Kim Worrall

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Education

The University of Edinburgh — Edinburgh, UK
PhD in Informatics — *Sep. 2024 – 2028*

- Project title: Concurrency-Aware Quantum Programming Languages and Compilers
- Advisors: Prof. Chris Heunen and Dr. Ohad Kammar

The University of Cambridge — Cambridge, UK
Masters of Engineering in Computer Science — *Oct. 2023 – June 2024*

- Thesis title: Typing Resource Requirements in Distributed Quantum Programming Languages
- Advisors: Prof. Jamie Vicary

Bachelor of Arts in Computer Science — *Oct. 2019 – June 2023*

- Thesis title: Compiling Functional Programs to Programs for Quantum Computers
- Advisors: Prof. Alan Mycroft and Dr. Steven Herbert

  Designed and implemented a compiler in F# that maps a hybrid quantum-classical functional language to quantum circuits.

  Developed a partial evaluation technique for reversible circuit generation from classical functions to quantum circuits, allowing recursion and procedural generation of circuits.

  Implemented compiler optimisations during IR lowering step, including using call-by-name referencing and live variable analysis to allow improved ancilla reuse and circuit optimisations. This was made possible by development of a semi-novel IR representation, quantum netlists.

Experience

Compiler Engineering Research Intern — June 2024 – Sep. 2024
Riverlane — *Cambridge, UK*

- Designed and developed an end-to-end compiler for quantum error-correction using xDSL and MLIR.
- Developed an integration pipeline with Stim and QASM to facilitate connection with existing open-source toolkits.
- Contributed upstream patches to the xDSL compiler framework.
- Work deployed as the scaffold for Riverlane's error-correction stack, and .
- Presented work at the EuroLLVM 2026 Conference.

Quantum Cryptography Research Intern — Jun. 2020 – Sep 2020
Quantinuum — *Chessington, UK*

- Implemented Randomness Amplification and Extractor protocols using adapted pseudo-randomness generation algorithms for the precursor to Quantum Origin
- Explored techniques for optimal qubit assignment when executing circuits in parallel on different IBM machines
- Benchmarked the effects of parallelisation of quantum circuits on fidelity on IBMQ machines using Qiskit and Pytket.
- Contributed on the 'Practical Randomness Amplification with Implementations on Quantum Computers' QRNG project with IBM.
- Conducted a research project into MDL-inequalities using partial entanglement to look for optimal states for a min-entropy-source randomness generator.
- Research project into feasible multi-source randomness extractors, two-source seeded extractors and bit-extractors, and modular object oriented implementations for use with quantum randomness generators.
- Investigation into naïve sources of randomness using IBM quantum computers and expanding good sources of randomness using hashing methods and pseudo-random generation techniques.

Research Activity

Quantum Instruments are a Quantum Effect Monad — Jun. 2026
LIQCS Workshop *- Extended Abstract* — *Paris, France*

How to Write a Scalable Compiler for an Error-Prone Quantum Computer — Apr. 2025
EuroLLVM *- Accepted Talk* — *Berlin, Germany*

Professional Activity

Organiser | *Scottish Programming Languages Seminar* June 2026
- Procured the venue and facilitated sign-ups and communication about the event.

Organising Team | *Young Quantum Researcher's Summer School* Jan. – Jul. 2026
- Developed lecture materials for attendees, organising and communicating the school's schedule, conducting risk assesments and venue procument.

Research Assistant - QAGORA | *Quantum Advantage Pathfinder* Feb. 2026 – Present
- Compiled and reviewed material for 15 cryptographic protocols on the Quantum Protocol Zoo
- Collaborated with administrators to update the knowledge graph system
- Developing a framework for the site's new Quantum Programming Language Zoo

Student Volunteer | *POPL* Jan. 2026
- Supported session chairs with microphones and facililitating questions, worked at reception desks.

Seminar Organiser | *Quantum Software Lab* Oct. 2025 – Present
- Scheduling biweekly seminars given by group members and external visitors.

Bounty Supervisor | *Unitary Hack* May. – Jul. 2025
- Set 3 issues for the inconspiquous quantum compiler project and reviewed pull requests from participants working on the issues.

Use-Case Reviewer | *NQCC Quantum Hackathon* May. 2025
- Expert reviewer for 5 Hackathon projects proposed by companies for feasiblilty, scientific interest, and applicability to the Hackathon.

Student Volunteer | *EuroLLVM* Apr. 2025
- Acted as session chair and coordinated speakers with the AV team.

Outreach and Community Organisation

Tutor | *Young Quantum Researchers Summer School, Edinburgh* June 2025
- Led tutorial sessions about quantum computing.

Outreach Material Designer | *Gonville and Caius College, Cambridge* May – Sep. 2024
- Developed educational materials for students to initate exploratory discussions whilst applying to university.

Access Ambassador | *Gonville and Caius College, Cambridge* Dec 2019 – May 2024
- Gave Q&As and advice to high school teachers and students at events on widening participation and access to higher education.
- Facilitated open days and school visits as a volunteer including giving over 50 tours of the university.
- Supported with reception desks and supervising candidates at interview weeks.
- Student volunteer for 3 residential summer school. Facilitated STEM based activities for the students.

Cambridge Applicant Support Program, eCAMbassador | *The University of Cambridge* Jul 2020 – May 2023
- Mentored and supported 26 prospective students from disadvantaged backgrounds through their UCAS applications to univeristy.
- Developed and gave workshops on personal statement writing, interview preparation and admissions exams
- Designed and delivered 3 mock seminars and tutorial workshops on computer science and quantum computing.

Teaching

Tutor and Lab Demonstrator | *The University of Edinburgh* Jan. – Apr 2025 and 2026
- Introduction to Quantum Programming and Semantics

Hackathons and Awards

Funded Attendance - Student Volunteer | *POPL* Jan. 2026
Fully-funded Attendance - Student Volunteer | *EuroLLVM* Apr. 2025
Quantinuum Trieste Quantum Hackathon | *Winning Team* May 2023
London Quantum Meetup Group Hackathon | *Winning Team* Oct. 2018
Arkwright Engineering Scholarship | *2 Year Scholarship, Sponsored by ARM* 2017-2019