Jeffrey Morais

Quantum Software Engineer

Website | Email | LinkedIn | Github

Educational Background

2024 - 2026 **M.Sc. Physics**, *University of Victoria*, Victoria, Canada

- Thermalization time scaling with Hilbert space dimension and coupling parameters, informing coherence constraints for quantum device architectures.
- Scholarships: NSERC CREATE Quantum Computing Program, BCGS, UVic FGS ($31,500)

2019 - 2023 **B.Sc. Honours Physics**, *McGill University*, Montréal, Canada

- Thesis on topological compactification techniques in quantum gravity, published in MSURJ.
- Scholarships: 2 NSERC USRAs + FRQNT, SURA, SURE, BSA ($41,600)

Experience

Present **Quantum Software Lead**, *BTQ*, Vancouver, Canada

- Designed post-quantum consensus protocols **to strengthen cryptographic security across distributed networks**, leveraging topological data analysis and quantum key distribution to characterize autonomous network evolution.
- Built QLDPC, a quantum low-density parity-check error correction toolkit **with interactive circuit construction, real-time decoding, and Qiskit integration**, and QRiNG, a quantum-blockchain protocol **for verifiable random number generation** via QKD.
- Developed Léonne, modular consensus networks **for post-quantum blockchain proof with topological trust partitioning**, enabling resilient verification under adversarial conditions.

Collaborators: Prof. Gavin Brennen, Dr. Peter Rohde

Present **Quantum Algorithms Researcher**, *University of Victoria*, Victoria, Canada

- Built exact diagonalization simulations **across fifteen quantum many-body models** to verify the eigenstate thermalization hypothesis, benchmarking thermalization via level spacing statistics and time evolution analysis.
- Quantified thermalization time scaling with Hilbert space dimension **to establish coherence bounds for quantum device design**, mapping coupling parameter landscapes to identify optimal operating regimes.
- Mapped thermalization landscapes across spin, fermionic, and bosonic systems **to reveal exploitable parameter regimes for controlling relaxation dynamics**, directly informing coherence-time optimization in quantum hardware.

Supervisor: Prof. Thomas Baker

Earlier Experience

2023 - 2024 **Quantum Machine Learning Researcher**, *Fudan University*, Shanghai, China

- Developed topological quantum neural networks **to bypass barren plateau limitations in quantum machine learning**, implementing gradient-free classification via spin-network encoding.
- Employed topological quantum field theory **to encode quantum information with inherent noise resilience**, supporting scalable and high-fidelity quantum computing operations.

Supervisors: Prof. Antonino Marcianò, Prof. Emanuele Zappala

Summer 2022 **Computational Physics Researcher**, *McGill University*, Montréal, Canada

- **Increased signal extraction efficiency by 1.7x** in noisy environments via wavelet and match-filter techniques, and created Python algorithms **to identify profiles with 45% greater accuracy**.
- Automated signal classification pipelines **to constrain distributions in non-stationary noise**, improving predictive accuracy for computational physics models.

Supervisor: Prof. Robert Brandenberger

2019 - 2020 **Quantum Simulation Developer**, *Vanier College*, Montréal, Canada

- Solved non-linear Hamilton-Jacobi PDEs **using Crank-Nicolson numerical methods**, generating predictive quantum trajectories in pilot-wave frameworks.
- Implemented RNN-driven simulations **to model quantum trajectories in real-time**, adapting efficiently to arbitrary potential landscapes in Python.

Supervisor: Prof. Ivan Ivanov