**Brian Coyle**

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I am a research scientist in the field of quantum computing and quantum machine learning, with over a dozen peer reviewed publications, conference presentations and preprints. I am experienced in writing software and developing solutions to run directly on quantum computers, and have used multiple quantum computing packages including AWS braket, Pennylane, Qiskit, Pyquil and Cirq. I am also experienced with machine learning libraries such as PyTorch and JAX.

**Education**

**Centre for Doctoral Training- Pervasive Parallelism (MRes + PhD).**

**Address** - University of Edinburgh, South Bridge, Edinburgh, EH8 9YL.

**Supervisors** – Prof. Elham Kashefi, Prof. Vincent Danos, Prof. Tony Kennedy and Prof. Ajitha Rajan.

**2017-2018 (MRes): Completed September 2018 - Distinction**

Courses:Introduction to Quantum Computing (A3), Introduction to Modern Cryptography (A2).

Dissertation - Grade (84%): *Useful Quantum Advantage with an Ising Born Machine.*

**2018-2021 (PhD).**

Dissertation: *Machine learning applications for noisy intermediate-scale quantum computers.*

Examiners: Prof. Iordanis Kerenidis, Prof. Raul Garcia-Patron.

**Master of Science Honours (MSc) - Distinction,**

**Theoretical Physics, Final Grade (85%):**

2016-2017: University of Edinburgh, South Bridge, Edinburgh, EH8 9YL

Selection of courses:

Relativistic Quantum Field Theory (A1), Statistical Physics (A1), Symmetries of Particles of Fields (A2), Gauge Theories in Particle Physics (A2), Advanced Cosmology (A2).

Research Project - Grade (86%),Supervisors – Dr. Matty Hoban, Prof. Elham Kashefi:

I completed a 3-month research project in Quantum Computing under supervisors Prof. Elham Kashefi and Dr. Matty Hoban: *One-Sided Device Independent Certification of Random Numbers.*

**Bachelor of Science Honours (BSc),**

**Applied and Computational Mathematics:**

2012-2016: University College Dublin (UCD), Belfield, Dublin, Ireland.

September 2014 – May 2015: McGill University, Montréal, Quebec, Canada.

Degree Classification: First Class Honours.

GPA: 4.2 (Out of a possible 4.2)

Selection of Final Year Courses:

Advanced Computational Science (A+), Theoretical Astrophysics (A+), Stochastic Models (A+), General Relativity (A+), Differential Geometry (A+), Environmental Fluids (A+), Quantum Field Theory (A+), Survey of Applied and Computational Mathematics (A+), Classical Electrodynamics (A+), High Energy Particle Physics (A+).

**Professional Experience**

**2025 - Present**

**Principal Researcher, Fujitsu Research of Europe,** August 2025 - Present.

Fujitsu Research of Europe Ltd., 9 Albert St, Slough, United Kingdom, SL1 2BE.

**Manager:** Dr. Michał Krompiec (Group Manager, Quantum Research Group).

**Description:** Conducting research into quantum algorithms and software, and their deployment on quantum computers.

**2025 - Present**

**Senior Researcher (part-time), University of Edinburgh,** May 2025 - Present.

University of Edinburgh, South Bridge, Edinburgh, United Kingdom, EH8 9YL.

**Manager:** Prof. Elham Kashefi (Chief Scientist of National Quantum Computing Centre & Personal Chair of Quantum Informatics at UoE).

**Description:** Quantum machine learning lead and co-technical lead for UK National Quantum Computing Centre (NQCC) Testbed Technical Evaluation (TTE) project consortium.

**2023 - 2025**

**Staff Scientist, QCWare,** October 2022 – July 2025.

Coeur Marais, 64-66 Rue des Archives, 75003 Paris, France

**Manager(s):** Prof. Iordanis Kerenidis, Dr. Robert Parrish, Dr. Jérôme Gonthier.

**Description:** Conducting research in quantum machine learning and quantum algorithms, and supporting software development. Leading and supporting client consulting projects, particularly in the finance sector.

**2021 - 2022**

**Postdoctoral Researcher, University College London,** October 2021 – October 2022.

London Centre for Nanotechnology (LCN), UCL Department of Physics & Astronomy, Gower St,

London, United Kingdom, WC1E 6BT.

**Supervisor:** Prof. Andrew Green.

**Topic:** Tensor networks for quantum and quantum inspired machine learning.

**2021**

**Research Scientist (part time), Cambridge Quantum Computing/Quantinuum** December 2020 - September 2021.

Partnership House, Carlisle Place, London, England, SW1P 1BX (Remote).

**Supervisors:** Dr. Marcello Benedetti & Dr. Mattia Fiorentini.

**Topic:** Generative quantum machine learning, variational inference.

**2020**

**Quantum Software Intern, Phasecraft,** August 2020 – September 2020.

9/F, Colston Tower, Colston St, Bristol BS1 4XE (Remote).

**Supervisors:** Dr Ashley Montanaro and Dr. Stasja Stanisic.

**Topic:** Variational quantum eigensolver for the Hubbard model.

**External Consultant, Phasecraft,** October 2020.

9/F, Colston Tower, Colston St, Bristol BS1 4XE (Remote).

**Supervisors:** Dr Ashley Montanaro and Dr. Stasja Stanisic.

**Topic:** The quantum approximate optimisation algorithm.

**2019**

**Tutor, School of Mathematics, University of Edinburgh,** September 2019 – May 2020.

James Clerk Maxwell Building, Peter Guthrie Tait Rd, Edinburgh EH9 3FD

**Description:** Tutor for several 1st/2nd year undergraduate mathematics courses.

**Volunteer Work/Outreach**

**QuHackEd Co-organiser,** July 2019.

University of Edinburgh.

I was one of the primary organisers of QuHackEd, the first Quantum Computing Hackathon to be held in Scotland. This involved raising funding from a variety of sponsors, including NQIT, LFCS, SICSA, GCHQ, Rigetti Computing and the School of Informatics. I also wrote a series of challenges in the form of Jupyter Notebooks to educate the 60 participants on using quantum computers through the Rigetti Forest Platform and python library, PyQuil.

Key Skills:

* Organisational and communication skills in arranging and advertising the event.
* Software and educational skills in writing the challenges and speaker line-up for a sequence of corresponding introductory and advanced talks.

**Young Quantum Information Scientists (YQIS) Conference**, Michigan State University (MSU), April 2021.

Program committee member.

**IEEE Quantum Week, International Conference on Quantum Computing and Engineering (QCE24), Quantum Algorithms Track (QALG)**, Albuquerque, New Mexico, USA, September 2025.

Program committee (PC) member.

**Quantum Techniques in Machine Learning, 2025 (QTML2025)**, 6 Science Drive 2, S16 Faculty of Science, Singapore 117546.

Program committee (PC) member.

**Journal/Conference reviewer.**

I have peer reviewed several publications across journals and conferences in physics, machine learning and quantum computing. These include: Physical Review A/X/X Quantum, Quantum Information Processing, Transactions on Pattern Analysis and Machine Intelligence, Quantum Machine Intelligence, Annalen der Physick, Nature Scientific Reports, Quantum.

Achievements

* UK/EU Masters Scholarship for University of Edinburgh, 2016-2017.
* Class Medal for highest mark in Theoretical Physics MSc, 2017.
* Higgs Prize for highest mark in Theoretical Phys. & Mathematical Phys. MSc, 2017.
* Conway Gold Medal for highest mark in ACM BSc, UCD 2015-2016.

Supervision

* Ieva Čepaitė – MPhys Project 2019 (A Continuous Variable Born Machine).
* Oskar Leimkuhler – Internship Summer 2019 (Investigation of Variational Quantum Eigensolver).
* Nishant Jain - Internship Summer 2021 (Initialisation of quantum approximate optimisation).
* Snehal Raj - PhD Student (2024-Present), Quantum techniques for machine learning.
* Natansh Mathur - PhD Student (2024-Present), Quantum techniques for machine learning.

**Research Output**

Publications

* One-Sided Device Independent Certification of Unbounded Random Numbers .
	+ **B Coyle**, Matty J. Hoban and Elham Kashefi.
	+ Pre-Proceedings of 9th International Workshop on Physics and Computation - DOI: [10.4204/eptcs.273.2](https://doi.org/10.4204/eptcs.273.2).
* Certified Randomness From Steering Using Sequential Measurements.
	+ **B Coyle**, Elham Kashefi and Matty J. Hoban.
	+ Cryptography 2019, 3(4), 27. - DOI: [10.3390/cryptography3040027](https://doi.org/10.3390/cryptography3040027).
* The Born supremacy: quantum advantage and training of an Ising Born machine.
	+ **B Coyle**, Daniel Mills, Vincent Danos, Elham Kashefi.
	+ Nature Partner Journals, Quantum Information 6 (1), 60 - DOI: [10.1038/s41534-020-00288-9](https://doi.org/10.1038/s41534-020-00288-9)
* Robust Data Encodings for Quantum Classifiers.
	+ Ryan LaRose and **B Coyle.**
	+ Physical Review A 102 (3), 032420 - DOI: [10.1103/PhysRevA.102.032420](https://doi.org/10.1103/physreva.102.032420)
* Progress toward practical quantum cryptanalysis by variational quantum cloning.
	+ **B Coyle**, Mina Doosti,Elham Kashefi, Niraj Kumar.
	+ Physical Review A 105 (4), 042604 - DOI: [10.1103/PhysRevA.105.042604](https://doi.org/10.1103/physreva.105.042604)
* Quantum versus classical generative modelling in finance.
	+ **B Coyle**, Maxwell Henderson, Justin Chan Jin Le, Niraj Kumar, Marco Paini, Elham Kashefi.
	+ Quantum Science and Technology 6 (2), 024013 - DOI: [10.1088/2058-9565/abd3db](https://doi.org/10.1088/2058-9565/abd3db)
* F-divergences and cost function locality in generative modelling with quantum circuits.
	+ Chiara Leadbeater, Louis Sharrock, **B Coyle**, Marcello Benedetti.
	+ Entropy 23 (10), 1281 - DOI: [10.3390/e23101281](https://doi.org/10.3390/e23101281)
* Variational inference with a quantum computer.
	+ Marcello Benedetti, **B Coyle**, Mattia Fiorentini, Michael Lubasch, Matthias Rosenkranz.
	+ Physical Review Applied 16 (4), 044057 - DOI: [10.1103/PhysRevApplied.16.044057](https://doi.org/10.1103/physrevapplied.16.044057)
* A continuous variable Born machine.
	+ Ieva Čepaitė, **B Coyle**, Elham Kashefi.
	+ Quantum Machine Intelligence 4 (1), 6 - DOI: [10.1007/s42484-022-00063-3](https://doi.org/10.1007/s42484-022-00063-3)
* Graph neural network initialisation of quantum approximate optimisation.
	+ Nishant Jain, **B Coyle**, Elham Kashefi, Niraj Kumar.
	+ Quantum 6, 861 - DOI: [10.22331/q-2022-11-17-861](https://doi.org/10.22331/q-2022-11-17-861)

Preprints

* Deterministic tensor network classifiers.
	+ Lewis Wright, Fergus Barratt, James Dborin, Vinul Wimalaweera, **B Coyle**, Andrew G. Green.
	+ ArXiv (quant-ph): 2205.09768 - DOI: <https://doi.org/10.48550/arXiv.2205.09768>
* Probably approximately correct quantum source coding.
	+ Armando Angrisani, **B Coyle**, Elham Kashefi.
	+ ArXiv: 2112.06841 - DOI: <https://doi.org/10.48550/arXiv.2112.06841>
* Training-efficient density quantum machine learning.
	+ **B Coyle**, Snehal Raj, Natansh Mathur, El Amine Cherrat, Nishant Jain, Skander Kazdaghli, and Iordanis Kerenidis.
	+ ArXiv: 2405.20237 - DOI: <https://doi.org/10.48550/arXiv.2405.20237>
	+ Under review at Nature Partner Journals, Quantum Information (npj QI)
	+ Presented at: Quantum Computing Theory in Practice (QCTIP24), Edinburgh, April 2024 and Quantum Techniques in Machine Learning (QTML24), Melbourne, Australia, November 2024 - long talk.
* Hyper Compressed Fine-Tuning of Large Foundation Models with Quantum Inspired Adapters.
	+ Snehal Raj, **B Coyle.**
	+ ArXiv 2502.06916 - DOI: <https://doi.org/10.48550/arXiv.2502.06916>
	+ Under review at Neurips 2025.
* Bayesian Quantum Orthogonal Neural Networks for Anomaly Detection
	+ Natansh Mathur, **B Coyle**, Nishant Jain, Snehal Raj, Akshat Tandon, Jasper Simon Krauser, and Rainer Stoessel
	+ ArXiv: 2504.18103 - DOI: <https://doi.org/10.48550/arXiv.2504.18103>
	+ Under review at IEEE Quantum Week 2025.

Patent

Computer system and method for utilizing variational inference (pending): Patent number: US20220292377A1

Talks/Conferences

* **QUISCO, April 2019** – Generative Modelling with Quantum Computers.
* **9th International Workshop on Physics and Computation July 2018** - One-Sided Device Independent Certification of Unbounded Random Numbers.
* **Symposium on AI and Quantum Computing - Technology, Techniques and Ethics - April 2019** - Generative Modelling with Quantum Computers.
* **Quantum Techniques in Machine Learning (QTML2019) – October 2019 -** The Born Supremacy: Quantum Advantage and Training of an Ising Born Machine.
* **Quantum Techniques in Machine Learning (QTML2020) – October 2020 -** Quantum versus Classical Generative Modelling in Finance.
* **Quantum Techniques in Machine Learning (QTML2020) – October 2020 -** A Continuous Variable Born Machine (Presented by Ieva Čepaitė).
* **Quantum Techniques in Machine Learning (QTML2021) – November 2021 -** Graph neural network initialisation for quantum approximate optimisation.
* **Quantum Natural Language Processing (QNLP23) - May 2023 (Invited speaker) -** Deterministic tensor network classifiers.
* **Quantum Computing Theory in Practice (QCTIP24) - April 2024 -** Efficiently trainable density quantum neural networks.

Posters

* **14th Conference on the Theory of Quantum Computation, Communication and Cryptography (TQC + NISQ 2019)** - The Born Supremacy: Quantum Advantage and Training of an Ising Born Machine.
* **Pervasive Parallelism Industrial Engagement Event 2019** - The Born Supremacy: Quantum Advantage and Training of an Ising Born Machine.

Miscellaneous

Experienced with LaTeX, MATLAB, Python. Have worked with several quantum computing software platforms (Rigetti PyQuil, IBM Qiskit, AWS Braket, Azure Quantum), and hardware vendors (IBM Quantum, Rigetti, IonQ). Experience with machine learning libraries PyTorch and Jax. Some experience with Tensorflow.