Adam Callison

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Employment

University College London (March 2021 - Present)
Post-doctoral Research Fellow in Quantum Computing

- Numerically simulate quantum algorithms, using Python libraries such as `numpy`, `scipy`, `qiskit` and the D-Wave Ocean SDK
- Study and develop quantum algorithms with a focus on near-term applications
- Develop new insights in quantum amplitude estimation algorithms through analytical and numerical study
- Develop improvements to quantum approximate optimization algorithms
- Investigate a quantum annealing approach to problems in crystallography
- Supervise an MSc student for a project focused on quantum phase estimation
- Present research to local research group in group meetings, and to colleagues in the broader research programme
- Write and otherwise contribute to high-quality research articles for publication

University of Surrey (June 2014 - September 2014)
Summer Placement Student

Developed an umbrella sampling scheme for a Monte Carlo atomic simulation of crystal nucleation using Python

University of Kent (July 2013 - August 2013)
SEPNet Summer Placement Student

Performed an Optical Coherence Tomography experiment, including writing control software using the LabVIEW graphical language

Education

Imperial College London/Durham University (October 2017 - March 2021)
PhD in Continuous-Time Quantum Computing (CTQC)

- Performed detailed numerical studies of continuous-time quantum algorithms in Python using a computing cluster
- Tested these approaches on existing quantum annealing hardware via D-Wave Ocean SDK
- Developed the continuous-time quantum walk approach to solve optimisation problems
- Combined the quantum walk and adiabatic approaches into hybrid algorithms
- Considered the feasibility of applying these algorithms on near-term quantum hardware
- Developed theoretical understanding of rapid quenches in quantum annealing
- Supervised summer project students

Imperial College London (**September 2016 - 2017**) - Controlled Quantum Dynamics

MRes **Modules include:** Quantum Information - Advanced Quantum Information - Platforms for Quantum Technology
Passed with Distinction

University of Surrey (**September 2012 - 2016**) - MPhys Physics, First Class Honours

MPhys **Modules include:** Advanced Quantum Physics (82%) - Modern Computational Techniques (95%) - Quantum Physics (93%)
Average each year (87.5%, 87.5%, 80.1%)

Final year project: Simulation of Majorana quasi-particles in superconducting qubit arrays

- Designed and implemented efficient computational modelling of a spin chain model using a combination of Python and C++ on a computing cluster
- Studied analytically the Kitaev Chain, a model of a 1D fermion lattice, finding evidence of topological protection in the results

The King Edmund School - Rochford, Essex (**September 2004 - June 2011**)

A-Level Mathematics (A) - Physics (B) - Biology (A)

GCSE Physics (A*) - Chemistry (A*) - Mathematics (A*) - Statistics (A) - Biology (A) - 7 other A-C grades

Relevant Skills

Computing

- Highly capable of programming in Python, having done so extensively throughout my research and having contributed to existing Python-based software via Github, including the quimb library for quantum information and many-body calculations
- Highly proficient in using `numpy` and `scipy` for demanding numerical computations, and `pandas` for manipulating and analysing data produced from simulations and experiments
- Experienced with quantum software platforms including `qiskit` and D-Wave Ocean SDK
- Experienced with Linux systems and HPC platforms running various schedulers
- Capable of programming in FORTRAN, C++, and MATLAB after studying them at university
- Demonstrated for undergraduates during FORTRAN and Python classes

Teamwork

- Wrote papers with co-authors, managing different areas of expertise and skill sets
- Collaborated with supervisors and other colleagues both locally and remotely during my PhD and post-doctoral fellowship, producing successful research outcomes

Communication

- Presented conference talks at **CoSec Conference** (2021), **APS March Meeting** (2021), and **AQC** (2021&2022)
- Presented posters at conferences within the UK and internationally, including **QIP** (2018&2022) and **QCTIP** (2019,2020&2022)

Selected publications and pre-prints

Adam Callison and Dan E. Browne, 2022. Improved maximum-likelihood quantum amplitude estimation. *arXiv:2209.03321*.

Adam Callison and Nicholas Chancellor, 2022. Hybrid quantum-classical algorithms in the noisy intermediate-scale quantum era and beyond. Physical Review A, 106, p.010101.

David Joseph, **Adam Callison**, Cong Ling and Florian Mintert, 2020. Two quantum Ising algorithms for the shortest-vector problem. Physical Review A, 103, p.032433.

Adam Callison, Max Festenstein, Jie Chen, Laurentiu Nita, Viv Kendon, Nicholas Chancellor, 2020. An energetic perspective on rapid quenches in quantum annealing. PRX Quantum, 2, p.010338.

Adam Callison, Nicholas Chancellor, Florian Mintert and Viv Kendon, 2019. Finding spin glass ground states using quantum walks. New Journal of Physics, 21(12), p.123022.

Callison, A., Grosfeld, E. and Ginossar, E., 2017. Protected ground states in short chains of coupled spins in circuit quantum electrodynamics. Physical Review B, 96(8), p.085121.