Léa Cassé

PhD Candidate
University of Waikato & École Polytechnique
Quantum Machine Learning for Data Streams

Christchurch
New Zealand
+33 6 89 22 42 22
casse.lea@gmail.com
léa-cassé-51b961215/
LeaCasse

Professional Summary

I design and analyze variational quantum models for time-series forecasting and decision-making under streaming constraints, focusing on Quantum Re-uploading Units and Quantum Residual Blocks. My research combines Fourier and spectral analysis with gradient and trainability studies to better understand expressivity in shallow circuits. I developed a World Bank GIC–winning QRU prototype for flood-risk forecasting, co-authored a reinforcement learning study on bus headway regulation, and wrote a preprint on calorimetry optimization using QRU architectures. My technical work relies on PennyLane, Qiskit, PyTorch, and qBraid for reproducible quantum-classical experiments.

Core Skills

Quantum ML & QC	QRU/QRB, variational circuits, parameter encodings, QAOA, Fourier/spectral analysis, notions: QSVT & coherent amplitude/phase; PennyLane, Qiskit.
ML & Data	PyTorch, scikit-learn, time-series/streaming, RL (policy/value, sim), metrics
Engineering	Python, NumPy/pandas, experiment tracking, qBraid, Git, basic HPC/GPU.
Languages	French (C2), English (C1), Spanish (B1).

Experience & Research

Mar 2024 – Mar 2027 **PhD in Quantum ML for Data Streams (co-tutelle Univ. of Waikato — École polytechnique / IP Paris, LLR)**, *Prof. Albert Bifet, Prof. Bernhard Pfahringer, and Dr. Frédéric Magniette*

- **RQ1 — Applications (QRU/QRB):** 1-qubit QRU for calorimetry; hyperparameter sweeps; GIC–World Bank winner (QRU flood-risk prototype presented at the Quantum World Congress, Washington, D.C).
- **RQ2 — Theory:** Fourier/spectral expressivity (QRU > mono-encoded VQC); gradient & trainability studies.
- **RQ3 — Streaming & decision:** Bus headway RL (next-station load); QRU→QAOA CVaR pipeline; QLSTM prototypes.

2015 – 2023 **Projects & Internships**

- **Quantum ML for Data Streams** (*AI Lab, Univ. of Waikato*, 2023): streaming QML. (Prof. Albert Bifet)
- **NV centers in diamond** (*L2C Montpellier*, 2022): experimental internship (Dr. V. Jacques).
- **Bell inequalities (proj. & exp.)** (*Univ. Montpellier*, 2022).
- **Quantum chaos (proj.)** (*Univ. Paul Sabatier*, 2020).
- **Bell violations (QC)** (*Quantumalta, Univ. Malta*, 2021) (Dr. A. Xuereb).

Publications & Preprints

2025 Cassé, L., Ponnambalam, S. *Quantum Reupload Units: A Scalable and Expressive Approach for Time Series Learning*. Presented at Quantum Week 2025 - IEEE-QCE25

2025 *Reinforcement learning for bus traffic: next-station load prediction and dispatch simulation* (in preparation).

2025 *Optimizing Hyperparameters for Quantum Data Re-Uploaders in Calorimetric Particle Identification* (in preparation).

Teaching

2019-2025 Private tutoring for Quantum Physics & Maths (*Superprof*), ∼4 h/week.

2024-2025 French teacher at Alliance Française of Hamilton and Christchurch, ∼6 h/week.

2024-2025 French teacher at Waikato Montessori Education Centre then at Christchurch Rudolf Steiner School ∼1.5 h/week.

Education

2021 – 2023 **MSc in Quantum Physics (with honors)**, *Univ. des Sciences, Montpellier, France*

2018 – 2021 **BSc in Advanced Fundamental Physics (with honors)**, *Univ. Paul Sabatier, Toulouse, France)*

2015 – 2018 **Scientific Baccalaureate (with honors)**, *Lycée Joseph Saverne, L'isle-Jourdain, France*

2012 – 2015 **College Certificate (first class honors)**, *Collège Edouart Lartet, Gimont, France*

Awards

2025 **Global Industry Challenge** — Winner of World Bank Track, Connected DMV: QRU flood-risk forecasting prototype.

2025 **UNSW Peter Farrell Cup Program**, University of New South Wales.

2025 **Aqora**, Quantum Pioneer badge earned

2024 **IBM Quantum Challenge 2024 Achievement**, IBM Research.