming
- Optimisation Methods

Implementation

- Python
- PyTorch
- Custom Autograd

Selected Publications and Patents

Nature M. B. Donnelly, Y. Chung, R. Garreis, ..., **S. Sutherland et al.**, "Large-scale analogue quantum simulation using atom dot arrays," (2026).

In Preparation **S. A. Sutherland**, M. B. Donnelly, J. G. Keizer et al., "A precision engineered Fermionic lattice for quantum-enhanced machine learning," (2026).

ACS Nano A. D. Tranter, L. Kranz, **S. Sutherland et al.**, "Machine Learning-Assisted Precision Manufacturing of Atom Qubits in Silicon," vol. 18, no. 30, (2024).

WO/2024 **S. Sutherland**, S. K. Gorman, C. Myers, and M. Y. Simmons, "Quantum machine learning devices and methods," WO2024007054A1, (2024).

WO/2023 S. K. Gorman, M. Y. Simmons, J. Keizer, ..., **S. Sutherland**, "Methods and systems for analogue quantum computing," WO2023064999A1, (2023).